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# Foreword

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

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

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

Always replace parts with genuine HYUNDAI parts or HYUNDAI 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 HYUNDAI distributor for further information.

## Engine and Emission Control System Maintenance

Proper inspection, maintenance and repair is essential to keeping engine and machine systems properly operating. This includes proper inspection and maintenance of the machine's emission control system. This could include machine and engine components, such as an EGR (Exhaust Gas Recirculation) system, 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 HYUNDAI distributor for further information.

## California Proposition 65

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a wall-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information go to [www.P65Warning.ca.gov](http://www.P65Warning.ca.gov).

## Product Identification Number (PIN)

A PIN number is stamped on upper frame under boom foot (Figure 1). It is also stamped on a product identification plate (Figure 2) on outside of cabin on right-hand side.

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

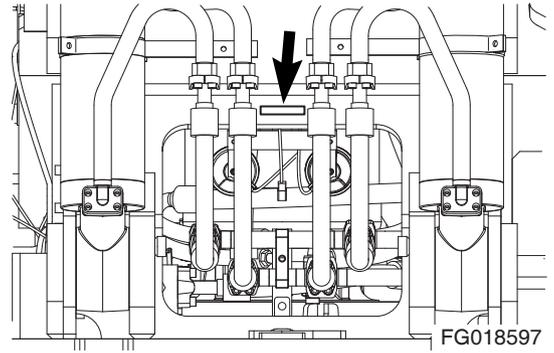


Figure 1

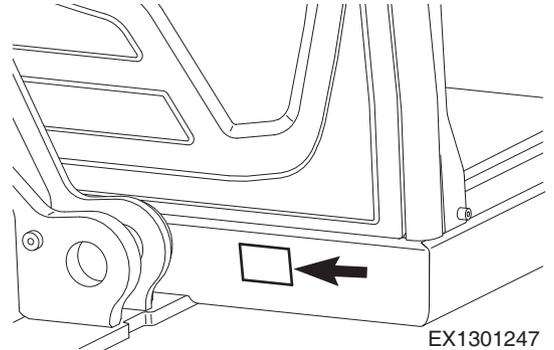


Figure 2



Figure 3

## Component Serial Numbers

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

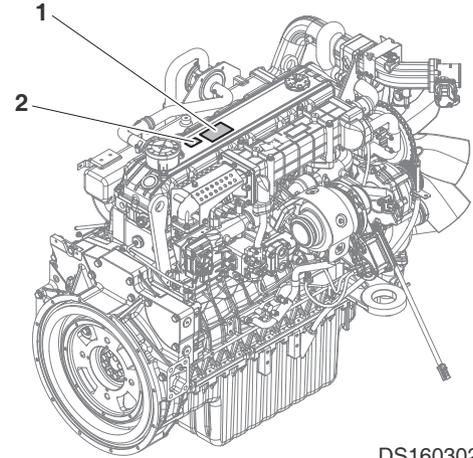
## Engine Identification

### Engine Data Plate

The engine data plate provides important facts about the engine. The 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 HYUNDAI.

The engine data plate and engine serial number are located on the head cover. Have the following engine data available when communicating with a HYUNDAI 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 |



DS1603025

Figure 4

## 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.

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## NOTICE

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

---

**NOTE:** *The word "NOTE" identifies information for effective use.*

## AEM SAFETY MANUAL (NORTH AMERICA ONLY)

The AEM Safety Manual delivered with the machine gives general safety information.

The AEM Safety Manual must be read and understood before beginning operation or maintenance and is not intended to replace the Operation & Maintenance Manual delivered with the machine.



FG020060

Figure 5

# FEDERAL AND CALIFORNIA EMISSION CONTROL SYSTEMS

## Limited Warranty for Non-road Engines (CI) (FDICL05.8LEA (DL08P))

### Owner's Warranty Rights and Obligations

The U.S. Environmental Protection Agency (EPA), the California Air Resources Board (ARB), and HYUNDAI are pleased to explain the Federal and California Emission Control System Warranty on your 2015MY to 2017MY non-road engine. HYUNDAI has designed, built and equipped the engine so as to conform at the time of sale with all applicable regulations of the EPA and of the California ARB. In California, new heavy-duty off-road engines must be designed, built and equipped to meet the State's stringent anti-smog standards.

HYUNDAI must warrant to the initial owner, and each subsequent owner, the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect, improper maintenance or unapproved modifications of your engine. Your emission control system may include those parts listed below:

1. Fuel Metering System  
Fuel Supply Pump (HP Pump), Injector, Common Rail, Glow Plug
2. Air-Induction System  
Intake Manifold, Turbocharger System
3. Exhaust Gas Recirculation (EGR) System  
EGR Valve, EGR Cooler
4. Catalyst or Thermal Reactor System  
Diesel Oxidation Catalyst (DOC), Exhaust Manifold, SCR System, Catalyst, NOx Sensor
5. Positive Crankcase Ventilation (PCV) System  
Right Head Cover
6. Electronic Control System  
ECU, Cam/ Crank Sensor, Coolant Temperature Sensor, MAF Sensor, MAP Sensor (Manifold Pressure Sensor), Inlet Boost Temperature Sensor, Fuel Temperature Sensor, Common Rail Pressure Sensor
7. Miscellaneous Items Used In Above Systems  
Temperature and time sensitive valve and switches  
Solenoids and wiring harnesses  
Hoses, clamps, fittings and tubing, sealing gasket

Pulleys, belts and idlers

Emission control information labels

Where a warrantable condition exists, HYUNDAI CONSTRUCTION EQUIPMENT will repair your heavy-duty off-road engine at no cost to you including diagnosis, parts, and labor.

### **Manufacturer's Warranty Coverage**

The 2015MY to 2017MY heavy-duty off-road engines are warranted for five years or 3,000 hours of operation, whichever occurs first. If any emission-related part on your engine is defective, the part will be repaired or replaced by HYUNDAI.

The warranty period shall begin on the date the machine is delivered to the first retail customer.

### **Owner's Warranty Responsibilities**

As the heavy-duty off-road engine owner, you are responsible for the performance of the **required maintenance listed in the Operation and Maintenance Manual**. HYUNDAI recommends that you retain all receipts covering maintenance on your heavy-duty off-road engine, but HYUNDAI cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

As the heavy-duty off-road engine owner, you should however be aware that HYUNDAI may deny you warranty coverage if your heavy-duty off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on **Ultra Low Sulfur Diesel Fuel Only**. Use of any other fuel may result in your engine no longer operating in compliance with the EPA's emissions requirements.

You are responsible for initiating the warranty process. The EPA and California ARB suggest that you present your heavy-duty off-road engine to a dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.

If you have any questions regarding your warranty rights and responsibilities, you should contact your nearest authorized HYUNDAI dealer.

# Safety

# SAFETY DECALS

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

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

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

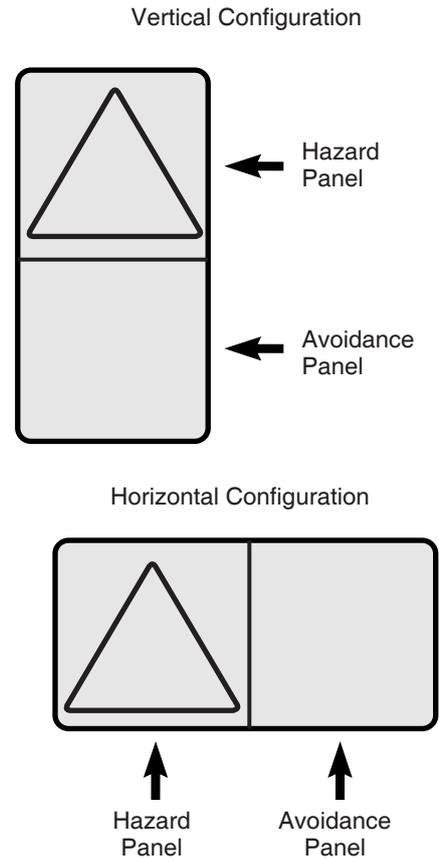
## **Safety Decals With Text**

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

### Safety Decals Without Text (No-Text)

Safety decals without text consist of a hazard panel(s) and avoidance panel(s). Hazard panels are located at the top or left side and the avoidance panels are located at the bottom or right side of the decal depending on its configuration. The hazard panels use a black triangular band and a pictorial to identify the hazard and the potential consequences of failure to follow the instructions. Avoidance panels use pictorials and/or prohibition signs to identify the actions necessary to avoid the hazard.

