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Foreword

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

If there are any questions, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor. This manual may illustrate options and accessories not installed on your equipment.
Any modification made without written authorization or approval from HD HYUNDAI CONSTRUCTION EQUIPMENT can create a safety hazard.

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

Intended Use

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

Engine and Emission Control System Maintenance

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

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

Machine Capacity

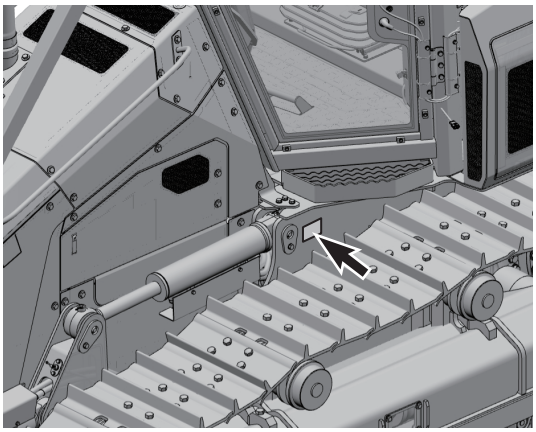
Do not exceed machine capacity by modifying machine or using unapproved attachments.

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

Product Identification Number (PIN)

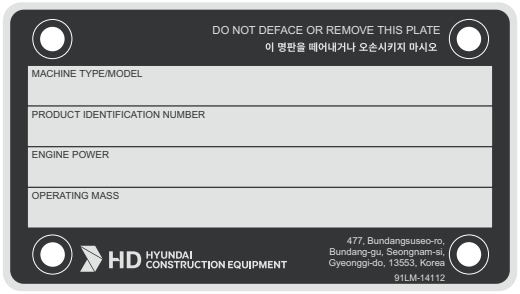
A product identification plate is located outside the left side of the machine.

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.*



DS2300920

Figure 1



DS2401649

Figure 2

Component Serial Numbers

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

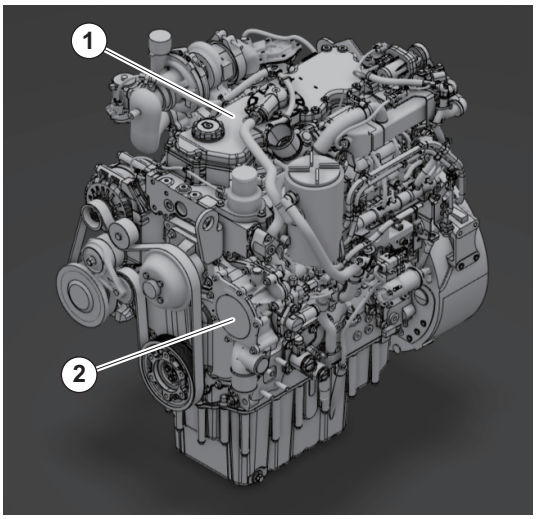
Engine Identification

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



DS2300708

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

Regulation (EU) 2017/654 Annex XV

HD HYUNDAI CONSTRUCTION EQUIPMENT provide to the customer all information and necessary instructions for the correct operation of the engine in order to maintain the gaseous and particulate pollutant emissions of the engine within the limits of the approved engine type or engine family.

The customer should operate machine in accordance with the following information and instruction.

Engine Operation and Maintenance

You must comply with the following things when you operate an engine.

- The engine, including the emissions control system, shall be operated, used and maintained in accordance with the instructions provided to the end users in order to maintain the emissions performance of the engine within the requirements applicable to the engine's category.
- No deliberate tampering with or misuse of the engine emissions control system in particular with regard to deactivating or a reagent dosing system should take place.
- This machine is equipped with an engine exhaust emission control system. The operator is responsible for proper operation and maintenance of the emission controls system.
- It is essential to take prompt action to rectify any incorrect operation, use or maintenance of the emissions control system in accordance with the rectification measures indicated by the warnings referred to Emission Control System
- Where the engine is to be operated within the Union on diesel or non-road gas-oil, a fuel with sulphur content not greater than 10 mg/kg (20 mg/kg at point of final distribution) cetane number not less than 45 and a FAME content not greater than 8% v/v shall be used.
- Use the correct lubrication oil to maintain the performance of the emissions control system. Refer to "Table of Recommended Lubricants" for more information.
- Maintain in accordance with the scheduled emission-related maintenance requirements. Refer to "Hydraulic Oil and Filter Service Intervals" for more information.

Malfunctions & Inducement

The operator will be informed by the operator warning system when the emission control system does not function correctly.

Ignoring the operator warning signals will lead to the activation of the operator inducement system, resulting in an effective disablement of machine operation.

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.

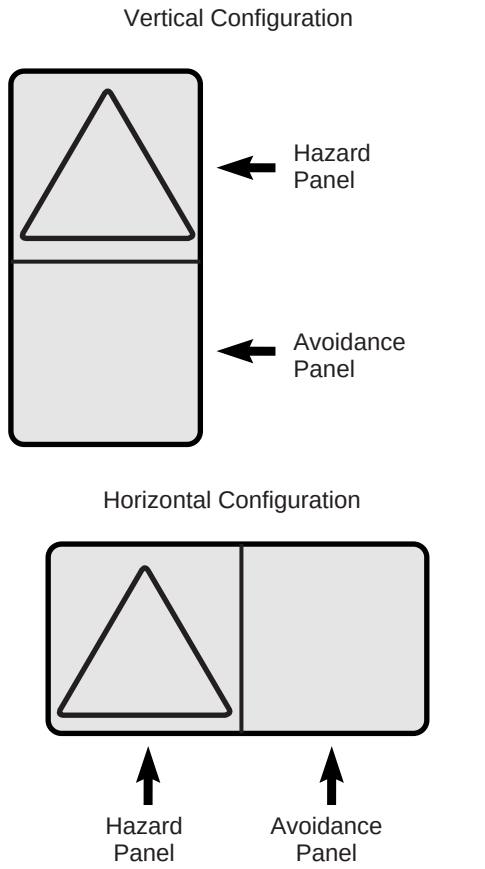
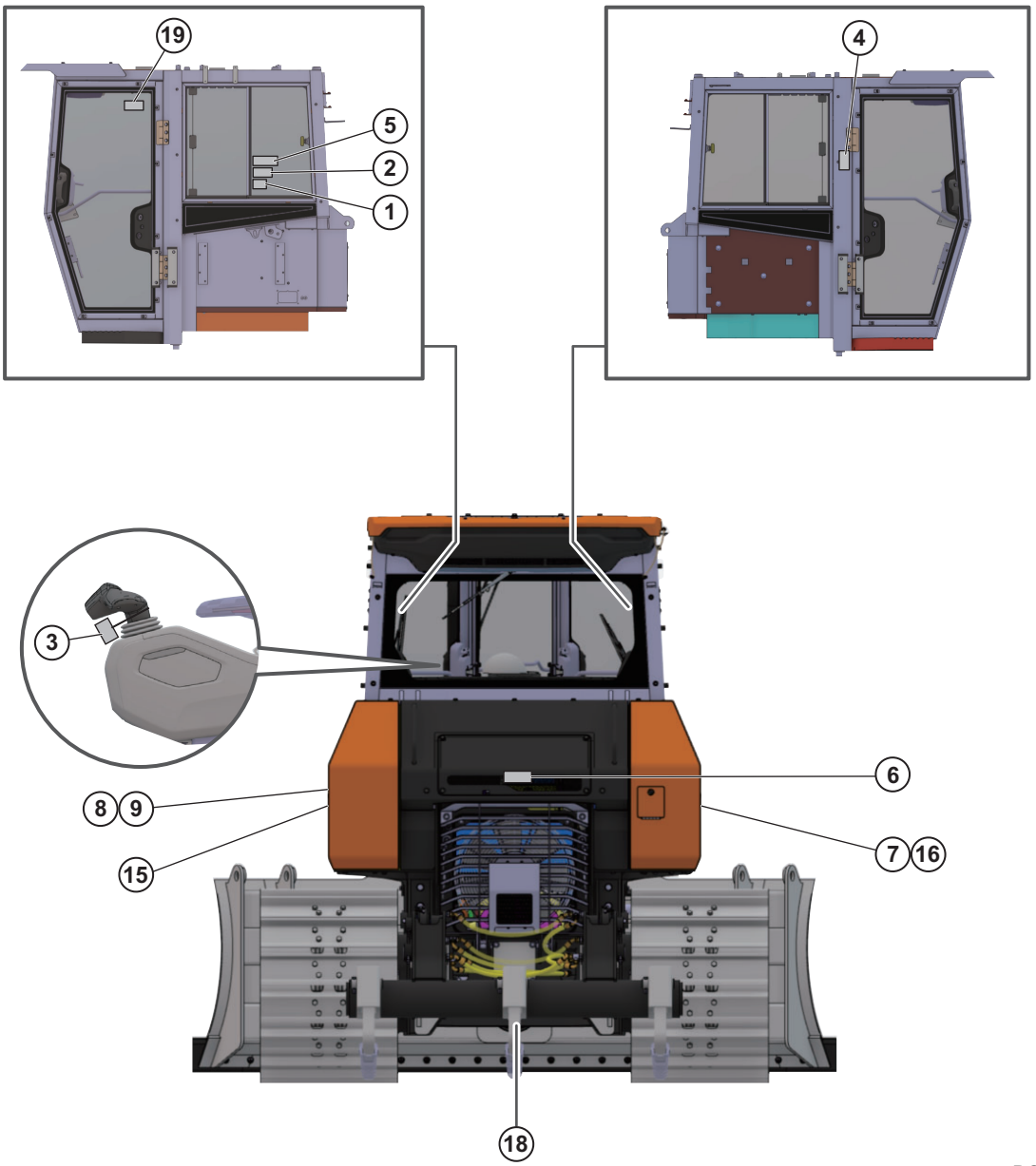
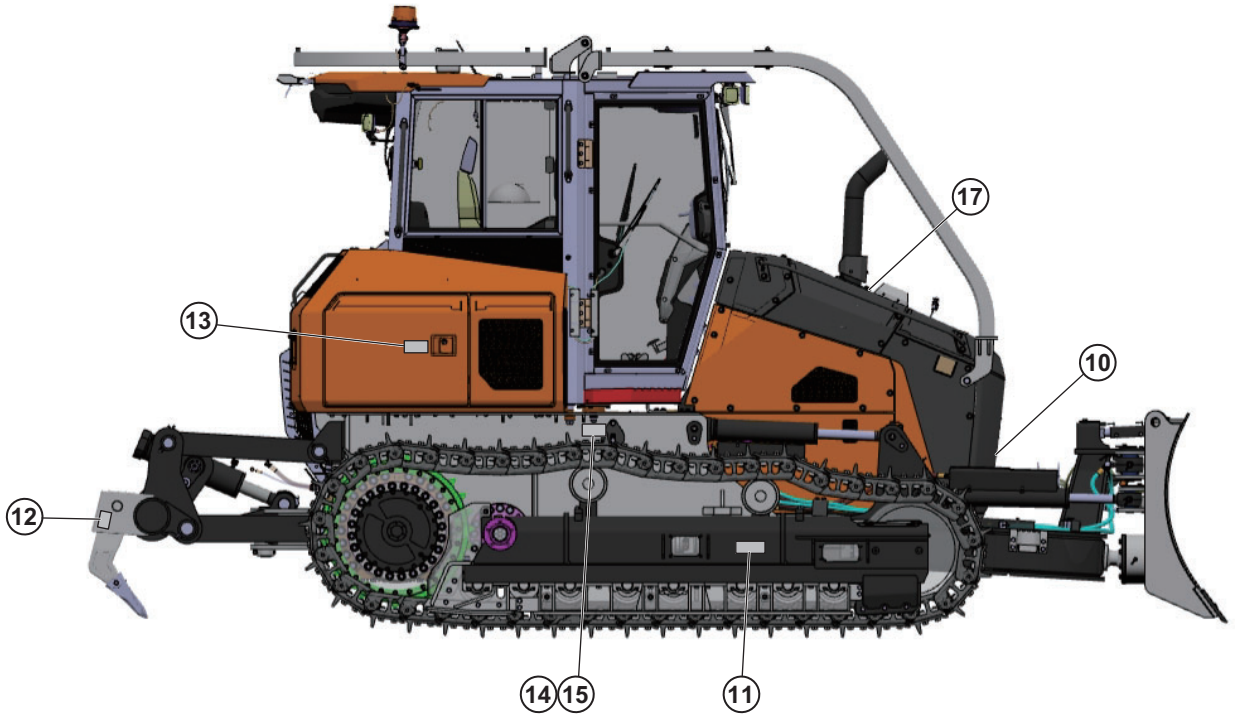


Figure 1



DS2202245

Figure 2



DS2300921

Figure 3

1. General Hazard (950205-09969)

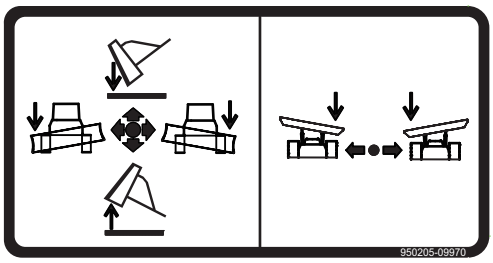
DS2201206

WARNING

AVOID DEATH OR SERIOUS INJURY

- Never use machine without instructions.
- Read Operation & Maintenance Manual before operation.
- Sound the horn to alert bystanders before operating.
- Always fasten your seat belt.
- Explosion or electrocution can occur if machine contacts utility lines or pipes. Check for overhead or underground lines before operating.
- Secure and lock front window when it is in raised position.
- Attachment interference can cause death, serious injury or machine damage. Check attachment to machine clearance through full working cycle before operation.
- Keep bystanders out of swing area and travel path and always look in the travel direction.
- Ensure mirrors and rear/side view camera are clean and working properly.
- Never operate machine from outside the operator's position.
- TO LEAVE THE MACHINE:
  1) Lower the attachment and dozer blade (if equipped) to the ground and make sure all controls are in neutral.
  2) Stop engine and remove key.
  3) Set hydraulic cutoff switch to OFF position.

2. Control Pattern (950205-09970)



DS2201207

WARNING

AVOID INJURY OR DEATH

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

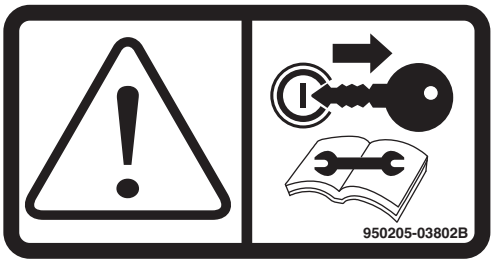
Refer to the "Operating Instructions" section of this manual for detailed information regarding the work levers (joysticks) control functions.

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

WARNING

AVOID DEATH OR SERIOUS INJURY

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



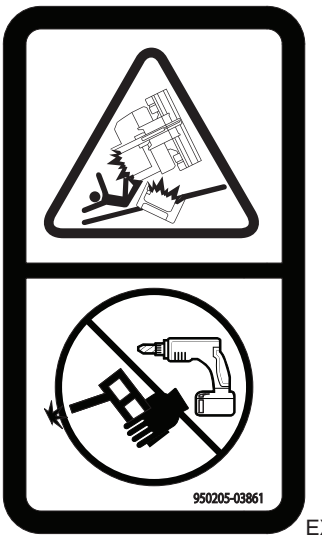
DS1801807

4. **ROPS/FOPS Warning (950205-03861)**

WARNING

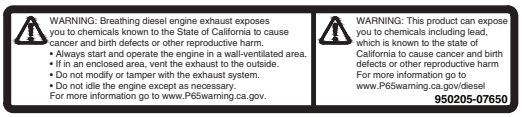
AVOID DEATH OR SERIOUS INJURY

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



EX1301197

5. **California Proposition 65 (950205-07650)**



DS1801347

6. **Rotating Fan (950205-03788)**

WARNING

CONTACT WITH ROTATING FAN CAN CAUSE DEATH OR SERIOUS INJURY

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

EX1301182

7. DEF (AdBlue®) (950205-01489A, 950205-02964)

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

DS2201208

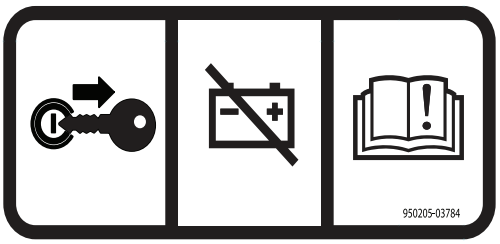
8. Battery Disconnection (950205-03784)

NOTICE

AVOID ELECTRICAL COMPONENT DAMAGE

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

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



EX1301184

9. Battery Explosion (950205-03785)

EX1301183

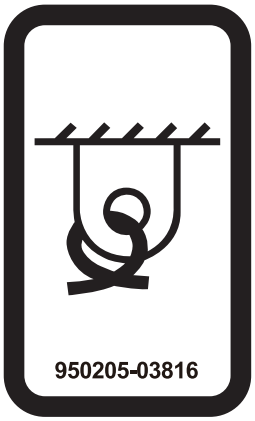
WARNING

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.**

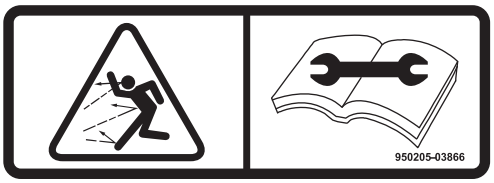
10. Tie Down (950205-03816)

Identifies tie down point location.



EX1301203

11. Flying Debris or Objects (950205-03866)



EX1301185

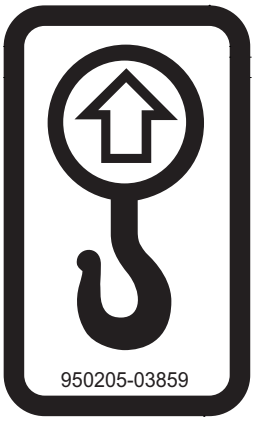
WARNING

HIGH-PRESSURE GREASE CAN CAUSE DEATH OR SERIOUS INJURY

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

12. Lift Down (950205-03859)

Identifies lift point location.

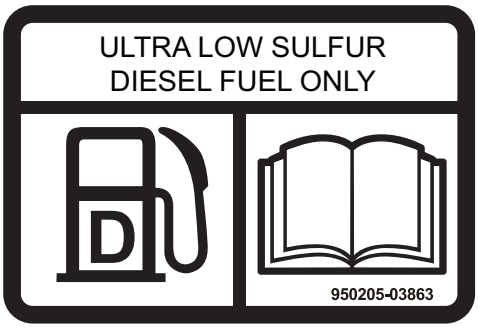


DS2201209

13. Ultra Low Sulfur Diesel Fuel (950205-03863)

NOTICE

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



EX1301196

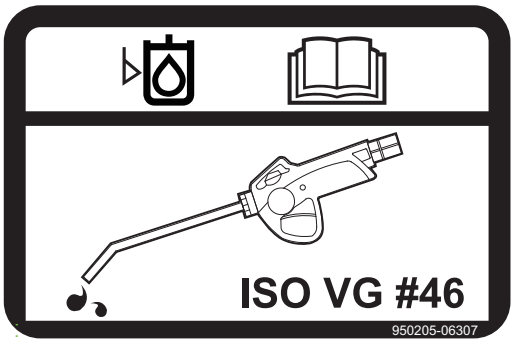
14. Hydraulic Oil Check (If Equipped) (950205-06307, 950205-06309)

NOTICE

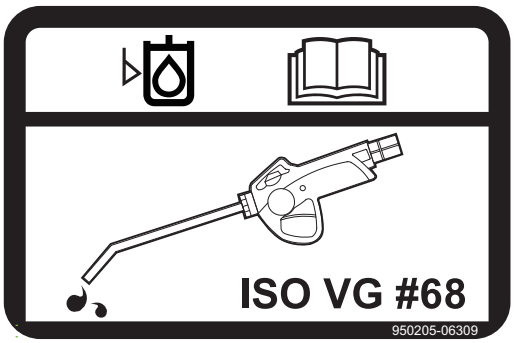
INCORRECT OIL LEVEL OR INCORRECT FLUID CAN CAUSE HYDRAULIC SYSTEM DAMAGE

Place the machine 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.



DS2201210



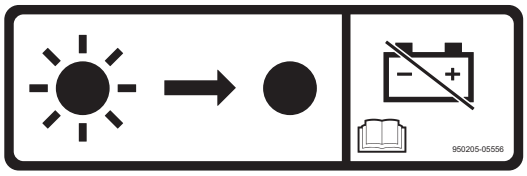
DS2201211

15. Wait to Disconnect (950205-05556)

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.



DS2102421

16. Pressurized Gas and Fluid (950205-03782)

WARNING

AVOID DEATH OR SERIOUS INJURY

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

EX1301187

17. Hot Surface (950205-03777)

WARNING

HOT SURFACE CAN CAUSE SERIOUS BURNS

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

EX1301189

18. Fall Hazard (950205-03783)

WARNING

AVOID DEATH OR SERIOUS INJURY

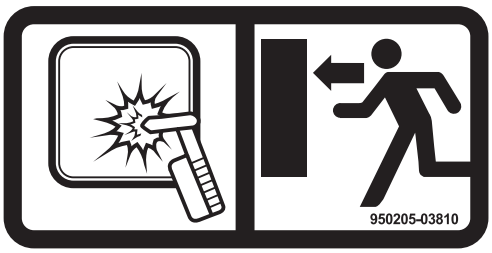
Do not step in this area.

EX1301188

19. Emergency Exit (950205-03810)

NOTICE

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



EX1301190

General

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 hydraulic cutoff Switch 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/FOPS certification plate.

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

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

Never use attachment as a work platform or manlift.

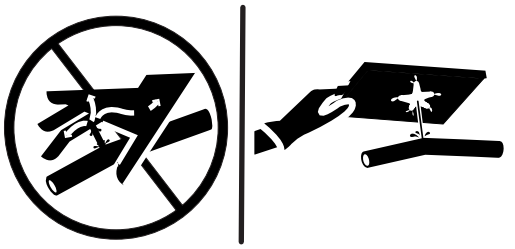
Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor about auxiliary hydraulic kits for attachments installation. If you are in doubt about compatibility of a particular attachment with a machine, consult your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

Pressurized Fluids

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

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

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



FG018457

Figure 4

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

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

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

Obey all local laws and regulations for disposal of liquids.

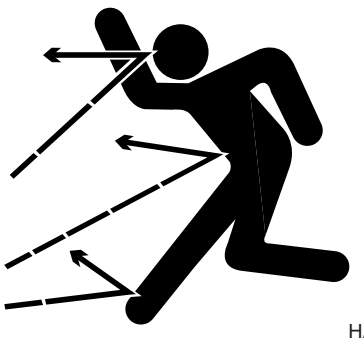
To prevent hot coolant from spraying out, stop engine and wait for coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

Flying or Falling Objects

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

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

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



HAOA110L

Figure 5

HAOA100L

Figure 6

Personal Protective Equipment (PPE)

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

Do not wear oily clothes. They are highly flammable.

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

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

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

HAOA020L

Figure 7

Correction of Machine Problems

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

Crushing and Cutting

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

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

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

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

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

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

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

HDO1010L

Figure 8

Hot Coolant and Oils - Burn Prevention

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

FG019095

Figure 9

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

FG019096

Figure 10

Fire and Explosion Prevention

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

Inspect for and remove all flammable materials such as spilled fuel and oil, and debris from machine. Do not allow any flammable materials to accumulate on machine.

Always observe the following:

HDO1015I

Figure 11

- 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 12

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 1-33, for proper procedure in this manual.

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

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

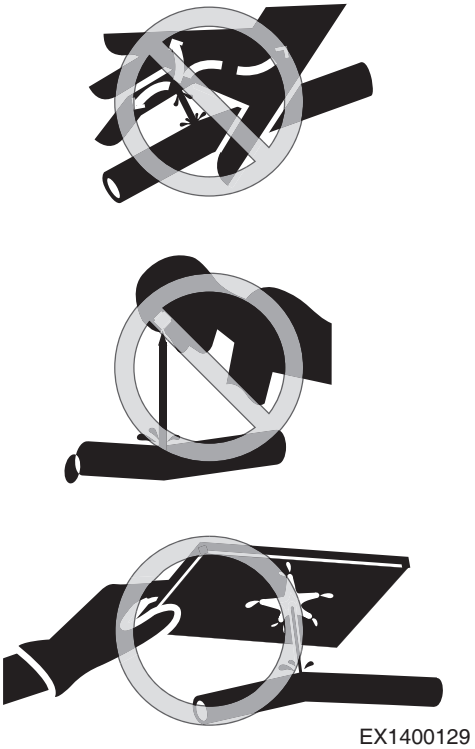
Hydraulic System

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

Tighten or replace any parts that show leakage.

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

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



EX1400129

Figure 13

Fueling

Use caution when you are refueling a machine.

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

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

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

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

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

Always place plastic fuel containers on the ground before filling.

EX1400130

Figure 14

Never Use Ether Starting Aids

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

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

FG018458

Figure 15

Welding and Grinding

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

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

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

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

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

If a Fire Occurs

If a fire occurs:

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

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

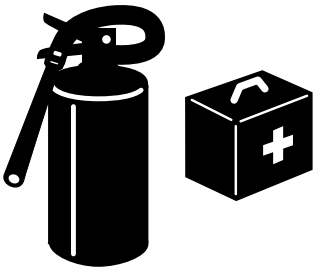
FG018459

Figure 16

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

To be prepared in the event of a fire:

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



HDO1009L

Figure 17

Electrical System and Electrical Shock

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

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

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

Roll-over Protective Structure (ROPS) / Falling Object Protective (FOPS)

The operator's cabin is a ROPS/FOPS certified structure for protecting the seat-belted operator. It absorbs the impact energy of a roll-over impact. Do not allow machine weight (mass) to exceed certified value on certification plate. If weight is exceeded, the ROPS/FOPS structure will not be able to fulfill its safety function.

Do not increase machine weight beyond certified value by modifying machine or by installing attachments on machine. If weight limit of protective equipment is exceeded, protective equipment will not be able to protect operator, and this can result in death or serious injury. Always observe the following:

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

ROPS/FOPS Certification

This machine has an operator's cabin that meets ROPS/FOPS requirements. The seat belt must be worn for roll-over protection.

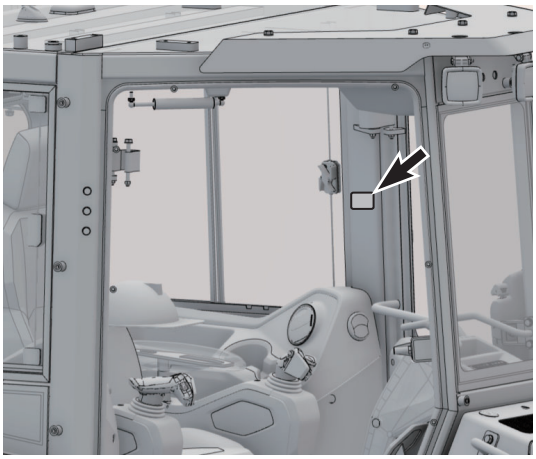
The ROPS/FOPS certification plate (Figure 18) is found on the left side of the cabin on most models. It may vary slightly in its location on some models.

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

Never modify the ROPS/FOPS 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 3471:2008.

FOPS - Falling Object Protective Structure complies with ISO 3449



DS2201212

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 roll-over and falling objects, and can result in death or serious injury.

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 machine may be necessary to meet travel restrictions or particular conditions at work site. See Shop Manual for information on partial disassembly.

Refer to "Transportation" on page 5-1, for information on loading, unloading and towing.

The machine can be disassembled into parts for transporting. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for assistance with disassembly.

Loading and Unloading

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

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

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

Transporting Machine

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

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

Operation

Always make sure that the machine is properly maintained.

Before Engine Starting

Machine Condition

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

- Check coolant, fuel, and hydraulic tank oil levels, and check for clogged air cleaner and damage to electrical wiring.
- Check operation of gauges, cameras (if equipped) and angle of mirrors, and check that hydraulic cutoff Switch is set to "O" (OFF) position.
- Check that work equipment and travel controls move freely, and work controls return to "NEUTRAL" when released.
- Check that attachment is properly attached and locked.

Make sure that the machine is equipped with a lighting system that is adequate for job conditions and lights are working properly.

Before moving machine, check position of undercarriage. The normal travel position is with idler wheels to front under cabin and drive sprockets to rear. When undercarriage is rotated in reversed position, directional or travel controls must be operated in opposite directions.

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

Know maximum operating dimensions of your machine.

Work Site

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

Before starting engine and moving machine, make sure that no one is underneath machine, around machine, or on machine.

Know width and length of your machine and work equipment to maintain proper clearance when you operate machine or work equipment near fences or near boundary obstacles.

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

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

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

Mounting/Dismounting

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

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

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

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

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

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

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

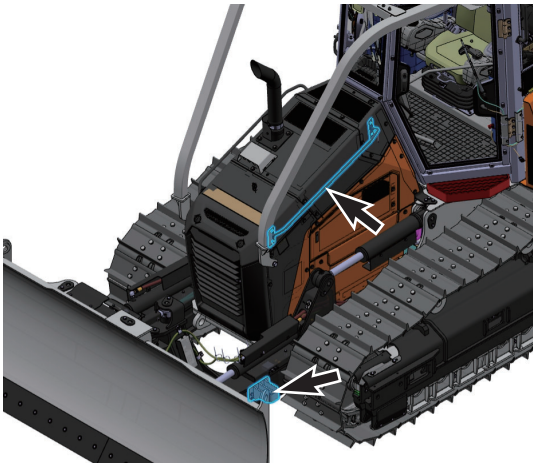


Figure 19 DS2300922

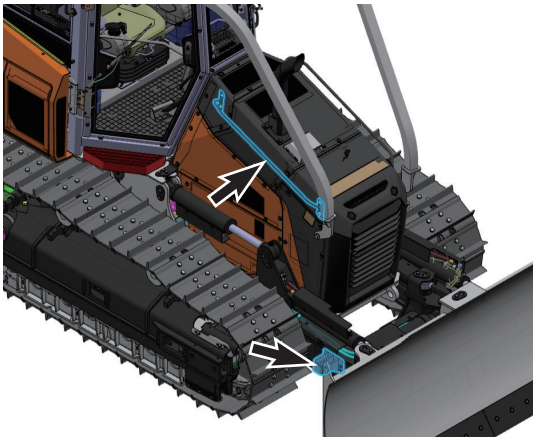


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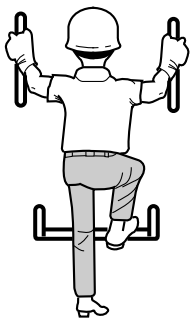
Figure 20



HA3O1003

Figure 21

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 hydraulic cutoff Switch in "O" (OFF) position. If you accidentally move work equipment levers when they are not locked, the machine could suddenly move and cause damage, death or serious injury.

Seat Belt

Check seat belt daily for correct function.

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

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

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

WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

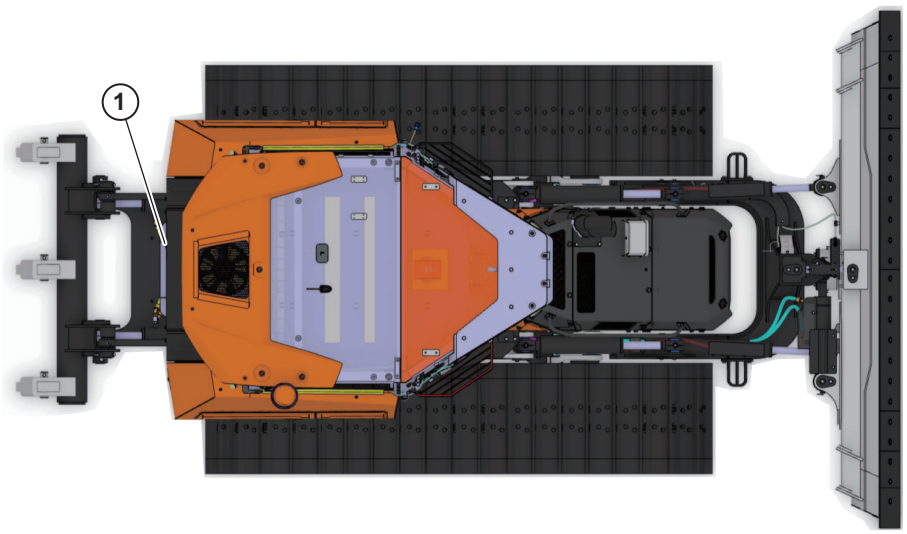
Always wear seat belt when operating machine.

Visibility Information

A rear view camera (if equipped) 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 22 shown.*



1. Rear View Camera

DS2201215

Figure 22

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 (camera(s)) are in proper working condition.

Your machine may be equipped with visual aids such as 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 of machine.

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

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

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

Restricted Visibility

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

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

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

Figure 23 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.

- Visible areas without visual aids at the ground level

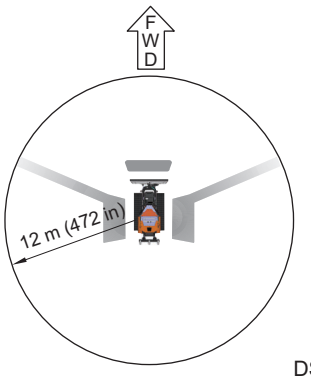


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Figure 23

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/side 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.

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 24

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 25) are mounted.
2. Connect one end of red cable (1, Figure 25) 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 25) 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 25).

   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.

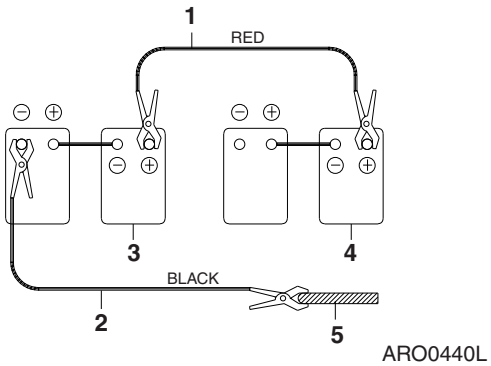

Figure 25

Disconnecting Booster Batteries

1. Disconnect black negative (-) cable (2, Figure 25) from the machine frame (5) first.
2. Disconnect the other end of black negative (-) cable (2, Figure 25) from the booster batteries (3).
3. Disconnect red positive (+) cable (1, Figure 25) from the booster batteries (3).
4. Disconnect red positive (+) cable (1, Figure 25) 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.

- Check operation of work equipment and travel system.
- Check for any problems 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.

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 pilot control lever (joystick), do not start engine or move lever.

Prevent personnel and all bystanders from walking or standing under raised arm, unless it is properly supported.

Traveling

When traveling with the machine, always keep lights on; make sure that you are in compliance with all federal, state and local laws and regulations concerning warning flags and signs.

If engine stops while machine is traveling and the machine is not equipped with an emergency steering system, it will be impossible to operate the steering system and control machine movement.

Pilot control valve lever (joystick) should not be operated while traveling.

Lower work equipment so it is 250 ~ 350 mm (9.8 ~ 13.8 in) above ground.

Never travel over obstacles or steep 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 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.

Keep to permissible water depth. Refer to "Working in Water".

When traveling over bridges or structures check first that bridge or structure can withstand weight of machine. Never exceed the maximum permitted load for bridges or structures.

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

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

- When changing travel direction from forward to reverse or from reverse to forward, reduce speed and stop machine before changing travel direction.
- Sound horn to alert people in area.
- Check that there is no one in area around machine. There are restricted visibility areas behind machine.
- When operating in areas with poor visibility, designate a flagman to direct work site traffic.
- Keep unauthorized personnel away from turning radius or travel path of the machine.
  Be sure to observe these precautions even if a backup alarm or mirrors are installed.
- Check that backup 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.
- Do not operate attachments while traveling.
- Know permitted ground pressure. Ground pressure of the machine may change depending on attachment and load.
- Keep height and length of attachment in mind.

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

Do not operate attachments while traveling.

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

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

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

When traveling on rough ground, travel at low speed, and avoid sudden changes in direction.

Always operate within permissible water depth. Permissible water depth is up to centerline of upper track roller(s).

When passing over bridges or structures on private land, check that structure is strong enough to support weight of machine. Before traveling on public roads, check with appropriate authorities and follow their instructions.

Never exceed maximum permitted load for bridges.

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

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

Keep height and length of attachment in mind.

Operation on Slopes

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

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

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

On hills, banks or slopes, carry equipment approximately 20 - 30 cm (8 - 12 in) above ground. In case of an emergency, quickly lower equipment 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.

If the machine begins to slide down on a grade, immediately lowering equipment.

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

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

- When traveling up a steep slope, extend work equipment to front to improve balance, keep work equipment approximately 20 - 30 cm (8 - 12 in) above ground, and travel at low speed.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change position of the machine, then travel backup the slope again.

Equipment Lowering with Engine Stopped

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

Engine Stop

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

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

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

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

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

Parking Machine

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 an incline is unavoidable, block wheels to prevent movement. Lower equipment completely to ground, or to a support saddle, to prevent unintended or accidental movement.

When parking on public roads, provide fences barricades, signs, flags, or lights, and put up any other necessary signs to ensure that passing traffic can see machine clearly. Park the machine so the 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 and place the hydraulic cutoff switch to "O" (OFF) 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 that the 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 set pilot cut off switch to "O" (LOCKED) position, before stopping the engine or immediately after engine stops running.

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:

Before Storage

Keep the machine in the position to prevent rust of the hydraulic piston rods.

- Inspect for damaged, loose or missing parts.
- Repaint necessary areas to prevent oxidation.
- Wash and clean all parts of machine.
- Store the machine in an indoor, stable place. If stored outside, cover with a waterproof tarp.
- Perform lubrication procedures on all grease points.
- Apply a coating of light oil to the exposed plated metal surfaces (such as hydraulic cylinder rods, etc.) and to all the control linkage and control cylinders. (Control valve spools, etc.)
- Remove battery from the machine to be fully charged and stored.
- Inspect the surge tank and radiator to make sure the antifreeze level in the system is correct. Make sure that antifreeze concentration is enough for the lowest temperature anticipated during storage.
- Seal all external openings (i.e. engine exhaust outlet, crankcase and hydraulic breather, fuel vent line, etc.) with tape wide enough to cover the opening, regardless of size.

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

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

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

During Storage

- Once a month, start the engine and follow the "Hydraulic Oil Warm-up" procedures listed in this manual.
- Operate hydraulic functions for traveling, swing and digging two or three times for lubrication after "Hydraulic Oil Warm-up". Coat all the moving parts and surfaces of the components with a new oil film after operating. At the same time, charge the battery. Rotate track to prevent track seizing".
- Every 90 days, use a hydrometer to measure the protection of the coolant. Refer to the antifreeze/coolant protection chart to determine protection of the cooling system. Add coolant as required.

After Storage

- Before operating the work equipment, remove all grease from the hydraulic cylinder rods.
- Add grease and oil at all lubrication points.
- Adjust fan and alternator belt tension.
- Connect the charged battery.
- Check condition of all hoses and connections.
- Check the levels of engine oil, fuel, coolant and hydraulic circuit oil. If there is water in the oil, change all the oil.
- Change all filters.
- Inspect for signs of nests. (i.e. birds, rodents, etc.)
- When starting the engine after long-term storage, follow the "Hydraulic Oil Warm-up" procedures listed in this manual.