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



FG018723

**Figure 1**

# Information and Location for Safety Decals

## STD Cabin

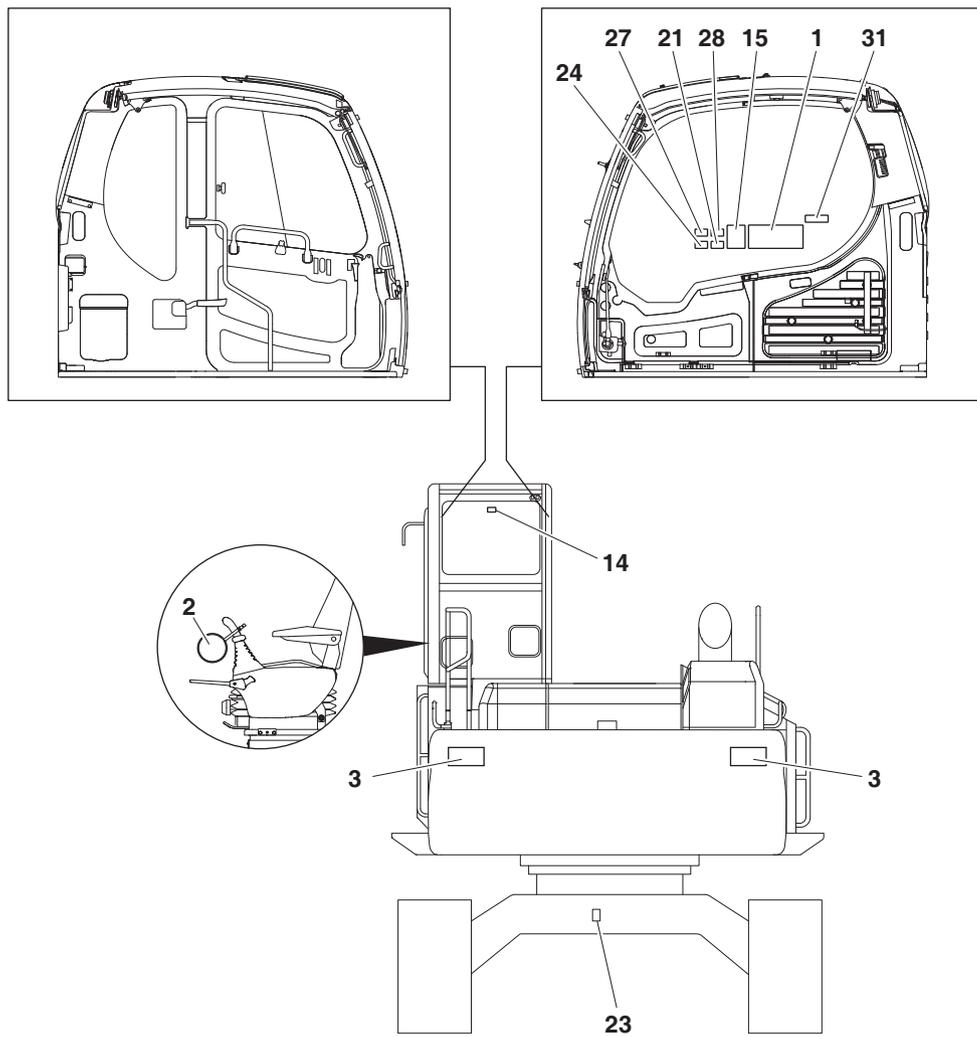
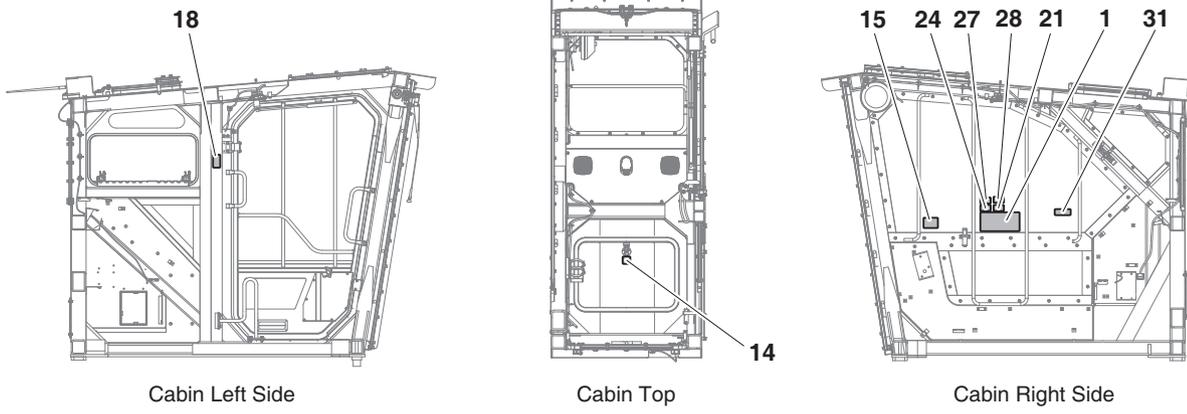


Figure 2

DS1801366

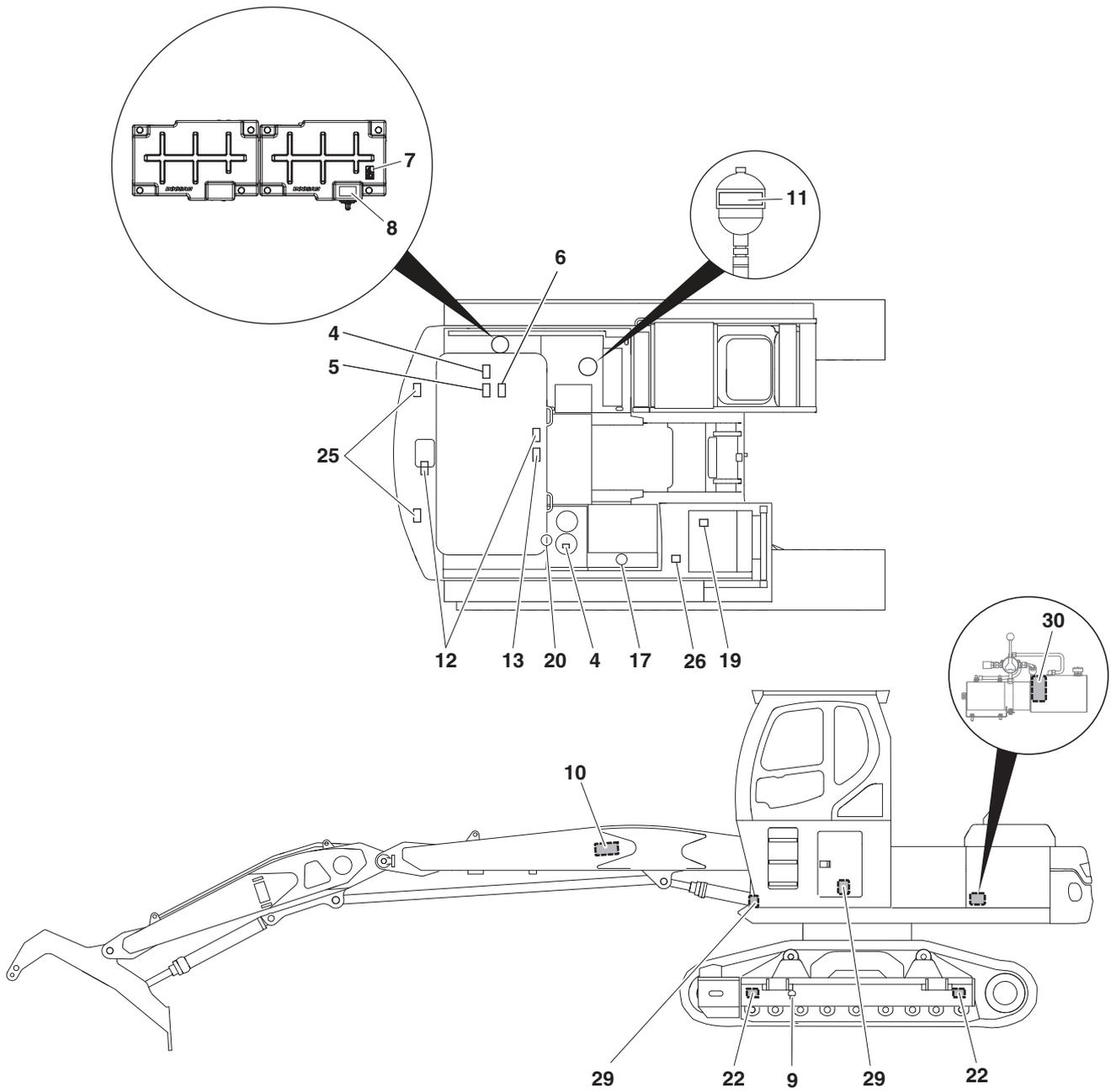
# Oregon Cabin



DS1801365

**Figure 3**

# Information and Location for Safety Decals (Continued)



DS1604721

Figure 4

1. General Hazard (950205-03804)



EX1301176

---

 **WARNING**

---

**AVOID DEATH OR SERIOUS INJURY**

- Never use forestry 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 prior to operation.
- Keep bystanders out of swing area and travel path and always look in the direction of travel.
- Ensure mirrors and rear view camera are clean and working properly.
- Never operate machine from outside the operator's position.
- **TO LEAVE THE FORESTRY MACHINE:**
  - 1) Lower the attachment and dozer blade (if equipped) to the ground and make sure all controls are in neutral.
  - 2) Stop the engine and remove the key.
  - 3) Lower safety lever to **LOCK** position.

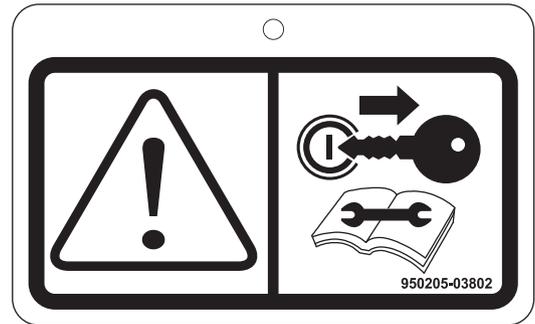
2. Warning Tag - "Do Not Operate" (950205-03802)



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

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



EX1301177

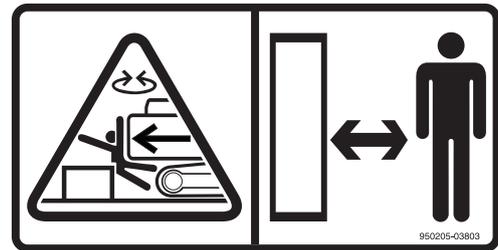
3. Keep Bystanders Away (950205-03803)



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

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



EX1301178

4. Hot Pressurized Fluid (950205-03781)



**WARNING**

**HOT PRESSURIZED FLUID CAN CAUSE  
SERIOUS BURNS**

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



EX1301180

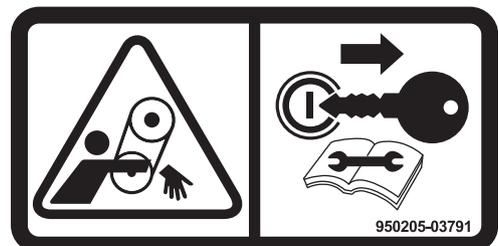
5. Entanglement in Rotating Parts (950205-03791)



**WARNING**

**ROTATING PARTS CAN CAUSE DEATH OR  
SERIOUS INJURY**

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



EX1301181

6. Rotating Fan (950205-03788)

---

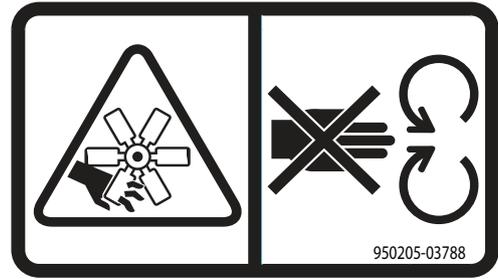
 **WARNING**

---

**CONTACT WITH ROTATING FAN CAN CAUSE  
DEATH OR SERIOUS INJURY**

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

---



EX1301182

7. Battery Explosion (950205-03785)

---

 **WARNING**

---

**AVOID DEATH OR SERIOUS INJURY**

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



EX1301183

8. Battery Disconnection (950205-03784)

---

 **NOTICE**

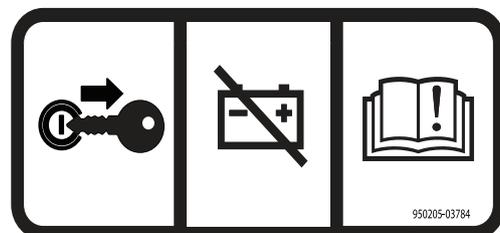
---

**AVOID ELECTRICAL COMPONENT DAMAGE**

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

**Disconnect battery only when the engine is turned  
OFF.**

---



EX1301184

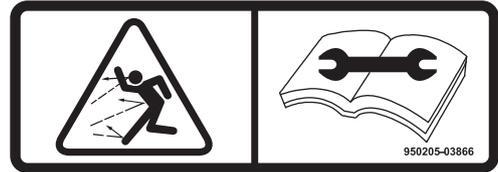
9. Flying Debris or Objects (950205-03866)



**WARNING**

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

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



EX1301185

10. Crush Hazard (950205-03805)



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

**Stay clear of the boom, arm, and attachment.**



EX1301186

11. 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

12. Fall Hazard (950205-03783)

---

 **WARNING**

---

**AVOID DEATH OR SERIOUS INJURY**

**Do not step in this area.**

---



EX1301188

13. Hot Surface (950205-03777, 950209-03415)

---

 **WARNING**

---

**HOT SURFACE CAN CAUSE SERIOUS BURNS**

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

---



EX1301189



DS1601290

14. Emergency Exit (950205-03810, 950205-05761)

- STD Cabin

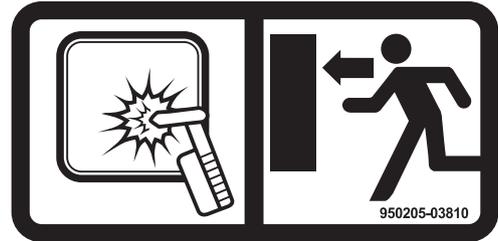
---

 **NOTICE**

---

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

---



EX1301190

- Oregon Cabin

---

 **NOTICE**

---

If primary exit is blocked, escape through the emergency door at the roof of cabin.

---



DS1601291

15. ISO Control Pattern (950205-03860)

---

 **WARNING**

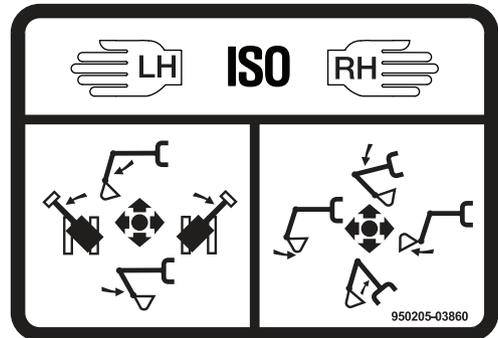
---

**AVOID INJURY OR DEATH**

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

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

---



EX1301191

BHL Control Pattern (US Only) (950205-03868)

---

 **WARNING**

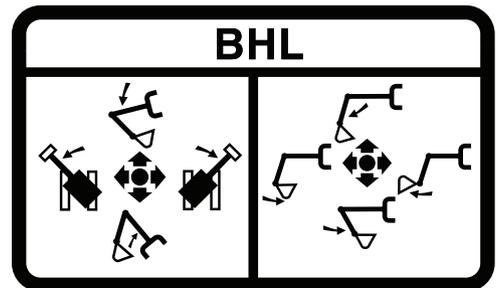
---

**AVOID INJURY OR DEATH**

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

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

---



EX1301192

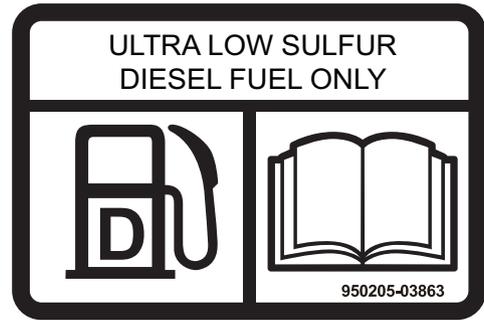
17. Ultra Low Sulfur Diesel Fuel (If Equipped)  
(950205-03863, 950205-03864)



---

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

---



EX1301196

18. ROPS Warning (Oregon Cabin Only) (950205-03861)



---

**AVOID DEATH OR SERIOUS INJURY**

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



EX1301197

19. Falling Object (If Equipped) (950205-03786)



---

**UNSUPPORTED DOOR CAN FALL CAUSING  
DEATH OR SERIOUS INJURY**

- To open door:
    - 1) Hold door firmly.
    - 2) Lift door slowly until locking device engages.
  - To close door:
    - 1) Hold door firmly.
    - 2) Press locking device to disengage.
    - 3) Lower door slowly.
- 



EX1301198

20. Hydraulic Oil Check (If Equipped)  
(950205-06281, 950205-03965, 950205-06282)

---

 **NOTICE**

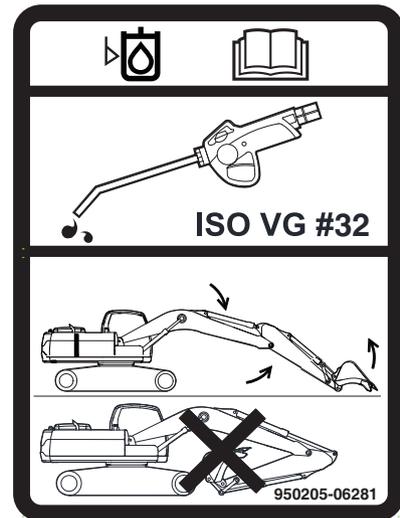
---

**INCORRECT OIL LEVEL OR INCORRECT FLUID CAN  
CAUSE HYDRAULIC SYSTEM DAMAGE**

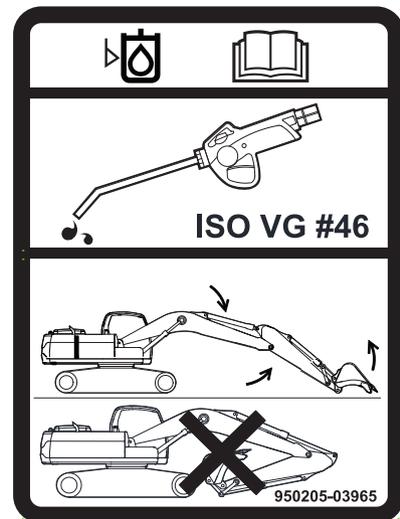
Place the forestry machine with the boom and arm fully extended with the attachment on the ground before checking hydraulic fluid level.

Use hydraulic oil which is suitable for machine.

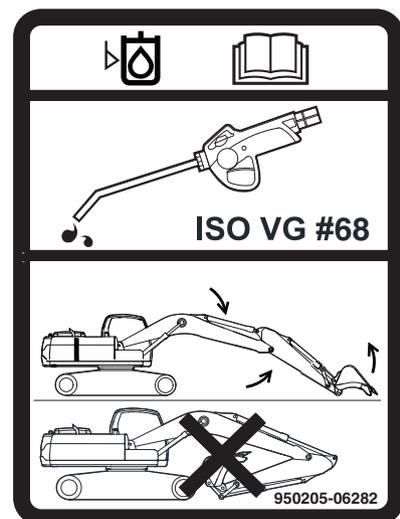
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EX1505097



EX1505098



EX1505099

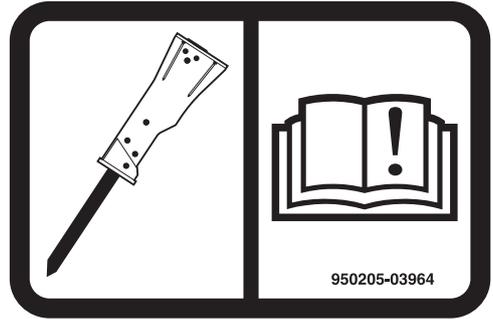
21. Hydraulic Breaker (If Equipped) (950205-03964)



**NOTICE**

**AVOID HYDRAULIC SYSTEM DAMAGE**

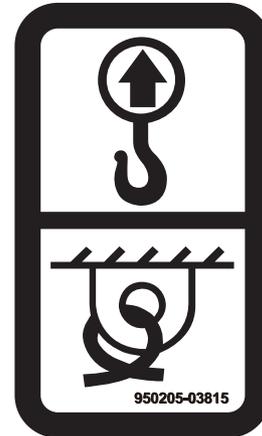
To adjust breaker impact, see Operation & Maintenance Manual for additional instructions.



EX1301200

22. Lift/Tie down (If Equipped) (950205-03815)

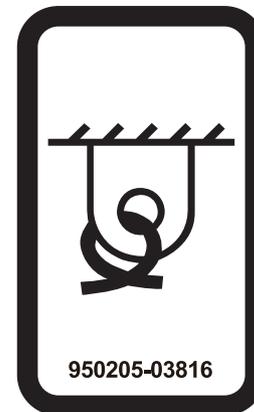
Identifies lift point and tie down point location.



EX1301201

23. Tie down (If Equipped) (950205-03816)

Identifies tie down point location.