Maintenance

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

WARNING

AVOID DEATH OR SERIOUS INJURY

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

- Never service HD HYUNDAI CONSTRUCTION EQUIPMENT without instructions.
- Always lower equipment and blade to ground before doing any maintenance.
- Use correct procedure to lift and support machine.
- 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 hydraulic cutoff Switch in "O" (OFF) 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.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine and press horn switch. If horn does not sound, the main power is shut off.)
- Put blocks under track to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
  - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
  - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.
- Do not touch any control levers or control pedals. If any control levers or control pedals must be operated, always give a signal to other workers and instruct them to move away.

- When performing maintenance of engine and you are exposed to engine noise for long periods of time, wear hearing protection while working.
- If noise from the machine is too loud, it can cause temporary or permanent hearing problems.
- Do not smoke when you service an air conditioner or if refrigerant gas is present.
- Inhaling fumes either from a flame or gas from a cigarette that has contacted air conditioner refrigerant can cause death or serious injury.
- Never put maintenance fluids into glass containers. Drain all liquids into a suitable containers.
- Unless instructed otherwise, perform maintenance with equipment in servicing position. Refer to this manual for procedure for placing equipment in servicing position.

Warning Tag

Alert others that service or maintenance is being performed by attaching a "DO NOT OPERATE" warning tag to the operator's cabin controls – and other machine areas, if required. Use of a chain or cable to keep the hydraulic cutoff Switch in "O" (OFF) position, complies with OSHA's lockout requirements.

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

- Always attach "DO NOT OPERATE" warning tag to work equipment control lever in the operator's cabin to alert others that you are performing service or maintenance on the machine. Attach additional warning tags on the machine, if necessary.
- Keep warning tags in tool box while it is not used. If there is not tool box or in the owner manual storage pocket.
- If any other person starts engine, and operates control levers or control pedals while you are performing service or maintenance, it can result in death or serious injury.

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

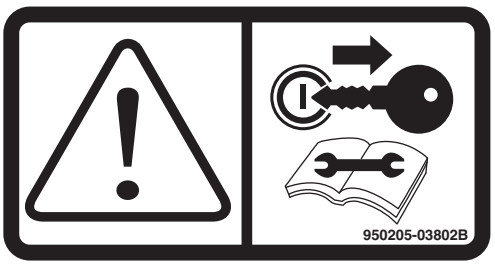

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Figure 26

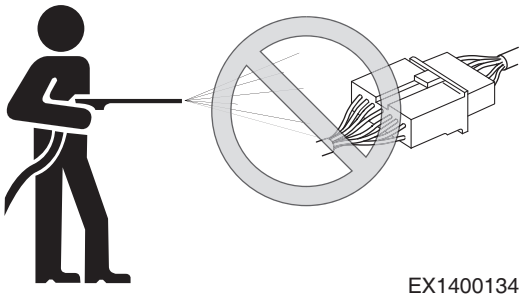
Cleaning

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 27

Proper Tools and Clothing

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

Disassembling Precautions

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

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

Use of Lighting

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

Fire and Explosion Prevention

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

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

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

Tighten all fuel and oil caps.

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

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

Clean all electrical connections and tighten all electrical connections. Check electrical wires daily for wires that are loose or frayed. Tighten all loose, and repair or replace all frayed, electrical wires before operating machine.

Remove all flammable materials and debris from the engine compartment, exhaust system components and hydraulic lines.

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Figure 28

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Figure 29

Burn Prevention

When checking surge tank 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 surge tank.

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

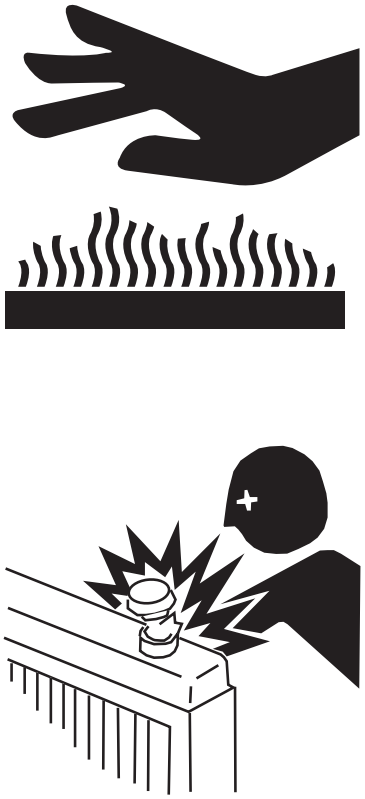

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Figure 30

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.

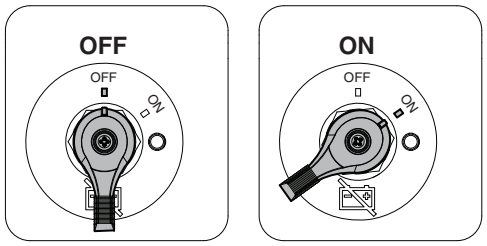

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Figure 31

Lock Inspection Covers

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

Working on Machine

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

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

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Figure 32

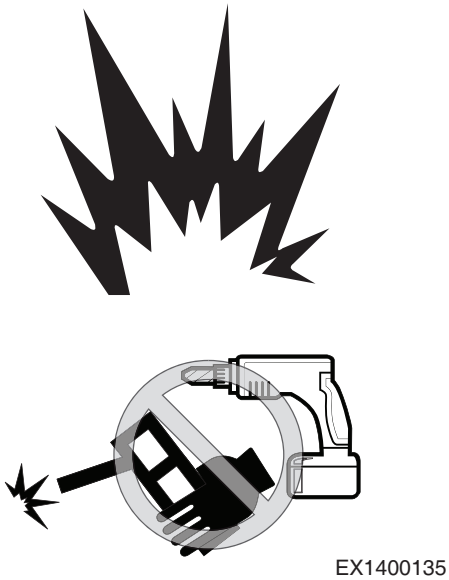
Accumulator

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

When performing maintenance on pilot control system, release hydraulic pressure in system as described in "Handling of Accumulator" on page 4-82.

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 33

Compressed Air

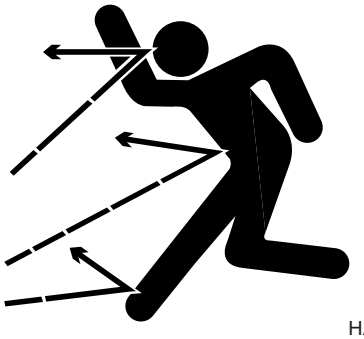
- When cleaning filters, radiator or other components with compressed air, there is a hazard of flying particles that can result in serious injury.
- Always wear safety goggles, dust mask, leather gloves, and other protective devices.

Track Tension Adjustments

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

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

Keep your face and body away from grease valve. Refer to "Track Tension" on page 4-84, for proper procedure in this manual or Shop Manual.



HAOA110L

Figure 34

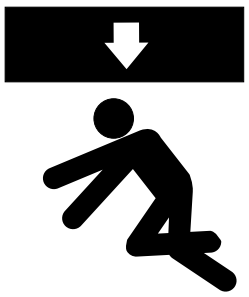
Supports and Blocking for Work Equipment

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 35

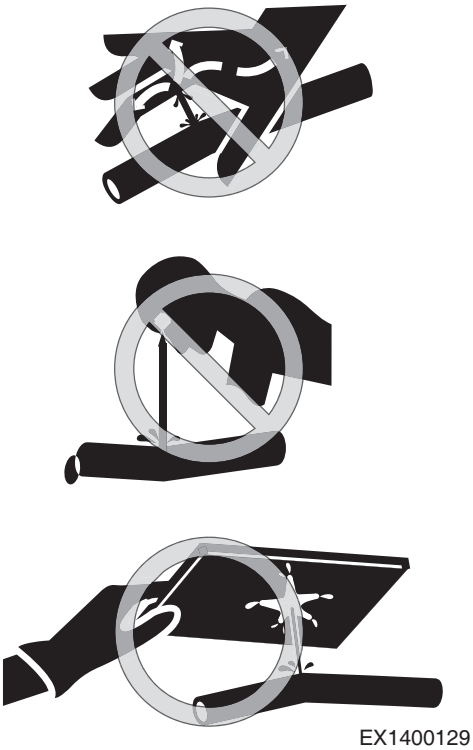
High-pressure Lines, Tubes and Hoses

When inspecting or replacing high-pressure piping or hoses, check to verify that pressure has been released from circuit. Failure to release pressure can result in death or serious injury. Release pressure as described in "Handling of Accumulator" on page 4-82.
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.

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 36

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.

EX1400136

Figure 37

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 "OFF" engine, 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 "OFF" engine. Then disconnect negative (-) terminal of battery to stop flow of electricity.

Environment and Circumstances

Work Site Areas Requiring Extra Caution

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

Drop-off or Edge

When working near or at an edge of 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. 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.

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.

Loose or Soft Ground

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

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

Thawing of frozen ground, rain, traffic, piling and blasting are other factors which increase risk of landslide. The risk also increases on sloping ground.

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, if ground should begin to collapse. Lower work equipment to improve stability of machine.

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 equipment 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.

Underground Operation

If working 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.

Working in Water

NOTICE

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

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

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.

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

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 4-17, in this manual or Shop Manual for details.
4. Always keep the fuel tank fully filled after completion of the operation. Always drain water from the fuel tank before and after the operation. In addition, check the water separator, and drain it if required. The fuel filter, if frozen, may interrupt the flow of fuel. Periodically remove water from the fuel tank, drain water from the filter, and replace the filter upon regular basis. To prevent fuel from being clogged because of formation of wax in fuel, make sure that wax formation point of fuel is lower than atmospheric temperature.

WARNING

AVOID DEATH OR SERIOUS INJURY

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

5. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-14, 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 surge tank. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block cooling passages.
   - Formation of scale and rust in cooling system occurs more rapidly in extremely high temperatures. Change antifreeze each year to keep corrosion inhibitor at full strength.
   - If necessary, flush cooling system periodically to keep passages clear. Avoid use of water with a high alkali content which increases scale and rust formation.
2. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries and store in a cool place.

NOTICE

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

3. Service fuel system as directed in "Fuel Level - Check" on page 4-28, 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 4-14, 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 4-14. 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 4-14, 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 surge tank 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 38

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

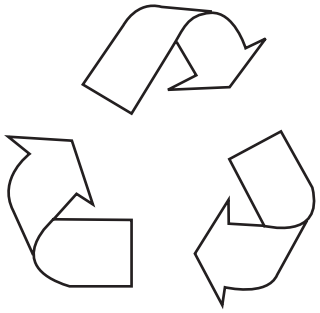
Physical contact with used motor oil or gear oil could create a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

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.



FG009156

Figure 39

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)	76 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)	105 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 more than 0.5 m/s^2 (less than 1.15 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.

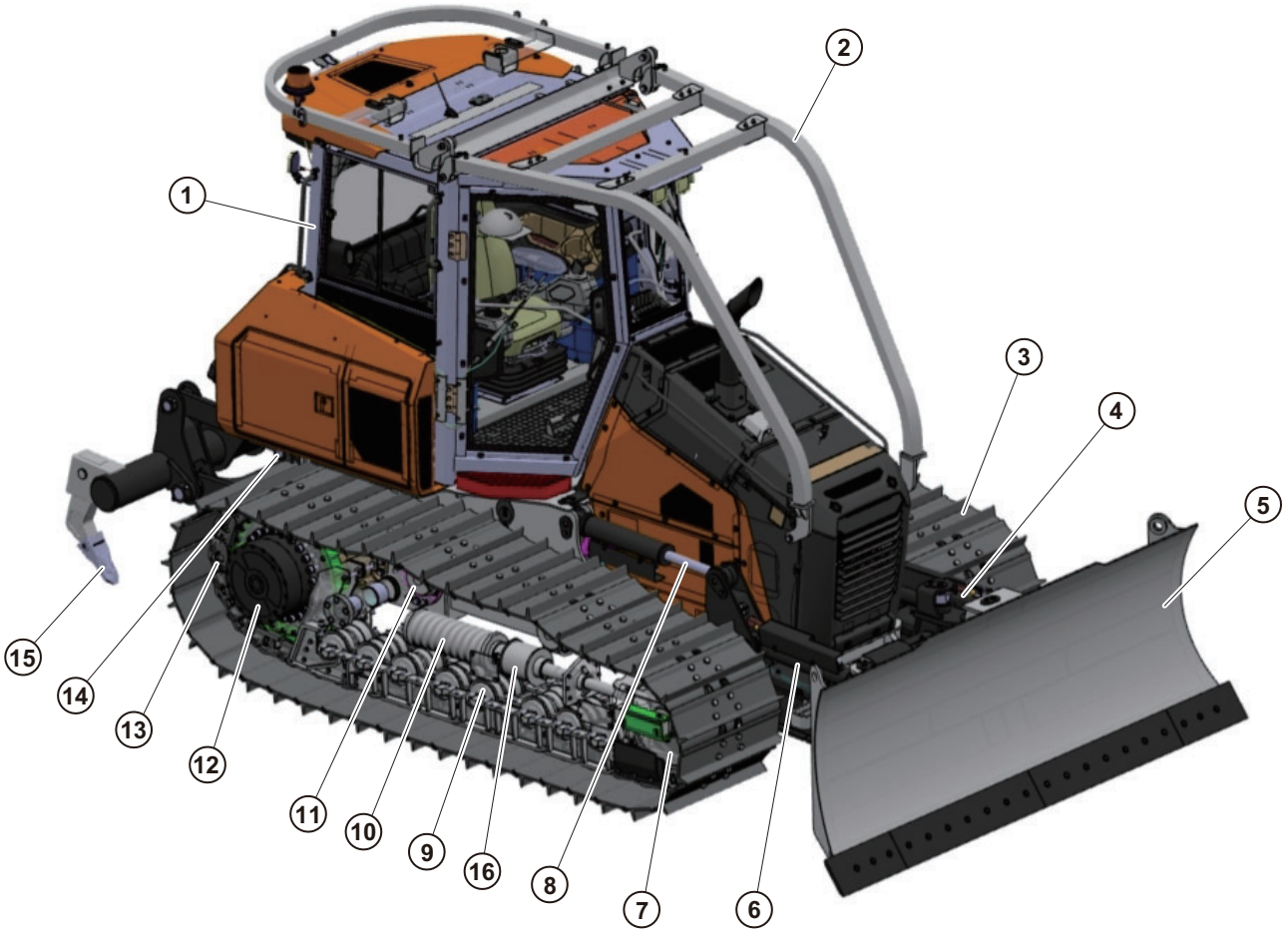
Warning symbols will appear above the gauges on the display monitor when a problem with the machine is detected.
The operator should monitor machine functions on the display monitor to ensure the machine is operating properly.

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

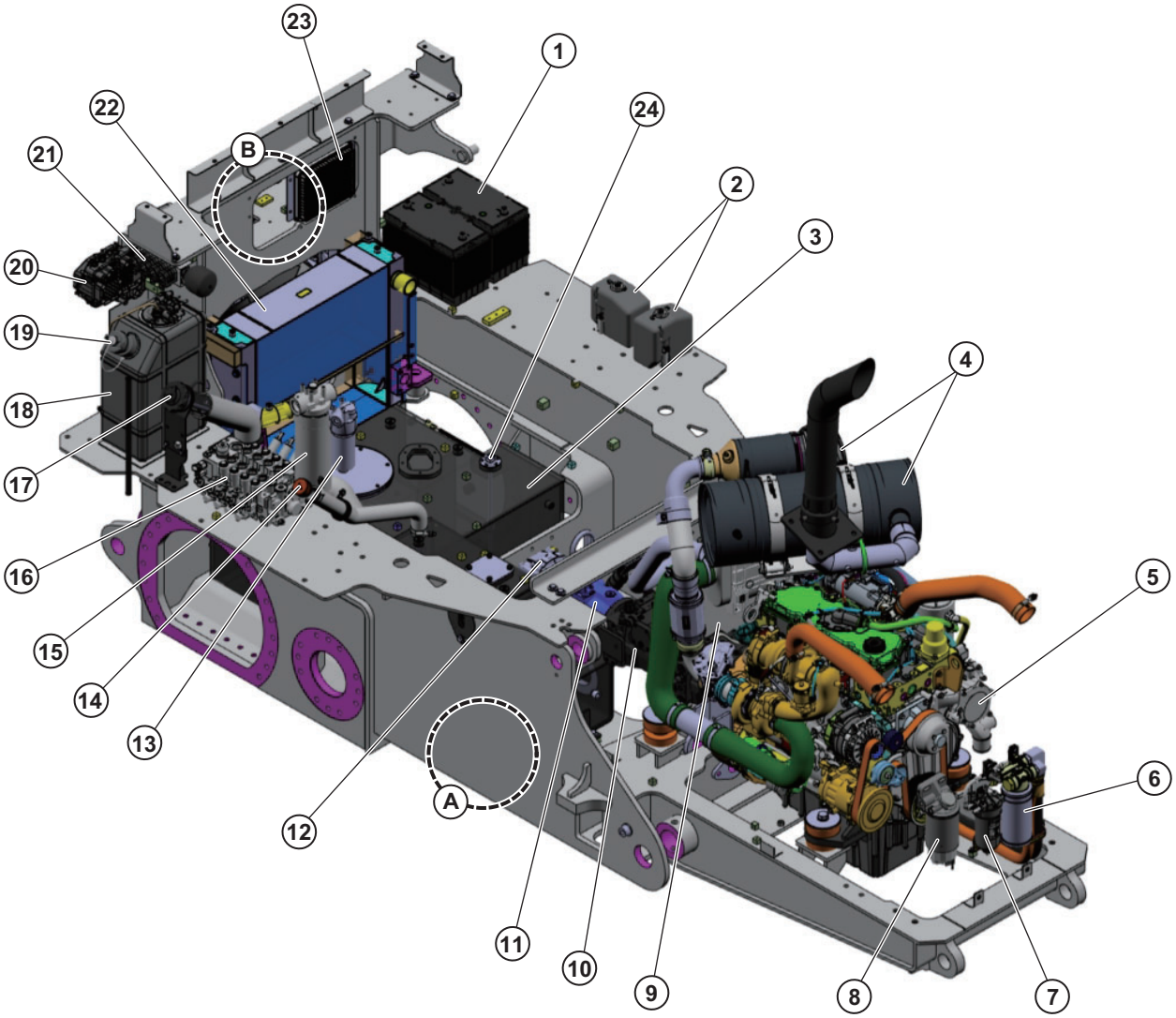


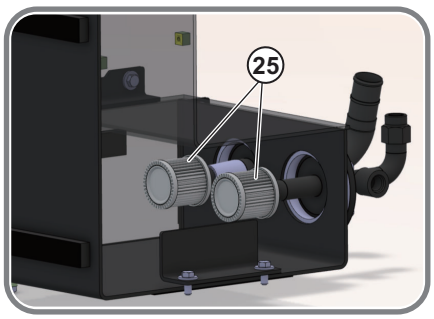
DS2300764

Figure 1

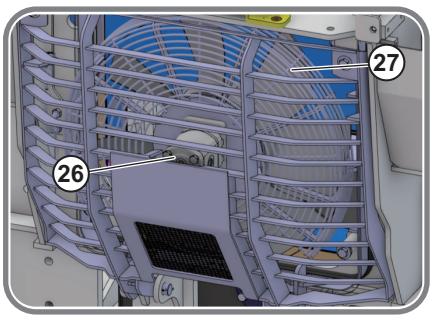
Reference Number	Description
1	Cabin
2	Cabin Guard
3	Track Shoe
4	Arm Crank
5	Blade
6	Angle Cylinder
7	Idler
8	Lift Cylinder

Reference Number	Description
9	Lower Roller
10	Track Adjuster
11	Upper Roller
12	Travel Motor
13	Sprocket
14	Ripper Cylinder
15	Ripper
16	Grease Cylinder





Detail View **A**



Detail View **B**

DS2300748

Figure 2

Reference Number	Description
1	Battery
2	Window Washer Tank
3	Fuel Tank
4	Aftertreatment Ass'y
5	Engine
6	Engine Oil Filter
7	Main Fuel Filter
8	Pre Fuel Filter (Water Separator)
9	Air Cleaner
10	HST Pump
11	Main Pump
12	Gear Pump
13	HST Filter
14	Hydraulic Oil Tank Breather

Reference Number	Description
15	Return Filter
16	Main Control Valve
17	Fuel Cap
18	DEF (AdBlue®) Tank
19	DEF (AdBlue®) Tank Cap
20	DEF (AdBlue®) Filter
21	Solenoid Valve
22	Radiator
23	Aircon Filter
24	Fuel Sensor
25	Suction Filter
26	Fan Motor
27	Fan Blade

Operator's Area

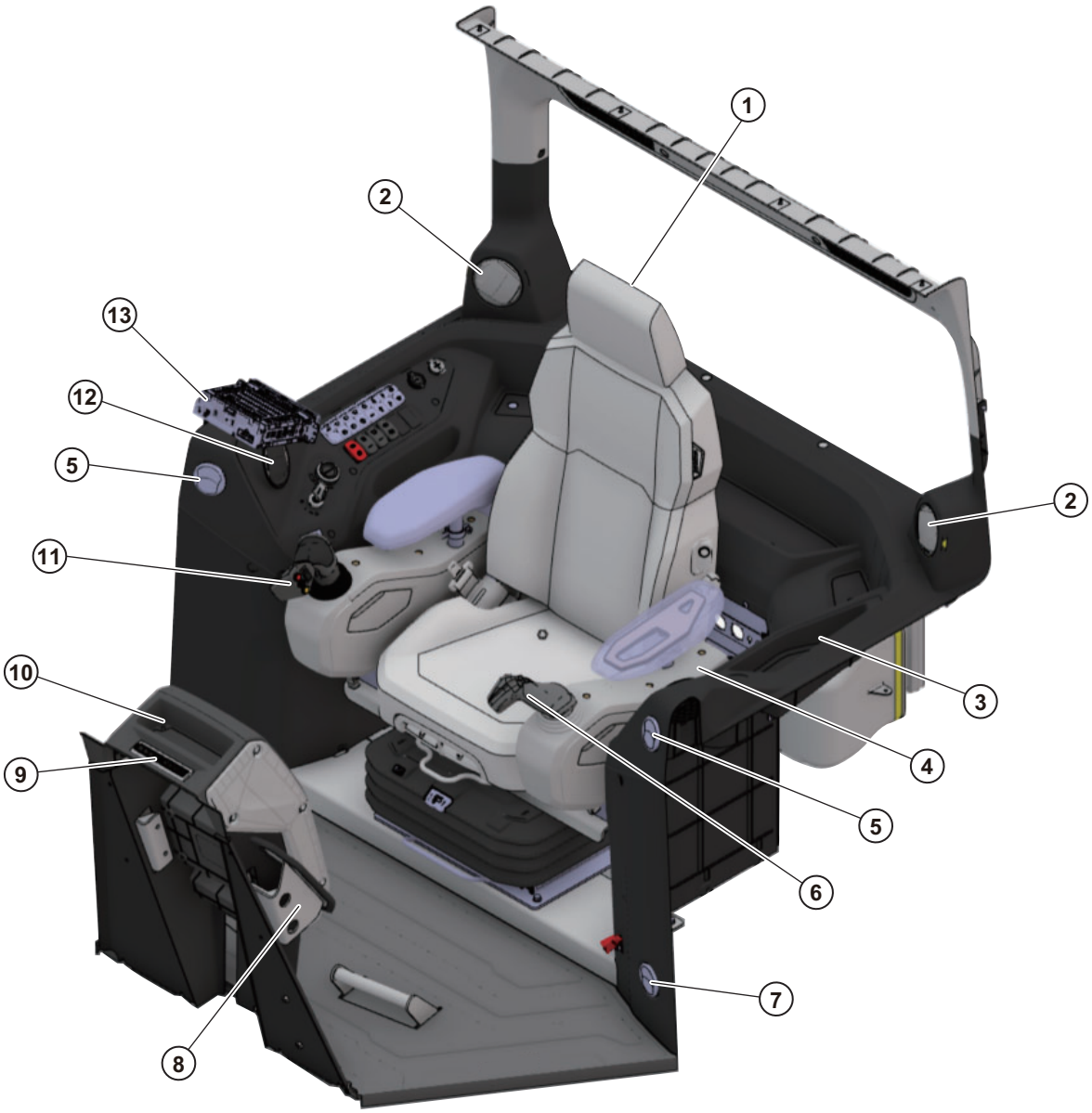


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Figure 3

Reference Number	Description
1	Seat
2	Air Vent
3	Storage Space
4	Cup Holder
5	Air Vent
6	Left-hand Work Lever (Joystick)
7	Foot Vent

Reference Number	Description
8	Foot Rest
9	Air Vent
10	Storage Space
11	Right-hand Work Lever (Joystick)
12	Air Vent
13	DAB Audio

Operational Controls and Panels

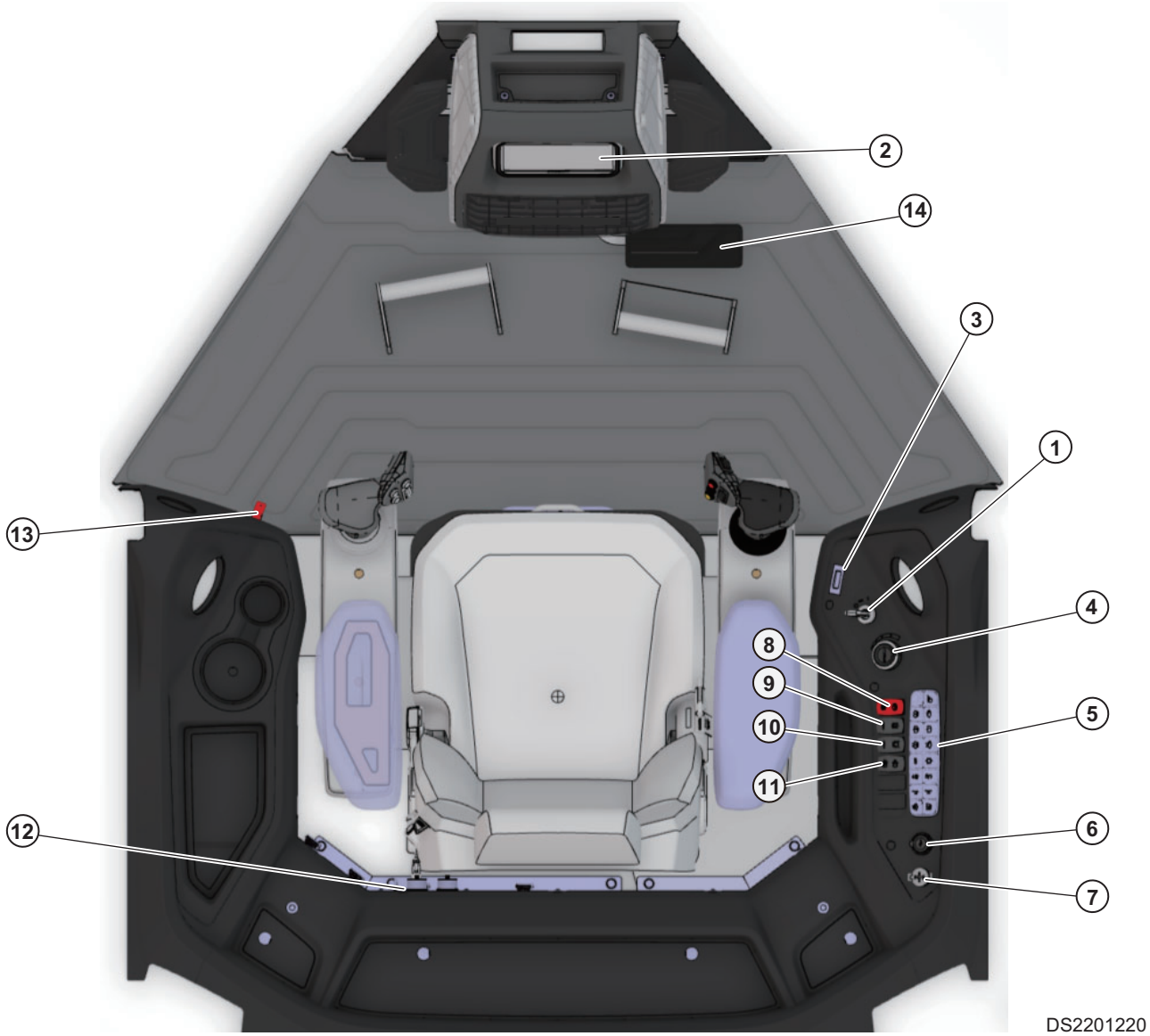


Figure 4

Reference Number	Description
1	Starter Switch
2	Display Monitor
3	Hour Meter
4	Engine Speed Control Dial
5	Keypad
6	USB Charger
7	12V Power Socket

Reference Number	Description
8	Parking Switch
9	Pilot Cut Off Switch
10	Beacon Switch
11	After Treatment System Switch
12	Emergency Start Mode Switch
13	Engine Emergency Stop Switch
14	Brake Pedal

1. Starter Switch

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

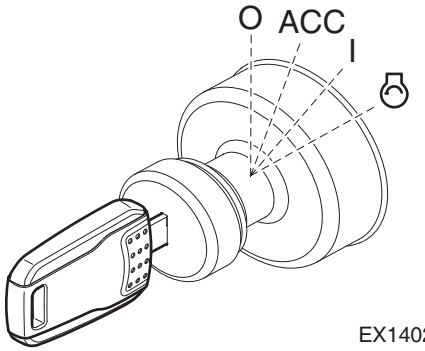
O. Turning switch to this position turns engine "OFF" with its electrical system.

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

- Stereo
- Display Monitor

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

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



EX1402126

Figure 5

WARNING

AVOID DEATH OR SERIOUS INJURY

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

2. Display Monitor

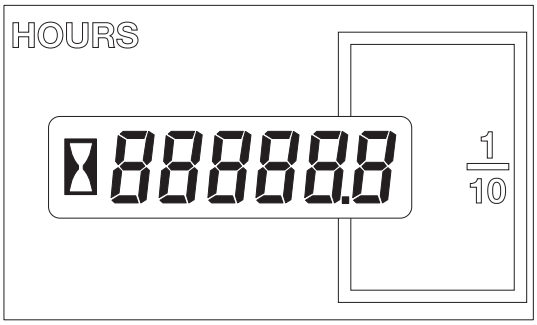
See "Display Monitor" on page 2-19.

DS2201221

Figure 6

3. 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 7

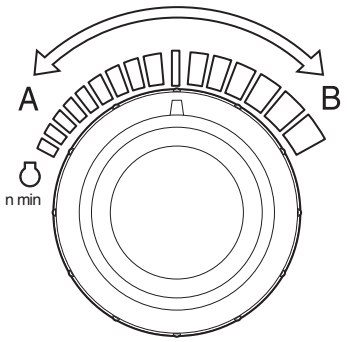
4. Engine Speed Control Dial

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).

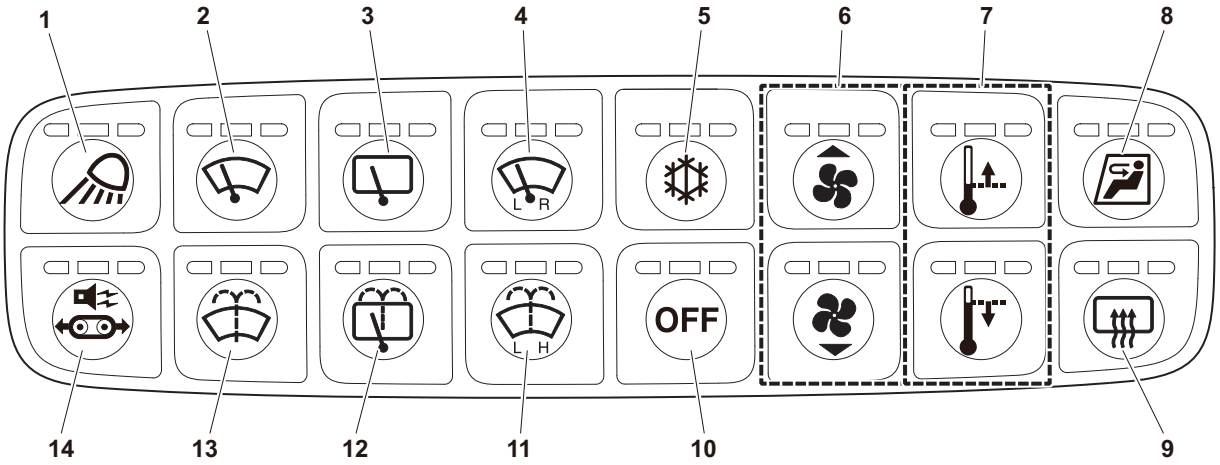
NOTE: *The auto idle system will automatically reduce engine speed to "LOW IDLE" approximately four seconds after all the control levers are in the "NEUTRAL" position. This system is designed to reduce fuel consumption and noise.*



DS1900273

Figure 8

5. Keypad



DS2201226

Figure 9

Reference Number	Description
1	Working Lamp Button
2	Front Wiper Button
3	Rear Wiper Button
4	Left/Right Side Wiper Button
5	Air Conditioner Button
6	Fan Speed Control Button (Up/Down)
7	Temperature Control Button (Up/Down)
8	Air Inlet Selector Button
9	Rear Defrost Button
10	Heater and Air Conditioner Off Button
11	Window Washer Button (Left/Right)
12	Window Washer Button (Rear)
13	Window Washer Button (Front)
14	Travel Alarm Off Button

1. Working Lamp Button

Lights up the working lamps to gain visibility at night.

OFF: Turns off the all lights.

Step 1: Turns on the display monitor and switch lights. (Left led ON)

Step 2: Turns on the display monitor, switch lights, working lamps. (Right led ON)

2. Front Wiper Button

Activates the wiper on the front of the cabin to clean the windshield.

OFF: Turns off the wiper on the front of the cabin

Step 1 (Intermittent): Turn on the wiper on the front of the cabin (Left led ON)

Step 2 (Intermittent): Turn on the wiper on the front of the cabin (Center led ON)

Step 3 (Continuous): Turn on the wiper on the front of the cabin (Right led ON)

3. Rear Wiper Button

Activates the wiper on the rear of the cabin to clean the windshield.

OFF: Turns off the wiper on the rear of the cabin

Step 1 (Intermittent): Turn on the wiper on the rear of the cabin (Left led ON)

Step 2 (Intermittent): Turn on the wiper on the rear of the cabin (Center led ON)

Step 3 (Continuous): Turn on the wiper on the rear of the cabin (Right led ON)

4. Left/Right Side Wiper Button

Activates the wiper on the left/right of the cabin to clean the windshield.

OFF: Turns off the wiper on the left/right of the cabin

Step 1 (Intermittent): Turn on the wiper on the left/ right of the cabin (Left led ON)

Step 2 (Intermittent): Turn on the wiper on the left/ right of the cabin (Center led ON)

Step 3 (Continuous): Turn on the wiper on the left/ right of the cabin (Right led ON)

5. Air Conditioner Button

Activates the air conditioner.

When this function is activated, an "A/C" is displayed. (Center led ON)

6. Fan Speed Control Button (Up/Down)

These buttons are used to control the speed of the blower fan.

Momentarily pressing a button changes the speed one stage.

Eeah time the button is pressed, the led on front the bottom button

7. Temperature Control Button (Up/Down)

These buttons are used to control the cabin temperature. Temperature setting is displayed on the Display monitor.

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

Eeah time the button is pressed, the led on front the bottom button

8. 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. (Center led ON)

9. Rear Defrost Button

Heats the heating wires in the cabin rear glass to get rid of frost and moisture. (Center led ON)

10. Heater and Air Conditioner Off Button

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

11. Window Washer Button (Left/Right)

Activates the washer on the left/right of the cabin to clean the windshield.

Turn on the wiper and washer on the left/right of the cabin (Center led ON)

12. Window Washer Button (Rear)

Activates the washer on the rear of the cabin to clean the windshield.

Turn on the wiper and washer on the rear of the cabin (Center led ON)

13. Window Washer Button (Front)

Activates the washer on the front of the cabin to clean the windshield.

Turn on the wiper and washer on the fronts of the cabin (Center led ON)

14. Travel Alarm Button

Turn off the alarm when operating the machine.

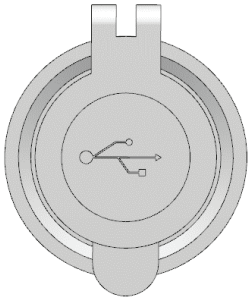
If you press the button when the buzzer sounds, the buzzer will not sound until the next ignition.

6. USB Power Socket

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

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

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



DS2000040

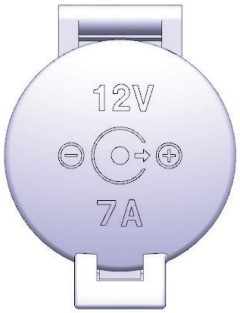
Figure 10

7. 12V Power Socket

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

Open the protective cap to use it.

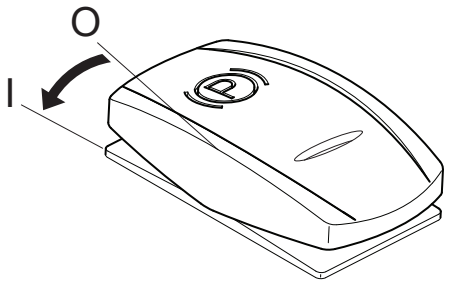
NOTE: *This power socket is intended for low-capacity devices. Using it for high-capacity electrical devices may damage the socket.*



DS2000039

Figure 11

8. Parking Brake Switch



DS2300610

Figure 12

This switch is used to park the machine.

O. The switch automatically returns to this position when it is "RELEASED", When the parking brake switch is released, 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 parking brake is released, the engine can not be started. To start the engine, engage parking brake first.*

NOTE: *When starting the engine parking brake is engaged automatically.*

To release parking brake, press the parking brake switch to "OFF" may look not to be engaged

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

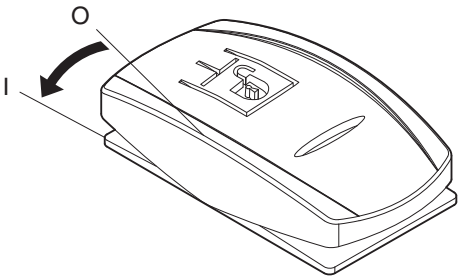
Set the parking brake switch in the "I" (APPLIED) position before leaving the machine.

Make sure to "APPLY" the parking brake switch before trying to start the machine.

⚠ NOTICE

Do not use the parking brake to stop the machine, except in an emergency; otherwise, it might cause premature wear or damage of the brake.

9. Hydraulic Cutoff Switch



DS2000043

Figure 13

O. In this position, Joystick Lever is turned "OFF". Operator cannot operate the Joystick Lever to control all functions.