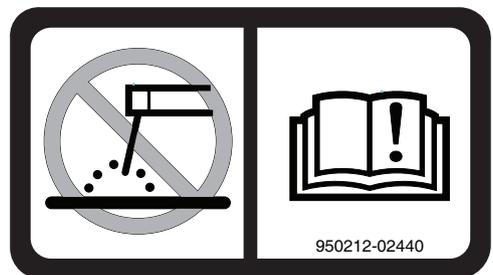
EX1301203

24. Electric Welding Attention (950212-02440)



**NOTICE**

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



EX1402396

25. Do Not Lift (950205-03570)

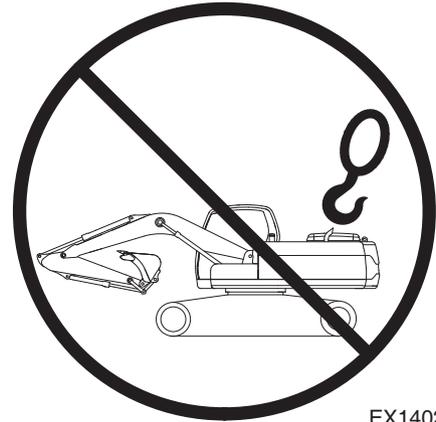


**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

Not a lift point for machine.

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



EX1402619

26. DEF (AdBlue) (950205-01489A)



**NOTICE**

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



950205-01489A

WL1300370

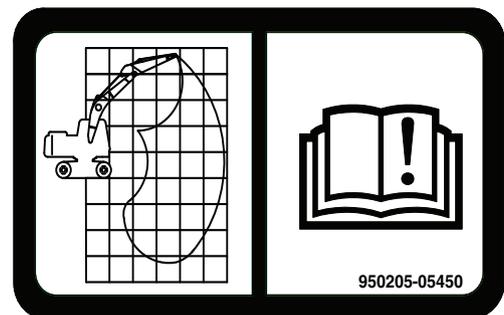
27. Lifting Capacity (950205-05450)



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

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



950205-05450

WE1500865

28. Front Control (190-00048)

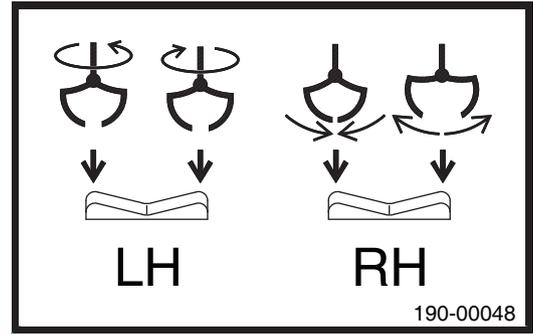


**WARNING**

**AVOID INJURY OR DEATH**

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

Refer to "Operational Controls and Panels" section of this manual for details regarding the Rotating/Shear switch control functions.



DS1601292

29. Crush Harzard (950205-03787)



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

- Keep out of cabin tilting area.
- Make sure cabin tilting area is clear of bystanders and objects.



EX1402207

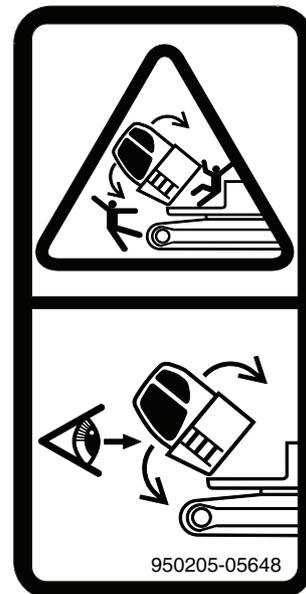
30. Cabin Tilting Warning (950205-05648)



**WARNING**

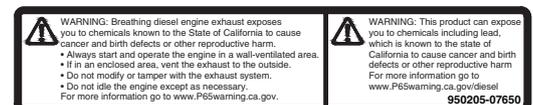
**AVOID DEATH OR SERIOUS INJURY**

- Keep out of cabin tilting area.
- When you are tilting the cabin, pay attention to the move of the cabin.



DS1601293

31. California Proposition 65 (950205-07650)



DS1801347

# 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 safety lever and seat belt. Use them properly.
- Never remove, modify or disable any safety features. Always keep them in good operating condition.
- Always check for and know the location of underground and overhead utility lines before excavating.
- Failure to use and maintain safety features according to instructions in this manual, Safety Manual 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 HYUNDAI for use on HYUNDAI machines. When installing and using optional attachments, read instruction manual for attachment, and general information related to attachments in this manual. Because HYUNDAI cannot anticipate, identify or test all attachments that owners may want to install on their machines, contact HYUNDAI for written authorization and approval of attachments, and their compatibility with optional kits.

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

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

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

Never use attachment as a work platform or manlift.

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

## Pressurized Fluids

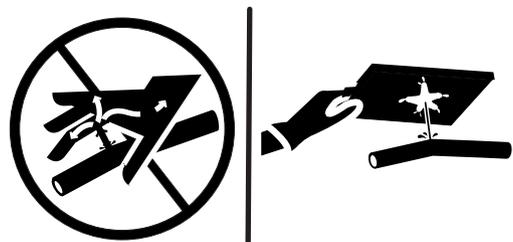
Pressurized air or fluids can cause debris and/or fluids to be blown out. This could result in death or serious injury.

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.

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.



FG018457

Figure 5

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 HYUNDAI distributor for information on available protective guards.

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

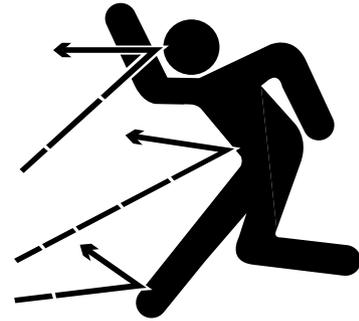


Figure 6

HAOA110L



Figure 7

HAOA100L

## Personal Protective Equipment (PPE)

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

Do not wear oily clothes. They are highly flammable.

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

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

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



Figure 8

## 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 9

## Hot Coolant and Oils - Burn Prevention

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



FG019095

Figure 10

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 11

## Fire and Explosion Prevention

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

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

Always observe the following:

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

### Maintenance

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

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

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

### Operation

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

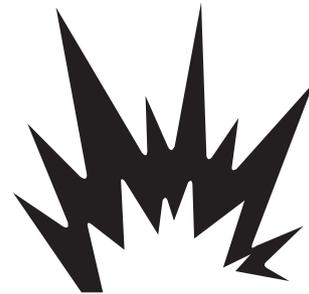
Do not operate machine near any flame.

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



HDO1015I

Figure 12



FG018458

Figure 13

## 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 "Starting Engine with a Booster Cable" on page 3-22, 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.

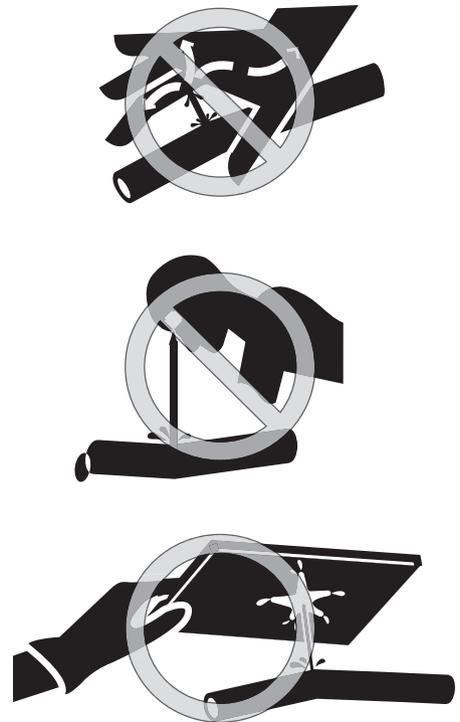
## Hydraulic System

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 14

## 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.

## 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.

## 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.

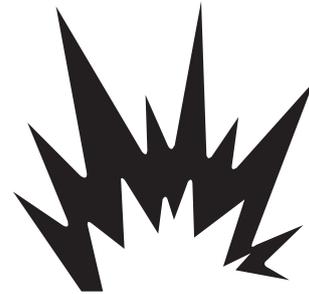
Repair such components in a well ventilated area away from flames or sparks.

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.



EX1400130

Figure 15



FG018458

Figure 16

## 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.*



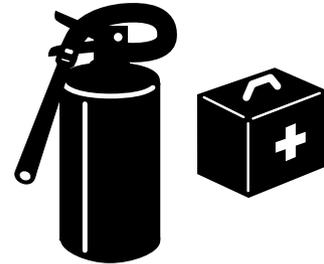
FG018459

Figure 17

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

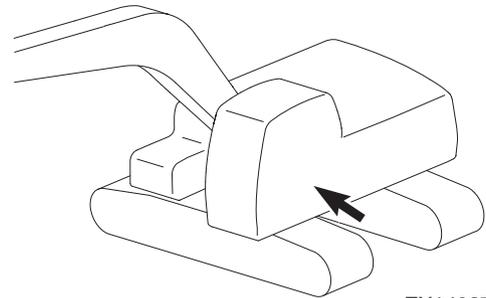
To be prepared in the event of a fire:

- Be sure that fire extinguishers have been provided and read labels to ensure that you know how to use them. It is recommended that an appropriately sized (2.27 kg [5 lb] or larger) multipurpose A/B/C fire extinguisher be mounted in cabin. Check and service fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- Inspect fire extinguisher and service fire extinguisher regularly.
- Follow instructions on extinguisher instruction plate.
- Keep a first aid kit in storage compartment (Figure 19) 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 18



EX1403736

Figure 19

## Electrical System and Electrical Shock

Never short across starter terminals or across batteries. Shorting could damage electrical system and engine neutral start system.

When engine is running or immediately after it has stopped, high voltage is generated at injector terminal and inside engine controller, so there is a potential for an electrical shock. Never touch injector terminal or inside of engine controller.

**NOTE:** *If it is necessary to touch injector terminal or inside engine controller, contact your HYUNDAI distributor.*

## Operator Protective Guards and Structures (If Equipped)

The machine may have different types of guards for operator protection. the type of guards might be vary on the applications and work demands.

Inspect and check the guards daily to ensure no cracks, bent or loose. DO NOT modify the protective structure, guards by welding, grinding, drilling holes or adding attachments. Changes to the cabin can cause loss of operator protection from roll-over and falling objects, and result in death or serious injury.

Always wear your seat belt when operating machine.

Logging operation required the protection from flying debris and / or objects. When use a work tool create flying debris, install a front guard. Close the window and wear safety glasses.

# Emergency Exit from Operator's Station

## STD Cabin

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

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



## WARNING

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**AVOID DEATH OR SERIOUS INJURY**

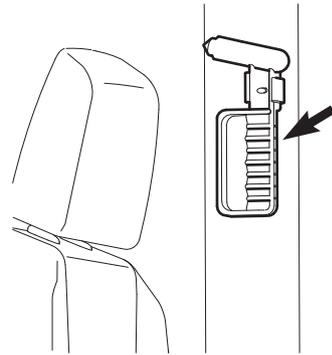
**Protect your eyes when breaking the glass.**

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## Oregon Cabin

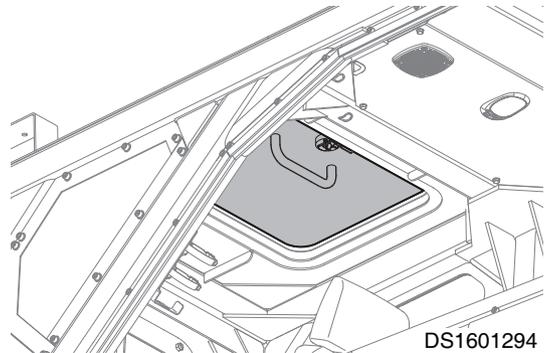
This model is equipped with an emergency exit on the roof of the cabin, through which you can escape when the regular door is blocked.

**NOTE:** *In case the operator is not able to open the emergency door, another person can open it from outside.*



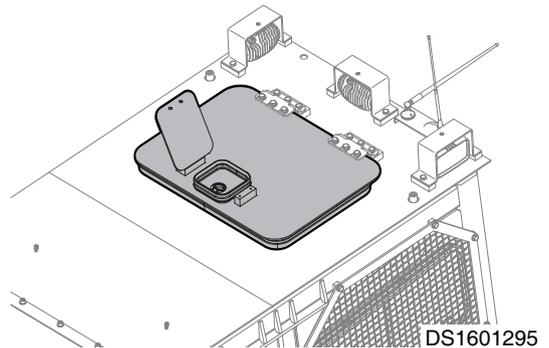
EX1300679

Figure 20



DS1601294

Figure 21



DS1601295

Figure 22

## **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 forestry 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 HYUNDAI distributor for assistance with disassembly.

## Loading and Unloading

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

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

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

## **Transporting Machine**

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

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

# OPERATION

Always make sure that the machine is properly maintained.

## Before Engine Starting

### Machine Condition

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

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

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

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

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

Know maximum operating dimensions of your machine.

## Work Site

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

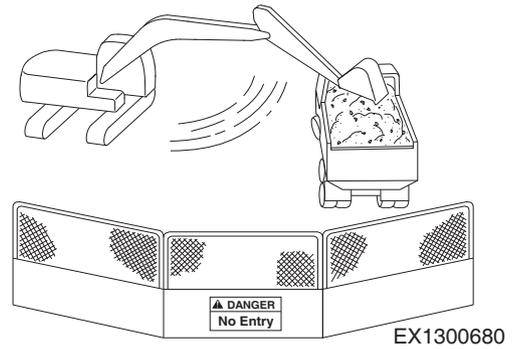
Before starting engine and moving machine, make sure that no one is underneath machine, around machine, or on machine.

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

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

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

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



**Figure 23**

## 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.

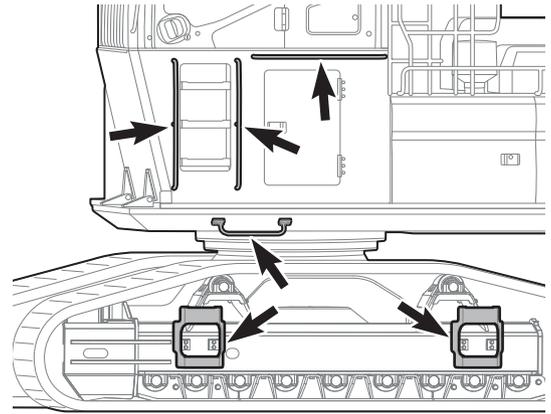
When getting on or off machine, always face machine. Maintain three-point contact (both feet and one hand or one foot and both hands) with handrails, guardrails, steps, and track shoes to ensure that you support yourself securely.

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.

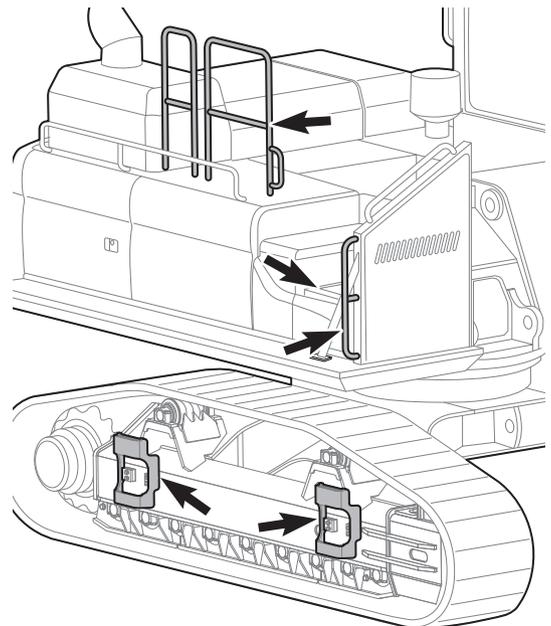
Use points marked by arrows in diagram when getting on or off machine.

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



EX1500971

Figure 24



EX1500972

Figure 25

## Cleaning

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

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

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

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

Clean window glass and working lights for good visibility.

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

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

Secure all loose items such as lunch boxes, and other items that are not a part of equipment.

## Operator Station

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

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

Keep all windows and doors closed on machine.

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

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

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

## Seat Belt

Check seat belt daily for correct function.

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

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

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



### **WARNING**

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#### **AVOID DEATH OR SERIOUS INJURY**

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

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

**Always wear seat belt when operating machine.**

---

## Visibility Information

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

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



## WARNING

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### AVOID DEATH OR SERIOUS INJURY

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

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

Adjust visual aids for best visibility around machine.

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

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

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

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

### Work Site Rules

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

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

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

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

## **Boost Starting or Charging Engine Batteries**

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

- Turn "OFF" all electric equipment before connecting leads to battery. This includes electric switches on battery charger or battery booster equipment.
- When boost starting from another machine or vehicle do not allow two machines to touch. Wear safety goggles and gloves while battery connections are made.
- 24 volt battery units consisting of two series connected 12 volt batteries have a cable connecting one positive (+) terminal on one of the 12 volt batteries to a negative (-) terminal on the other battery. Booster or charger cable connections must be made between the nonseries connected positive (+) terminals and between the negative (-) terminal of the booster battery and metal frame of the machine being boosted or charged. The final booster cable connection, at metal frame of the machine being charged or boost started, must be as far away from the batteries as possible. Refer to "Starting Engine with a Booster Cable" on page 3-22, for proper procedure in this manual.
- Connect positive (+) cable first when installing cables and disconnect negative (-) cable first when removing them.

## Starting Engine

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

Only operate controls while engine is running.

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

- Read and understand control pattern before operating. Check that movement of the machine matches display on control pattern label. If it does not match, replace it immediately with correct control pattern label.
- Check operation of work equipment, travel system and swing system.
- Check for any problem with machine. Check for unusual sounds, vibration, heat, odor, or improper readings from gauges. Check for any oil or fuel leaks.
- If any problem is found, stop operation and perform repairs immediately.

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

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

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

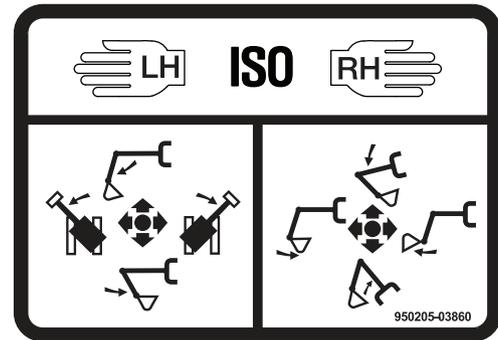
- Do not attempt to start engine by short-circuiting engine starting circuit. This can result in death or serious injury, or fire.
- When starting engine, sound horn as a warning to alert personnel in the work area.

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

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

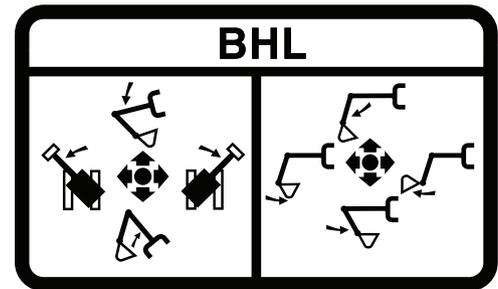
**NOTE:** *When starting engine in cold temperatures, "white engine exhaust smoke" from the tail pipe can occur until engine reaches normal operating temperatures.*

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



EX1301191

Figure 26



EX1301192

Figure 27

## Swinging or Traveling

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

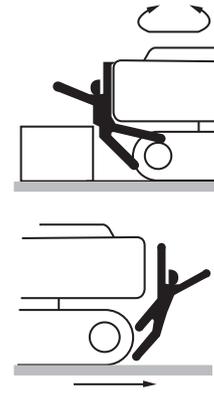
It is important to keep in mind that the machine, in comparison with the rest of traffic, is a slow moving and wide vehicle which can cause traffic delays. Pay attention to traffic behind you and allow traffic to pass you.