I. In this position, Joystick Lever is turned "ON". Operator can fully control the movement of all functions.

⚠ NOTICE

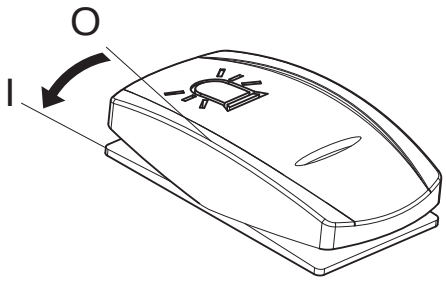
When parking, the hydraulic cutoff Switch must be set to "O" (OFF) position so the operator can not fully control the movement of the joystick functions.

10. Beacon Switch (If Equipped)

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

O. In this position, the warning light is turned "OFF".

I. In this position, the warning light turns "ON" and will start flashing.



FG016020

Figure 14

11. After Treatment 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 3-12, for more information.*

NOTICE

Move Set hydraulic cutoff Switch to "O" (OFF) 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).

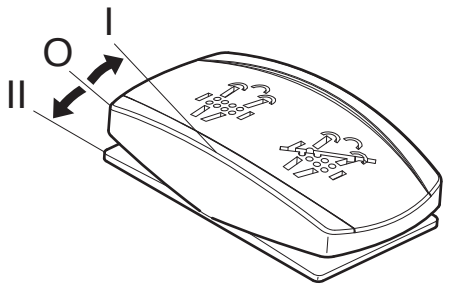
The inhibition (non-regeneration) symbol will light up on the display monitor.

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.



FG018280

Figure 15

12. 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.

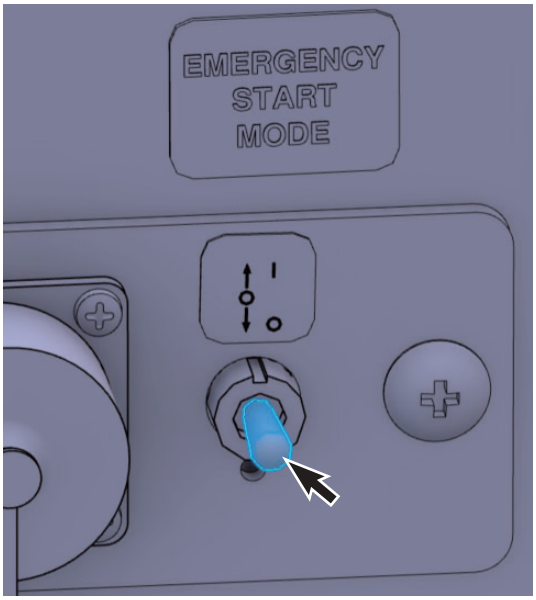
O. Emergency start mode "OFF"

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.



DS2201222

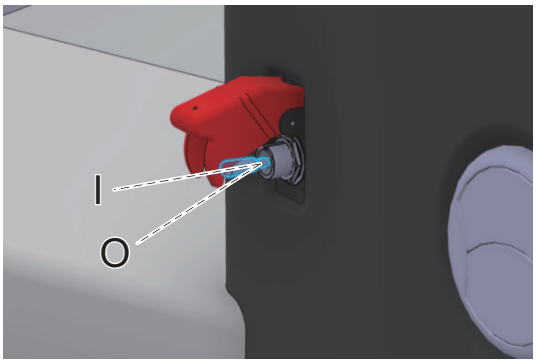
Figure 16

13. Engine Emergency Stop Switch

If the engine cannot stop when using the start/stop button, 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.



DS2201223

Figure 17

14. Brake Pedal

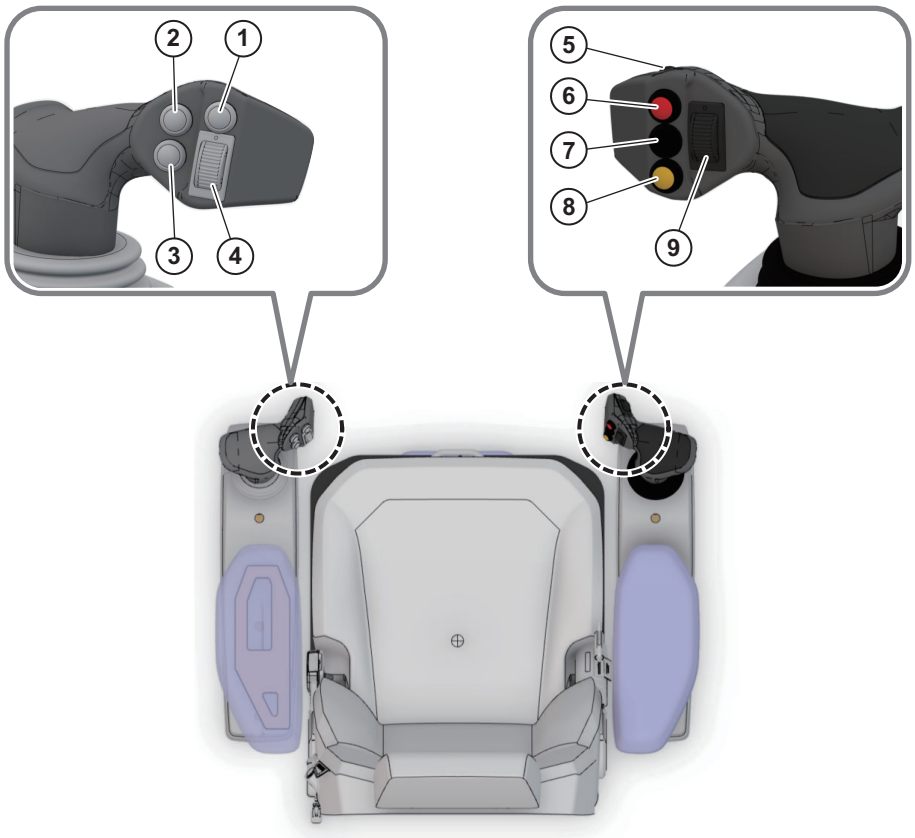
Pressing brake pedal will apply the brakes to the machine.

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.

Joystick Operation and Controls

Button and Switch Operation



DS2201224

Figure 18

1. Horn Button

Press the button on the left joystick to activate the horn

2. Dozing Auto Up Button

This button is available when the DAC/DAAC mode is in the "Auto".

Pressing the button increase the target slope by 0.1%.

Press and hold the button to increase the target slope by 1%.

3. Dozing Auto Down Button

This button is available when the DAC/DAAC mode is in the "Auto".

Pressing the button decrease the target slope by 0.1%.

Press and hold the button to decrease the target slope by 1%.

4. Travel Speed Control Switch

Raising the thumb wheel switch increases the travel speed.

Lowering the thumb wheel switch decreases the travel speed.

5. Ripper Control Switch

Push the thumb wheel switch to lower the ripper

Pull the thumb wheel switch to raise the ripper

6. Blade Shake Button

Press the button, the blade continuously tilts to remove the remaining load from the blade.

7. Blade Float Button

When the blade is down while the button is pressed, the blade is in float mode.

8. Dozing Auto/Manual Button

Press the button to change DAC/DAAC mode status. (Auto/Manual)

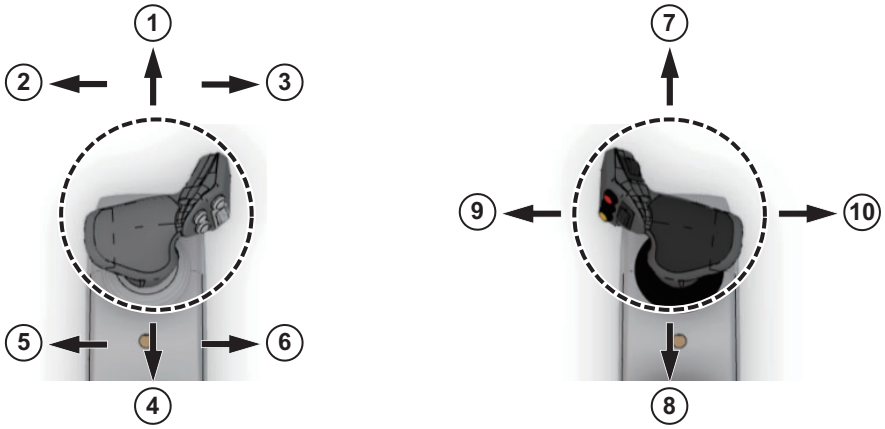
9. Blade Angle Control Switch

Press the button to adjust the blade angle.

When the thumb wheel switch is raised, the blade turns to the right.

When the thumb wheel switch is lowered, the blade turns to the left.

Joystick Operation

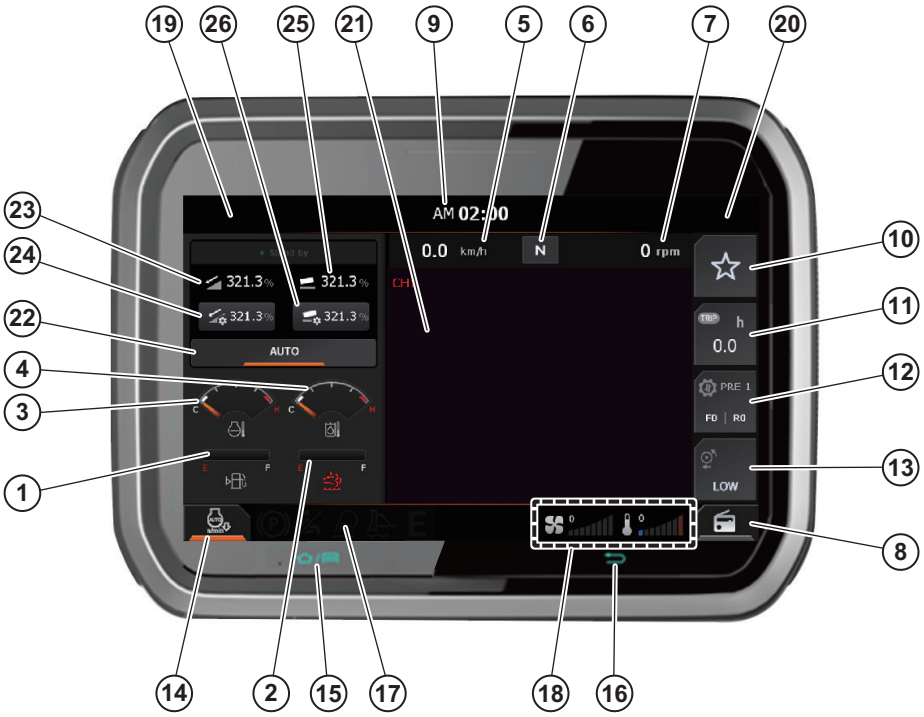


DS2201225

Figure 19

1. **Forward**
2. **Forward + Turn Left**
3. **Forward + Turn Right**
4. **Reverse**
5. **Reverse + Turn Left**
6. **Reverse + Turn Right**
7. **Blade Down**
8. **Blade Raise**
9. **Blade Tilt (Left)**
10. **Blade Tilt (Right)**

Display Monitor



DS2201227

Figure 20

Number	Name
1	Fuel Gauge
2	DEF (AdBlue®) Level Gauge
3	Engine Coolant Temperature Gauge
4	Hydraulic Oil Temperature Gauge
5	Travel Speed Display
6	FNR Display
7	RPM Display
8	Audio Display
9	Digital Clock
10	Favorites Button
11	Main Information Selector Button
12	Travel Speed Management
13	Traction Mode Selector Button

Number	Name
14	Auto Idle Selector Button
15	Menu Selector Button
16	Back Button
17	Mode Symbol Display
18	HVAC Display
19	Display Warning Symbols
20	Indicator Display
21	Camera Display
22	Dozing Assist Control Auto Button
23	Blade Lift Angle Display
24	Blade Lift Angle Control Button
25	Blade Tilt Angle Display
26	Blade Tilt Angle Control Button

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 three seconds.

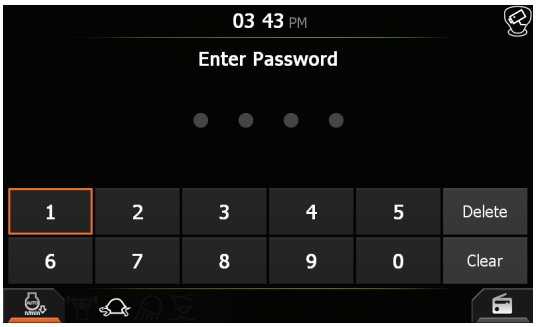
The HD HYUNDAI CONSTRUCTION EQUIPMENT logo is displayed on the screen during functional checks.

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 2-51.



DS1900406

Figure 21

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.

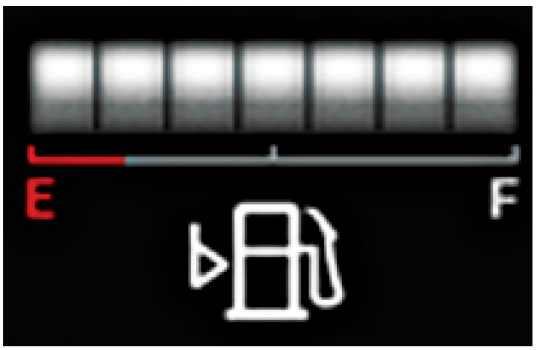
White range - Normal amount of fuel.

Red range - Not enough fuel.

If the bar 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 "19. Display Warning Symbols" on page 2-26.*

Check the fuel level on firm, level ground.



DS1900407

Figure 22

2. DEF (AdBlue®) Level Gauge

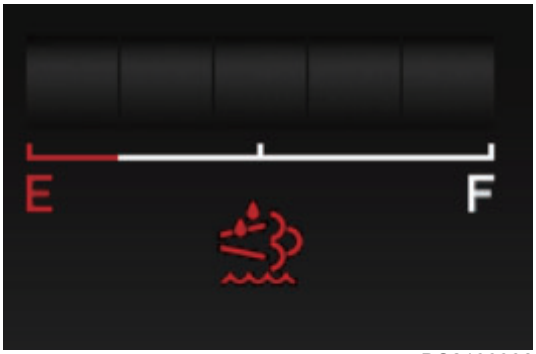
This gauge indicates the amount of DEF remaining in the DEF (AdBlue®) tank.

White range - Normal amount of DEF.

Red range - Not enough DEF.

If the bar 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.



DS2100338

Figure 23

3. Engine Coolant Temperature Gauge

This gauge indicates the temperature of the engine coolant.

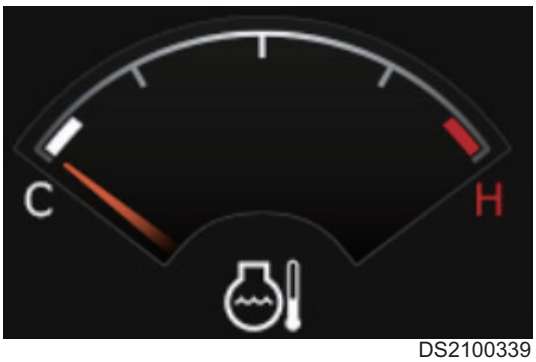
C range - Overcooled or initial start-up period.

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.



DS2100339

Figure 24

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 "19. Display Warning Symbols" on page 2-26.*

DS1900410

Figure 25

5. Travel Speed Display

The indicates the travel speed as a number.

6. FNR Display

The indicates the FNR.

7. RPM Display

The indicates the engine speed as a number.

8. Audio Display

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

DS1900422

Figure 26

9. Digital Clock

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

- Time

DS1900424

Figure 27

- Time + date

  For more information on setting the time, please refer to "User Menu" on page 2-37.

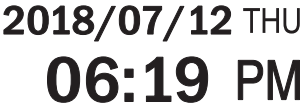


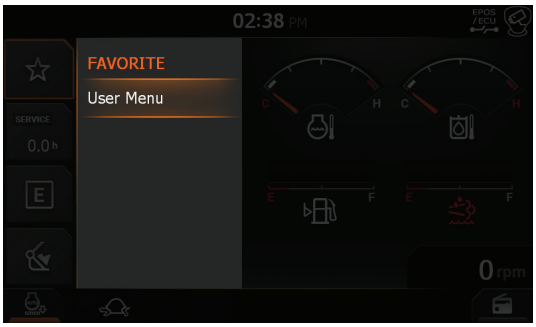
Figure 28

DS1900982

10. 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 2-37.



DS1900426

Figure 29

11. 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.

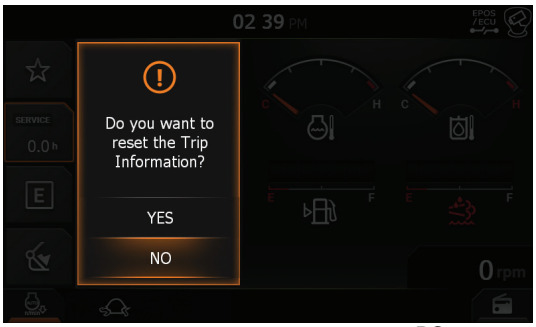
- Reset trip information
- Trip operating time
- Trip fuel level
- Trip fuel consumption
- Soot level
- Service meter (Total operating time)

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

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

DS1900427

Figure 30



DS1900428

Figure 31

12. Travel Speed Management

Operator can set the forward and backward speed levels of the machine.

If you set the four presets in the user menu, the operator can change the setting.

13. Traction Mode Button

This function controls the maximum driving torque when moving forward.

It consists of 4 steps and can be set by the operator according to the situation.

14. Auto Idle Selector Button

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

- Selected

DS1900435

Figure 32

- Not selected

DS1900436

Figure 33

15. Menu Selector Button

Allows you to access the main menu.

DS1900437

Figure 34

16. Back Button

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

DS1900438

Figure 35

17. Mode Symbol Display

Symbol	Meaning
	Parking Brake ON
	OPS State ON
	Work Light ON
	Floating Hold ON
	ECO Mode ON
	Hydraulic Lock ON

18. HVAC Display

Display the information with the HVAC operation.

19. Display Warning Symbols

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

Number	Symbol	Type	Meaning
1		Warning	Battery warning
2		Warning	Engine oil pressure warning
3		Warning	Coolant overheated
4		Warning	Engine warning
5		Warning	Stop engine
6		Warning	WIF sensor
7		Warning	Hydraulic oil warning
8		Warning	Fuel warning
9		Warning	Air cleaner clogged
10		Warning	OWD warning
11		Warning	Quick coupler warning
12		Warning	Manual regeneration request
13		Warning	Low DEF level
14		Warning	Problem in SCR system
15		Warning	VBO angle sensor failure or I-CEPT sensor failure
16		Warning	VBO joystick pressure sensor failure
17		Warning	EPPR valve failure
18		Warning	AGS warning

Number	Symbol	Type	Meaning
19		Warning	Clogged fuel filter
20		Warning	Removable counterweight
21		Warning	Ultrasonic sensor failure
22		Warning	Engine rpm and starting restricted by TMS or TMS terminal failure
23		Warning	Coolant level warning
24		Warning	Seat belt
25		Warning	No smart key
26		Warning	Failed to detect smart key
27		Warning	Low smart key battery
28		Warning	DEF pressure Warning
29		Warning	Engine coolant level warning
30		Caution	Return filter clogged
31		Caution	Regeneration prohibition
32		Caution	Active regeneration operating
33		Caution	Manual regeneration
34		Caution	GPS antenna failure
35		Caution	GSM antenna failure
36		Caution	Satellite antenna failure

Number	Symbol	Type	Meaning	Number	Symbol	Type	Meaning
37		Failure	Check the machine	38		Failure	Stop the machine

1. Battery warning

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

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

2. 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.

See "After Treatment System" for more information.

13. Low DEF level

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

Refer to "Emission Control System" on page 3-10, 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 3-10, 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. DEF pressure Warning

This symbol illuminates when the pressure of the DEF system is low. Check the DEF system.

29. Engine coolant level warning

This symbol illuminates when the coolant level is low.
Add the coolant.

30. 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.

31. Regeneration prohibition

It is illuminated when regeneration is prohibited.

See "After Treatment System" for more information.

32. Active regeneration operating

The lamp turns on when automatic regeneration begins.

See "After Treatment System" for more information.

33. Manual regeneration

The lamp turns on when forced regeneration begins.

See "After Treatment System" for more information.

34. GPS antenna failure

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

35. GSM antenna failure

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

36. Satellite antenna failure

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

37. 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.*

38. 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.*

20. Indicator Display

The indicator symbols are as follows.

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

21. Camera Display

Outputs the camera screen mounted on the machine.

Use the view mode selector button to switch to the full screen.

22. Dozing Assist Control Auto Button

After pressing the button, press the joystick button to activate this function.

Operator can work by keeping the blade slope constant.

23. Blade Lift Angle Display

Display the up/down angle of the blade.

24. Blade Lift Angle Control Button

The operator can set the up/down angle of the blade.

25. Blade Tilt Angle Display

Display the left/right angle of the blade.

26. Blade Tilt Angle Control Button

The operator can set the left/right angle of the blade.

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 failure
- 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 36

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 37

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

DS1900763

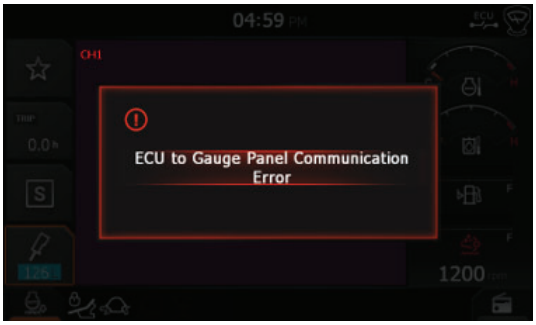
Figure 38

3. Communications failure

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 39

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 40

The following replacement interval-related messages appear.

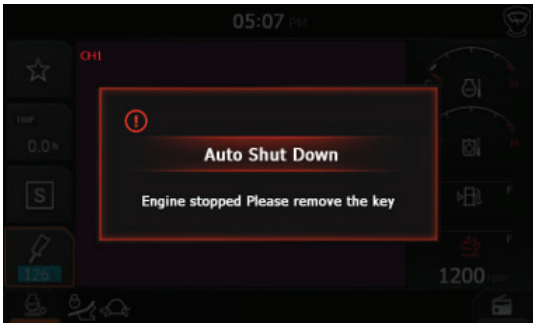
- Service interval is almost over: Service interval is within 10 hours of the replacement interval
- Service interval has expired: Service interval matches the replacement interval
- Service interval has passed: Service interval is over an hour past the replacement interval

5. Auto shutdown notifications

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

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

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



DS1900766

Figure 41

User Menu

User Menu - Access and Escape Methods

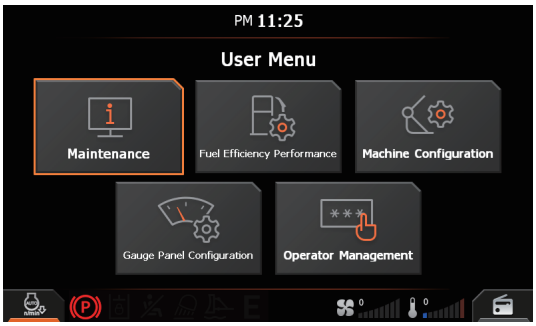
Access Method

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
- Gauge Panel Configuration
- Operator Management

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



DS2201241

Figure 42

Exiting/Escaping Menus

- ESC Button
- Over 15 seconds have passed without any buttons being pushed
- Turning "OFF" the starter switch to cut off power, you will move to the normal display screen.

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

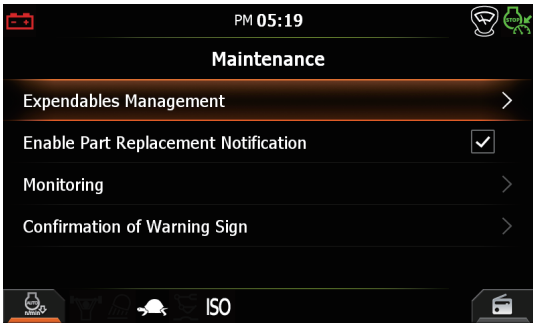
Do not change the vehicle mode while traveling or operating the machine.

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



DS2100347

Figure 43

A. Expendables Management

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

How to access: User Menu → Maintenance → Expendables Management

DS1900314

Figure 44

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 45

DS1900316

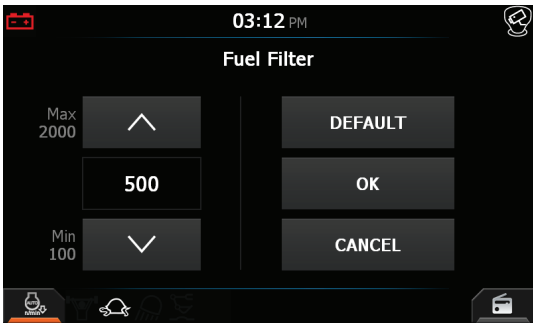
Figure 46

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 47

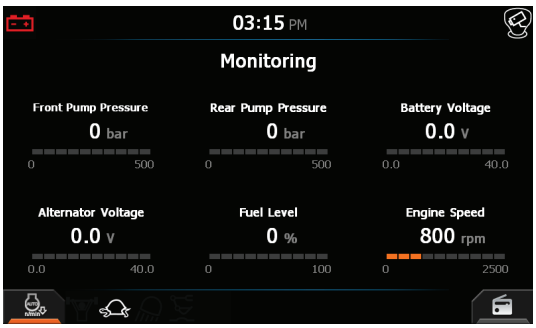
B. Enable part Replacement Notification

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 48

D. Confirmation of Warning Sign

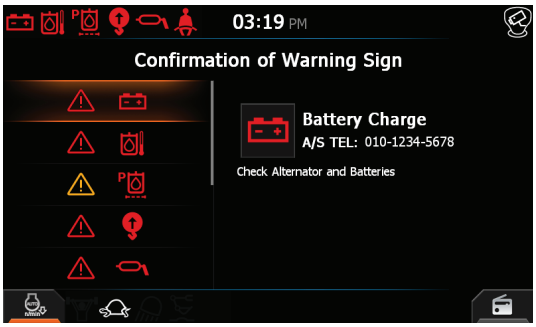
This menu allows you to see detailed information about warnings and failures in the machine.

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

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

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

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



DS1900319

Figure 49

DS1900320

Figure 50

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 Auto Idle Time

DS2201242

Figure 51

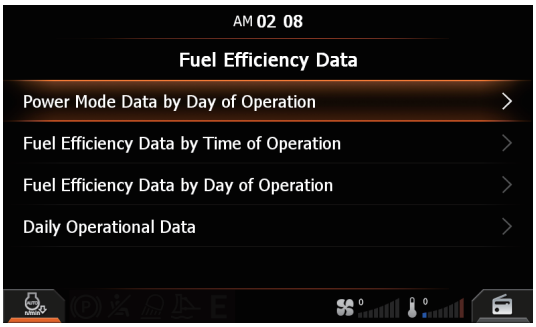
A. Fuel Efficiency Data

This menu displays information about the vehicle fuel consumption.

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

The following menus can be accessed.

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



DS2201243

Figure 52

1) Power Mode Data by Day of Operation

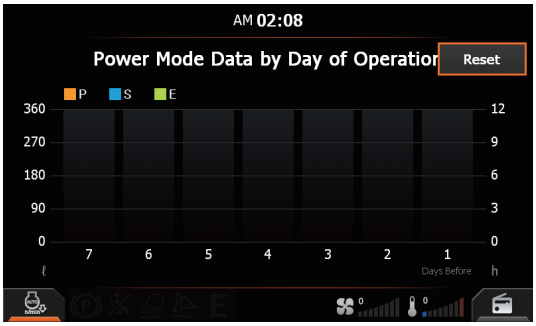
This menu provides information about the amount of fuel used and the operating time in each power mode during the past week.

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

The following double bar graphs are displayed for each day.

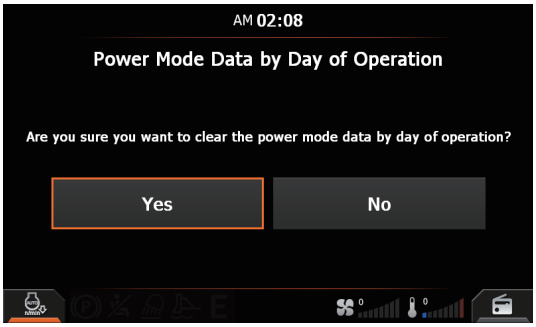
- Left-hand bar: Fuel used in each power mode
- Right-hand bar: Operating time in each power mode
- Bottom axis: Days of operation until the present

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



DS2201244

Figure 53



DS2201245

Figure 54

2) Fuel Efficiency Data by Time of Operation

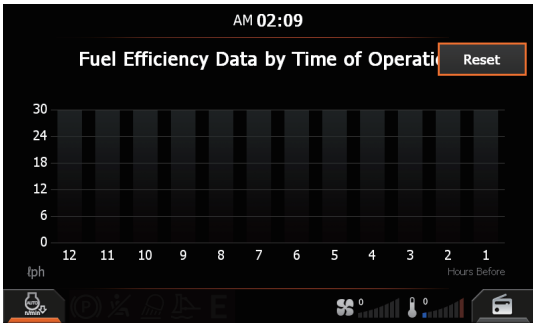
This menu displays the fuel consumption for the current day.

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

The axes are as follows.

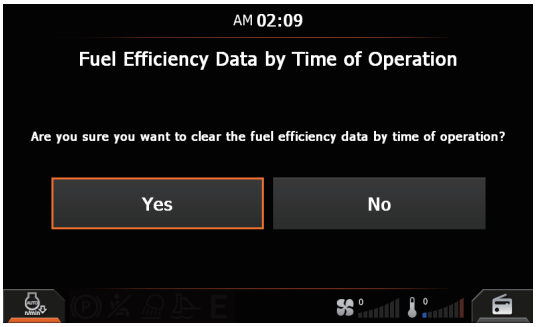
- Left-hand axis: Average fuel consumption
- Bottom axis: Operating time until the present

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



DS2201246

Figure 55



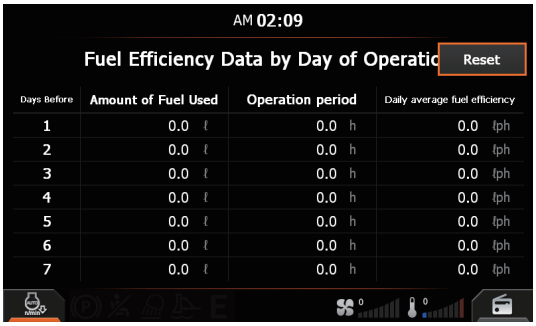
DS2201247

Figure 56

3) Fuel Efficiency Data by Day of Operation

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

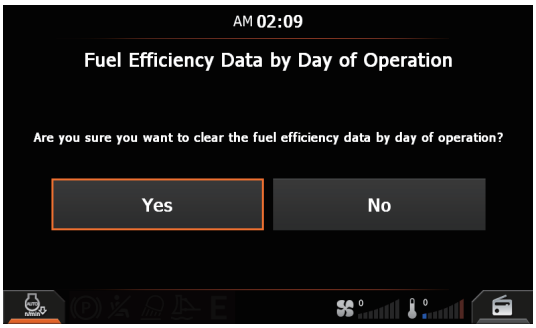
How to access: User Menu → Fuel Efficiency Performance → Fuel Efficiency Data → Fuel Efficiency Data by Day of Operation



DS2201248

Figure 57

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



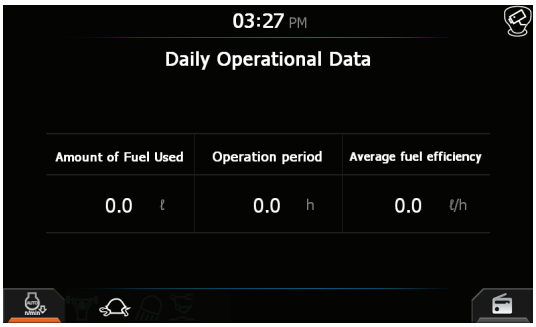
DS2201249

Figure 58

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 59

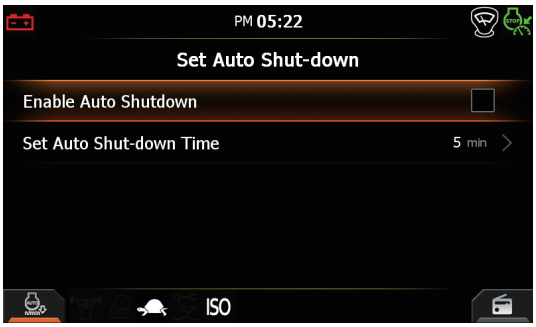
B. Set Auto Shut-down

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



DS2100349

Figure 60

1) Enable Auto Shutdown

The auto shutdown function can be toggled on/off.

Auto shutdown conditions

	Input								Output
	GP Menu	**Auto Idle Switch**	**Hydraulic Cutoff Switch**	**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

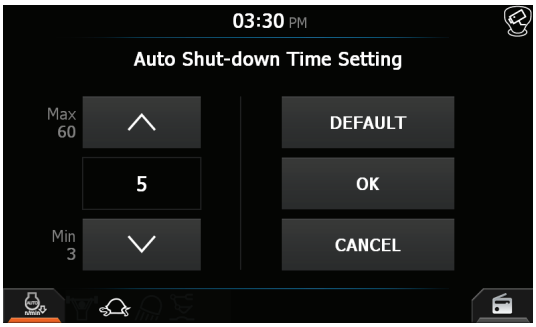
This menu allows you to set the time for enabling auto shutdown.

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

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



DS1900331

Figure 61

C. Set Auto Idle Time

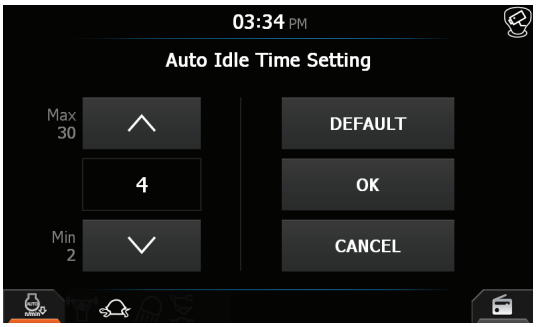
This menu allows you to set the time for enabling auto idle.

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: 60



DS1900333

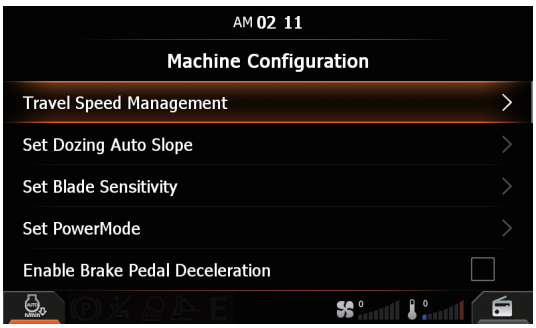
Figure 62

3. Machine Configuration

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

The following menus can be checked and changed.

- Travel Speed Management
- Set Dozing Auto Slope
- Set Blade Sensitivity
- Set Power Mode
- Enable Brake Pedal Deceleration
- Set Reverse Fan
- Start CAC Reverse Fan
- Start Condenser Reverse Fan
- Enable Camera Guideline
- Temporary Security Unlock



DS2201250

Figure 63

A. Travel Speed Management

The machine travel speed can be set.

How to access: User Menu → Machine Configuration → Travel Speed Management

1) Select Travel Speed

The operator can select the travel speed to 4 settings.

DS2201251

Figure 64

2) Set Travel Speed

The operator can set the travel speed to 4 settings.

DS2201252

Figure 65

B. Set Dozing Auto Slope

The operator can set the dozing auto slope.

How to access: User Menu → Machine Configuration → Set Dozing Auto Slope

DS2201253

Figure 66

1) Lift Set Slope

The operator can set and select the lift slope.

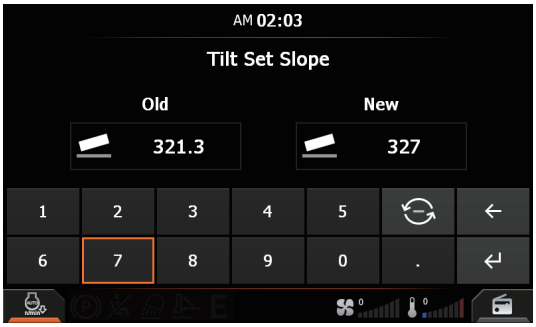
How to access: User Menu → Machine Configuration → Set Dozing Auto Slope → Lift Set Slope

DS2201254

Figure 67

2) Tilt Set Slope

The operator can set and select the tilt slope.



DS2201255

Figure 68

C. Set Blade Sensitivity

The operator can set the blade sensitivity.

How to access: User Menu → Machine Configuration → Set Blade Sensitivity

- Set Tilt Sensitivity
- Set Lift Sensitivity
- Set Angle Sensitivity

1) Set Tilt Sensitivity

The tilt sensitivity can be set normal or fine mode.

2) Set Lift Sensitivity

The lift sensitivity can be set normal or fine mode.

3) Set Angle Sensitivity

The angle sensitivity can be set normal or fine mode.

DS2201256

Figure 69

D. Set Power Mode

The operator can set power mode and ECO mode.

DS2201257

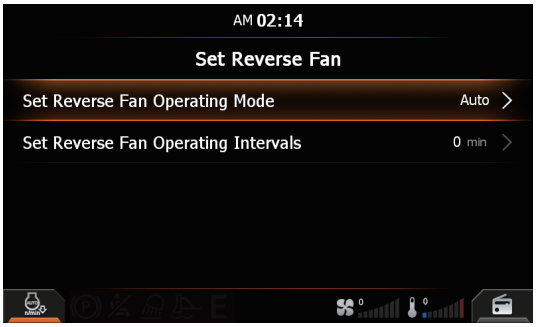
Figure 70

E. Enable Brake Pedal Deceleration

The operator can set the brake pedal deceleration.

F. Set Reverse Fan

The operator can set the reverse fan.



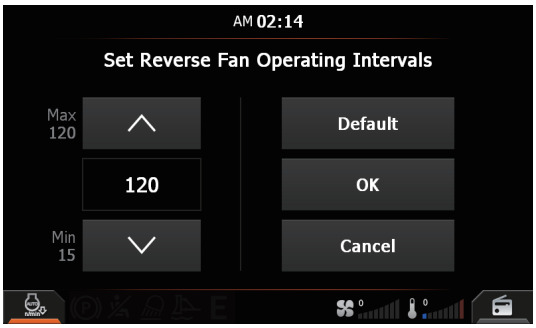
DS2201258

Figure 71

How to change the reverse fan operating interval.

– After setting the new flow and pushing 'OK',

– Default setting: 120



DS2201259

Figure 72

G. Start CAC Reverse Fan

The operator can start CAC reverse fan.

H. Start Condenser Reverse Fan

The operator can start condenser reverse fan.

I. Enable Camera Guideline

The operator can set camera.

J. Temporary Security Unlock

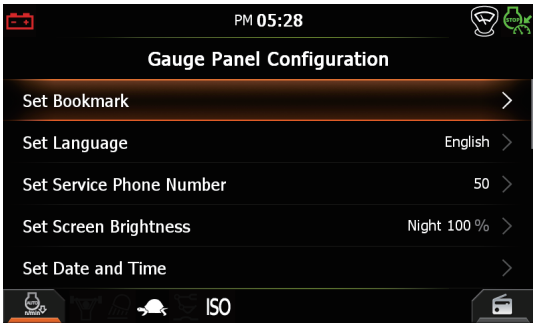
This menu enables authorized personnel to temporarily unlock those machines that have been locked by the TMS server (Ignition lock or RPM limitation) but are currently located where they cannot receive an unlocking command from the server.