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

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

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

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



**Figure 28**

EX1400131

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

Do not operate attachments while traveling.

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

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

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

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

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

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

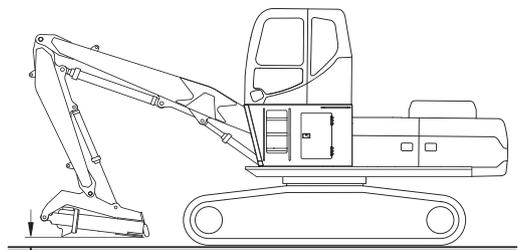
Never exceed maximum permitted load for bridges.

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

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

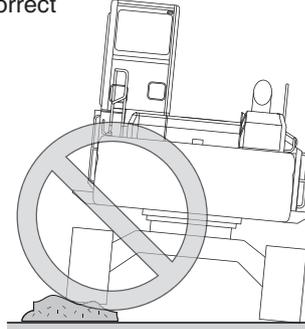
Keep height and length of attachment in mind.

Travel Posture



40 ~ 50 cm (16 ~ 20 in.)

Incorrect



EX1500910

Figure 29

## Lifting and Logging

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

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

To lift loads safely the following must be evaluated by the operator and work site crew.

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

Always watch load. Bring load close to the machine before traveling any distances or swinging load. Logs must be held securely within the grapple. Do not pinch with the grapple tines. It would lead to loss of control and dropped loads.

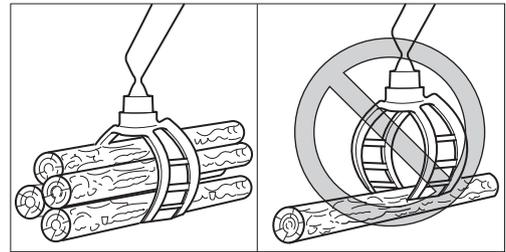
Lifting capacity decreases as load is moved further from the machine.

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

Lifting and handling loads over the front and rear, rather than either side, has better stability of the machine.

Do not suddenly lower, swing, or stop work equipment. Haste can cause loss of stability and control. If tracks leave the ground, immediately lower the load and return the machine slowly to the ground.

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



EX1300849

**Figure 30**

## Operation on Slopes

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

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

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

On hills, banks or slopes, carry bucket or work tool approximately 20 ~ 30 cm (8 ~ 12 in) above ground. In case of an emergency, quickly lower bucket or work tool to ground to help stop machine.

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

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

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

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

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

On slope, locate the drive sprockets downward the slope. Head the heaviest side of the machine uphill, as possible.

DO NOT mount a wire cable.

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

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

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

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

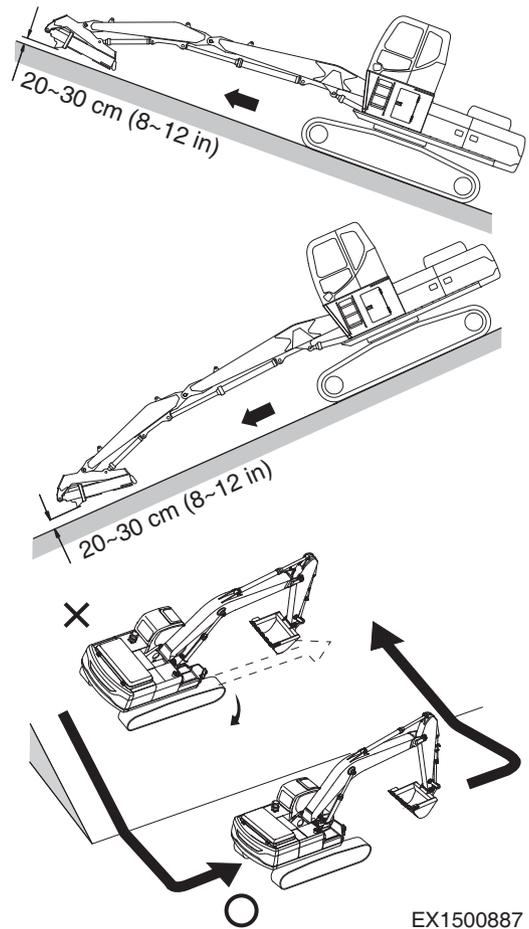


Figure 31

EX1500887

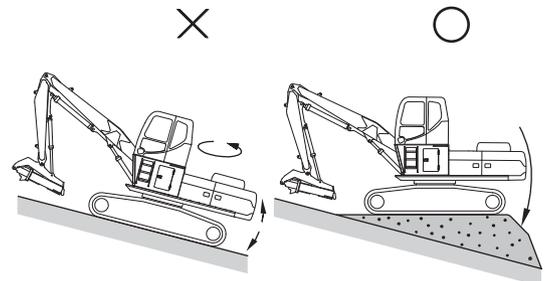


Figure 32

EX1300663

## Towing

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

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

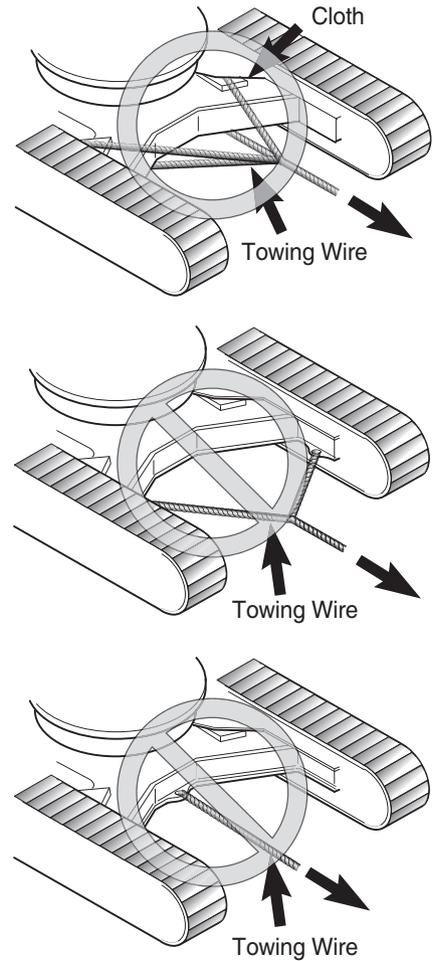


Figure 33

EX1400132

## Attachment

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

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

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

## 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.

Wear appropriate personal protective equipment and follow the established procedure in the Operation Section of the manual.



Figure 34

EX1400133

## Engine Stop

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

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

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

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

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

## Parking Machine

Avoid making sudden stops, or parking machine wherever it happens to be at end of workday. Park machine on firm and level ground away from traffic and away from high walls, drop-offs and any area of potential water accumulation or runoff. If parking on inclines is unavoidable, block crawler tracks to prevent movement. Lower bucket or other working attachment completely to ground, or to an overnight support saddle. To prevent unintended or accidental movement.

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

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

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

The hydraulic system remains pressurized, provided accumulator, is charged even when engine is not running. Accumulator pressure should decrease in a short time (approximately one minute). While hydraulic system maintains a charge, hydraulic work tools and machine controls remain functional.

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

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

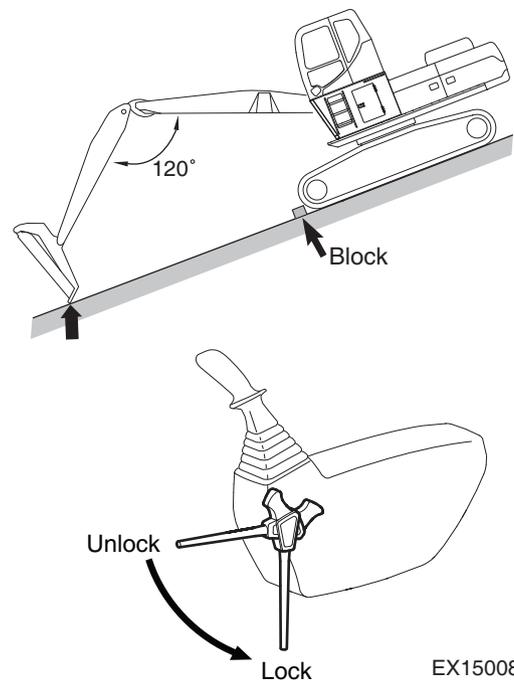


Figure 35

EX1500888

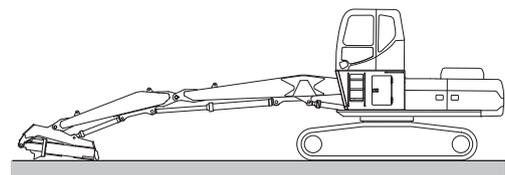


Figure 36

EX1300554

## Preservation/Storing Machine

Perform the following if storing forestry machine for more than one month.

| Conditions       | Maintenance Required   |
|------------------|--|
| Cleaning         | Pressure wash undercarriage and track assemblies. Inspect for damage or loose or missing parts.  |
| Lubrication      | Perform all daily lubrication procedures.  |
|                  | Apply a coating of light oil to exposed plated metal surfaces, such as hydraulic cylinder rods, etc.   |
|                  | Apply a coating of light oil to all control linkages and control cylinders (control valve spools, etc.)  |
| Battery          | Turn "OFF" the battery disconnect switch.  |
| Cooling System   | Inspect coolant recovery tank to make sure that antifreeze level in system is at correct level.  |
|                  | Every 90 days, use a hydrometer to measure protection level of coolant. Refer to "Antifreeze Concentration Tables" on page 4-98, to determine amount of protection cooling system requires. Add coolant as required. |
| Hydraulic System | Once a month, start engine and follow procedures in "Hydraulic System Warm-up" on page 3-23, listed in this manual.  |

1. Complete the preceding steps.
2. Wash machine and touch up paint finish to avoid rusting.
3. Treat exposed parts with antirust agent, lubricate machine thoroughly and apply grease to unpainted surfaces like lifting and tilting cylinders etc.
4. Fill fuel tank and hydraulic oil tank to "FULL" marks.
5. Cover exhaust pipe (parking outside).
6. Make sure that coolant is at proper concentration for expected lowest temperatures.
7. Park machine on level, firm ground where there is no risk of freezing, landslide or flooding. Avoid parking machine on a slope.