4. 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 Camera Brightness
- Set Screen Brightness
- Set Date and Time
- Unit Setting



DS2100360

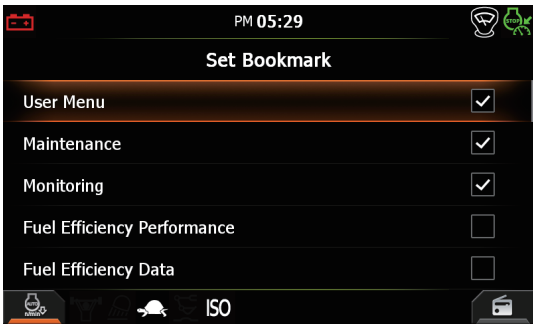
Figure 73

A. Set Bookmark

Bookmarks can be set.

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

Up to 5 bookmarks may be set.



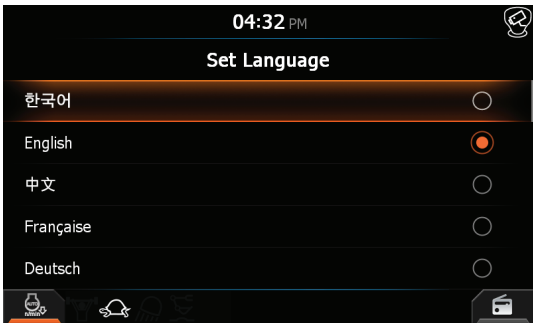
DS2100369

Figure 74

B. Set Language

The display monitor language can be set.

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



DS1900357

Figure 75

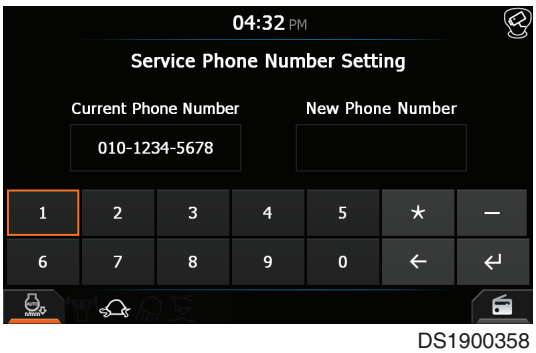
C. Set Service Phone Number

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.



DS1900358

Figure 76

D. Set Camera/Screen Brightness

The brightness of the camera/screen can be set.

How to access: User Menu → Gauge Panel Configuration → Set 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%.*

DS2105239

Figure 77

E. Set Date and Time

The date and time can be set.

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

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

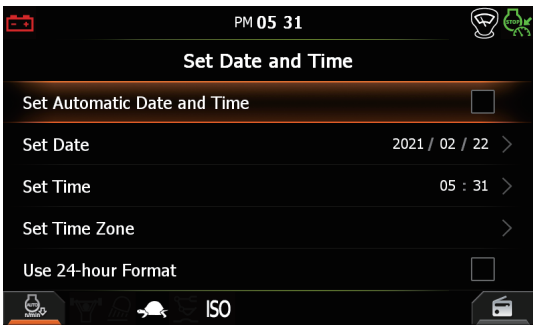
- Set Automatic Setting of Date and Time
- Set Date
- Set Time
- Set Time Zone
- Use 24-hour Format

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

- Set Date
- Set Time
- Set Time Zone

1) Automatic Setting of Date and Time

This option sets the date and time automatically.



DS2100370

Figure 78

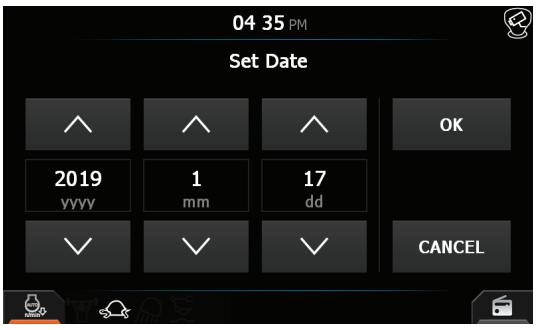
2) Set Date

The date can be set.

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

The format for the date is shown below.

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



DS1900361

Figure 79

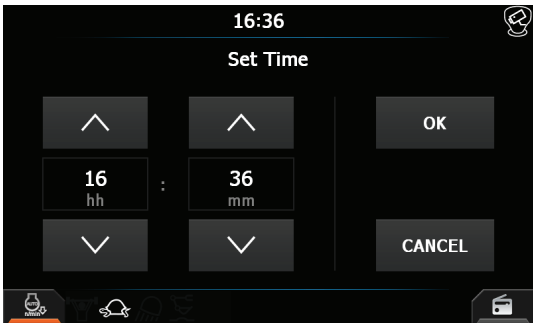
3) Set Time

The time can be set.

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

The format for the time is shown below.

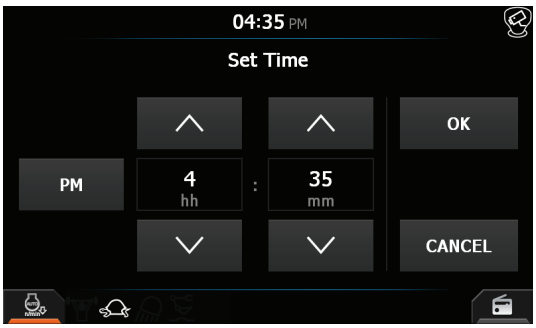
- Hour: hh
- Minute: mm



DS1900362

Figure 80

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



DS1900363

Figure 81

4) Set Time Zone

The time zone can be set.

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

DS1900364

Figure 82

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

The following cities can be selected.

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

5) Use 24-hour Format

The 24-hour format can be selected.

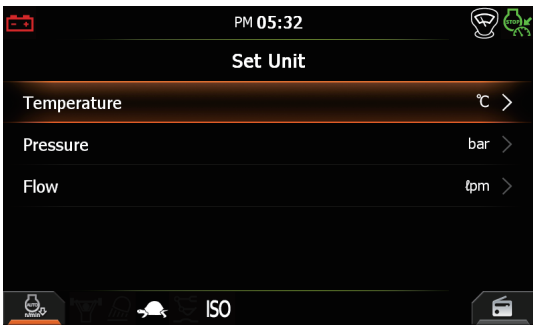
How to access: User Menu → Gauge Panel Configuration → Date and Time Setting → Use 24-hour Format

F. Set Unit

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

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

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



DS2100371

Figure 83

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 84

5. 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

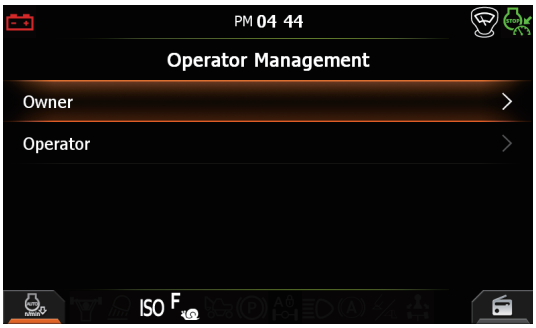


Figure 85 DS2100597

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

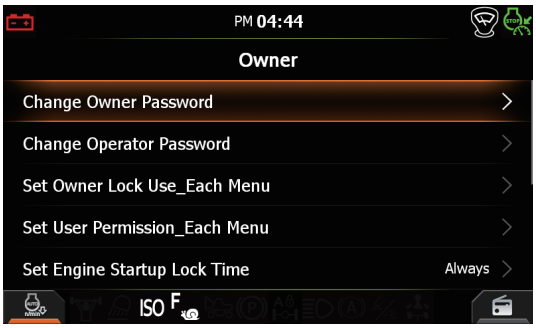


Figure 86 DS2100598

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".

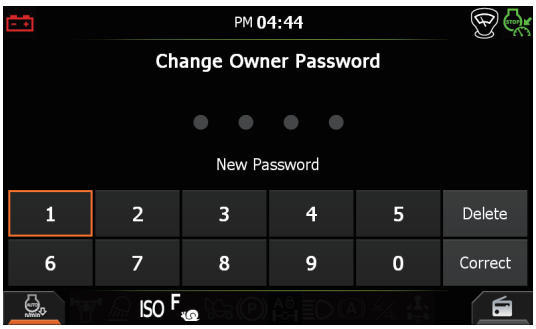


Figure 87 DS2100599

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 88 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 89 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

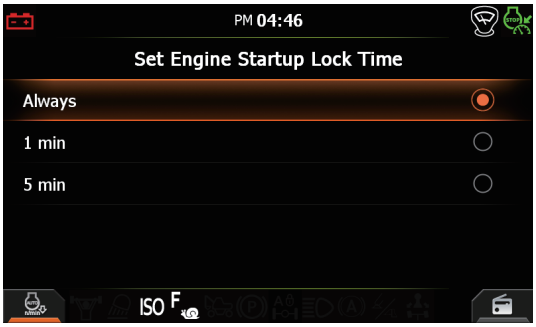


Figure 90 DS2100602

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

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".

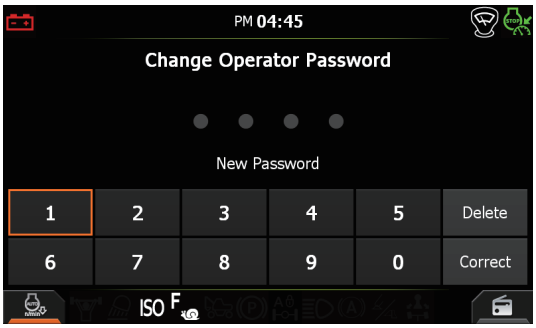


Figure 91 DS2100603

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 92 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

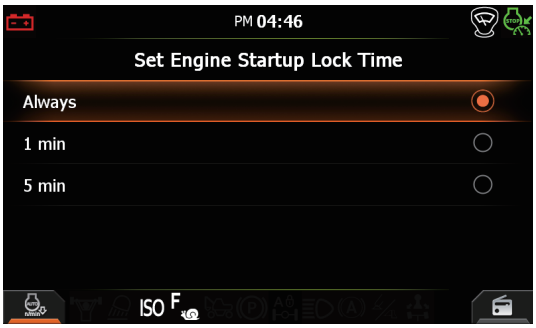


Figure 93 DS2100602

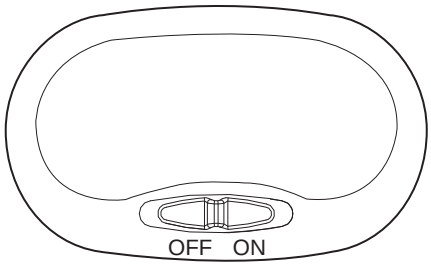
Miscellaneous Electrical Devices

Room Lamp

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

The light will work despite start/stop button.

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



DS1900485

Figure 94

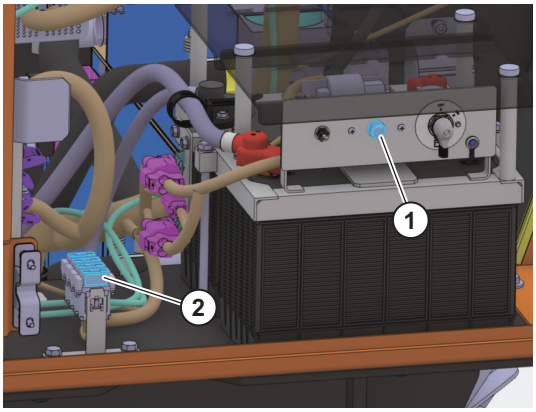
Circuit Breaker (40A, 60A, 80A)

A main circuit breaker is located in the left side door. 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.

- Circuit Breaker (1): 80A
- Circuit Breaker (2): 40A, 60A



DS2201229

Figure 95

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.

Fuse Boxes

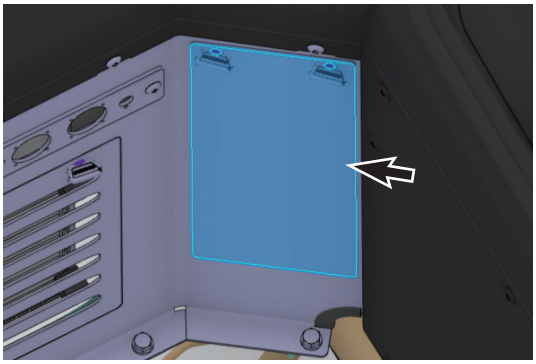
There are two fuse boxes (Figure 96) on the left side of the cabin. The fuses prevent electrical devices from overloading or shorting.

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

NOTE: *For a further explanation see "Fuse Identification" on page 4-74.*

Spare fuses are mounted on the inside of fuse box access cover.

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



DS2201230

Figure 96

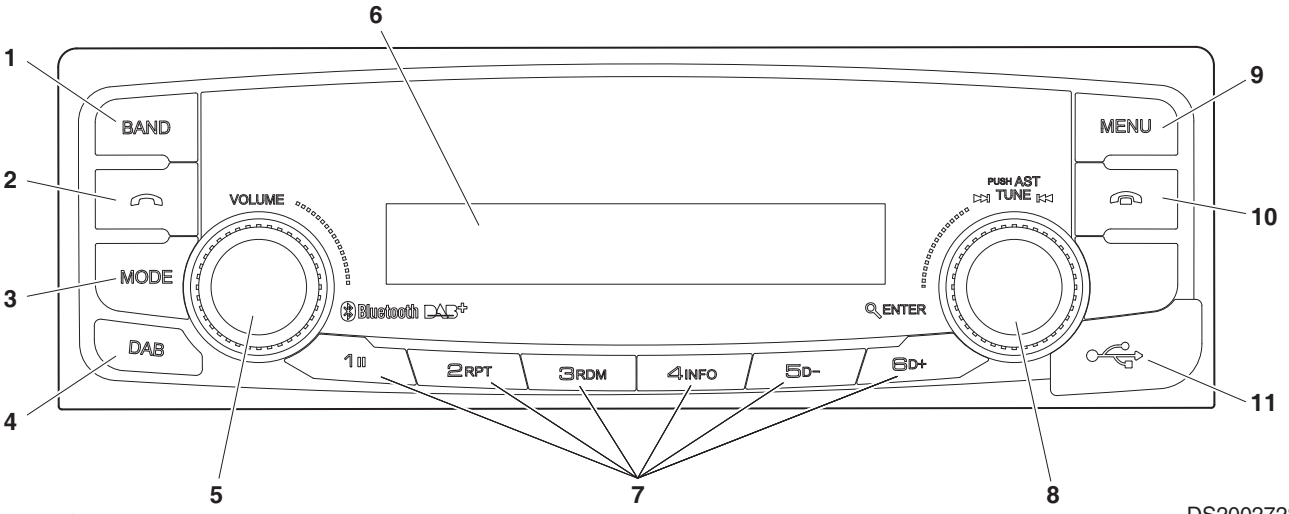
WARNING

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.



DS2002728

Figure 97

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

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.

Forward/Backward Adjustment

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

Adjusting Height of Seat and Depth of Cushion

Seat Height

It is possible to move the seat up or down by combining adjustments forward and rear tilt.

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

- Green: Standard weight
- Red: Underweight or overweight

Forward Tilt

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

Cushion Slide

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

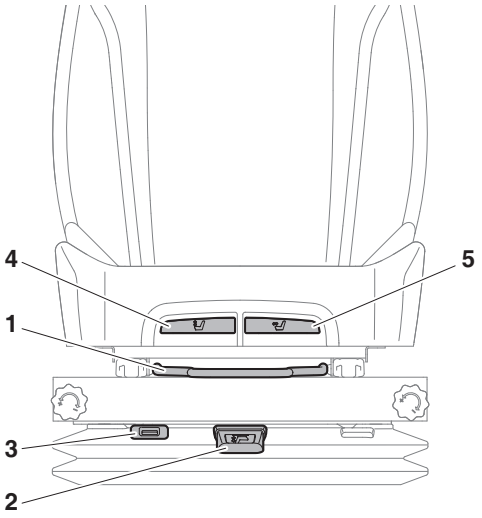


Figure 98

Reclining Position Adjustment

Pulling up left lever (1) 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.

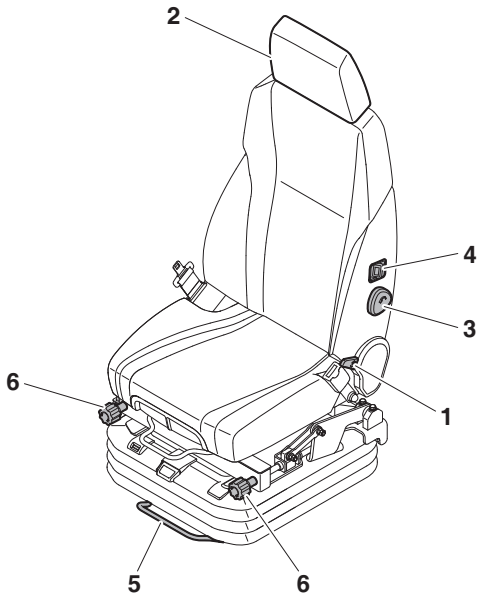
Headrest

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

Lumbar Support Adjustment

A lumbar support is located in the seat back.

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



DS1901198

Figure 99

Seat Heater Switch

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

I. 26 ~ 36°C (79 ~ 97°F)

II. 35 ~ 45°C (95 ~ 113°F)

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

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

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

Left and Right Control Stand Adjustment

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

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

Left and Right Control Stand Height Adjustment

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

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

Adjusting Height of Armrest

It is possible to adjust height of armrest by pulling lever of stand.

DS2201231

Figure 100

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 machine while seated in the operators position.

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

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

When the seat belt is not worn, a warning symbol (Figure 101) illuminates on the display monitor; the symbol turns off when the seat belt is put on.

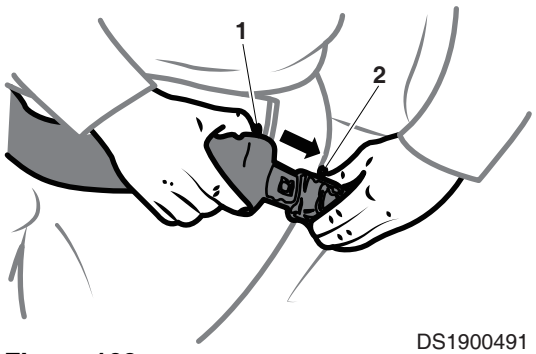
DS1901260

Figure 101

Seat Belt Locking and Unlocking

Insert belt end (1, Figure 102) into buckle (2, Figure 102). Pull belt to check that belt end is locked into buckle.

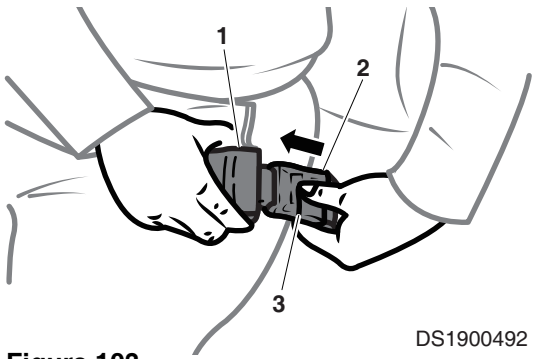
Adjust belt length so it is comfortably tight against operator's pelvic region (hipbone).



DS1900491

Figure 102

Press button (3, Figure 103) in center of buckle (2, Figure 103) and pull out belt (1, Figure 103) to unlock.



DS1900492

Figure 103

Miscellaneous Convenience Devices

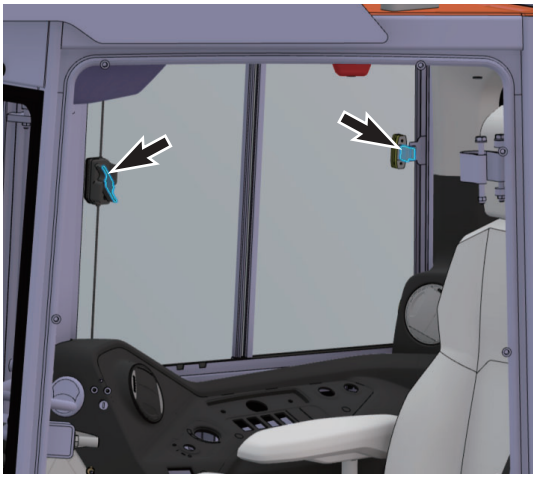
Cabin Windows (Left, Right)

Hold handles, then pull windows.

WARNING

AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, set hydraulic cutoff Switch to "O" position and stop engine to prevent accidental activation of the work levers and controls.

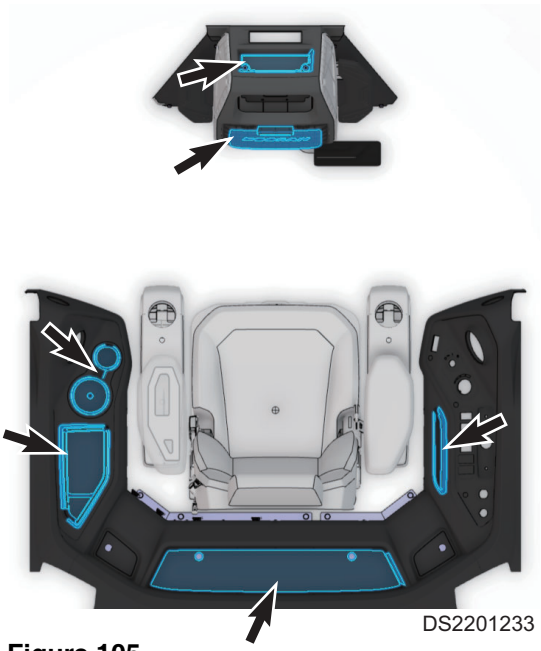


DS2201232

Figure 104

Cabin Storage Compartments

There are storage compartments in the cabin.
Store items according to size.



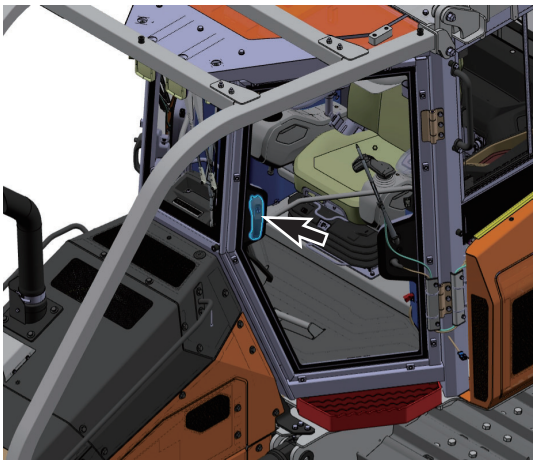
DS2201233

Figure 105

Miscellaneous Access Covers and Doors

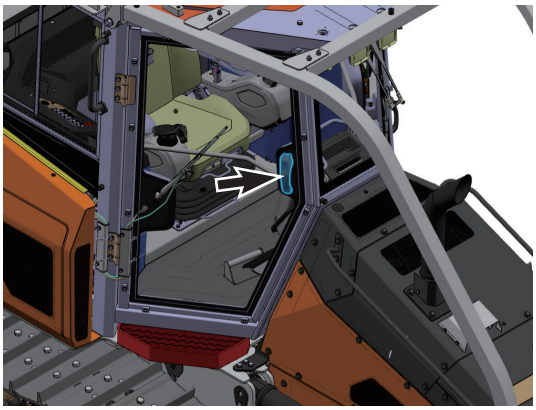
Cabin Door

Hold and pull the handle to open the cabin door.



DS2300924

Figure 106

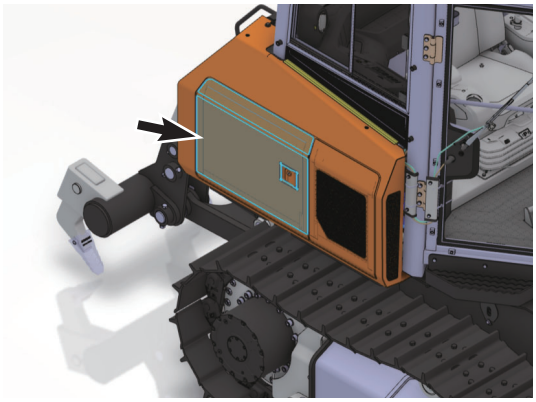


DS2300925

Figure 107

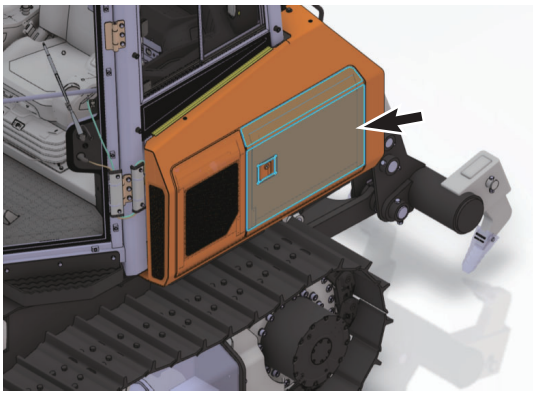
Side Door

Hold and pull the handle to open the side door.



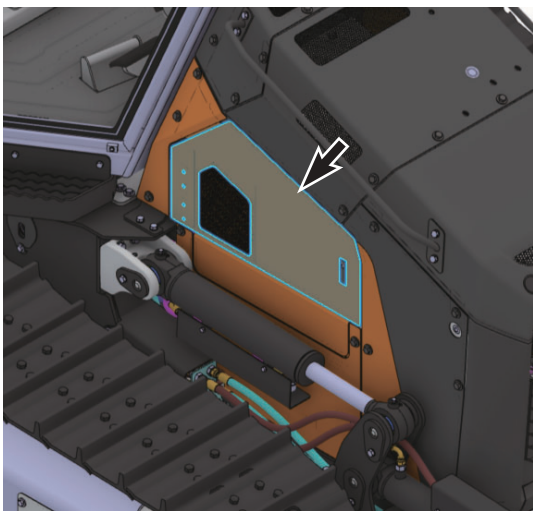
DS2201236

Figure 108



DS2201237

Figure 109

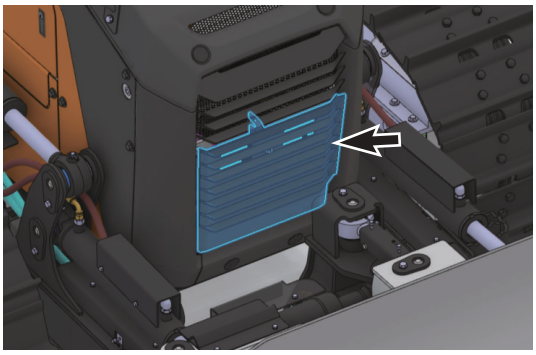


DS2201238

Figure 110

Front Door

Hold and pull the handle to open the front door.



DS2201239

Figure 111

Operation

To Operate a New Machine

All 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 from time to time.*
4. *Avoid an extreme engine load.*
5. *Operate unit at 80% load until engine and all other components are at operating temperatures.*
6. *Check that work equipment is operating normally.*
7. *Check machine for loose parts or for damage that may have occurred during shipping.*
8. *Check for loose wiring or terminals, check gauge operation and battery electrolyte level.*
9. *After the machine is newly installed or replaced, some of its components are to be initially and only once lubricated/greased or replaced.*
   For details, refer to "Inspection, Maintenance and Adjustment" on page 4-1 of this manual.

Starting and Stopping Engine

Inspection Before Starting Engine

Walk Around Checks

WARNING

AVOID DEATH OR SERIOUS INJURY

If flammable materials such as leaves, paper, etc. are allowed to accumulate on high temperature components, such as the engine muffler and turbo, a fire can occur. Fuel, lubricant, and hydraulic oil leaks can cause a fire. Clean machine, remove all flammable materials from machine, and repair machine before operating.

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

1. Overall
    - Check for damage, wear, crack, oil leakage, play in work equipment, cylinders, linkages and hoses.
    - Check the undercarriage for damage, wear, crack, oil leakage and loose bolts.
    - Check for problems in doors, handrails, guardrails, steps and loose bolts.
    - Clean and check cabin glass, rearview mirrors, cameras and lights.
    - Clean and check monitor, switches and gauges in the cabin.
2. Cleaning
    - Remove dirt and debris from around engine, radiator, oil cooler and battery.
    - Check and remove flammable material around muffler, turbocharger, battery or other high temperature components.
    - Clean and inspect fins of radiator, oil cooler, CAC (Charged Air Cooler), fuel cooler and condenser.
3. Engine system
    - Check for coolant and oil leakage around the engine and cooling system.
    - Check engine emission control system.

4. Fuel system
    - Drain water and sediment from fuel tank and water separator.
    - Check for fuel leakage in fuel system.
5. Hydraulic system
    - Check for hydraulic oil leaks, damaged tubing and hoses and interference points of components.
6. Electric system
    - Check for damaged electrical cables and loose or missing connectors.
7. Lubrication
    - Perform all daily and periodic maintenance services. Perform services according to reading shown on hour meter.
8. Safety
    - Perform a machine walk-around. Make sure that no one is under the machine or performing any maintenance on it before starting engine.
9. After starting machine
    - Check that all operational controls and components are in proper operating condition and are functioning correctly. Stop operation and correct any problems before continuing work.

Checks Before Starting Engine

Before starting engine, inspect the following items. If any problem is found, repair it before machine operation. If the oil, fuel or coolant level are below the "LOW" mark, add it. For detail method, see "10 Hour / Daily Service" on page 4-25.

1. Grease front attachment pins.
2. Check engine oil level.
3. Check level of hydraulic oil tank.
4. Check fuel level.
5. Check DEF (AdBlue®) level.
6. Clean dust net in front of oil cooler and intercooler.
7. Check cooling system and refill as required.
8. Check level of window washer liquid.
9. Inspect the blade and ripper for signs of wear.
10. Inspect engine fan blade.
11. Check air intake system.
12. Inspect seat belt for any damage and proper operation.
13. Inspect the structure for cracks and faulty welds.
14. Check the operation of all switches.
15. Check the operation of all exterior lights, horn, travel alarm, 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, set the hydraulic cutoff Switch to "O" (OFF) position and stop engine to prevent accidental activation of the work levers and controls.

2. Set hydraulic cutoff Switch to "O" 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. Turn 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".

   - 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 starter switch is in "Key On" mode, there is a problem.*

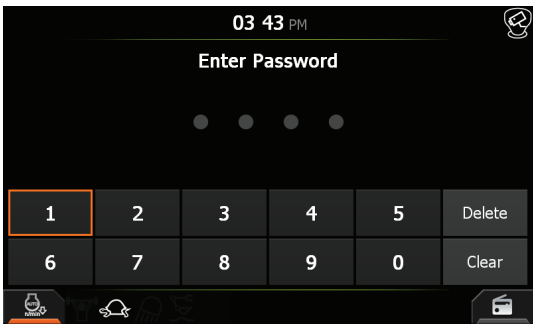
WARNING

AVOID DEATH OR SERIOUS INJURY

Sound the horn before to starting the engine and make sure there are no people or obstacles in the operating area.

1. Perform all steps in "Operational Checks Before Starting Engine" on page 3-5.
2. Set engine speed control dial to "LOW IDLE". If control dial is at "HIGH IDLE", the engine will accelerate suddenly and cause damage to the engine.
3. Sound horn.
4. Turn the starter switch to "I" (ON) position.
5. Enter password.

   NOTE: *If the security system is "LOCKED", a four-digit password will be required to start the engine. If the system is "UNLOCKED", no password will be required and this display screen will not appear.*
6. Turn the starter switch to "Start" position. Engine should start in approximately five (5) seconds.



DS1900406

Figure 1

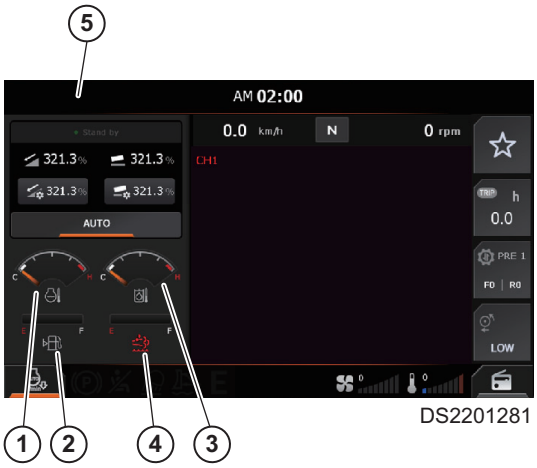
NOTICE

If the engine does not start after approximately fifteen seconds of cranking, never press the start/stop button. Wait about five minutes and repeat above steps.

7. After warming unit, check all operating indicators to make sure that all engine systems (oil pressure, coolant, etc.) are in the normal operating range. If any problems are noticed, stop engine and correct the problem.

   Normal indicators are:

No.	Instrument Panel Light or Gauge	Indicator Reading
1	Engine Coolant Temperature Gauge	White Range
2	Fuel Gauge	
3	Hydraulic Oil Temperature Gauge	
4	DEF (AdBlue®) Level Gauge	
5	Charging Warning	OFF
	Engine Oil Pressure Warning	
	Engine Coolant Temperature Warning	
	Engine Check Warning	



DS2201281

Figure 2

8. 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.

9. 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.*

10. 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.

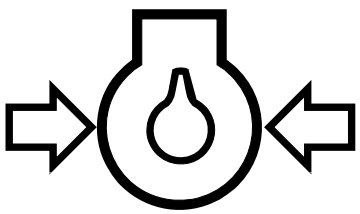

HAOA620L

Figure 3

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.*

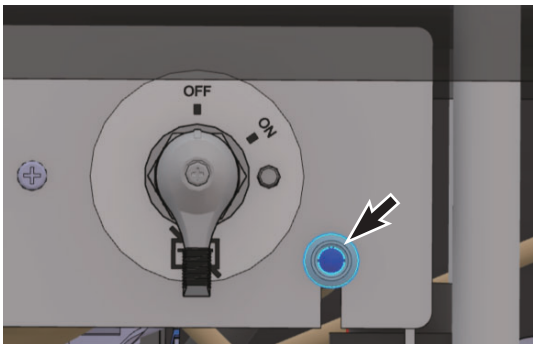
1. Park machine on firm and level ground.
2. Lower front end attachment to ground and make sure all operating controls are in "NEUTRAL".
3. Set parking brake switch to "I" (ENGAGED) position
4. Set engine speed control dial to "LOW IDLE".
   Allow engine to idle for three - five (3 - 5) minutes.
5. Stop engine by turning key to "O" (OFF) position.

Checks and Maintenance After Stopping Engine

1. Park the machine on dry and hard ground.
2. Repair machine if there are any coolant or oil leaks.
3. Inspect front attachment and undercarriage for abnormal appearances. Check that attachment is secure. Correct any problems.
4. Fill fuel tank and drain any water collected in the fuel system to prevent it from freezing.
5. Inspect and remove accumulated flammable materials, such as leaves, paper etc., in engine compartment.
6. Clean all mud, debris, etc. from undercarriage and tracks. Make sure that all steps and handholds are clean, and that operator's cabin is clean.

Wait to Disconnect Indicator

After engine is shutdown, the DEF system must perform an automatic fluid purge cycle that requires the use of the DEF pump motor. If battery power is turned "OFF", the purge cycle the fluid left within the pumps and the DEF lines may cause component failures and fault codes. Do not turn master disconnect switch for batteries until disconnect indicator is "OFF".



DS2201240

Figure 4

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.

Travel

WARNING

AVOID DEATH OR SERIOUS INJURY

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

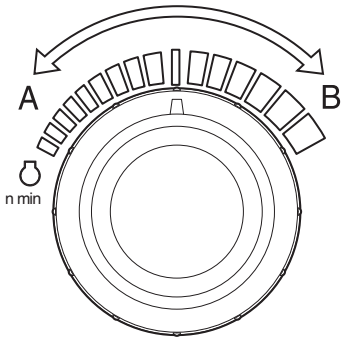
Operating Instructions

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 5

Emission Control System

This machine is equipped with an engine exhaust emission control system that meets applicable engine EPA/CARB/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.

Inducement

Inducement Items	Inducement Level	DEF (AdBlue®) Level/Time	Notification Method	Torque Reduction	Symbol
Low level DEF	Warning	DEF tank level < 13.5%	Constant symbol	-	
	Moderate	DEF tank level < 7.5%	Slow blinking symbol	Torque is reduced by 1% per minutes to 75% of highest torque	
	Severe	DEF tank level < 3%	Fast blinking symbol + buzzer	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.	
Malfunction of the monitoring	Warning	Immediately	Constant symbol	-	
	Moderate	+ 35 hours	Slow blinking symbol	Torque is reduced by 1% per minutes to 75% of highest torque	
	Severe	+ 1 hours	Fast blinking symbol + buzzer	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.	
DEF quality / Dosing error	Warning	Immediately	Constant symbol	-	
	Moderate	+ 2.5 hours	Slow blinking symbol	Torque is reduced by 1% per minutes to 75% of highest torque	
	Severe	+ 70 mins	Fast blinking symbol + buzzer	Torque is reduced by 1% per minute to 50% of the highest torque. The engine speed is reduced to 60% of the nominal engine speed.	

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.

State	Condition	Notification Method	Symbol
Auto regeneration	Elapsed specific time from past regeneration	Constant	
Service regeneration Request	Auto regeneration is fail	Constant	
Service regeneration	Activating service regeneration by operator	Constant	
Regeneration prohibition	Inhibition switch in the "prohibition" condition	Constant	

NOTE: *Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for service regeneration and ATS 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 joystick in "NEUTRAL" and engage parking brake.
3. Activate regeneration switch (Figure 6) 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 set the hydraulic cutoff.*

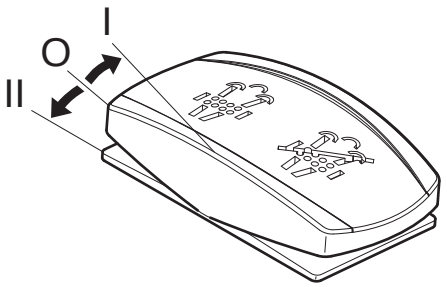


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Figure 6

Parking Machine

WARNING

AVOID DEATH OR SERIOUS INJURY

Park machine on firm and level ground. Avoid parking on slopes. If machine must be parked on a slope, block tracks or wheels and place blade teeth in ground.

1. Park machine on firm and level ground. Lower blade or work tool to ground.
2. Set engine speed control dial on "LOW IDLE"
3. If you move the operation lever unintentionally, it can cause accidental movement of the work group on attachment. Before leaving operator's seat, set the hydraulic cutoff Switch to "O" position. Stop engine.

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.

Check for Leaks in Fuel System

Perform an inspection of engine compartment to verify that fuel system is not leaking. If any is noted, determine source of leak and repair.

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.

Check for Leaks in Hydraulic System

Perform a daily walk-around inspection to make sure that hoses, piping, fittings, cylinders and hydraulic motors are not showing any signs of leakage. If any is noted, determine the source of the leak and repair.

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 4-86.

Hydraulic Hose Installation

- When removing part at locations with O-rings or gasket seals, clean mounting surface and replace with new parts.

  When doing this, be careful not to forget to assemble O-rings and gaskets.
- When installing hoses, do not twist them or bend them sharply. This will extend service life and prevent damaging hoses.

Checks After Inspection and Maintenance Works

Perform checks after inspection and maintenance to prevent operation problems. Always do the following:

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

– Is there any leakage of fuel or oil when engine speed is raised?

Coolant, Oil, Fuel - Drain and Change

The engine must be turned off when draining, replacing, or adding fluid to the machine.

Safety Precautions

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

Machine Setup Position for Maintenance

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

1. Position the machine on even, firm and level ground.
2. Lower blade or work tool to the ground.
3. Set parking brake switch to "I" (APPLIED) position.
   This will ensure that parking brake is "APPLIED".
4. Allow engine to run at "LOW IDLE" for a minimum of five minutes to allow engine to cool, If this is not done, heat surge can occur.
5. Press the start/stop button for more 1 second to stop the engine. After releasing hydraulic system and tank pressure.
6. Before starting maintenance work, place a "DO NOT OPERATE" Warning Tag on cabin door or work lever.

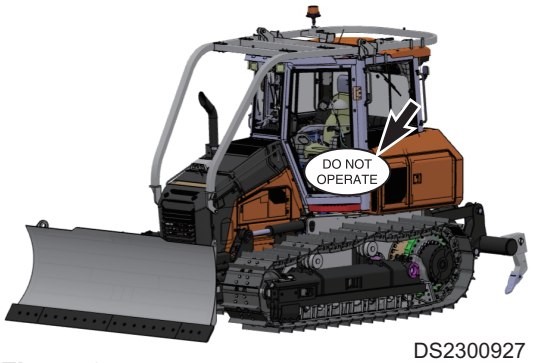
WARNING

AVOID DEATH OR SERIOUS INJURY

If engine must be running while performing maintenance, use extreme care. Always have one person in cabin at all times. Never leave cabin with engine running.

DS2300926

Figure 1



DS2300927

Figure 2

Handling Oil, Fuel, DEF (AdBlue®), Coolant

Oil

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

Fuel

To ensure good fuel consumption characteristics and exhaust gas characteristics, the engine mounted on this machine uses an electronically controlled high-pressure fuel injection device. This device uses high precision parts and lubrication. If low viscosity fuel with reduced lubricating ability is used, the durability of the fuel injection device could be affected.

- To prevent moisture in air from condensing and forming water inside fuel tank, always fill fuel tank after completing day's work.
- The fuel pump is a precision instrument and if fuel containing water or dirt is used, it cannot work properly.
- Be careful not to let impurities get in when storing or adding fuel.
- Always use fuel specified for temperature given in this manual.

  - If fuel is used at temperatures lower than specified temperature (particularly at temperatures below -15°C (5°F), the fuel will gel-up and solidify.
  - If fuel is used at temperatures higher than specified temperature, the viscosity will drop, and this can cause performance problems.
- Before starting engine, or when 10 minutes have passed after adding fuel, drain sediment and water from fuel tank.
- If engine runs out of fuel, or if filters have been replaced, it is necessary to bleed air from circuit.
- If there is any foreign material in fuel tank, wash tank and fuel system.

NOTICE

This machine is equipped with an exhaust aftertreatment system, which requires the use of ultra low sulfur diesel (ULSD) fuel.

For ULSD, please use a Diesel with a specification specific to your country, as the adoption specification differs by country.

North 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 level can have the following negative effects:
- Shorten the time interval between aftertreatment device service intervals (cause the need for more frequent service intervals)
- Adversely impact the performance and life of aftertreatment devices (cause loss of performance)
- Reduce regeneration intervals of aftertreatment devices
- Reduce engine efficient and durability
- Increase the wear.
- Increase the corrosion.
- Increase the deposits.
- Lower fuel economy.
- Shorten the time period between Oil drain intervals (more frequent oil drain intervals)
- Increase overall operating costs.

Failures that result from use of improper fuels are not HD HYUNDAI CONSTRUCTION EQUIPMENT factory defects. Therefore the cost of repairs would not be covered by a HD HYUNDAI CONSTRUCTION EQUIPMENT warranty.

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 smell 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 about 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 in the applications listed below.

HD HYUNDAI CONSTRUCTION EQUIPMENT engine oils meeting the API CJ-4 and ACEA E9 oil categories have been developed with limited sulfated ash, phosphorus, and sulfur.

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 4-79.
- 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 4-79 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 4-81.
  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 4-14.

  When working in severe conditions, replace filters at shorter intervals according to oil and fuel (sulfur content) being used.

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

Electrical System Maintenance

- If electrical equipment becomes wet or covering of wiring is damaged, this will cause an electrical short circuit and result in improper machine operation. Do not wash inside of operator's cabin with water. When washing the machine, be careful not to let water get into electrical components.
- Service relating to the electrical system is: checking damage or wear to the fan belt, and checking battery electrolyte level.
- Never install any electric components other than those specified by HD HYUNDAI CONSTRUCTION EQUIPMENT.
- External electromagnetic interference can cause malfunction of the control system controller. Before installing a radio receiver or other wireless equipment, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor to prevent electromagnetic interference.
- When working in saltwater areas or in or around snow, carefully clean the electrical system to prevent corrosion.
- When installing electrical equipment, connect it to the special power source connector. See "7. 12V Power Socket" on page 2-12.

  Do not connect the optional power source to a fuse, start/ stop button, 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 4-14 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.

SERVICE DATA												
No.	**Items to Check**	**Service**	**Qty.**	**Service Interval (hr)**								
				10	**50**	**150**	**250**	**500**	**1000**	**1500**	**2000**	**4500**
1	Dozer Blade Joint Pin	Grease	16	F100	W10							
2	Ripper [1)]	Grease	12	F100	W10							
3	Equalizer Bar Center Pin	Grease	1		V							
4	C-frame, Main Frame Joint Pin	Grease	2	F100	W10							
5	Track Spring	Grease	2				W10, V					
6	Equalizer Bar Pins (Side)	Grease	2				V					
7	Pivot Shaft Oil	Engine Oil	2				V					
8	Engine Oil	Engine Oil	12.35 L	V								
9	Pre Fuel Filter and Water Separator	Cartridge	1	V, D								
10	Engine Oil Filter	Cartridge	1									
11	Main Fuel Filter	Cartridge	1									
12	Hydraulic Oil Return Filter	Element	1				F					
13	HST Filter	Element	1				F					
14	Air Conditioner Filter (Outer)	Element	1					C				
	Air Conditioner Filter (Inner)	Element	1					C				
15	Fuel Cap Filter	Element	1									
16	Travel Reduction Gear	Gear Oil	2 x 4.5 L		V	F						
17	Hydraulic Oil Tank [3)]	Hydraulic Oil	100 (93) L	V								
18	Coolant [5)]	Coolant	44.6 L	V								
19	Air Cleaner (Outer)	Element	1					C				
	Air Cleaner (Inner)	Element	1									
20	DEF (AdBlue) Filter	Element	1									
21	Fuel Tank [4)]	Diesel	267 (261) L	V	D							

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.

[1)] If Ripper Is Equipped (Optional)

[3)] Total Tank Capacity (Level)

[4)] Total Tank Capacity (Max. Possible Refueling Volume)

[5)] Coolant Capacity

[6)] Actual Tank Capacity (Usable)

SERVICE DATA												
No.	Items to Check	Service	Qty.	Service Interval (hr)								
				10	50	150	250	500	1000	1500	2000	4500
22	Hydraulic Oil Suction Strainer	Strainer	1								C	
23	Idler Guide Wear Plates	-	12								V	
24	DEF (AdBlue) Tank [6]	DEF	19 L	V								
25	Radiator Core	Core	1					C				
26	Oil Cooler Core	Core	1					C				
27	Intercooler Core	Core	1					C				
28	Aircon Condenser Core	Core	1					C				

V: Maintenance and Refill. / **C**: Cleaning. / **D**: Drain Water. / **F**: First Time Exchange Only.

F100: Every 10 Hours For First 100 Hours. / **W10**: Every 10 Hours If Operating In Water.

: Replacement On Every Interval.

[1] If Ripper Is Equipped (Optional)

[3] Total Tank Capacity (Level)

[4] Total Tank Capacity (Max. Possible Refueling Volume)

[5] Coolant Capacity

[6] Actual Tank Capacity (Usable)

Fluid Capacities

Component		Capacity
Engine	Oil Pan with Filter	12.35 L (3.3 U.S. gal.)
	Cooling System	44.6 L (11.8 U.S. gal.)
Fuel Tank		261 L (68.9 U.S. gal.)
DEF (AdBlue®) Tank		19 L (5.0 U.S. gal.)
Hydraulic Oil	Tank Level	93 L (24.6 U.S. gal.)
	System	100 L (26.4 U.S. gal.)
Travel Reduction Gear (Each)		4.5 L (1.2 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" on page 4-14 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	SAE 10W-30
		SAE 5W-30
		SAE 0W-30
		SAE 0W-40
		[2] SAE 5W-40
		[3] SAE 10W-40
		[4] SAE 15W-40
Final Drive Case	Gear Oil	SAE 90 and API GL5
		[1] SAE 80W-90 and API GL5
		SAE 140 and API GL5
Hydraulic Oil Tank	[6] Hydraulic Oil	ISO VG. 15
		ISO VG. 32
		ISO VG. 46
		ISO VG. 68

Fuel Tank	Diesel Fuel				ASTM D975 No. 1		[1] ASTM D975 No. 2						
Grease Fitting	Grease				DIN 51502 KP-1K-30 / NLGI No.1								
							DIN 51502 KP-2K-10 / NLGI No.2						
							DIN 51502 KP-3K-10 / NLGI No.3						
Cooling System	Coolant	Add Antifreeze [1] (50% antifreeze - 50% distilled water) (Note that mixing ratio is for reference purpose only, and is not an absolute standard.) Make sure to use HD HYUNDAI CONSTRUCTION EQUIPMENT's genuine antifreeze. If HD HYUNDAI CONSTRUCTION EQUIPMENT's genuine antifreeze is not available, see the "Type of Antifreeze" page.											

[1]	Installed at factory.
[2]	(5W40) - Recommended for use at extremely low temperature below -20°C.
[3]	(10W40) - Filled at factory. HD HYUNDAI CONSTRUCTION EQUIPMENT genuine engine oil is recommended for use.
[4]	(15W40) - HD HYUNDAI CONSTRUCTION EQUIPMENT genuine engine oil is recommended for use.
[5]	(Engine oil) - Engine oil must meet API CJ-4/ACEA E9.
[6]	Note that oil grade is for reference purpose only, and is not an absolute standard.
API: American Petroleum Institute.	
ACEA: Association des Constructeurs 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

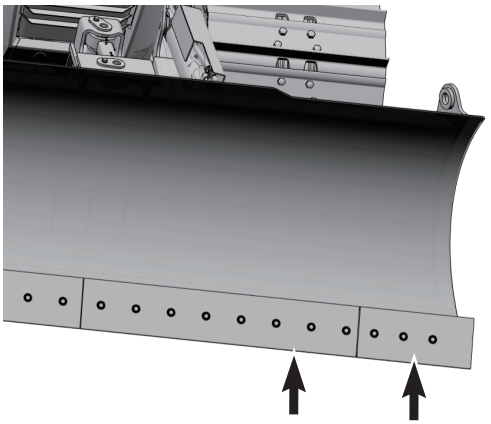
SERVICE ITEM	PAGE
Fuel Cap Filter - Replace	4-59
1,500 Hour / 9 Month Service	
Travel Reduction Gear Oil - Change	4-60
2,000 Hour / Yearly Service	
Perform All Daily, 50, 250, 500 and 1,000 Hour Service Checks	4-61
Idler Guide Wear Plates - Inspect	4-61
Hydraulic Oil - Change	4-61
Hydraulic Oil Suction Strainer - Clean	4-63
Coolant - Change	4-64
Air Cleaner Outer and Inner Filter - Replace	4-66
4,500 Hour / Biennial Service	
DEF (AdBlue®) Filter - Replace	4-68

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

When Required

Cutting Edges and End Bits - Inspect / Replace

1. Raise the bulldozer blade. Place mechanical blocking under the blade. Blocking height is the minimum blade height that would allow the cutting edges and end bits to be removed.
2. Lower the blade onto the blocking.
3. Engage the parking brake.
4. Activate the hydraulic lockout switch to the "LOCKED" position.
5. Stop the engine.
6. Remove the bolts.
7. Remove the cutting edge and the end bits.
8. Thoroughly clean all contact surfaces.
9. Inspect the opposite side of the cutting edge. If the opposite side of the cutting edge is not worn, turn the opposite side of the cutting edge downward and install the cutting edge.
10. If both sides of the cutting edge are worn, install a new cutting edge.
11. Repeat Steps 9 and 10 for the end bits.
12. Install all bolts and tighten the bolts to the specified torque.



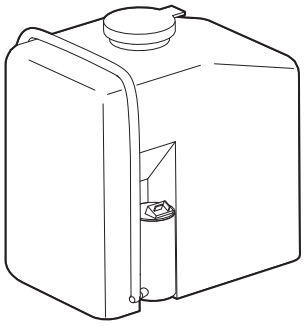
DS2300963

Figure 3

Window Washer Liquid Level - Check

1. Open left access door and check fluid level in windshield washer tank.
2. Open fill cap and add fluid.

   NOTE: *Use a washer liquid that is rated for all seasons. This will prevent freezing during cold weather operation.*



DS1901236

Figure 4

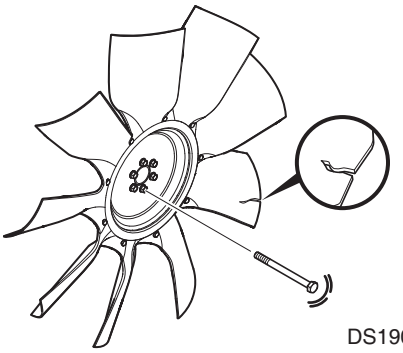
Cooling Fan Blade - Inspect

WARNING

AVOID DEATH OR SERIOUS INJURY

Death or serious injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade(s) and cause fan failure.

1. An inspection of the cooling fan is required daily. Check for cracks, loose bolts, bent or loose blades, and for contact between the blade tips and the fan shroud. Check the fan to make sure it is securely mounted.



DS1900945

Figure 5

Exterior Lights, Horn, Control Console Indicator, Gauge Panel - Check

1. Press the start/stop button to access key on mode 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.

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.

Track Assemblies (Links, Shoes, Rollers, Idlers) - Inspect

Do a daily walk-around inspection of all components including the track assemblies. Look for missing, damaged or excessively worn parts.

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.

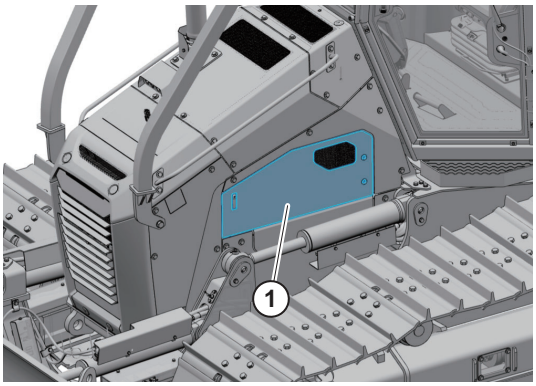
Engine Oil Level - Check

WARNING

AVOID DEATH OR SERIOUS INJURY

Allow engine to cool before checking oil level to avoid burn injury.

1. Park the machine on a level surface before check the engine oil level.
2. Stop engine and wait for fifteen minutes.
3. This will allow all oil to drain back to oil pan.
   Open the engine access door on the left side of the machine.

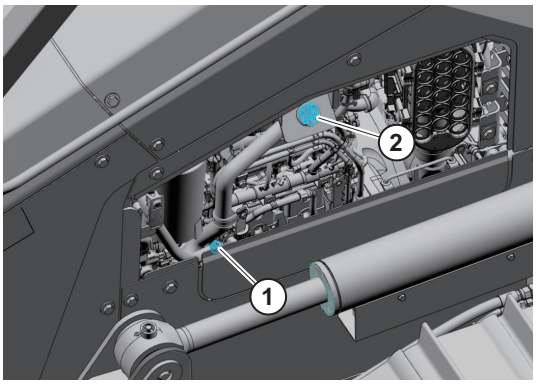


DS2300782

Figure 6

4. Remove dipstick (1) and wipe the oil off with a clean cloth.

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



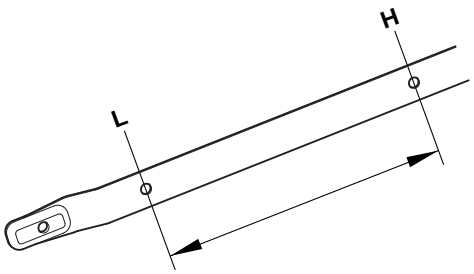
DS2300783

Figure 7

5. Insert dipstick fully in oil gauge tube, then take it out again.
6. 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.*

7. Fill engine oil, if the oil level is below the "LOW" mark.



FG000616

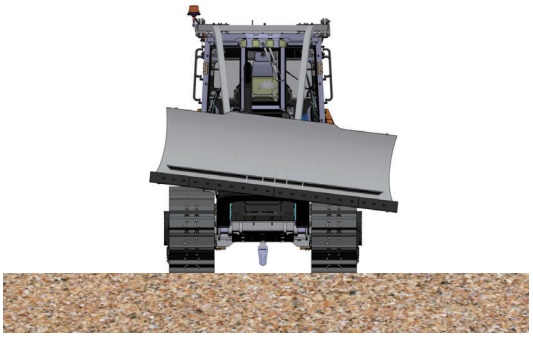
Figure 8

Hydraulic Oil Level - Check

1. Park the machine on a level surface before you check the hydraulic oil level.

DS2301317

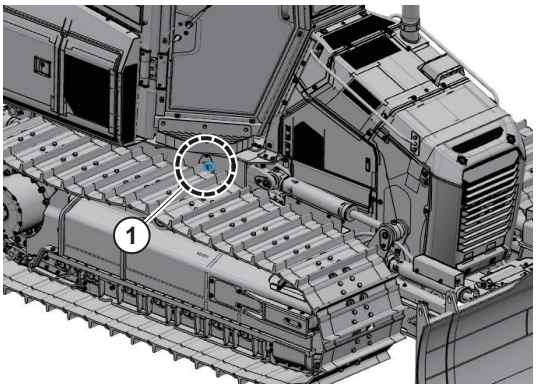
Figure 9



DS2301318

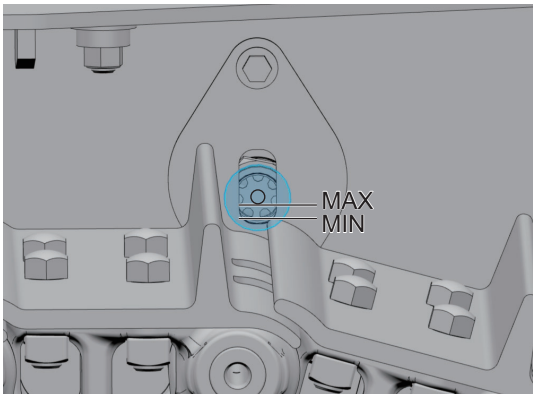
Figure 10

2. Check sight gauge that is attached to hydraulic tank. Oil level must be located between the bottom of the center red circle shown on the level gauge and the bottom of the sight gauge.



DS2201183

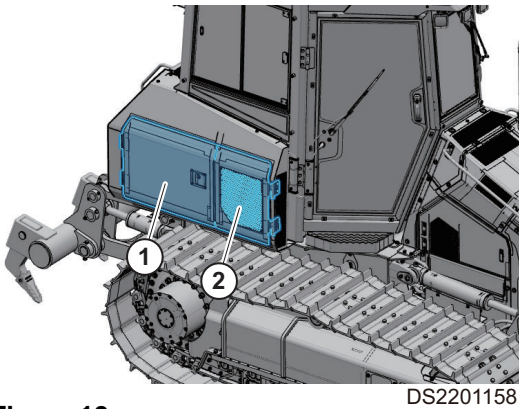
Figure 11



DS2301319

Figure 12

3. Open right side covers (1, 2).



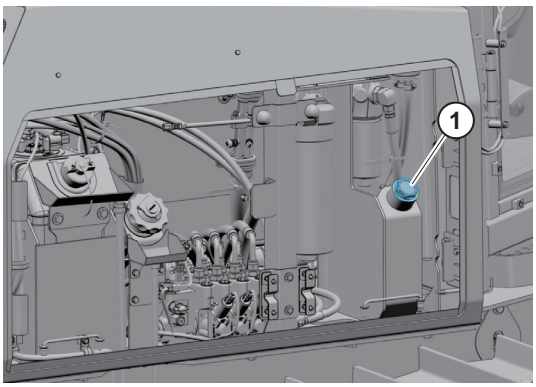
DS2201158

Figure 13

4. Remove hydraulic tank filler cap (1) and fill the hydraulic oil, if necessary.

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.



DS2300784

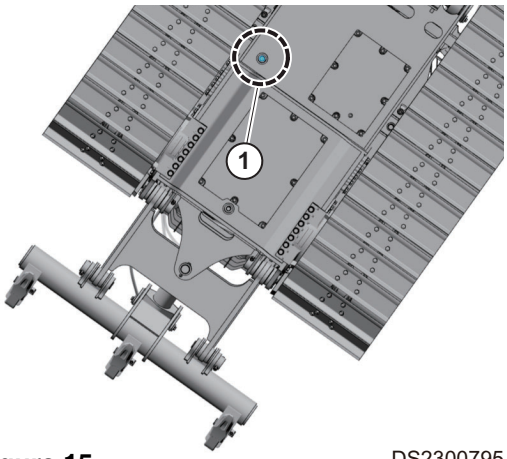
Figure 14

5. Remove hydraulic tank drain plug (1) and drain hydraulic oil, if necessary.

NOTICE

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

Disconnect the drain hose and install the protecting cap.



DS2300795

Figure 15

Fuel Level - Check

WARNING

AVOID DEATH OR SERIOUS INJURY

Use proper safety while refueling to prevent explosions or fire.

Immediately clean up any spilled fuel.

1. Open right side covers (1).

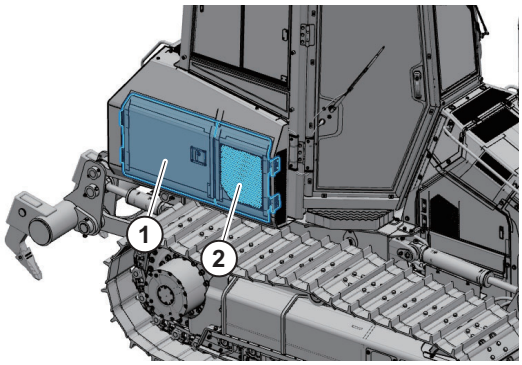


Figure 16 DS2201158

2. At the end of each workday, fill the fuel tank.

   NOTE: *Only use Ultra Low Sulfur Diesel (ULSD) fuel.*

   NOTE: *An excessive amount of fuel level triggers the LED lamp (1) to light off.*

3. Securely tighten cap (2) after fueling.

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

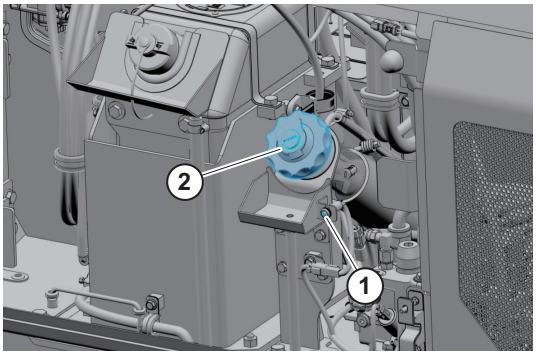


Figure 17 DS2300785

Pre Fuel Filter and Water Separator - Drain

1. A pre fuel filter is inside the front access door.
2. Open the access door (1).

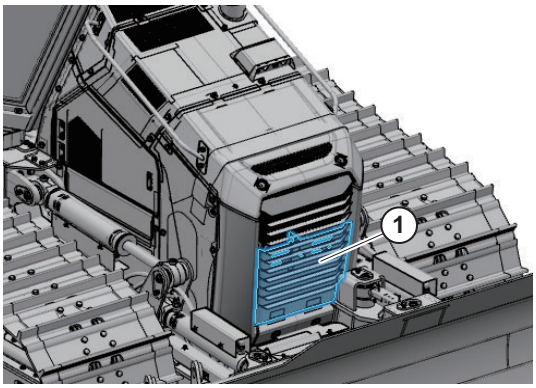


Figure 18 DS2201117

3. It is necessary to drain collected water if bowl is full of water or sediment.

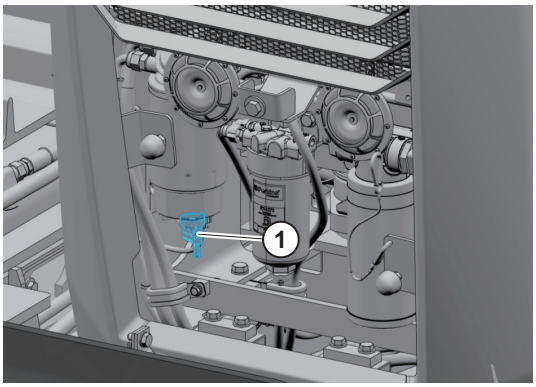
4. Position a small container under pre fuel filter. Drain water or sediment by opening drain valve (1) on bottom of bowl.

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

5. Close drain valve (1).

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

NOTE: *If operator leave the machine with no measure for 30 minutes after the water in fuel warning light up, the engine power will be derated.*



DS2300786

Figure 19

Coolant Level - Check

WARNING

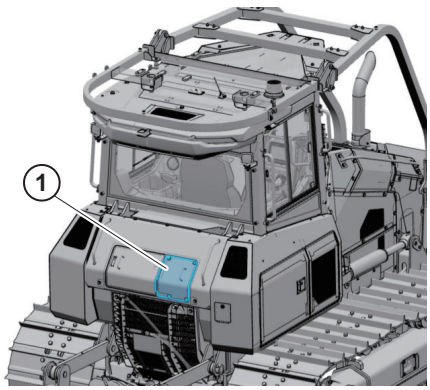
AVOID DEATH OR SERIOUS INJURY

Allow the engine to cool before releasing the surge tank cap. Loosen the cap slowly to release any remaining pressure.

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

NOTE: *Do not mix ethylene glycol and propylene glycol antifreeze together. When the engine is cold, remove surge tank cap and check the coolant level inside the radiator. Do not rely on the level of coolant in the coolant recovery tank. Refill surge tank as required. Refer to coolant concentration table.*
Check to make sure that coolant transfer line from the surge tank to the surge tank is free and clear of obstructions, or is not pinched.

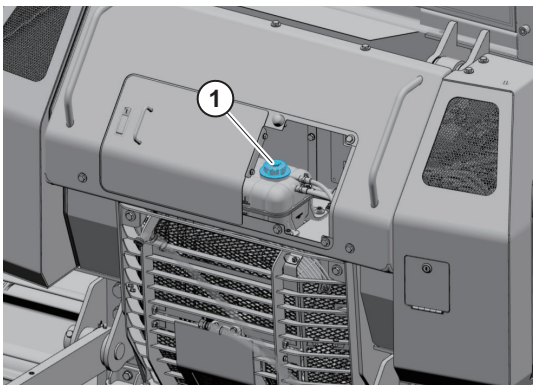
1. Open the rear cover (1), and remove mounting bolts.



DS2201120

Figure 20

2. Check the level of coolant in the surge tank.
   The normal cold engine fluid level must be between "FULL" and "LOW" marks on tank.
3. Remove coolant filler cap (1) and fill the coolant, if necessary.



DS2201121

Figure 21

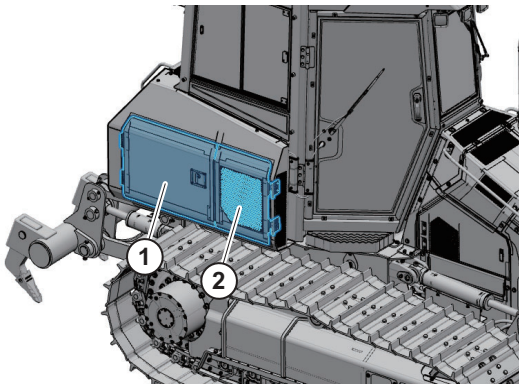
DEF (AdBlue®) Tank Level - Check

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.

1. At end of each workday, fill the DEF (AdBlue®) tank.
2. Open right side doors (1, 2).

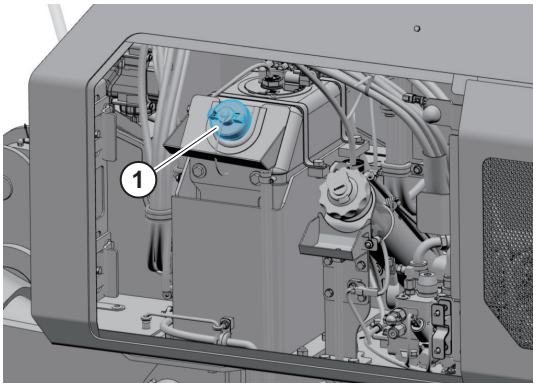


DS2201158

Figure 22

3. Clean and remove DEF (AdBlue®) fill cap (1).
4. Fill the DEF (AdBlue®) into tank.

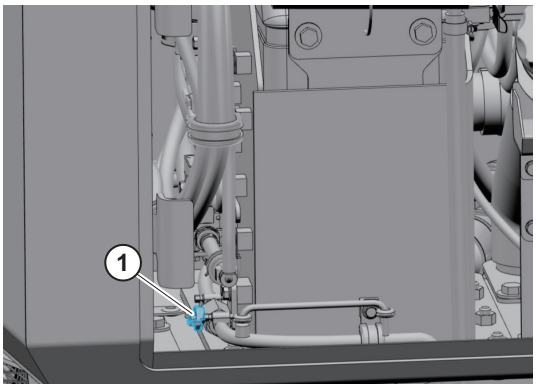
   NOTE: *Do not over fill the tank.*



DS2300787

Figure 23

5. Turn the valve on the lower left of the DEF tank to the right to open it.



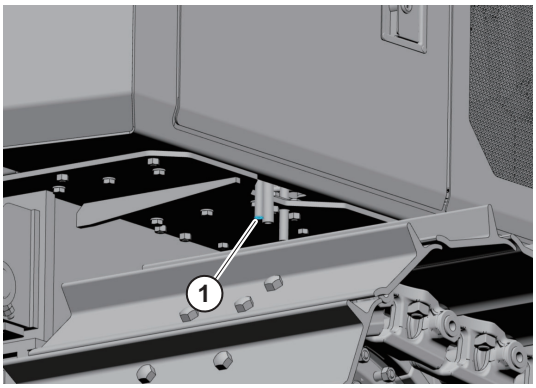
DS2300788

Figure 24

6. Position a small container under drain port.
7. Remove DEF (AdBlue®) drain plug (1) from tank.
8. Drain the DEF (AdBlue®).

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

9. Install drain plug and fill cap.



DS2300789

Figure 25

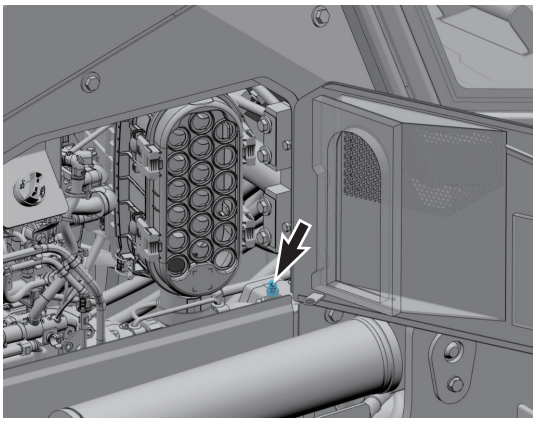
50 Hour / Weekly Service

Perform All Daily Service Checks

Equalizer Bar Center Pin - Lubricate

NOTE: *Apply lubricant to the fittings with a hand operated grease gun only. Use of pressure operated lubricating equipment damages the seals.*

1. The grease fitting is located when you open the left engine cover.
2. Press the grease fitting and inject grease with the grease gun on the marked point.



DS2301442

Figure 26

Dozer Blade Joint 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.*

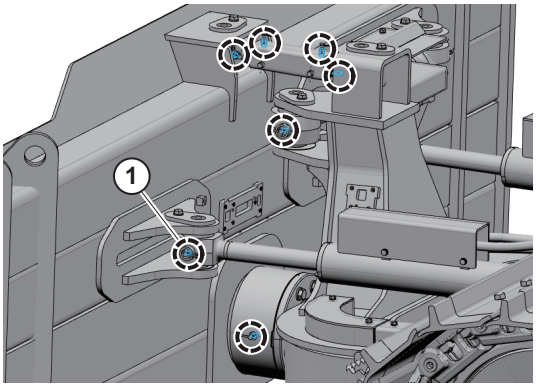
NOTE: *If the unit has been running or working in water, the machine must be greased on a 10 hour/daily basis.*

1. Position machine on firm and level ground.

DS2300926

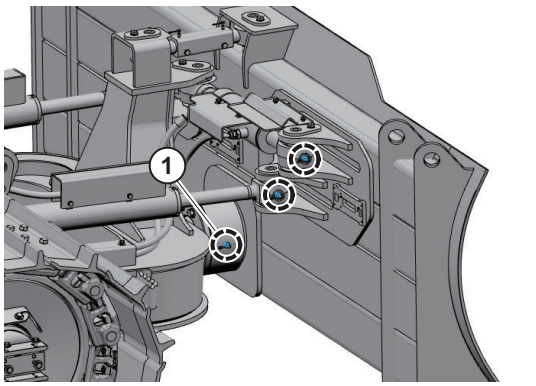
Figure 27

2. Lower dozer blade to the ground.
3. Press the grease fitting (1, 18 ea) and inject grease with the grease gun on the marked point.
4. After greasing, clean off the old grease that has been purged.



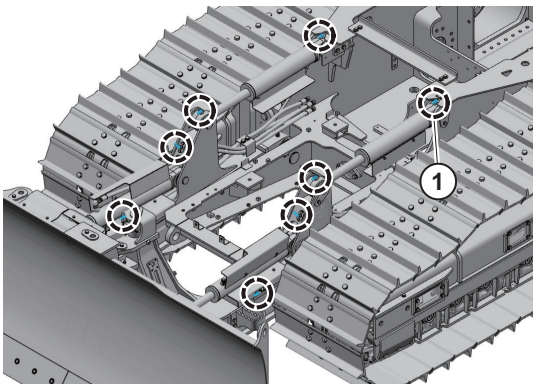
DS2201147

Figure 28



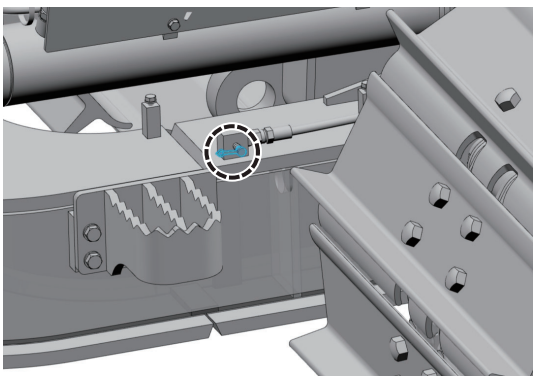
DS2201148

Figure 29



DS2300964

Figure 30



DS2301443

Figure 31

Ripper Joint Pin - Lubricate

WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

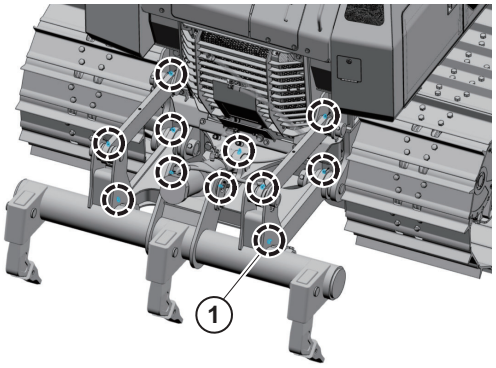
NOTE: *If the unit has been running or working in water, the machine must be greased on a 10 hour/daily basis.*

1. Position machine on firm and level ground.

DS2300926

Figure 32

2. Lower ripper to the ground.
3. Press the grease fitting (1, 11 ea) and inject grease with the grease gun on the marked point.
4. After greasing, clean off the old grease that has been purged.



DS2300790

Figure 33

C-frame, Main Frame Joint Pin - Lubricate

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

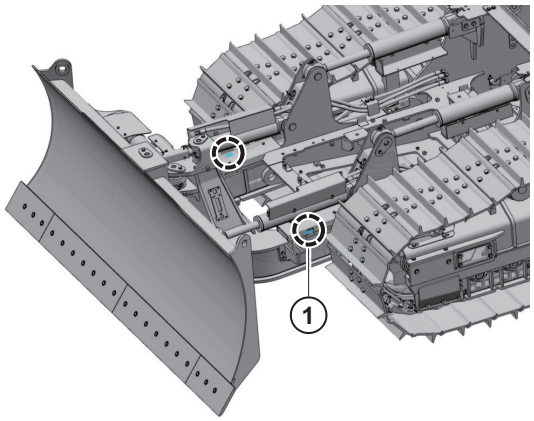
NOTE: *If the unit has been running or working in water, the machine must be greased on a 10 hour/daily basis.*

1. Position machine on firm and level ground.

DS2300926

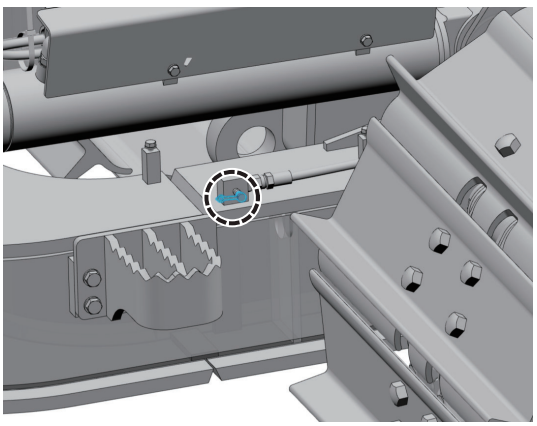
Figure 34

2. Press the grease fitting (1, 2 ea) and inject grease with the grease gun on the marked point.
3. After greasing, clean off the old grease that has been purged.



DS2301444

Figure 35

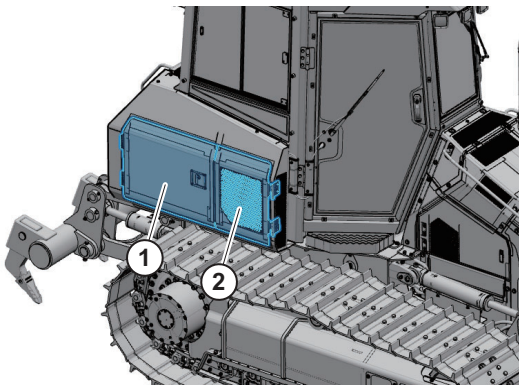


DS2301443

Figure 36

Fuel Tank Water and Sediment - Drain

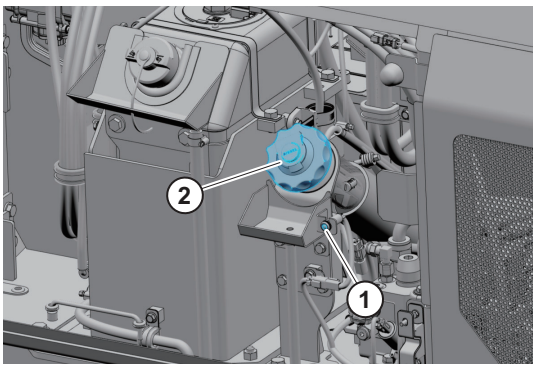
1. Perform this procedure before operating the machine.
2. Open right side covers (1, 2).