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

- Removing starter key when the machine is left unattended.
- Locking doors and covers after working hours.
- 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.

See "Long Term Storage" on page 3-59, for more information.

### **Check After Long-term Parking**

- All oil and fluid levels.
- Tension of all belts.
- Air pressure.
- Air cleaner.
- Batteries and electrical connections.
- Lubricate all greasing points.
- Wipe off grease from piston rods.
- Inspect for signs of nests (i.e. birds, rodents, etc.)
- Inspect safety labels (decals). Replace if damaged, worn, or missing.

# 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.

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## WARNING

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### 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 HYUNDAI equipment without instructions.
- Always lower bucket or work tool and blade to ground before doing any maintenance.
- Use correct procedure to lift and support forestry 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 HYUNDAI replacement parts.
- Only authorized personnel should service and repair the machine. Do not allow unauthorized personnel into work area.
- Lower work equipment and stop engine before performing maintenance.
- Park machine on firm and level ground.
- Turn starter switch to "ON" position and keep safety lever in "UNLOCK" position. Cycle work levers (joysticks) back and forth, left and right at full stroke 2 to 3 times to eliminate remaining internal pressure in hydraulic circuit. Then move safety lever to "LOCK" position.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine starter switch key and press horn switch. If horn does not sound, the main power is shut off.)
- Put blocks under track to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
  - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
  - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.
- Do not touch any control levers or control pedals. If any control levers or control pedals must be operated, always give a signal to other workers and instruct them to move away.

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

## Warning Tag

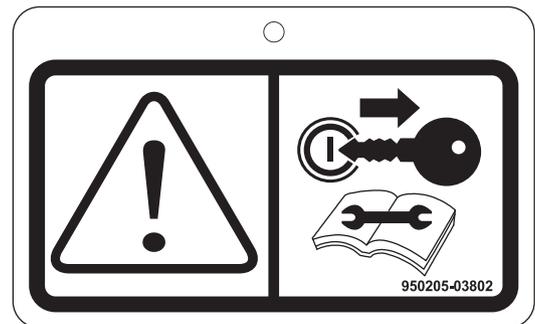
Alert others that service or maintenance is being performed by attaching a "DO NOT OPERATE" warning tag to the operator's cabin controls – and other machine areas, if required. Use of a chain or cable to keep the safety lever in the fully lowered "LOCK" position, complies with OSHA's lockout requirements.

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



EX1301177

**Figure 37**

## Cleaning

Clean machine before performing inspection and maintenance.

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

When washing machine, do the following:

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

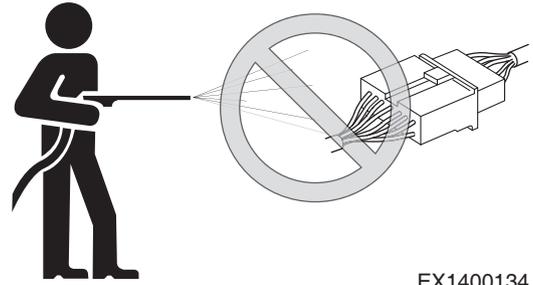


Figure 38

EX1400134

## Proper Tools and Clothing

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

## Disassembling Precautions

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

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

## Use of Lighting

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

## Fire and Explosion Prevention

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

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

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

Tighten all fuel and oil caps.

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

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

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

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



HDO1015I

**Figure 39**



FG018458

**Figure 40**

## Burn Prevention

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

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

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

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

Allow cooling system components to cool before draining cooling system.

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

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

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

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

Do not smoke while you are checking battery electrolyte level.

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

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

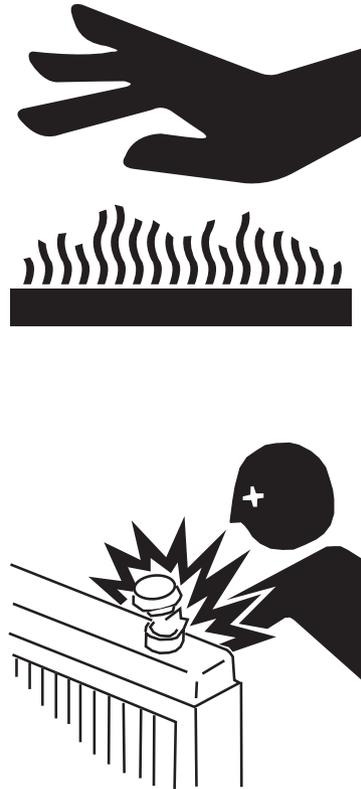


Figure 41

haae2090

## 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

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.
- 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 by electrical welding, observe the following procedures:

1. Turn battery disconnect switch to "OFF" position.
2. Proceed with welding.
3. Clean battery compartment.
4. Turn battery disconnect switch to "ON" position.
5. Close battery compartment door.

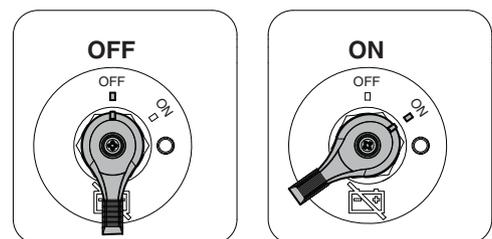


Figure 42

EX1500481

## Warning for Counterweight and Front Attachment Removal

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### WARNING

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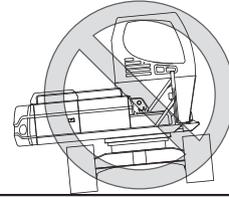
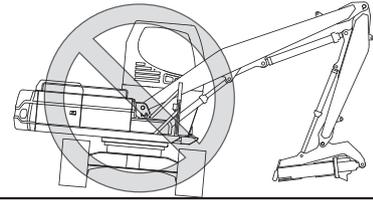
#### AVOID DEATH OR SERIOUS INJURY

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

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

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

---



EX1500889

Figure 43

## 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.



Figure 44

ARO1380L

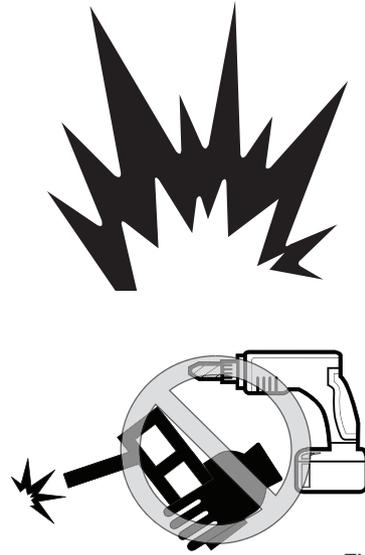
## Accumulator

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 4-102.

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 HYUNDAI 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 45

## 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 (IF EQUIPPED TYPE 1)" on page 4-103, for proper procedure in this manual or Shop Manual.

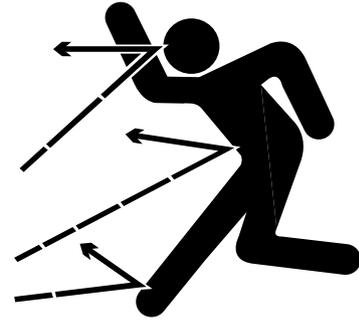


Figure 46

HAOA110L

## 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.



Figure 47

HDO1042L

## 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 4-102.

Always do the following:

- Wear eye protection and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but has enough force to pierce skin and can result in death or serious injury. Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers. Wear safety goggles.
- Do not bend high-pressure lines. Do not strike high-pressure lines. Do not install lines, tubes or hoses that are bent or damaged.
- Make sure that all clamps, guards and heat shields are correctly installed to prevent vibration, rubbing against other parts, and excessive heat during operation.
- Replace hose or components if any of the following problems are found:
  - Damage or leakage from hose end fitting.
  - Wear, damage, cutting of hose covering, or wire braiding is exposed on any hose.
  - Cover portion is swollen in any section.
  - The hose is twisted or crushed.
  - Foreign material is embedded in hose covering.
  - Hose end is deformed.
  - Connection fittings are damaged or leaking.

**NOTE:** Refer to "Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN))" on page 4-87, for additional European regulations.

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

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

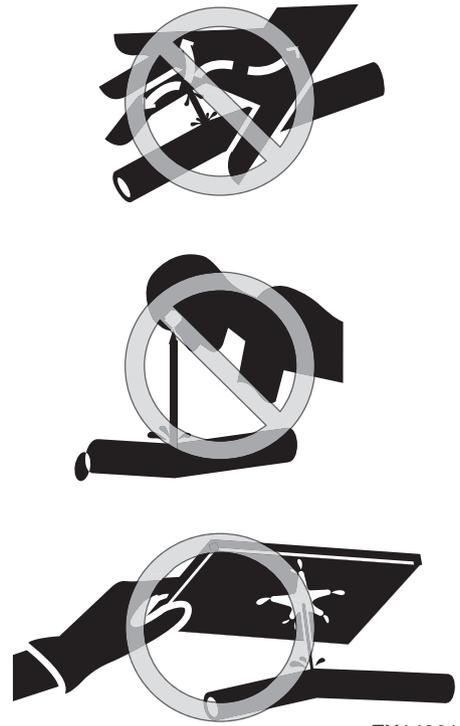


Figure 48

EX1400129

# 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. Do not allow electrolyte to contact skin or eyes. Always wear safety goggles and protective clothing when servicing batteries. Wash hands after touching batteries and connectors. Use of acid-resistant gloves is recommended. Always observe the following precautions.

- Do not smoke or bring any flame near battery.
- When working with batteries, Always wear safety goggles, protective clothing, and acid-resistant gloves.
- If you spill battery electrolyte on yourself or your clothes, immediately flush area with water.
- If battery electrolyte gets into your eyes, flush them immediately with large quantities of water and get immediate medical attention from a physician familiar with this injury.
- If you accidentally drink battery electrolyte, call a poison prevention center immediately and get immediate medical attention from a physician familiar with this injury.
- 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.
- Do not use or charge battery if battery electrolyte level is below LOW LEVEL line. This can cause an explosion. Periodically check battery electrolyte level and add distilled water to bring electrolyte level to FULL LEVEL line.
- Before maintaining or working with batteries, turn starter switch to "O" (OFF) position.