DS2201158

Figure 37

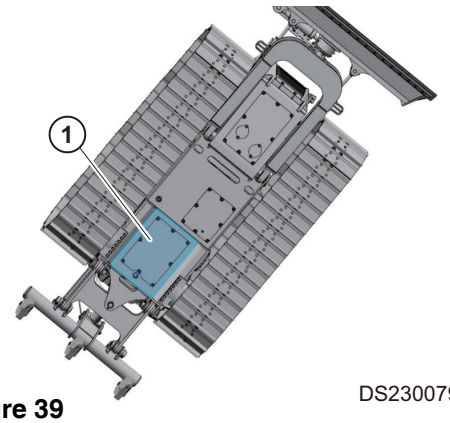
3. Remove fuel fill cap (2) to relieve pressure.



DS2300785

Figure 38

4. Remove under cover (1) from frame.
   The drain plug for the fuel tank is located underneath the fuel tank.



DS2300791

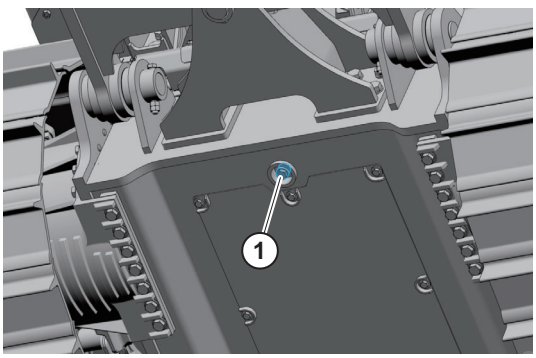
Figure 39

5. Remove drain plug (1) from fuel tank.
6. 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.*

   NOTE: *Only use Ultra Low Sulfur Diesel (ULSD) fuel.*
7. Install the fuel fill cap and close the right doors.



DS2300792

Figure 40

Travel Reduction Gear Oil - Check

WARNING

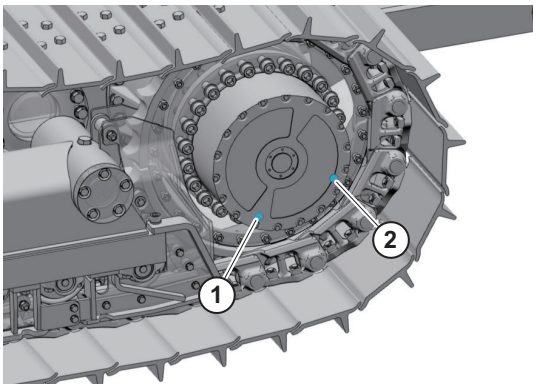
AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool.

Before removing the motor case, loosen the plug slightly to allow pressurized air to escape. Residual pressure in the travel reduction gear can cause the plug to be dislodged and oil to squirt out suddenly.

NOTE: *Change oil after first 150 hours of operation or rebuild, and every 1,500 hours thereafter.*

1. Make sure that the machine is on firm and level ground.
2. Rotate the track until the drain port (1) is in a low position.
   - Oil Drain Port (1)
   - Oil Level and Filler Port (2)
3. Loosen the oil level and filler port (2) slowly to allow pressurized air to escape.
4. Remove the oil level and filler port (2).
5. Check the oil level. The oil must be near the bottom of the level port opening.
6. If necessary, add oil through the oil level and filler port (2).
7. Wipe the oil level and filler port (2) clean and retighten it.
8. Repeat this procedure on the other travel reduction gear.



DS2300793

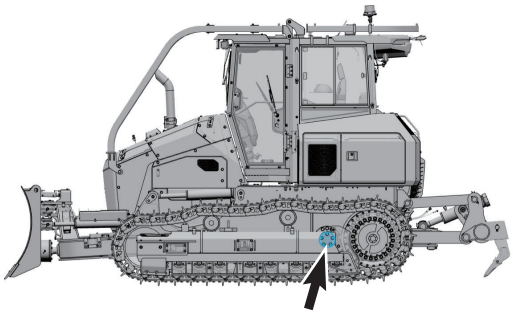
Figure 41

250 Hour / Monthly Service

Perform All Daily and 50 Hour Service Checks

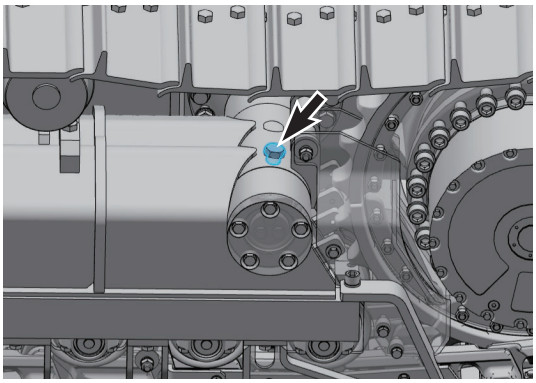
Pivot Shaft Oil Level - Check

1. Remove the oil plug on one side of the machine.
2. Check the pivot shaft oil level. The oil level should be at the bottom of the threaded hole.
3. If necessary, add oil to bring the oil level up to the bottom of the threaded hole.
4. Repeat this procedure on the other side of the machine.



DS2300929

Figure 42



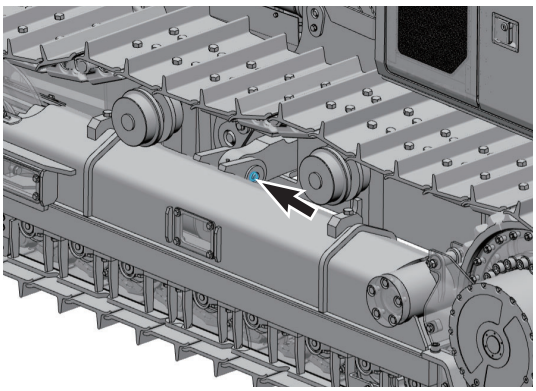
DS2300930

Figure 43

Equalizer Bar Pins (Side) - Lubricate

NOTE: *Apply lubricant to the fittings with a hand operated grease gun only. Use of pressure operated lubricating equipment damages the seals.*

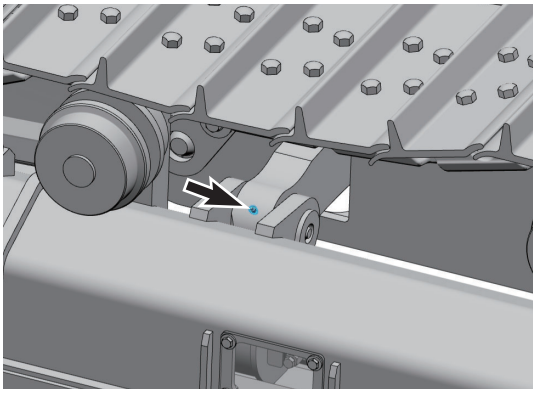
1. The grease fitting is on the ends of the equalizer bar.



DS2300928

Figure 44

2. Clean the areas that are around the end pin.
3. Lubricate fitting located in the pin with grease.
4. Repeat this procedure on the other side of the machine.



DS2300931

Figure 45

Track Spring - Check

Check the track tension every 250 hours. If necessary, adjust the track spring.

NOTE: *If the unit has been running or working in water, the track spring must be greased on a 10 hour/daily basis. Refer to Operation and Maintenance Manual, "Track Tension".*

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

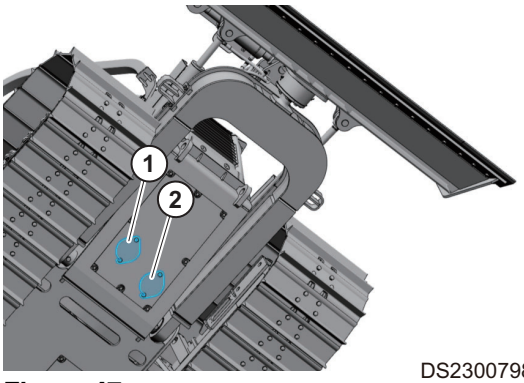
DO NOT change oil on a hot engine. Allow the engine to cool down before attempting to change the engine oil and filter to avoid burns by touching hot engine parts.

1. Park the machine on a level surface.
2. Stop engine and wait for fifteen minutes.
   This will allow all oil to drain back to oil pan.

DS2300926

Figure 46

3. Remove a cover under the engine.



DS2300798

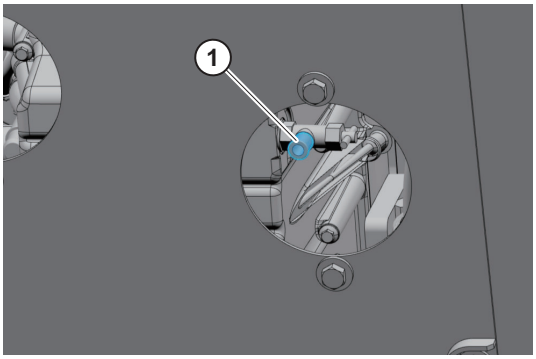
Figure 47

4. Position a larger container under the engine. Remove a plug to drain the engine oil.
5. Drain the engine oil and then install the plug.

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

NOTICE

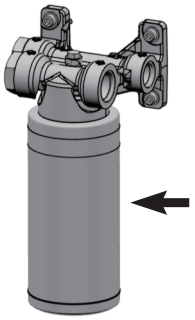
Dispose of filters/oils/liquids in compliance with all applicable environmental laws and regulations.



DS2300810

Figure 48

6. Replace engine oil filter by using filter wrench. The engine oil filter is a spin-on type. Remove and discard filter.
7. Install new filter. Apply a small amount of oil around filter gasket. Screw filter on head until gasket contacts head, turn filter 1/2 turn more.

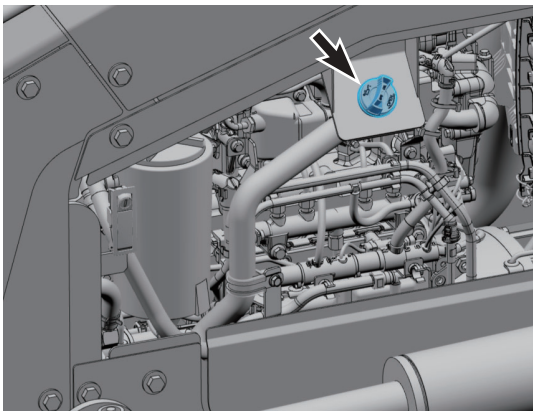


DS2300811

Figure 49

8. Refill the engine with the correct oil through the oil fill port (Figure 50). Refer to the Lubrication Table of this manual for the recommended oil for the operating conditions.

   NOTE: *See "Fluid Capacities" on page 4-16. for capacity.*
9. Start engine. Run engine for five minutes at "LOW IDLE" and check engine oil pressure light.
10. Stop engine. Look for signs of leaks at filter. Recheck oil level after fifteen minutes.



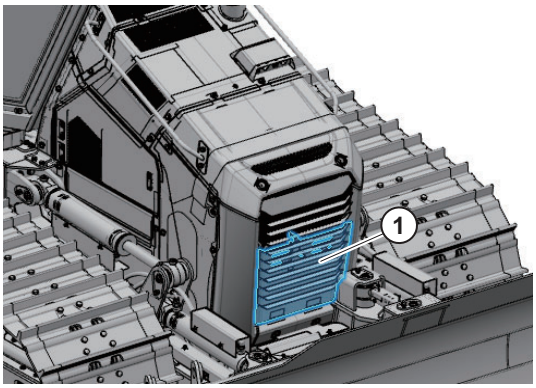
DS2300812

Figure 50

Pre Fuel Filter and Water Separator - Replace

1. Open the pump compartment door to access fuel prefilter.
2. Position a small container under prefilter. Drain fuel by opening drain valve on bottom of filter.

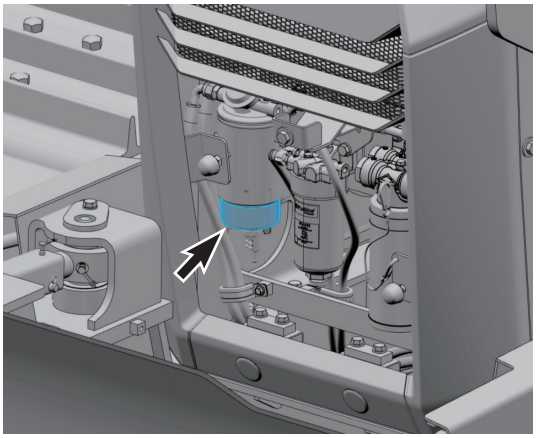
   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*



DS2201117

Figure 51

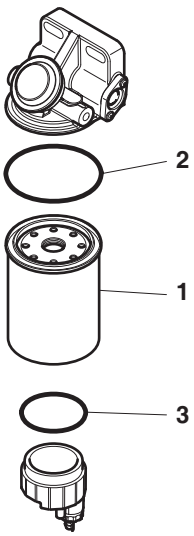
3. Remove bowl using supplied tool.
4. Remove cartridge.



DS2300813

Figure 52

5. Coat surface of packing (2, Figure 53) with fuel on new cartridge (1).
6. Tighten cartridge by hand until packing comes into contact with surface of filter housing head.
7. When packing contacts surface, tighten the cartridge about 3/4 of a turn more.
8. Coat surface of seal (3, Figure 53) with fuel, and tighten the bowl with tool.



EX1404493

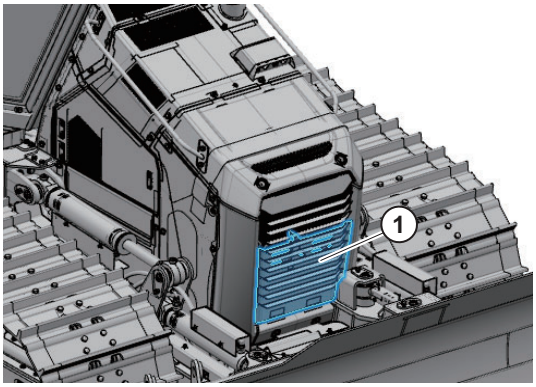
Figure 53

Main Fuel Filter - Replace

WARNING

AVOID DEATH OR SERIOUS INJURY

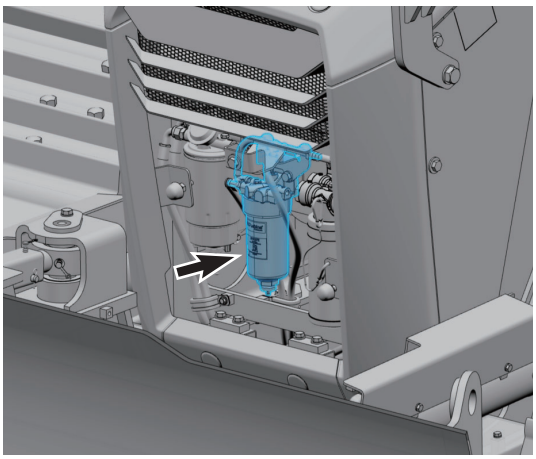
Change filter after waiting for engine to cool. Be careful of fire hazards. Do not smoke.



DS2201117

Figure 54

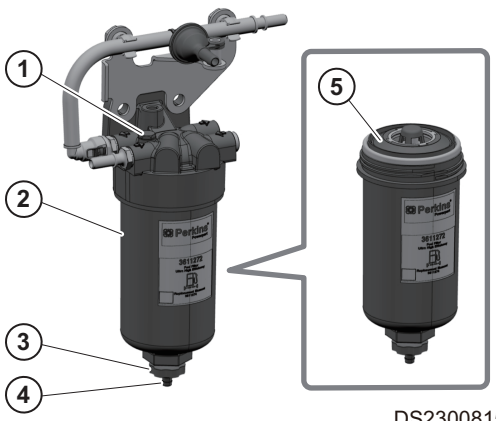
1. Locate fuel filter inside pump compartment.
2. Place a suitable container under the fuel filter to catch any fuel that might spill. Clean up any spilled fuel. Clean the outside body of the filter assembly.



DS2300814

Figure 55

3. Install a suitable tube onto drain (4).
   Open the drain valve (3). Rotate the drain valve counterclockwise. Two full turns are required.
   Loosen vent screw (1).
4. Allow the fuel to drain into the container and remove tube.
5. Tighten the vent screw (1) securely.
6. Remove filter bowl (2).
   Rotate the filter assembly counterclockwise to remove assembly.
7. Rotate the filter (5) counterclockwise and remove filter. Clean the filter bowl.
8. Repeat procedure if necessary.



DS2300815

Figure 56

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. Move the key on mode.
4. Start engine and check fuel system for leaks.

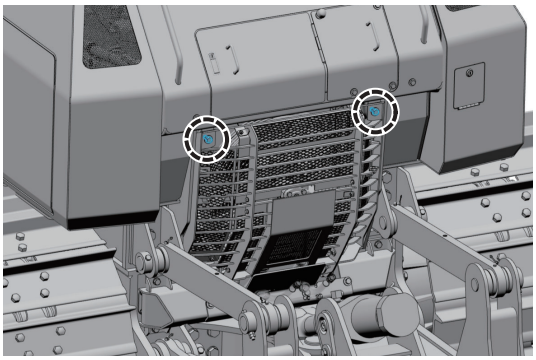
Radiator Core - Clean

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.

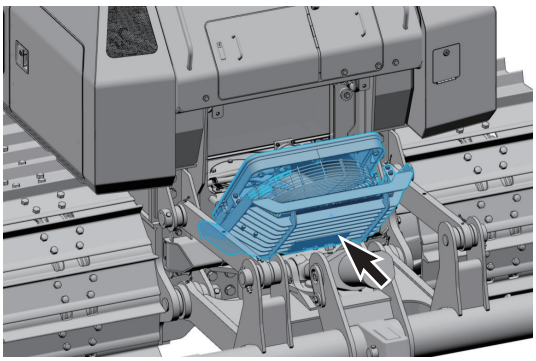
1. Remove bolt (2 ea).



DS2301314

Figure 57

2. Open the radiator guard and fan motor bracket.

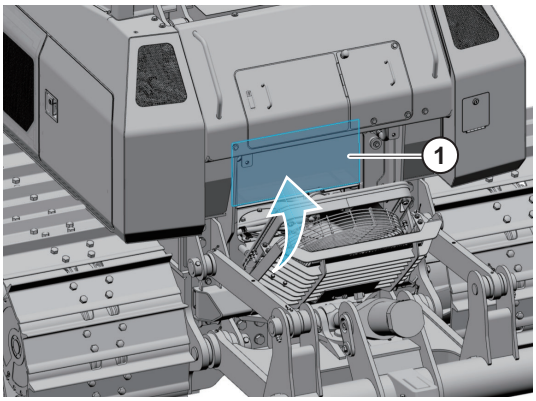


DS2301315

Figure 58

3. Clean radiator core (1) with compressed air, steam or water.

NOTE: *Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*



DS2301316

Figure 59

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.

Oil Cooler Core - Clean

WARNING

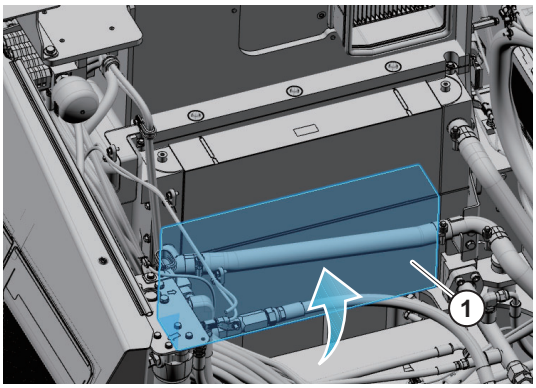
AVOID DEATH OR SERIOUS INJURY

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.

NOTE: *The oil cooler core is accessible via the cabin assembly tilt.*

1. Tilt the cabin.
   Refer to Operation and Maintenance Manual, “Cabin Tilting Operation”.
2. Clean oil cooler core (1) with compressed air, steam or water.

NOTE: *Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*



DS2201112

Figure 60

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.

Intercooler Core - Clean

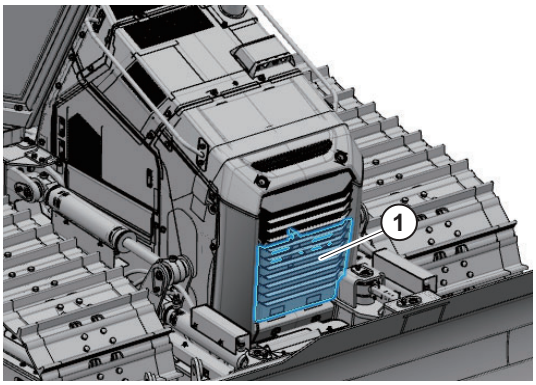
WARNING

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.

NOTE: *The intercooler core is accessible by removing the front cover.*

1. Open the access door (1).



DS2201117

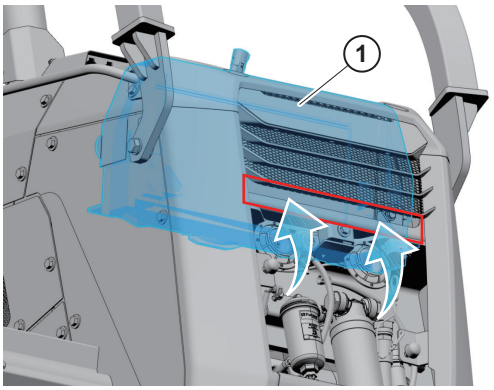
Figure 61

2. Clean intercooler core (1) with compressed air, steam or water.

   NOTE: *Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

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.



DS2300807

Figure 62

Aircon Condenser Core - Clean

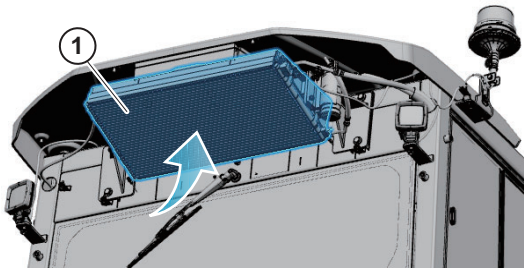
WARNING

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. Clean aircon condenser core (1) with compressed air, steam or water.

   NOTE: *Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*



DS2201107

Figure 63

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.

Air Conditioner Outer Filter - Clean

WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of the air-conditioning system must be performed with the engine off.

WARNING

AVOID DEATH OR SERIOUS INJURY

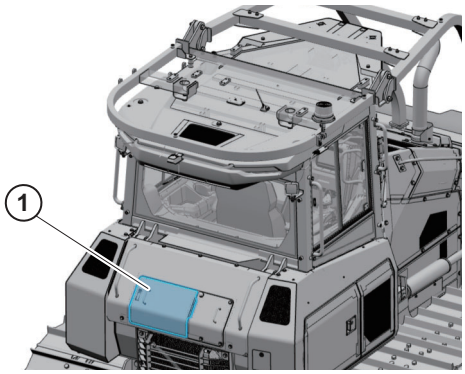
If using compressed air to clean the element, make sure that proper eye protection is worn.

NOTE: *The unit is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cabin. This filter must be cleaned.*

NOTE: *In the unit is being operated in a dusty environment, the cleaning and replacement must be performed more frequently. If filter is damaged, replace damaged filter with a new one.*

1. Open the rear cover (1).

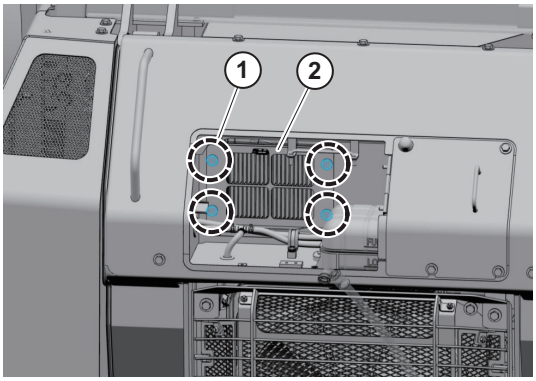
   NOTE: *Air conditioner outer filter is located on the rear side of machine.*



DS2301310

Figure 64

2. Remove knob bolt (1, 4 ea).
3. Remove air conditioner outer filter cover (2).

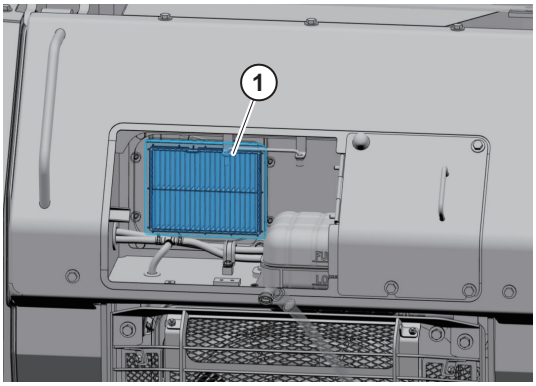


DS2201139

Figure 65

4. Remove air conditioner outer filter (1) and inspect it for damage.
5. Use compressed air to clean filter. If element is very dirty, replace it with a new one.

   NOTE: *Clean air-conditioning outer filter every 500 hours and replace with a new one every 1,000 hours of service.*
6. Install air conditioner outer filter.
7. Install knob bolts and cover.



DS2201140

Figure 66

Air Conditioner Inner Filter - Clean

WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of the air-conditioning system must be performed with the engine off.

WARNING

AVOID DEATH OR SERIOUS INJURY

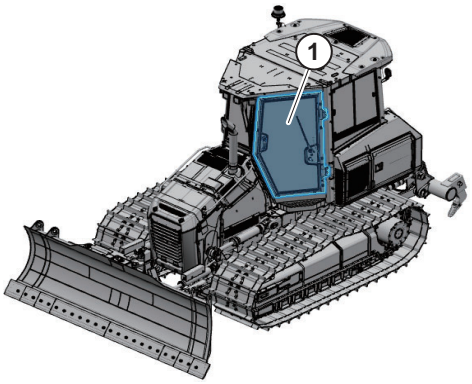
If using compressed air to clean the element, make sure that proper eye protection is worn.

NOTE: *The unit is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cabin. This filter must be cleaned.*

NOTE: *In the unit is being operated in a dusty environment, the cleaning and replacement must be performed more frequently.*
If filter is damaged, replace damaged filter with a new one.

1. Open cabin door (1).

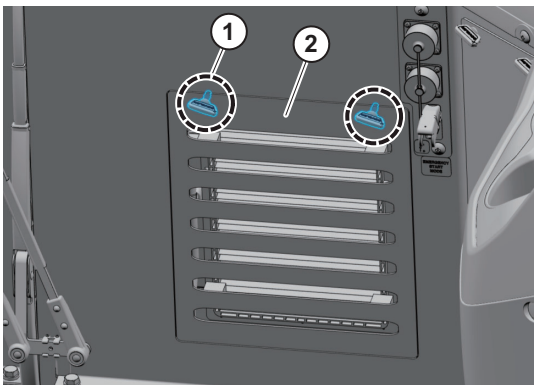
   NOTE: *Air conditioner inner filter is located on the inside of the cabin.*



DS2201141

Figure 67

2. Remove stud (1, 2 ea) from cabin rear side.
3. Remove air conditioner inner filter cover (2).



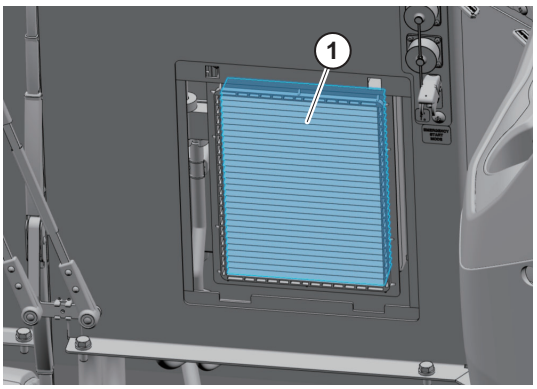
DS2300808

Figure 68

4. Remove air conditioner inner filter (1) and inspect it for damage.
5. Use compressed air to clean filter. If element is very dirty, replace it with a new one.

   NOTE: *Clean air-conditioning inner filter every 500 hours and replace with a new one every 1,000 hours of service.*

6. Install air conditioner inner filter.
7. Install stud bolts and cover.



DS2300809

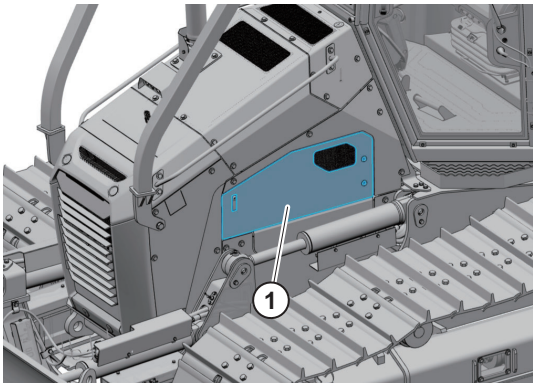
Figure 69

Air Cleaner Outer Filter - Clean

NOTICE

Never remove air cleaner filter while engine is running. This will allow dirt into engine and cause serious engine damage. Always turn engine "OFF" before servicing air cleaner.

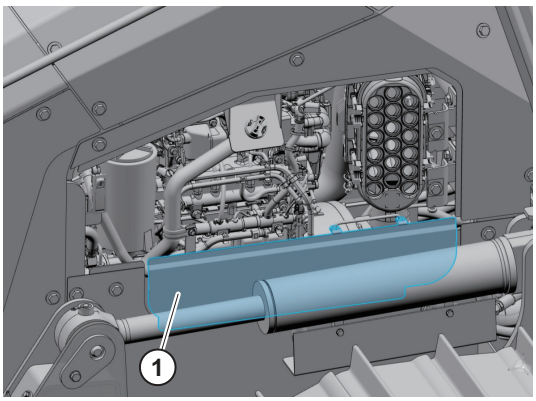
1. Open left side cover (1).



DS2300782

Figure 70

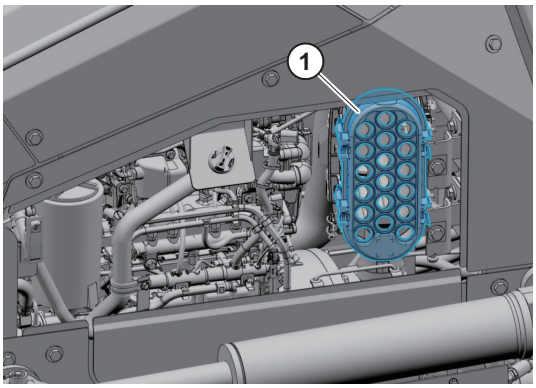
2. Remove side cover (1).



DS2300800

Figure 71

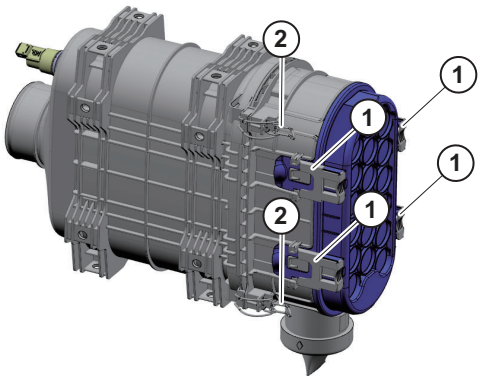
3. Remove air cleaner assembly cover (1) from air cleaner.



DS2300801

Figure 72

4. Pull up all the wedges (1) before servicing the pre cleaner.
5. Loosen the cover latches (2).



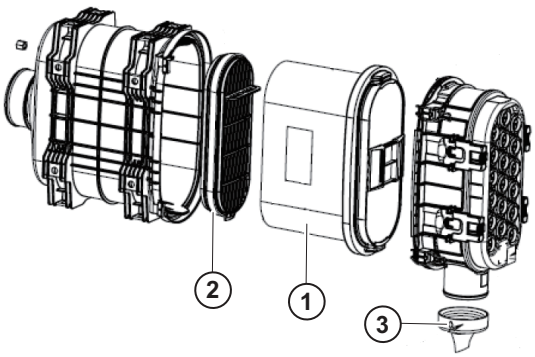
DS2201184

Figure 73

6. Remove air cleaner outer element (1).
7. Remove vacuator valve (3) from the air cleaner cover.

   NOTE: *Inspect vacuator valve seal lips for wear or damage. Replace valve if necessary.*
8. Wipe off the dirt stuck to the air cleaner cover and the inside of the air cleaner housing.
9. Use compressed air to clean filter. If element is very dirty, replace it with a new one.

   NOTE: *If the inner element is not installed properly and the outer element and cover are installed, the outer element will be damaged.*



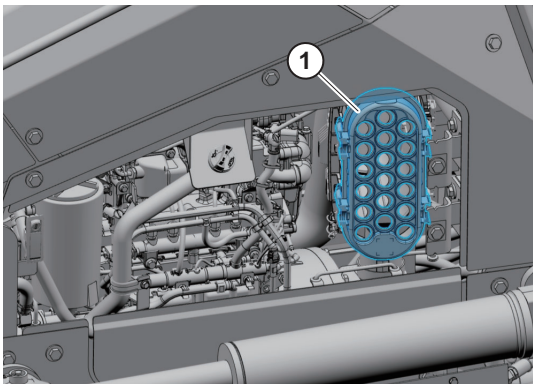
DS2201185

Figure 74

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.

10. Push down all the wedges.
11. Install air cleaner assembly cover (1) to air cleaner.
12. Close the right side door.



DS2300801

Figure 75

1,000 Hour / 6 Month Service

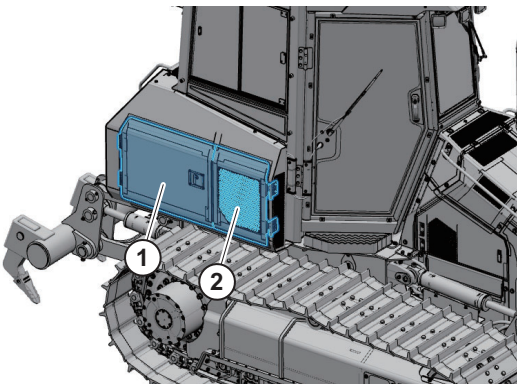
Perform All Daily, 50, 250 and 500 Hour Service Checks

Hydraulic Oil Return Filter - Replace

NOTE: *Replace hydraulic oil return filter after first 250 hours of operation or rebuild and every 1,000 hours thereafter.*

1. Park machine on firm and level ground.
2. Open right side doors (1, 2).

   NOTE: *Hydraulic oil return filter is located on the right side of the machine.*
3. Place a pan under the hydraulic oil return filter.

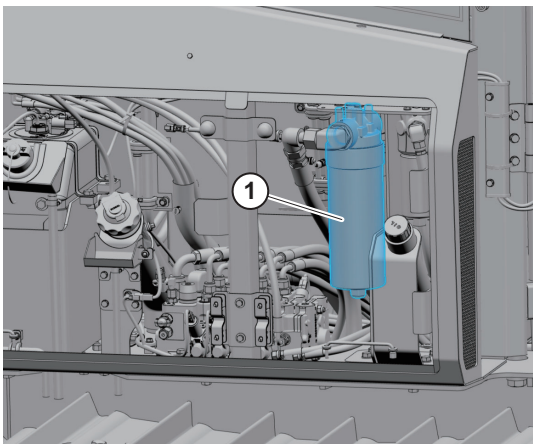


DS2201158

Figure 76

4. Drain the hydraulic oil from the filter assembly.

   NOTE: *The drain plug is located at the bottom of the oil filter.*
5. Remove hydraulic oil return filter (1) from filter head.
6. Insert a new filter element and O-ring. Apply a small amount of oil around the entire O-ring and install the element onto the filter head.
7. After replacing filter, vent air from system and check level of hydraulic oil tank.
8. Add hydraulic oil, if necessary.



DS2300816

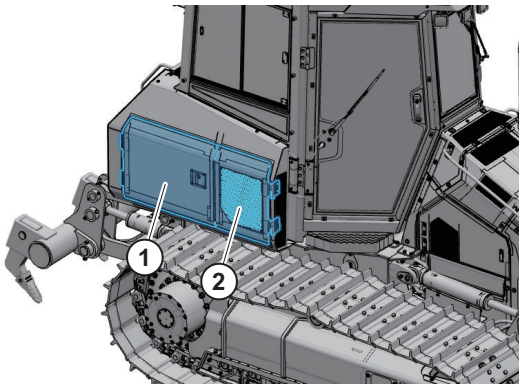
Figure 77

HST Filter - Replace

NOTE: *Replace HST filter after first 250 hours of operation or rebuild and every 1,000 hours thereafter.*

1. Park machine on firm and level ground.
2. Open right side doors (1, 2).

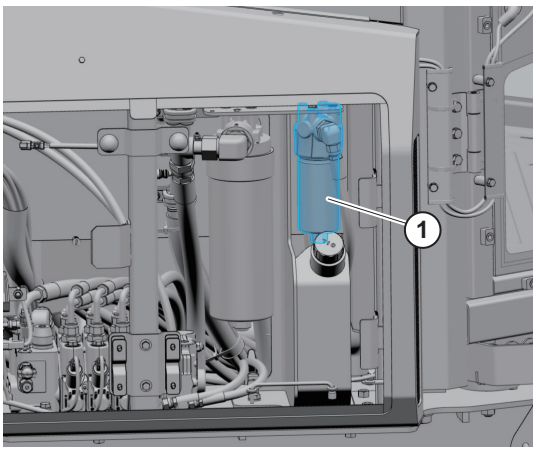
   NOTE: *HST filter is located on the right side of the machine.*
3. Place a pan under the HST filter.



DS2201158

Figure 78

4. Remove HST filter (1) from filter head.
5. Insert a new filter element and O-ring. Apply a small amount of oil around the entire O-ring and install the element onto the filter head.
6. After replacing filter, vent air from system and check level of hydraulic oil tank.
7. Add hydraulic oil, if necessary.



DS2300817

Figure 79

Air Conditioner Outer Filter - Replace

WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of the air-conditioning system must be performed with the engine off.

WARNING

AVOID DEATH OR SERIOUS INJURY

If using compressed air to clean the element, make sure that proper eye protection is worn.

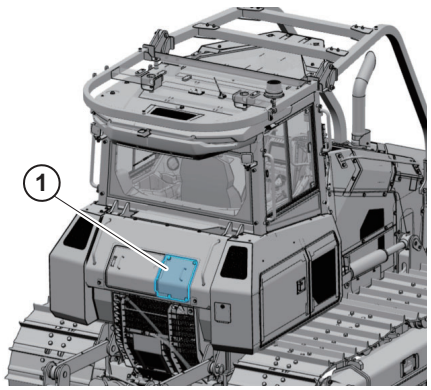
NOTE: *Clean air-conditioning outer filter every 500 hours and replace with a new one every 1,000 hours of service.*

NOTE: *The unit is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cabin. This filter must be cleaned.*

NOTE: *In the unit is being operated in a dusty environment, the cleaning and replacement must be performed more frequently.*
If filter is damaged, replace damaged filter with a new one.

1. Open the rear cover (1).

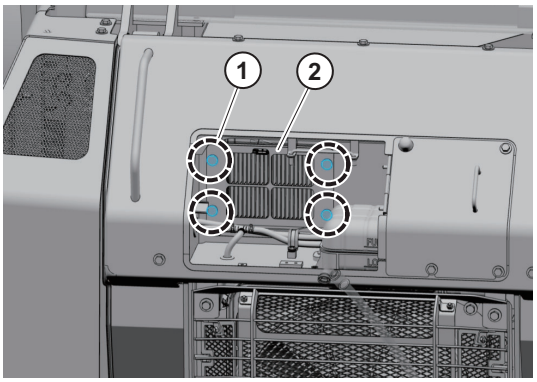
   NOTE: *Air conditioner outer filter is located on the rear side of machine.*



DS2201120

Figure 80

2. Remove knob bolt (1, 4 ea).
3. Remove air conditioner outer filter cover (2).



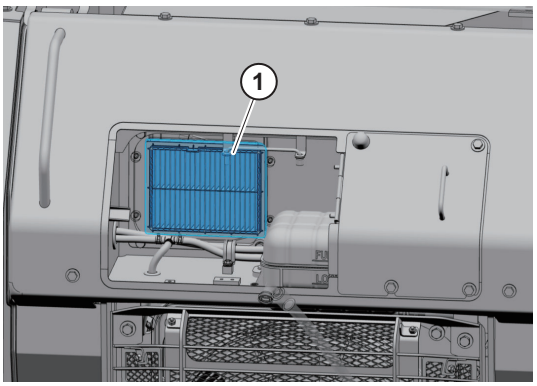
DS2201139

Figure 81

4. Remove air conditioner outer filter (1) and inspect it for damage.
5. Install a new air conditioner outer filter.

   NOTE: *Clean air-conditioning outer filter every 500 hours and replace with a new one every 1,000 hours of service.*

6. Install knob bolts and cover.



DS2201140

Figure 82

Air Conditioner Inner Filter - Replace

WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of the air-conditioning system must be performed with the engine off.

WARNING

AVOID DEATH OR SERIOUS INJURY

If using compressed air to clean the element, make sure that proper eye protection is worn.

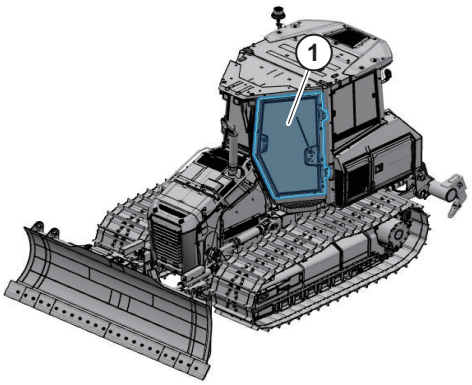
NOTE: *Clean air-conditioning inner filter every 500 hours and replace with a new one every 1,000 hours of service.*

NOTE: *The unit is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cabin. This filter must be cleaned.*

NOTE: *In the unit is being operated in a dusty environment, the cleaning and replacement must be performed more frequently.*
If filter is damaged, replace damaged filter with a new one.

1. Open cabin door (1).

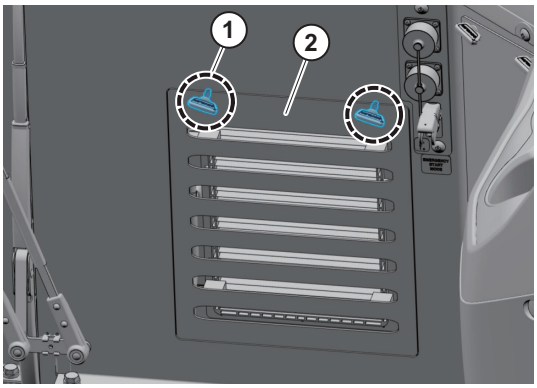
   NOTE: *Air conditioner inner filter is located on the inside of the cabin.*



DS2201141

Figure 83

2. Remove stud (1, 2 ea) from cabin rear side.
3. Remove air conditioner inner filter cover (2).



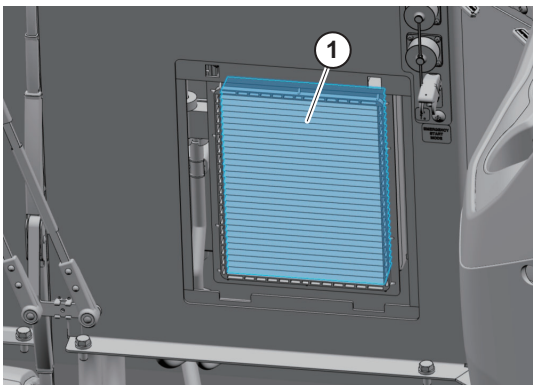
DS2300808

Figure 84

4. Remove air conditioner inner filter (1) and inspect it for damage.
5. Install a new air conditioner inner filter.

   NOTE: *Clean air-conditioning inner filter every 500 hours and replace with a new one every 1,000 hours of service.*

6. Install stud bolts and cover.



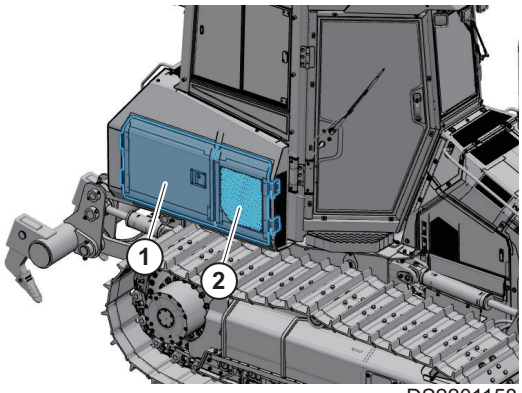
DS2300809

Figure 85

Fuel Cap Filter - Replace

1. Park machine on firm and level ground.
2. Open right side doors (1, 2).

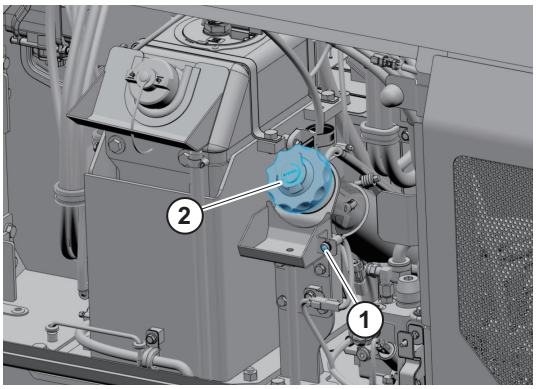
   NOTE: *Fuel cap is located on the right side of the machine.*



DS2201158

Figure 86

3. Remove fuel cap (2) from fuel filler neck.



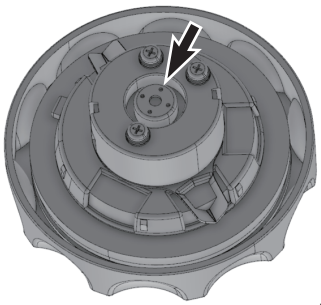
DS2300785

Figure 87

4. Inspect the O-ring on the fuel cap for damage. If the O-ring is damaged, replace the O-ring.
5. Inspect the debris rubber on the fuel tank cap for damage. If the debris rubber is damaged, replace the boot.

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

6. Install the fuel cap to fuel filler neck.



DS2103143

Figure 88

1,500 Hour / 9 Month Service

Travel Reduction Gear Oil - Change

WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool.

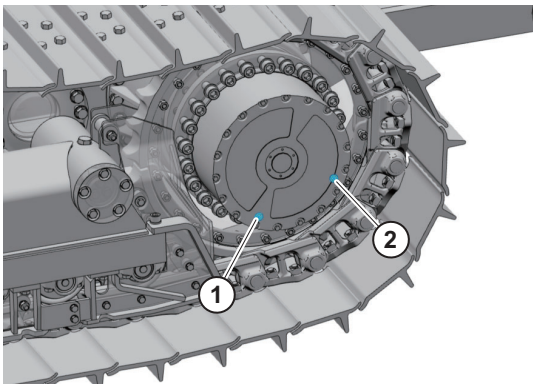
Before removing the motor case, loosen the plug slightly to allow pressurized air to escape. Residual pressure in the travel reduction gear can cause the plug to be dislodged and oil to squirt out suddenly.

NOTE: *Change oil after first 150 hours of operation or rebuild, and every 1,500 hours thereafter.*

1. Make sure that the machine is on firm and level ground.
2. Rotate the track until the drain port (1) is in a low position.
   - Oil Drain Port (1)
   - Oil Level and Filler Port (2)
3. Place a container under the drain port (1) and remove the ports (1 and 2) to drain the travel reduction gear oil.

   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*
4. Install the drain port (1). Add oil until it reaches the bottom of the oil level and filler port (2). Install the oil level and filler port (2).

   NOTE: *See "Fluid Capacities"*
5. Repeat this procedure on the other travel reduction gear.



DS2300793

Figure 89

2,000 Hour / Yearly Service

Perform All Daily, 50, 250, 500 and 1,000 Hour Service Checks

Idler Guide Wear Plates - Inspect

During a field inspection, check the Idler Guide Wear Plates for damage. Replace the plate if it is worn by more than 3 mm.

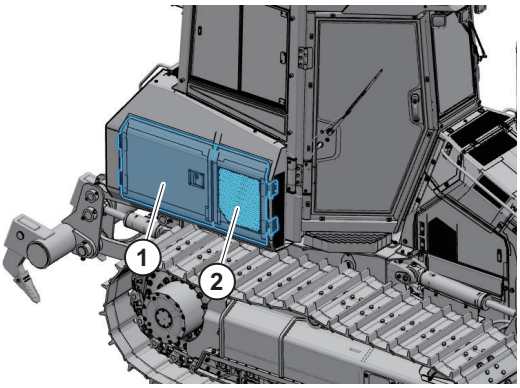
Hydraulic Oil - Change

1. Position machine on firm and level ground.
2. Engage parking brake and stop engine.

DS2300926

Figure 90

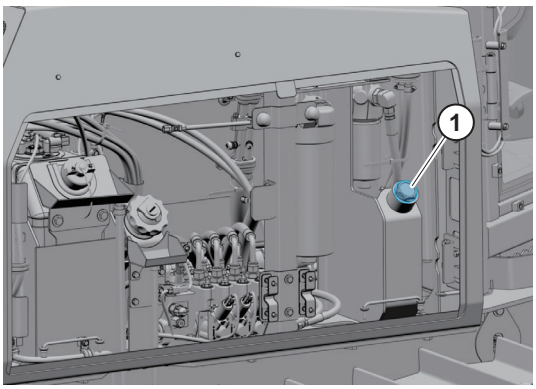
3. Open right side doors (1, 2).



DS2201158

Figure 91

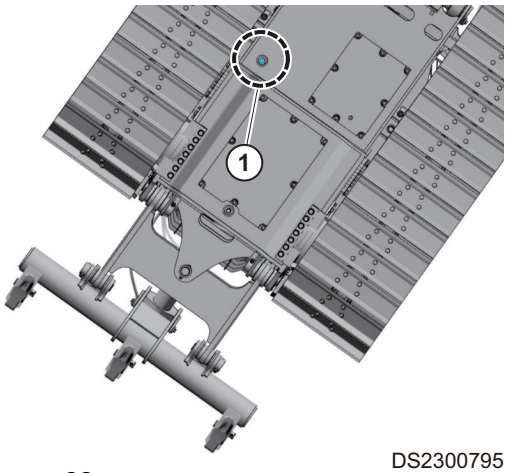
4. Remove hydraulic oil fill cap (1) from tank.



DS2300784

Figure 92

5. Position a container under hydraulic tank drain plug.
6. Remove hydraulic oil drain plug (1) from oil tank.



DS2300795

Figure 93

WARNING

AVOID DEATH OR SERIOUS INJURY

Be careful of squirting oil when removing drain plug.

NOTE: *Used filter and used oil should always be disposed of according to local laws and regulations.*

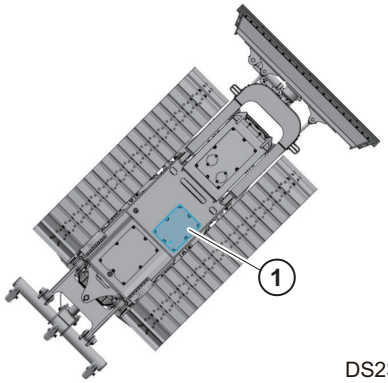
7. After draining tank, install drain plug.
8. Clean the hydraulic oil suction strainer. Refer to Operation and Maintenance Manual, “Hydraulic Oil Suction Strainer - Clean”.
9. Fill the hydraulic oil tank. Check level using sight gauge on side of tank.

NOTICE

Do not fill above red centered circle on sight gauge. Overfilling can result in damage to equipment and oil leaking from hydraulic tank because of expansion.

Hydraulic Oil Suction Strainer - Clean

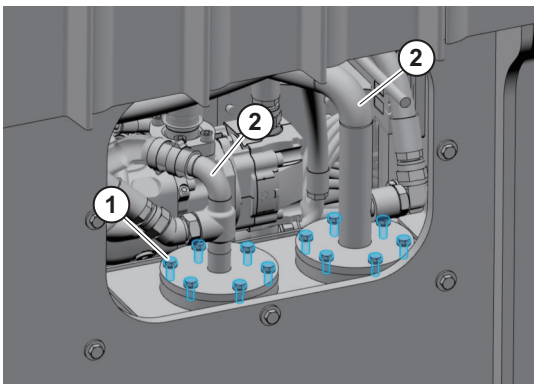
1. Remove under cover (1) from frame.



DS2300796

Figure 94

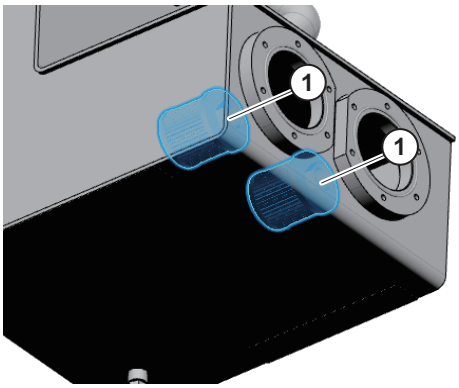
2. Drain the hydraulic oil. Refer to Operation and Maintenance Manual, “Hydraulic Oil - Change”.
3. Remove mounting bolts (1) and suction pipes (2).



DS2300797

Figure 95

4. Remove and clean suction strainers (1) inside hydraulic oil tank.
5. Install hydraulic oil suction stainers to oil tank.
6. Install the mounting bolts and suction pipes to oil tank.
7. Fill the hydraulic oil tank. Check level using sight gauge on side of tank. Refer to Operation and Maintenance Manual, “Hydraulic Oil - Change”.



DS2201116

Figure 96

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 surge tank 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 surge tank cap unless it is required. Check the coolant level in the coolant recovery tank.

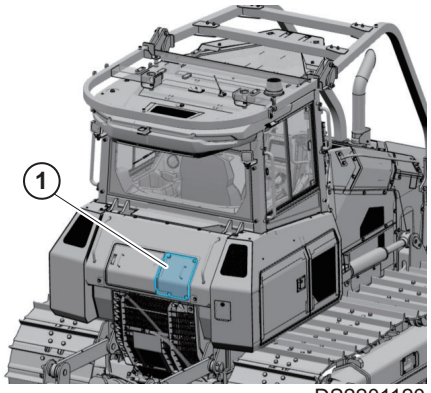
NOTICE

Do not mix up the antifreeze from different makers. Mixing the two compounds can cause generation of foreign material which can damage the system.

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.

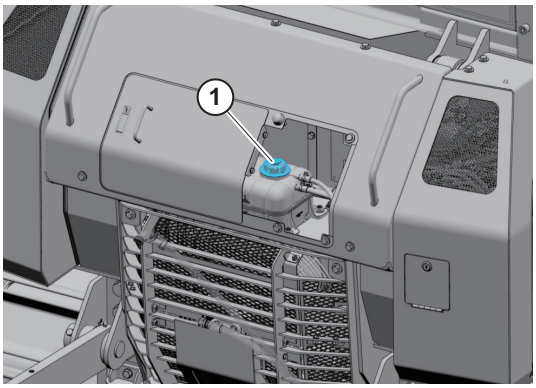
1. Open the rear cover (1), and remove mounting bolts.



DS2201120

Figure 97

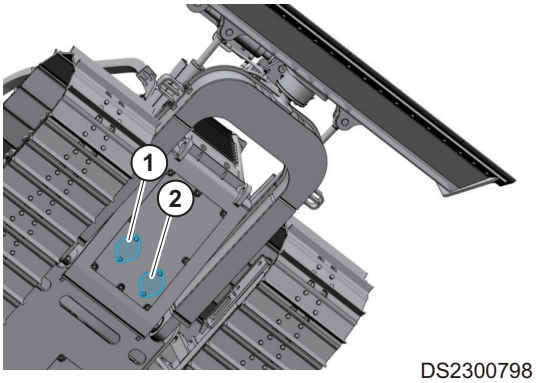
2. Slowly open surge tank cap (1) to allow any pressure to escape.



DS2201121

Figure 98

3. Remove mounting bolts and under cover (2) from frame.



DS2300798

Figure 99

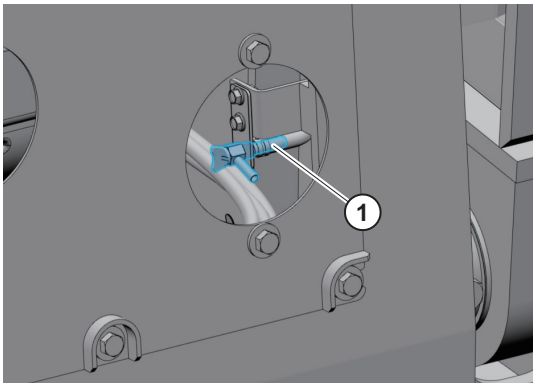
4. Place a container under the radiator and open the drain plug (1).

   NOTE: *Dispose of drained fluids according to local applicable environmental laws and regulations.*

5. Fill cooling system with a flushing solution.
6. Run engine at low idle until coolant temperature gauge reaches the "WHITE ZONE". Run engine for another ten minutes.
7. Allow engine to cool.
8. Drain flushing fluid and fill system with water.
9. Run engine again to allow water to completely circulate.
10. After allowing engine to cool, drain water and fill system with proper antifreeze mixture for ambient temperature.

    NOTE: *Refer to "Fluid Capacities" for capacity.*

11. Run engine without radiator cap and surge tank cap installed, so all air will be purged from system. Fill radiator to fill neck.
12. Drain and fill radiator coolant recovery tank.



DS2300799

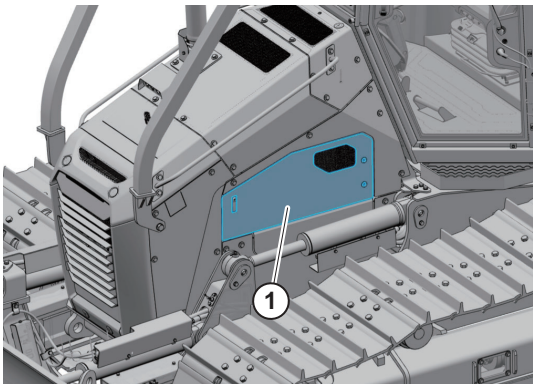
Figure 100

Air Cleaner Outer and Inner Filter - Replace

NOTICE

Never remove air cleaner filter while engine is running. This will allow dirt into engine and cause serious engine damage. Always turn engine "OFF" before servicing air cleaner.

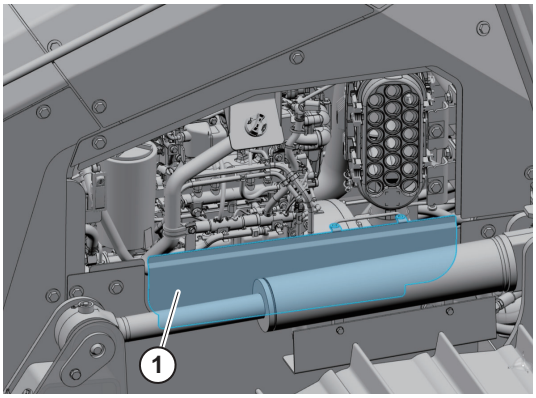
1. Open left side cover (1).



DS2300782

Figure 101

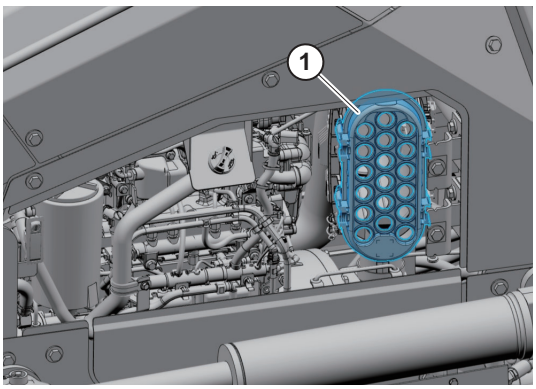
2. Remove side cover (1).



DS2300800

Figure 102

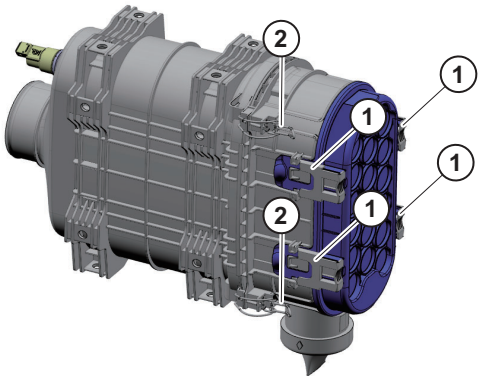
3. Remove air cleaner assembly cover (1) from air cleaner.



DS2300801

Figure 103

4. Pull up all the wedges (1) before servicing the pre cleaner.
5. Loosen the cover latches (2).



DS2201184

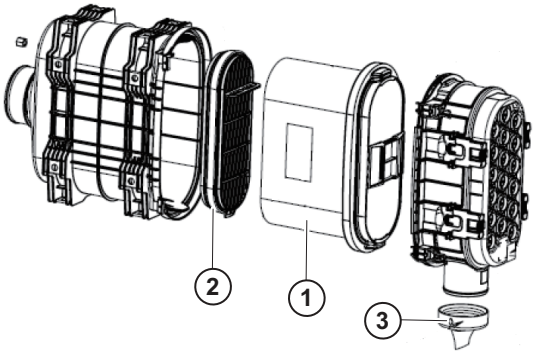
Figure 104

6. Remove air cleaner outer element (1) and inner element (2).
7. Remove vacuator valve (3) from the air cleaner cover.

   NOTE: *Inspect vacuator valve seal lips for wear or damage. Replace valve if necessary.*
8. 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.*
9. Install the new air cleaner outer element and 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.*



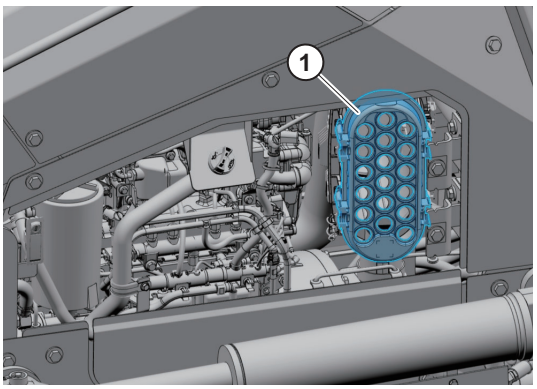
DS2201185

Figure 105

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.

10. Push down all the wedges.
11. Install air cleaner assembly cover (1) to air cleaner.
12. Close the right side door.



DS2300801

Figure 106

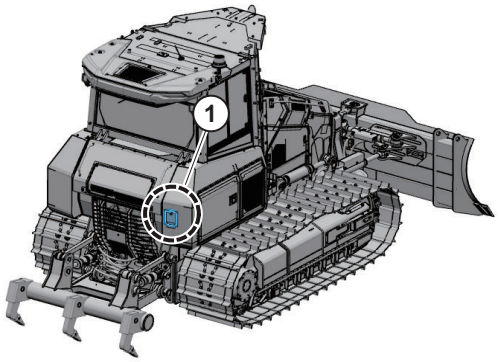
DEF (AdBlue®) Filter - Replace

NOTICE

The replacement interval of the DEF (urea solution) filter is different by the amount of foreign materials in DEF.

Make sure to use only the specified DEF and container and keep the surrounding area of the tank clean to prevent possible foreign materials.

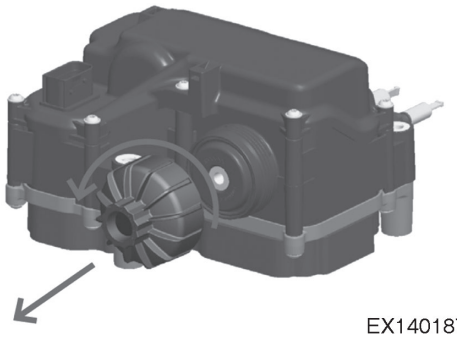
1. Open rear cover (1).



DS2201144

Figure 107

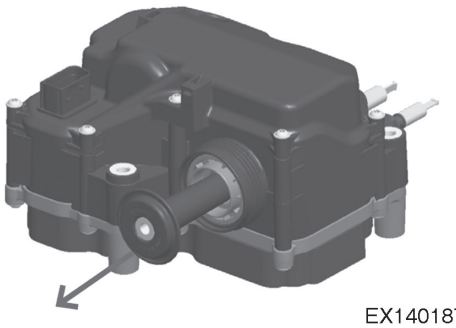
2. Remove filter cover.
   - Tool: 27 mm



EX1401870

Figure 108

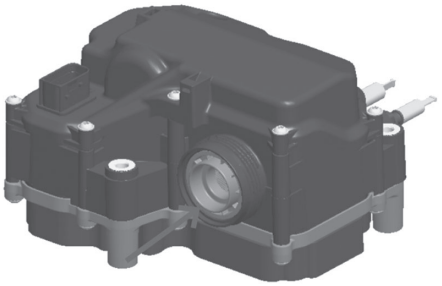
3. Remove equalizing element.



EX1401871

Figure 109

4. Check the color (gray/green) in the filter.



EX1401872

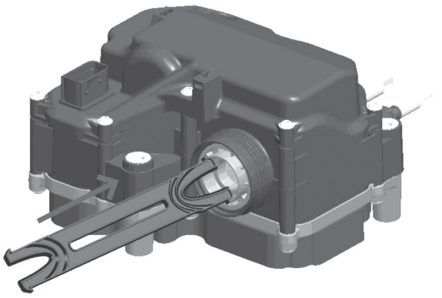
Figure 110

5. 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 111

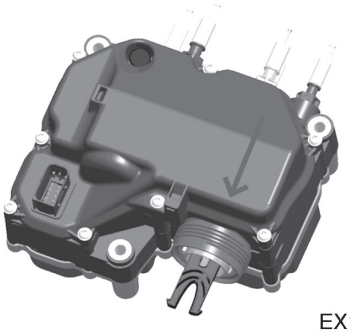
6. Insert the end of the filter removing tool until a clicking sound is heard or engagement with the filter is felt.



EX1401874

Figure 112

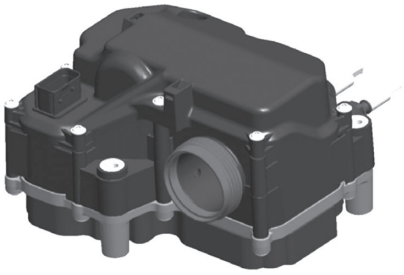
7. Pull the filter removing tool to remove filter.



EX1401875

Figure 113

8. The surface must be kept clean. It can be cleaned with water only.



EX1401881

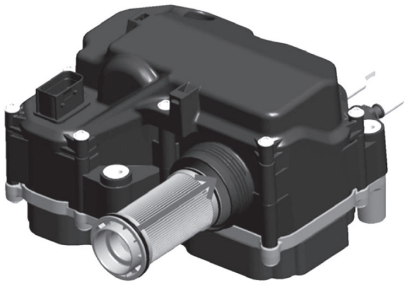
Figure 114

9. Apply oil to the O-ring and install a new filter.

NOTICE

AVOID INJURY

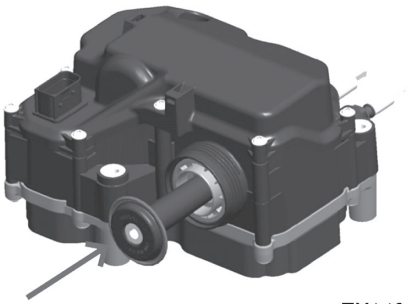
Use Mobil Velocite No. 6 oil from Bosch.



EX1401882

Figure 115

10. Install a new equalizing element.



EX1401883

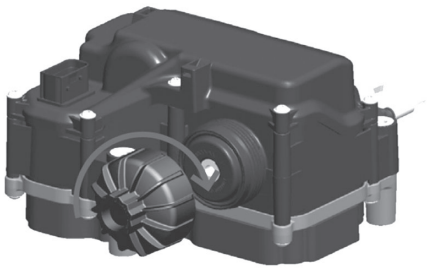
Figure 116

11. Tighten the filter cover.
    - Cover tightening torque: 20 + 5 N.m (2.0 + 0.5 kg.m, 14.8 + 3.7 ft lb)

NOTICE

AVOID INJURY

Check that filter surface is clean. It can be cleaned with water only.



EX1401884

Figure 117

Electrical System

NOTE: *Never disassemble electrical or electronic parts. Consult a HD HYUNDAI CONSTRUCTION EQUIPMENT distributor before servicing.*

Battery

WARNING

AVOID DEATH OR SERIOUS INJURY

Battery electrolyte contains sulfuric acid and can quickly burn the skin and eat holes in clothing. If you spill acid on yourself, immediately flush the area with water.

Battery acid could cause blindness if splashed into the eyes. If acid gets into the eyes, flush them immediately with large quantities of water and seek professional medical attention immediately.

If you accidentally ingest acid, call a doctor or poison prevention center immediately.

When working with batteries, always wear safety goggles.

Battery generates hydrogen gas, so there is a danger of an explosion. Do not smoke near batteries, or do anything that will cause sparks.

Before working with batteries, stop engine and turn the starter switch to "O" (OFF) position.

Avoid short-circuiting the battery terminals through accidental contact with metallic objects, such as tools.

When removing or installing, check which is the positive (+) terminal and negative (-) terminal.

When removing the battery, first disconnect the negative (-) terminal. When installing the battery, first connect the positive (+) terminal.

If the terminals are loose, there is a danger that defective contact may generate sparks that will cause an explosion. When installing the terminals, install them tightly.

Batteries in Cold Weather

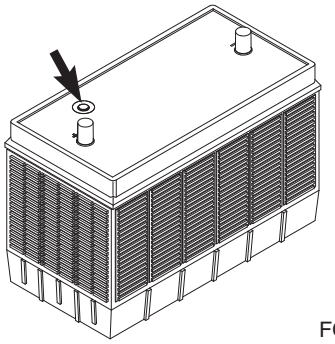
In colder weather, a greater drain is placed on the batteries when they are used for the preheat cycle and when starting a cold engine. Battery performance decreases as the temperature gets lower.

In extremely cold weather, remove batteries at night and move them to a warm location. This will help to keep them at a higher energy level.

Inspection of Battery Electrolyte Level

This machine has two maintenance free batteries. They never require the addition to water.

When the charge indicator becomes white, this indicates a low electrolyte state because of a leakage or charging system error. Determine the cause of problem and replace the batteries immediately.



FG028451

Figure 118

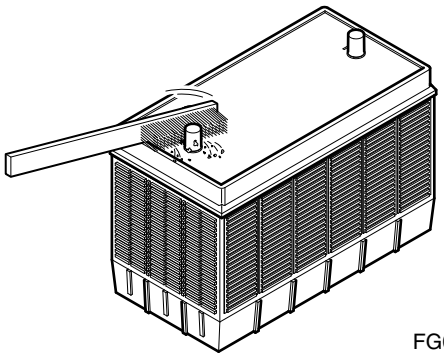
Check Charging State

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.



FG010162

Figure 119

Battery Replacement

When the charging indicator shows a white condition, replace the battery. The batteries should always be replaced in pairs.

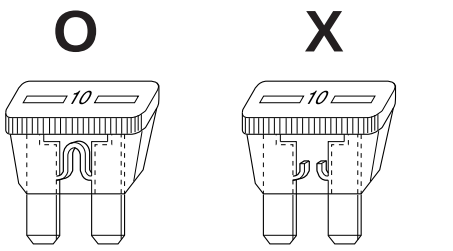
Using an old battery with a new one will shorten the life span of the new battery.

Fuses

The fuses in the fuse box are used to protect the various electrical circuits and their components from being damaged. The fuses used are standard automotive type fuses.

The section on "Fuse Identification" on page 4-74 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.

Do not insert a higher amperage fuse into a lower amperage slot. Serious damage to the electrical components or fire can result.



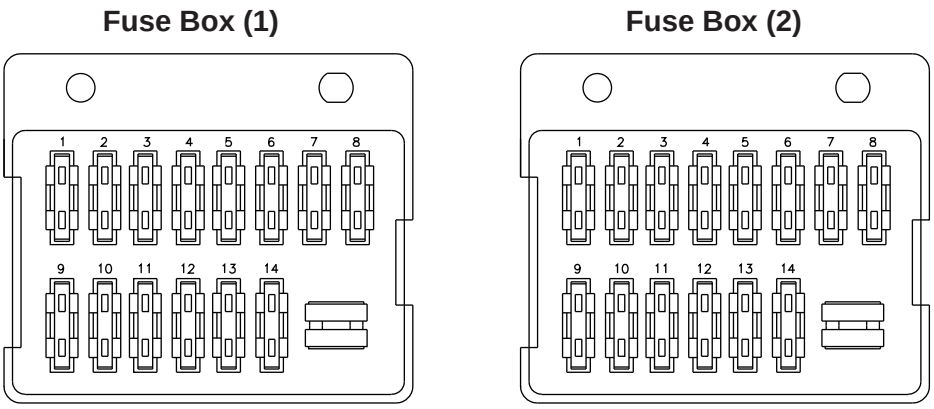
HAOC670L

Figure 120

NOTICE

Before replacing a fuse, be sure to turn starter switch to "O" (OFF) position.

Fuse Identification



FG000542

Figure 121

No.	Fuse Box One	
	Name	Capacity
1	USB Charger	5A
2	Rear Wiper Motor	5A
3	IMU Sensor, WIF Sensor, LS Pressure Sensor	5A
4	GP, TMS	5A
5	Parking Switch, Horn Relay, Traction Switch, Buzzer Relay, Parking Switch	5A
6	HVAC, Horn	20A
7	Front Wiper, Rear Heating	30A
8	Left Wiper Motor	10A
9	Right Wiper Motor	10A
10	-	10A
11	Washer	15A
12	Fuel Led, Check Connector, Keypad	15A
13	Seat Heater	20A
14	Back Buzzer	20A

No.	Fuse Box Two	
	Name	Capacity
1	Fuel Heater 1	30A
2	Glow Plug	30A
3	Working Lamp, Beacon	30A
4	12V Socket	10A
5	ECU (SCR) E- Joystick	20A
6	Full Feed Pump	30A
7	Hour Meter, TMS, Key Switch	5A
8	DCC-DC Converter, Audio, Antenna, USB Charger, GP	10A
9	Room Lamp	5A
10	GP, Audio	10A
11	HVAC	20A
12	TCU	20A
13	EPOS	20A
14	ECU (Main)	30A

Cabin Tilting Operation

WARNING

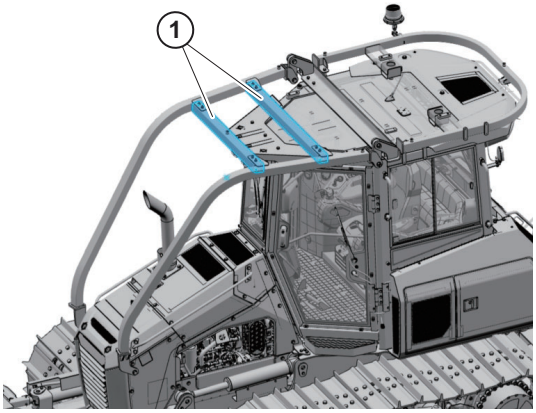
AVOID DEATH OR SERIOUS INJURY

1. **Make sure that all other work site clear from bystanders and other hazardous materials.**
2. **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.
3. **Do not exceed machine capacity by modifying machine or using unapproved attachments.**
4. **Check the cabin tilting system once a month.**
5. **Do not operate the cabin tilting system more than three times without operating the machine. Machine may be discharged.**

If forestry guard is installed on the top of the cabin, follow these steps before proceeding with cabin tilting.

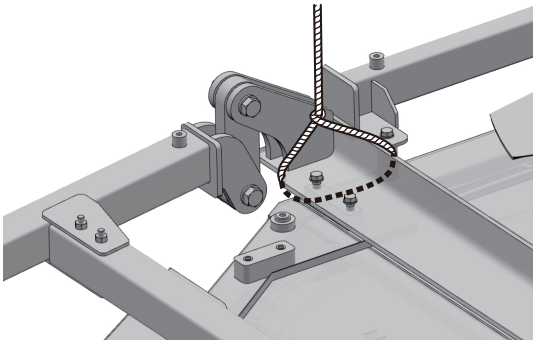
NOTE: *This procedure requires towing, so please work for at least 2 people.*
One person operates the towing machine, and the other person holds the guard to prevent it from hitting the machine.

1. Lower the work equipment to the ground.
2. Lower the dozer blade to the ground.
3. Check the lifting Point (1) and bind wire ropes that location.



DS2300846

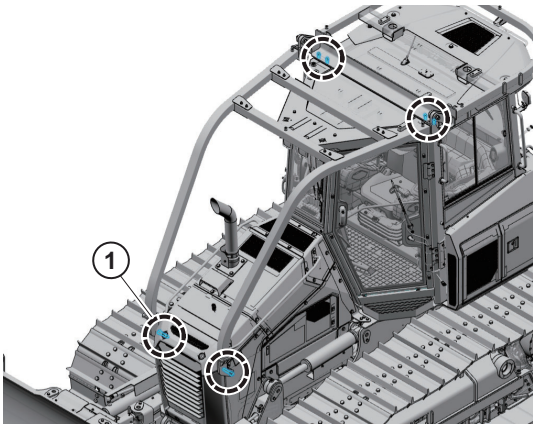
Figure 122



DS2300965

Figure 123

4. Remove bolt (1, 6 ea).
5. Check the hook condition, and then lift slowly.

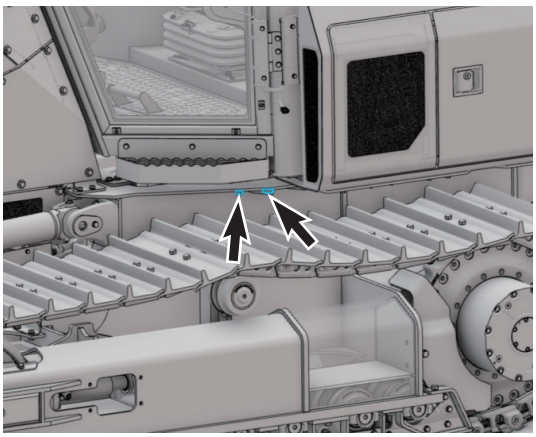


DS2300818

Figure 124

6. To operate cabin tilting system, remove bolts and nuts under the cabin.

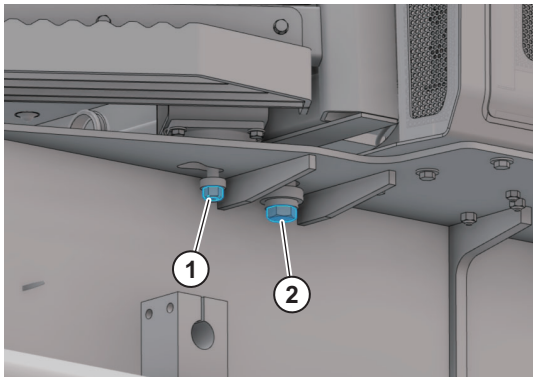
   NOTE: *Both the left/right bolts of the cabin must be removed.*
   Failure to remove bolts can cause serious damage to the machine.



DS2201285

Figure 125

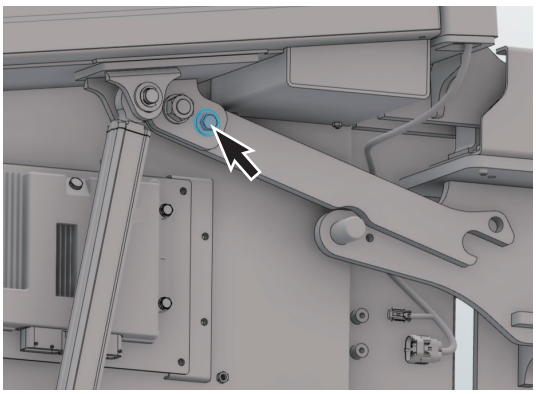
7. Remove nuts (1).
   - Tool: 24 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159 ft lb)
8. Remove bolts (2).
   - Tool: 36 mm ( )
   - Torque: 127.4 N.m (13 kg.m, 94 ft lb)



DS2201286

Figure 126

9. Remove the bolt and washer on the safety bar. Safety bar is located in left side door.



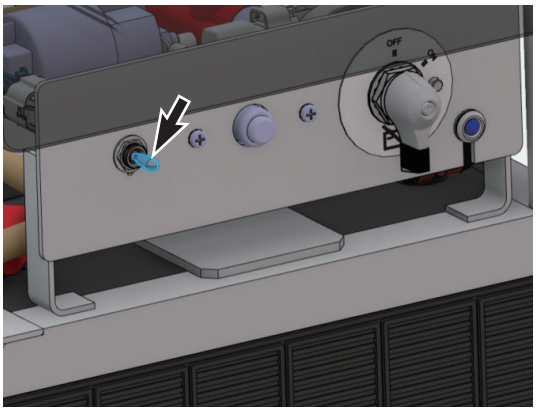
DS2201290

Figure 127

10. Cabin tilting switch is located in left side door.
    Turn cabin tilting switch to "ON" position.

NOTICE

Do not operate the tilting system for at least 45 minutes, when if you lower the cabin tilting system immediately after raising it.



DS2201287

Figure 128

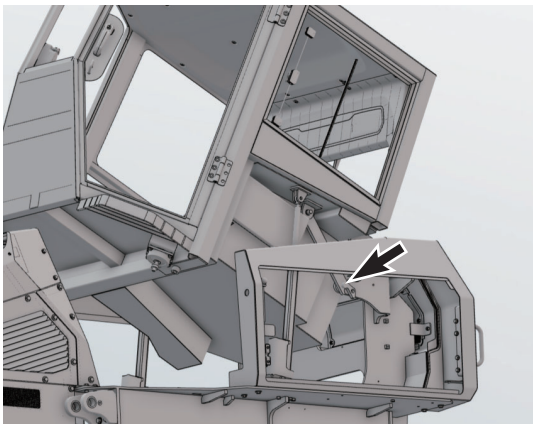
11. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.

WARNING

AVOID DEATH OR SERIOUS INJURY

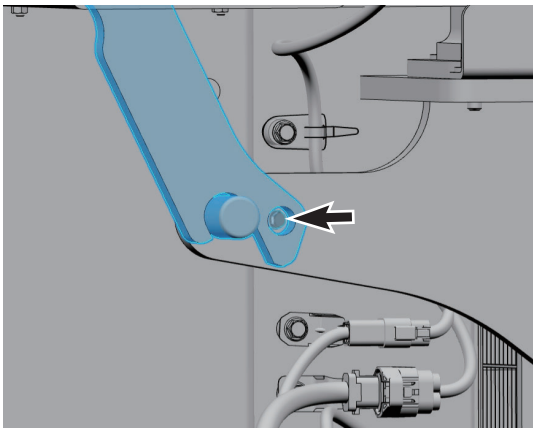
Always check the installation of the safety bar during tilt operation.

It can cause death or serous injury.



DS2201288

Figure 129



DS2300933

Figure 130

12. Perform operating in the reverse order to return.

NOTE: *In the case of cabin tilting, in addition to fastening the safety bar, make sure that the cabin can be lifted as auxiliary as possible.*

Engine Cooling System

General

Keeping an engine's cooling system in peak operating condition can have many benefits in keeping a machine in good operating condition. A properly functioning cooling system will improve fuel efficiency, reduce engine wear, and extend component life.

Always use distilled water in the radiator. Contaminants in tap water neutralize the corrosion inhibitor components. If tap water must be used, Refer to "Table of Standards for Allowed Tap Water" on page 4-81. 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 surge tank 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

AVOID INJURY

The standard of tap water is for reference only, and may not be regarded as a standard.

If quality of the water is not trustable, stop using tap water whenever possible and use distilled water.

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 control levers. Even though the engine is stopped, hydraulic actuated components may move while releasing pilot pressure. Keep all personnel and bystanders away from machine while performing this operation.

- **Set the hydraulic cutoff Switch to "O" 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. Set hydraulic cutoff switch on "I" (ON) position.
3. Turn the starter switch to "I"(ON) position.
4. Fully stroke work in all directions.
5. Set the hydraulic cutoff switch to "O" position.
6. Turn the starter switch to "O" position.
7. Remove accumulator by unscrewing it slowly.

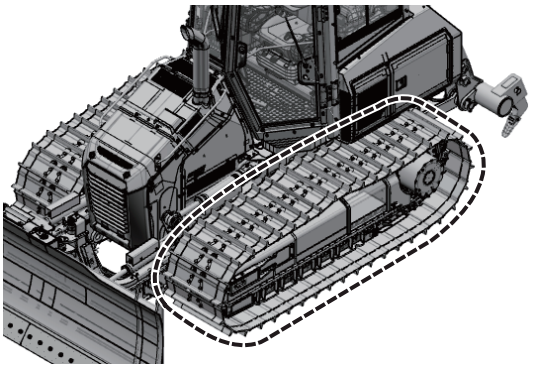
Undercarriage Cleaning

Clean the undercarriage daily to prevent excessive material build-up and hardening. Cleaning the undercarriage reduces wear, increases the service life of seals and components and prevents breakage lift cylinder cover, grease remote hose adapter and frame cover.

At the end of every work shift, use a shovel to remove excess dirt, mud, trash, or debris from the final drive hub and spindle, top of track roller frame, track idlers, and rollers.

In heavy mud or debris packing environments.

1. Thoroughly clean-out the undercarriage with a shovel using the procedure described above.
2. In addition, the undercarriage can be washed with water to aid cleaning. Keep high-pressure spray nozzle away from all seal areas, and the track pin, roller, and idler rubber stoppers to prevent seal damage and leakage.
3. On firm ground, operate the machine in 2F for approximately 50m using a moderate S-shaped pattern. Then operate the machine in 2R in the same pattern. This procedure helps further remove loose material and equalize pressure on duo-cone seal.
4. At the start of the next work shift, keep the machine in motion for 10 ~ 15 minutes without stopping. This operation will allow seals to work out loose material and equalize seal pressure. Moving only a short distance and stopping the machine can allow seals to leak.



DS2300596

Figure 131

Track Tension

WARNING

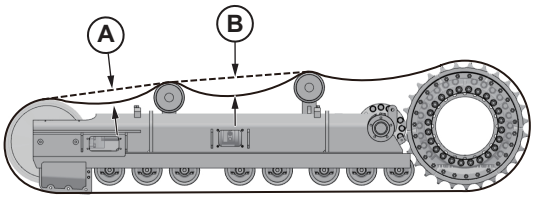
AVOID DEATH OR SERIOUS INJURY

Measuring track tension requires two people. One person must be in the operator's seat, operating the controls while the other person makes dimensional checks. Warm up the engine to prevent stalls, park the machine in an area that provides level, uniform ground support and/or use support blocks when necessary.

NOTE: *The track tension must be adjusted in accordance with the operating conditions. If a lot of dust stick to the track assembly in the working place, keep the track as loose as possible. Track shoe link pins and bushings wear with normal usage, reducing track tension. Periodic adjustment is necessary to compensate for wear and it may also be required by working conditions.*

1. Move the machine forward for a distance of two times the length of the machine. Slowly reduce the machine to zero speed with the travel control. Stop the engine.
2. Adjust the track pin to be positioned at the top of the idler.
3. The operator gets on points A and B and makes the track shoe droop evenly.
4. Using a suitable tool, measure (A/B) the straight distance between both end track grouser tips at the lowest sagging point of the track shoe.

Reference	Distance
A + B	50 ~ 65 mm (1.9 ~ 2.6 in)



DS2300802

Figure 132

WARNING

AVOID DEATH OR SERIOUS INJURY

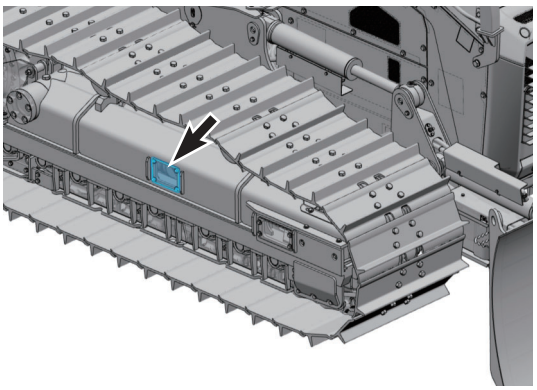
The track adjusting mechanism is under very high-pressure. NEVER release grease pressure too fast. The track tension grease valve should never be loosened more than one (1) complete turn from the fully tightened down position. Bleed off grease pressure slowly. Keep your body away from the valve always. Always wear eye and face protection when adjusting track tension.

5. The track tension can be adjusted with the grease fitting valve (2) and handle screws (1) in the center of each side frame. Filling the grease fittings with grease increases the length of the adjustable cylinders. The longer the adjustable cylinders become, the more pressure builds in the tension springs which expand beyond the track idlers.

6. If the tracks and adjustment devices expand to the point that there is a lack of deflection or space between parts, turn the handle screw clockwise once or twice to drain some of the grease. Once the track tension is suitable, tighten the handle screw in the counterclockwise direction.

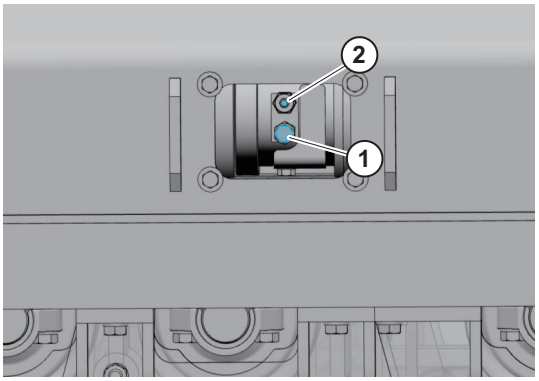
   - Grease fitting valve tightening torque: 68.6 ±9.8 N.m (7 kg ±1 kg.m, 5.2 ±0.7 ft lb)
   - Check the tension again after rotating the track 3 ~ 4 times.

   NOTE: *After draining, failure to turn the handle screw counterclockwise will allow the grease to keep draining.*
   Also, turning it too far counterclockwise may cause damage to the stopper of the screw.
   Turn the handle screw by no more than one or two turns.



DS2300803

Figure 133



DS2300804

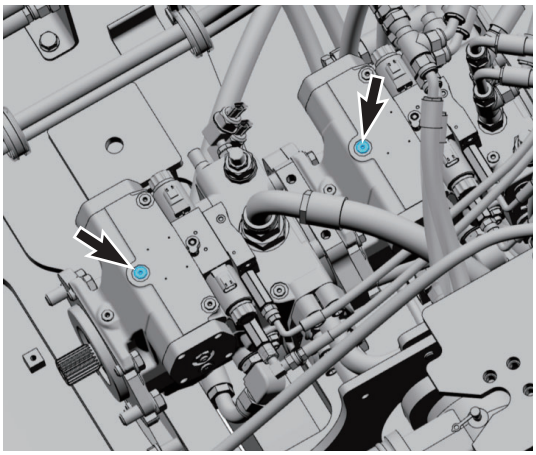
Figure 134

Venting and Priming Hydraulic System

Hydraulic Pump

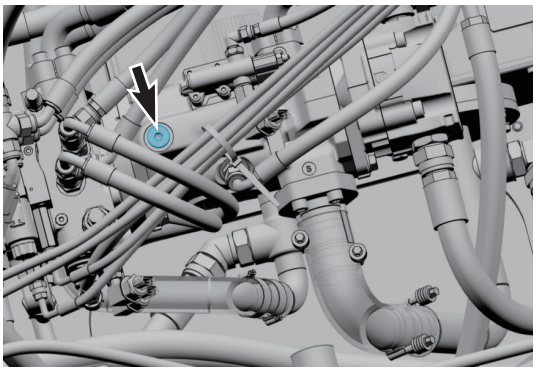
NOTE: *If pump is run without sufficient oil in the main hydraulic pump, damage can occur. Always vent pump of air after draining hydraulic system.*

1. With the engine stopped, remove vent plug to see if any oil is present.
2. If oil is not present, fill oil tank with oil.
3. Install vent plug first.
4. Slowly loosen vent plug several turns, until hydraulic oil flows out of plug. This shows that air has been released.
5. Tighten the plug.



DS2300805

Figure 135



DS2300806

Figure 136

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.

Travel Motor

NOTE: *Perform this only when oil is drained from travel motor.*

NOTE: *Refer to Ventin and Priming Hydraulic System.*

1. Stop the engine and perform air venting on the hydraulic pump.
2. Start the engine and operate joystick slightly, the air in the motor moves to the hydraulic pump.
3. Stop the engine and perform air venting on the hydraulic pump again.

General Venting

1. After venting air from all components, stop engine and check the hydraulic oil level. Fill hydraulic oil tank to "H" mark on sight gauge.
2. Start engine and operate all controls again, and run engine for five minutes to ensure all systems have been vented and purged of air. Move engine speed to "LOW IDLE" and check hydraulic oil level again. Add oil as necessary.
3. Check for oil leaks and clean all fill and venting locations.

Maintenance in Special Conditions

NOTE: *See "Operation in Extreme Conditions" on page 1-60 for other recommendations.*

Conditions	Maintenance Required
Operating in mud, water or rain.	Perform a walk around inspection to check for any loose fittings, obvious damage to the machine or any fluid leakage.
	After completing operations, clean mud, rocks or debris from the machine. Inspect for damage, cracked welds or loosened parts.
	Perform all daily lubrication and service.
	If the operations were in salt water or other corrosive materials, make sure to flush the affected equipment with fresh water and check that all control systems operate properly.
Operating in an extremely dusty or hot environment.	Clean the air intake filters on a more frequent basis.
	Clean the radiator and oil cooler fins to remove embedded dirt and dust.
	Clean the fuel system intake strainer and fuel filter more frequently.
	Inspect and clean as required the starter and alternator.
Operating in rocky terrain.	Check the undercarriage and track assemblies for damage or excessive wear.
	Inspect for loose or damaged fittings or bolts.
	Relax track tension.
	On a more frequent basis, inspect the front end attachments for damage or excessive wear.
	Install a top guard and front guard as required for protection against falling rock.
Operating in extreme cold.	Use the proper fuel for the temperature conditions.
	Using a hydrometer, check the antifreeze to make sure that it is providing the proper cold weather freeze protection.
	Verify the condition of the batteries. In extreme cold weather, remove batteries at night and store them in a warmer area.
	Remove mud buildup as soon as possible to prevent it from freezing to the undercarriage and causing damage.

Transportation

Check federal, state and local laws and regulations regarding weight, width, and length of a load before making preparations for transporting on public roads or highways.

The hauling vehicle, trailer, and load must comply with all applicable laws and regulations.

Check the intended route for road width, overhead clearances, weight restrictions, and traffic control regulations. Special approval or permits may be required.

If the actual height exceed the limitation on the trailer, the operator must submit special permission to the government. Consult to the national or regional Road authorities.
Or, to avoid height limit, one may disassemble front linkage or guardrail during transportation.

DS2300926

Figure 1

WARNING

AVOID DEATH OR SERIOUS INJURY

Whenever removal or reassemble guardrail, always use external ladder to access, and NEVER climbing up machine without guardrail and external ladder.
Consult to the HD HYUNDAI CONSTRUCTION EQUIPMENT dealer.

NOTICE

Do not reuse counterweight torque bolt. Once fastened and used under the harsh condition such as counterweight, the bolt may exceeded its yield point.
Use new bolt to counterweight reassemble every time.

Loading and Unloading

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.

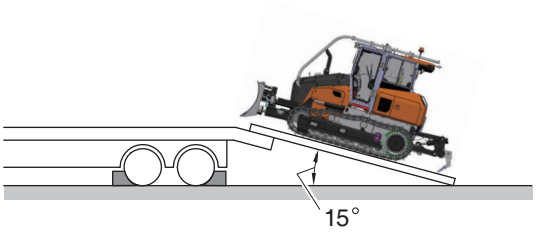
Make sure that ramp being used can handle the weight of the machine. If required, add blocking under the ramp for additional support.

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 dozer.

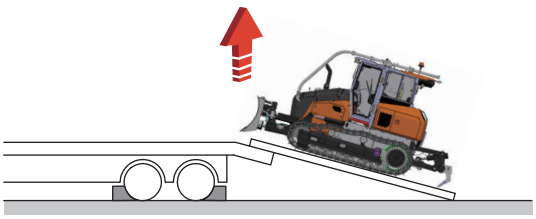
If it is necessary to turn the machine while it is on the trailer, make sure to do this at the slowest engine and travel speeds possible.

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 dozer. If required, add blocking under the ramp to provide additional support.
3. The ramp angle must be less than a 15° angle. Ramps steeper than this can cause traction or stability problems when loading or unloading.
4. Move engine speed to "LOW IDLE".
5. If the machine is equipped with dozer blade, raise the dozer so that the dozer blade does not touch the ground, and travel forward to load it.



DS2300934

Figure 2



DS2300935

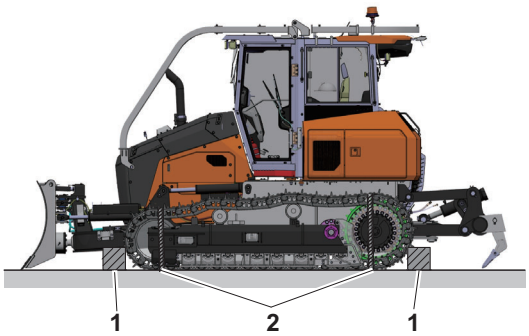
Figure 3

6. Slowly lower the dozer blade to the floor.
7. Set the hydraulic cutoff switch to "O"(OFF) position.
8. Press the start/stop button to stop the engine.
9. Turn battery disconnect switch to "OFF" position.
10. Lock all doors and covers.

DS2300926

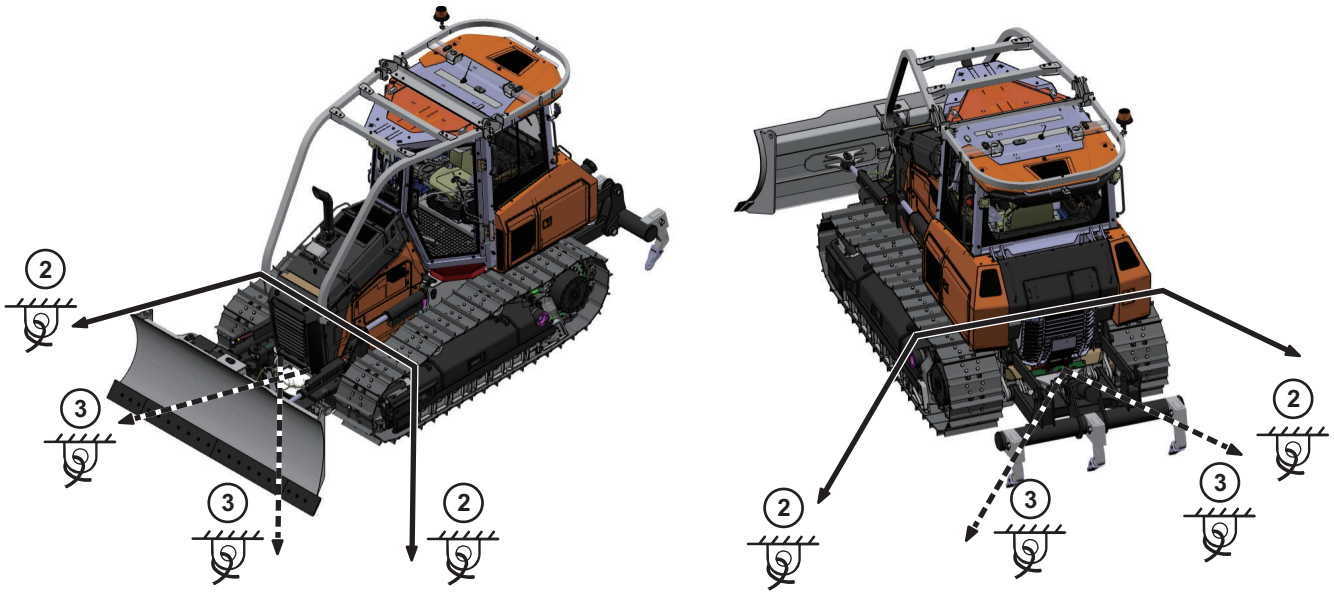
Figure 4

11. Make sure to secure the machine onto the trailer before transporting. Place blocking (1, Figure 5) in front of and behind each track. Tie front and rear (2, Figure 6) and tie down point (3, Figure 6) on the lower frame with wire cable as required by local transportation regulations.
12. Refer to "Specification" section of this manual for overall machine height and width dimensions. Make sure to position the machine as shown. If not transported in this position, the height measurements may be different.



DS2300936

Figure 5



DS2300937

Figure 6

Lifting Machine

WARNING

AVOID DEATH OR SERIOUS INJURY

Never lift the machine with a person in the cabin or on the machine.

Never enter the area under or around a raised machine.

Improper lifting can allow load to shift and cause death or serious injury or property damage.

When lifting, set the hydraulic cutoff Switch to "O" (OFF) position to prevent the machine from moving unexpectedly.

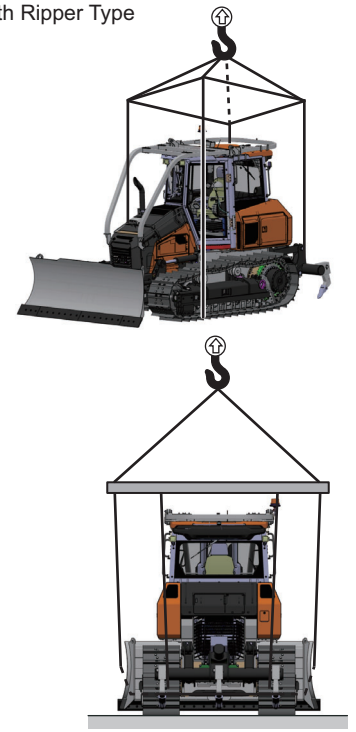
Use only properly rated cables and slings.

Never go in the area under or around the machine when it is raised.

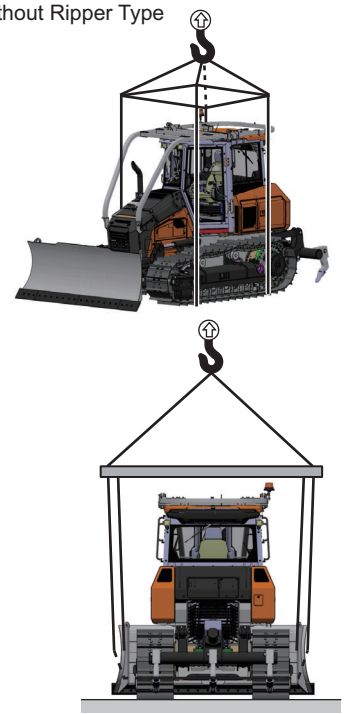
Always use the posture given in the procedure below and use the proper lifting equipment to lift the machine.

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 to the ground.
4. Set the hydraulic cutoff Switch to "O" (OFF) position. Stop engine.
5. Ensure there is nothing around the operator's compartment, close the cabin door and front glass securely.
6. Check the lifting point (track/ripper bracket) and bind wire ropes that location.
7. Use spreader bars between the wire rope and the machine to prevent damage to the rope or machine.
8. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.

With Ripper Type



Without Ripper Type



DS2300938

Figure 7

Towing Procedure

WARNING

AVOID DEATH OR SERIOUS INJURY

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

Always wear gloves when handling a chain or wire rope (cable).

When towing the machine, use a wire rope (cable) or chain capable of handling the load.

Attach chain or wire rope (cable) to track frame.

Insert protective material such as thick cloths between track frame and wire rope (cable) to prevent the wire rope from being damaged.

WARNING

AVOID DEATH OR SERIOUS INJURY

Only use shackle hook on track frame to haul objects that weigh less than 5 metric tons (5.51 U.S. Tons). Never use shackle hook to haul objects over 5 metric tons (5.51 U.S. Tons).

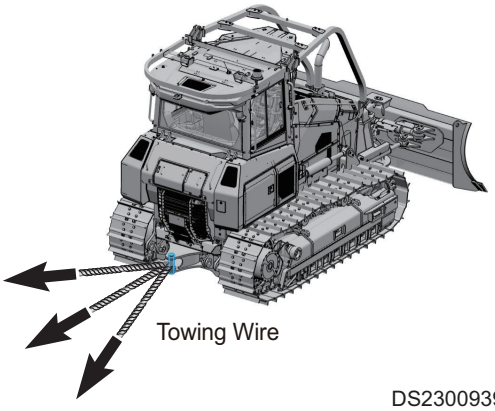


Figure 8

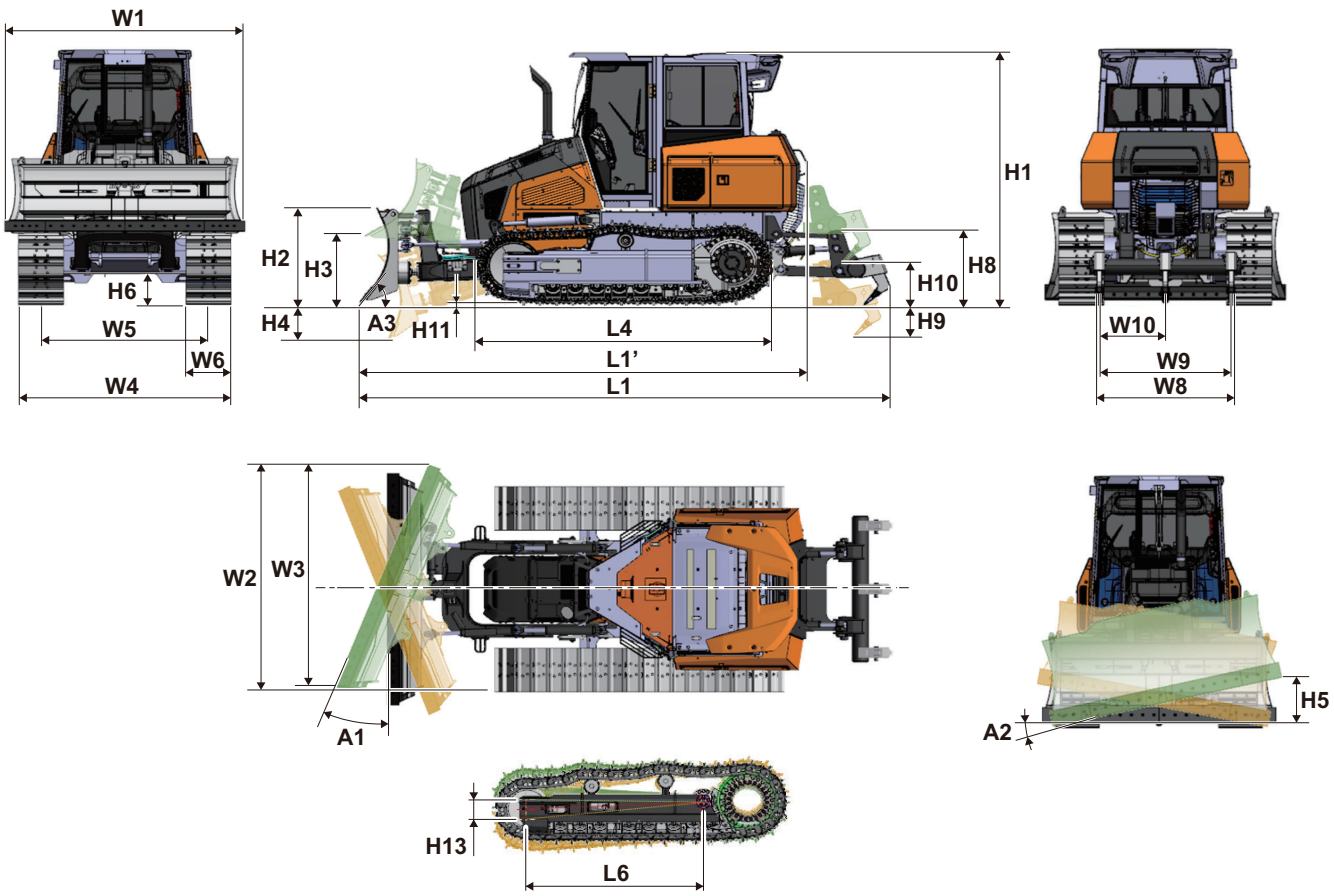
Specification

Standard Specification

Component		Specification	
		Metric	**English**
Blade Capacity		4.18 m^3	5.5 yd^3
Operating Weight		15.3 metric tons	16.8 US tons
Engine	Model	Perkins 1204J	
	Type	4-Cycle, Water-Cooled, Variable Geometry Turbocharger (2-Stage), Common Rail, Direct Injection	
	Rated Output (Gross)	117 kW @2,200 rpm	157 HP (159 PS) @ 2,200 rpm
	Rated Output (Net)	117 kW @2,200 rpm	157 HP (159 PS) @ 2,200 rpm
	Maximum Torque	710 N.m @ 1,400 rpm	524 ft lb @ 1,400 rpm
Main Pump	Type	Axial Piston, Variable Displacement	
	Discharging Pressure	270 kg/cm^2	3,844 psi
	Maximum Discharge Quantity	121 L/min	32 U.S. gpm
Fan Pump	Type	Gear	
	Maximum Discharge Quantity	66.75 L/min	17.6 U.S. gpm
Performance	Travel Speed	9 km/h	5.6 MPH
	Traction Force	22 metric tons	24.2 tons
	Gradeability	35° (70% Slope)	
Upper Roller Qty.		2 per side	
Bottom Roller Qty.		8 per side	

* Base Option: LGP Blade, LGP Shoe, Non-Rear Attachment

Overall Dimensions



DS2300962

Figure 1

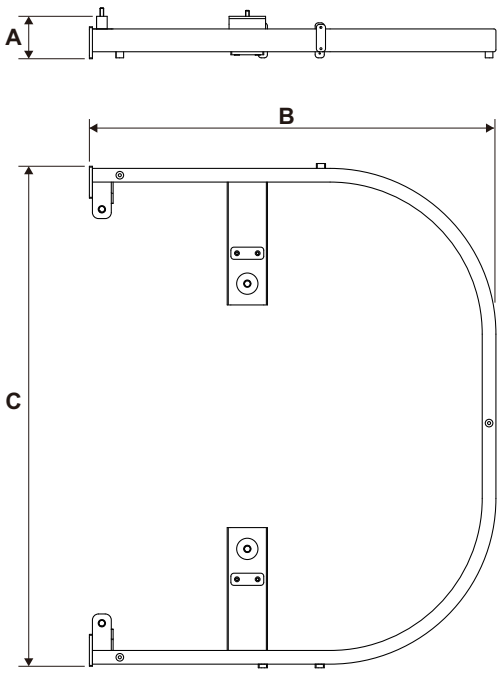
Classification		Dimension	Unit	XL	LGP
Height	H1	Machine Height from Tip of Grouser (Cabin)	mm (ft in)	3,130 (10' 3")	
	H2	Blade Height		1,115 (3' 8")	
	H3	Blade Lift Height		1,110 (3' 8")	
	H4	Digging Depth		405 (1' 4")	
	H5	Maximum Tilt Height (Blade)		435 (1' 5")	510 (1' 8")
	H6	Ground Clearance Center (Without Grouser)		355 (1' 2")	
	H8	Ripper Height		1,110 (3' 8")	
	H9	Ripper Digging Depth		280 (0' 11")	
	H10	Maximum Ground Clearance Under Tip (Ripper)		585 (1' 11")	
	H11	Grouser Height		57 (0' 2")	
	H13	Side Frame Tilting Stroke @ Idler Center (Up & Down)		133 (0' 5")	
Length	L1	Overall Length with Blade and Ripper		6,030 (19' 9")	
	L1'	Overall Length with Blade Only		5,035 (16' 6")	
	L4	Track Length		3,690 (12' 1")	
	L6	Dimension: Distance between Pivot Shaft to Idler Center		2,175 (7' 2")	
Width	W1	Blade Width		3,105 (10' 2")	3,655 (11' 12")
	W2	Overall Width at Max. Angle		2,870 (9' 5")	3,370 (11' 1")
	W3	Blade Width at Max. Angle		2,870 (9' 5")	3,370 (11' 1")
	W4	Machine Width (Without Blade)		2,330 (7' 8")	2,760 (9' 1")
	W5	Track Gauge		1,770 (5' 10")	2,000 (6' 7")
	W6	Shoe Width		560 (1' 10")	760 (2' 6")
	W8	Overall Ripper Width		1,860 (6' 1")	
	W9	Ripping Width		1,740 (5' 9")	
	W10	Distance Between Shank (Ripper)		870 (2' 10")	
Angle	A1	Maximum Blade Angle	deg	25	
	A2	Maximum Tilt Angle		8	
	A3	Blade Cutting Edge Angle (Adjustable)		52 ~ 58	

Disassembled Parts, Dimension and Weight

Components

Description	Weight kg (lb)	Remarks
Body Without Front	12,280 (27,073)	With Shoe
Shoe	2,970 / 2,500 (6,548 / 5,512)	LGP / XL
C-frame Assy	956 (2,108)	With Cover
C-Frame	700 (1,543)	With Bush
Lifting Cyl. (2 ea)	92 (203)	With Bush
Angle Cyl. (2 ea)	89 (196)	With Bush
Tilt Cyl. (1 ea)	54 (119)	With Bush
Blade Assy XL	933 (2,057)	-
Blade Assy LGP	1,072 (2,363)	-
Ripper Assy	865 (1,907)	-

Cabin Top Guard

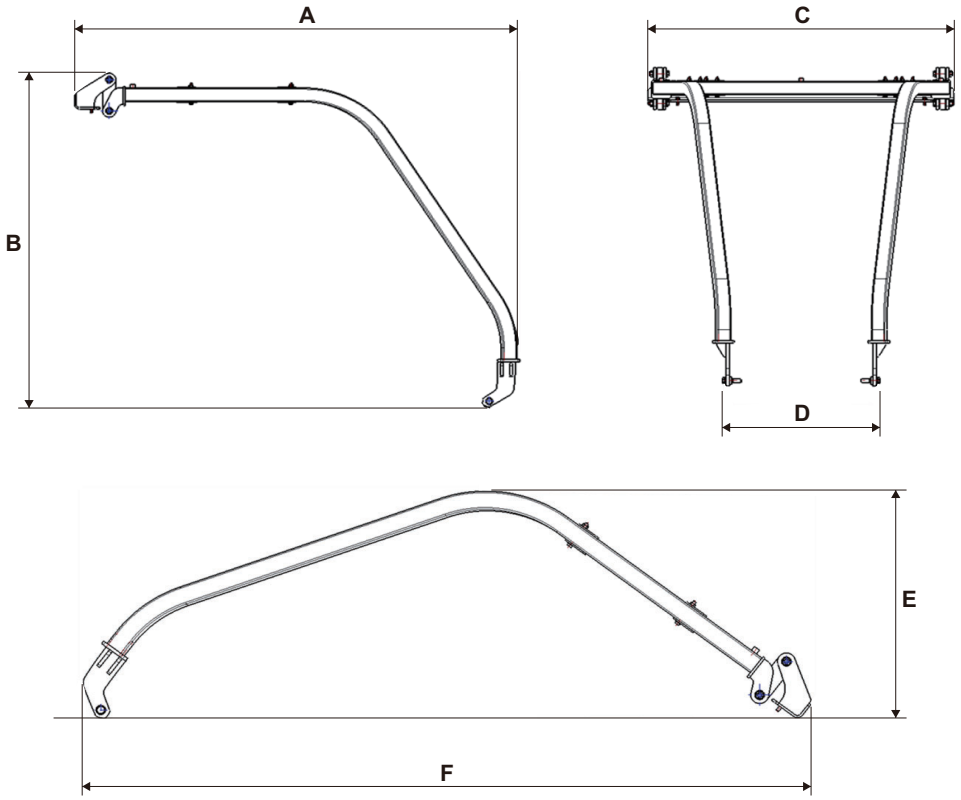


DS2300966

Figure 2

Description		Cabin Top Guard
Length (A)	mm (ft in)	139.5 (0' 5")
Length (B)		1,336 (4' 5")
Length (C)		1,658 (5' 5")
Weight	kg	37
	lb	82

Front Guard



DS2300967

Figure 3

Description		Front Guard
Length (A)	mm (ft in)	2,369 (7' 9")
Length (B)		1,859 (6' 1")
Length (C)		1,670 (5' 6")
Length (D)		820 (2' 8")
Length (E)		970 (3' 2")
Length (F)		2,890 (9' 6")
Weight	kg	125
	lb	276

Ground Pressure

Description	Shoe Width mm	Machine Weight ton (lb)	Ground Pressure kg/cm^2 (psi)
LGP	760	15.3 (33,730)	0.33 (4.6)
XL	560	14.5 (31,967)	0.43 (6.1)

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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