Figure 49

EX1400136

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

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

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

# ENVIRONMENT AND CIRCUMSTANCES

## Work Site Areas Requiring Extra Caution

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

## Digging Under an Overhang

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

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

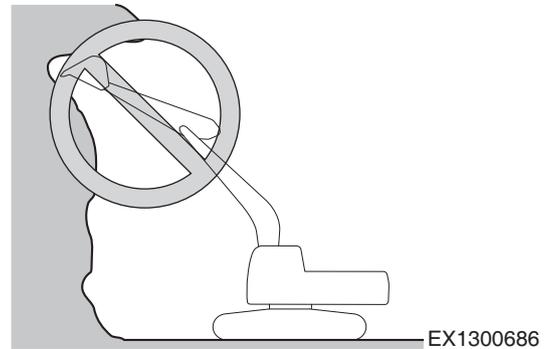


Figure 50

## Deep Digging

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

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

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

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

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

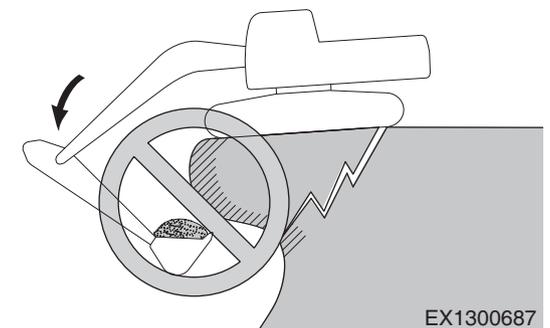


Figure 51

## **Drop-off or Edge**

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

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

## **Poor Visibility**

For good visibility, always do the following:

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

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

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

## **Loose or Soft Ground**

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

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

The excavated material must not be dumped too close to edge. How far away from edge of trench excavated material must be dumped depends on soil type and moisture content. If loose clay is being excavated, place it at least 5 m (16 ft) away from edge.

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

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

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

When working on loose or unstable ground, it is important not to dig too deep and to carefully reposition the machine. Do not panic and do not raise bucket or work tool, if ground should begin to collapse. Lower work equipment to improve stability of machine.

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

## High-voltage Cables

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

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

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

| Voltage  | Minimum Distance |
|----------|------------------|
| 6.6 kV   | 3 m (9' 10")     |
| 33.0 kV  | 4 m (13' 1")     |
| 66.0 kV  | 5 m (16' 5")     |
| 154.0 kV | 8 m (26' 3")     |
| 275.0 kV | 10 m (32' 10")   |

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

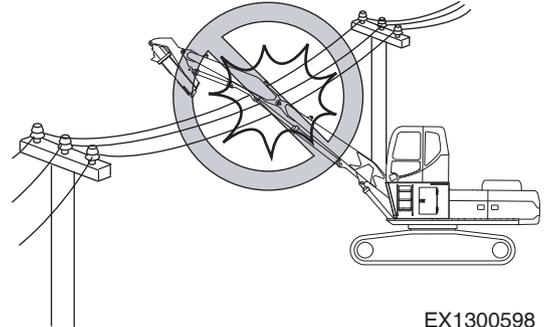


Figure 52

EX1300598

## **Roll-over Protective Structure (ROPS), Falling Object protective Structure (FOPS) (Oregon Cabin Only)**

The operator's cabin is a ROPS/FOPS certified structure for protecting the seat-belted operator. It absorbs the impact energy of a rollover impact. Do not allow machine weight (mass) to exceed certified value on certification plate. If weight is exceeded, the ROPS/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 operator may suffer 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 HYUNDAI. Changes to the cabin can cause loss of operator protection from rollover and falling objects, and operator may suffer 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 properly fulfill its function. In these cases, always contact your HYUNDAI distributor for advice. Never repair a ROPS/FOPS cabin.
- Always wear your seat belt when operating machine.

## ROPS/FOPS Certification (Oregon Cabin Only)

This HYUNDAI forestry machine has an operator's cabin that meets ROPS/FOPS requirements. The seat belt must be worn for rollover protection.

The ROPS/FOPS certification plate (Figure 53) 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 HYUNDAI dealer for parts.

ROPS Roll-over Protective Structure complies with ISO 8082:2003, WCB G602.

FOPS Falling Object Protective Structure complies with ISO 8083:2006, WCB G608.

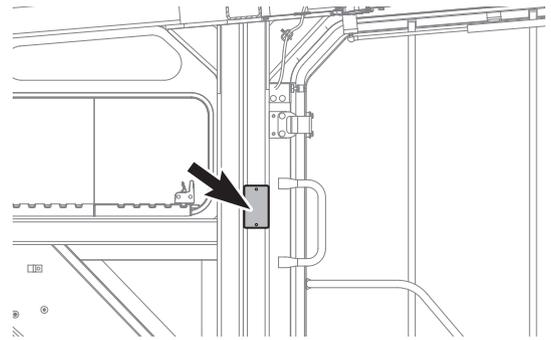


Figure 53

DS1601338



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

## Working in Water



## NOTICE

Do not exceed maximum permissible water depth. The water level must not reach higher than centerline of upper track roller(s) (1, Figure 54).

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

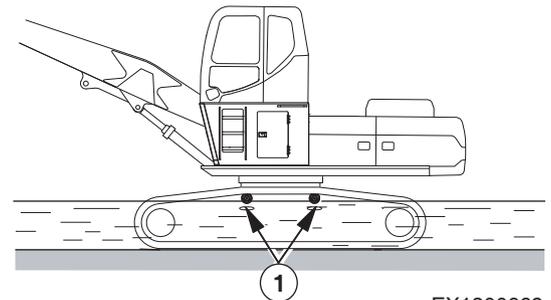


Figure 54

EX1300669

## Working in Contaminated Environment

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

# Operation in Extreme Conditions

## Operation In Extreme Cold

In extremely cold weather, avoid sudden travel movements and stay away from even slight slopes. The machine could slide down the slope.

Snow accumulation could hide potential hazards and slippery surfaces.

Warming up engine for a short period may be necessary to avoid operating with sluggish or reduced working capacity. The jolting shocks and impact loads caused by bumping or bottoming boom or attachment could cause severe stress in very cold temperatures. Reducing work cycle rate and workload may be necessary.

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

1. Preheat the engine before startup. Wait 3 - 4 seconds after preheating until voltage of the battery returns, and then actuate the key switch.
2. 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, effectiveness of the battery is reduced accordingly. Insulation of the battery prevents this reduction, and supports improvement of starting power of the starter.



## WARNING

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**BATTERY EXPLOSION CAN CAUSE DEATH OR  
SERIOUS INJURY**

**Never attempt to directly heat the battery with open fire.**

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3. Keep engine in good mechanical condition for easy starting and good performance during adverse weather.
4. Use engine oil with proper specifications for expected temperatures. Refer to "Table of Recommended Lubricants" on page 4-21, in this manual or Shop Manual for details.
5. Always keep the fuel tank fully filled after completion of operation. 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 due to formation of wax in fuel, make sure that wax formation point of fuel is lower than atmospheric temperature.

6. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-17, in this manual or lubrication chart on machine.



## **WARNING**

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### **FUEL TANK EXPLOSION CAN CAUSE DEATH OR SERIOUS INJURY**

**Never attempt to heat the fuel tank with an open flame.**

---

7. 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.
8. 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.
9. Clean off all mud, snow and ice to prevent freezing. Cover machine with a tarp if possible, keep ends of tarp from freezing to ground.

### **Operation in Extreme Heat**

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

1. Make frequent inspections and services of fan and radiator. Check coolant level in radiator. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block cooling passages.
  - Formation of scale and rust in cooling system occurs more rapidly in extremely high temperatures. Change antifreeze each year to keep corrosion inhibitor at full strength.
  - If necessary, flush cooling system periodically to keep passages clear. Avoid use of water with a high alkali content which increases scale and rust formation.

2. Check level of battery electrolyte daily. Keep electrolyte above plates to prevent damage to batteries. Use a slightly weaker electrolyte solution in hot climates. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries and store in a cool place.



## NOTICE

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

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3. Service fuel system as directed in "Check Fuel Level" on page 4-31 and "Check for Leaks in Fuel System" on page 4-31, 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 4-17, 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

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**AVOID DEATH OR SERIOUS INJURY**

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

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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 4-17. 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 4-17s, in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

## Operation at High Altitudes

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

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

## Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

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

## Exhaust Ventilation

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

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

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

### Ventilation for Enclosed Area

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

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

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



Figure 55

ARO1770L

## Asbestos Information

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### 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

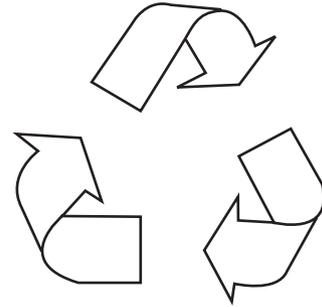
Physical contact with used motor oil or gear oil could create a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

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 56

## 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)  | 69 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) | 103 dB(A) |

# Operating Controls

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

1. "Component Locations" on page 2-2
2. "Operator's Area" on page 2-7
3. "Operational Controls and Panels" on page 2-10
4. "Display Monitor" on page 2-27
5. "User Menu" on page 2-54
6. "Heater and Air Conditioner Control Panel" on page 2-96
7. "Stereo" on page 2-101
8. "Miscellaneous Electrical Devices" on page 2-102
9. "Seat Adjustment" on page 2-104
10. "Engine Emergency Stop Switch" on page 2-108
11. "Emergency Exit Glass Breaking Tool (STD Cabin Only)" on page 2-108
12. "Miscellaneous Convenience Devices" on page 2-109
13. "Miscellaneous Access Covers and Doors" on page 2-118

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

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**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.**

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# COMPONENT LOCATIONS

## Log Loader

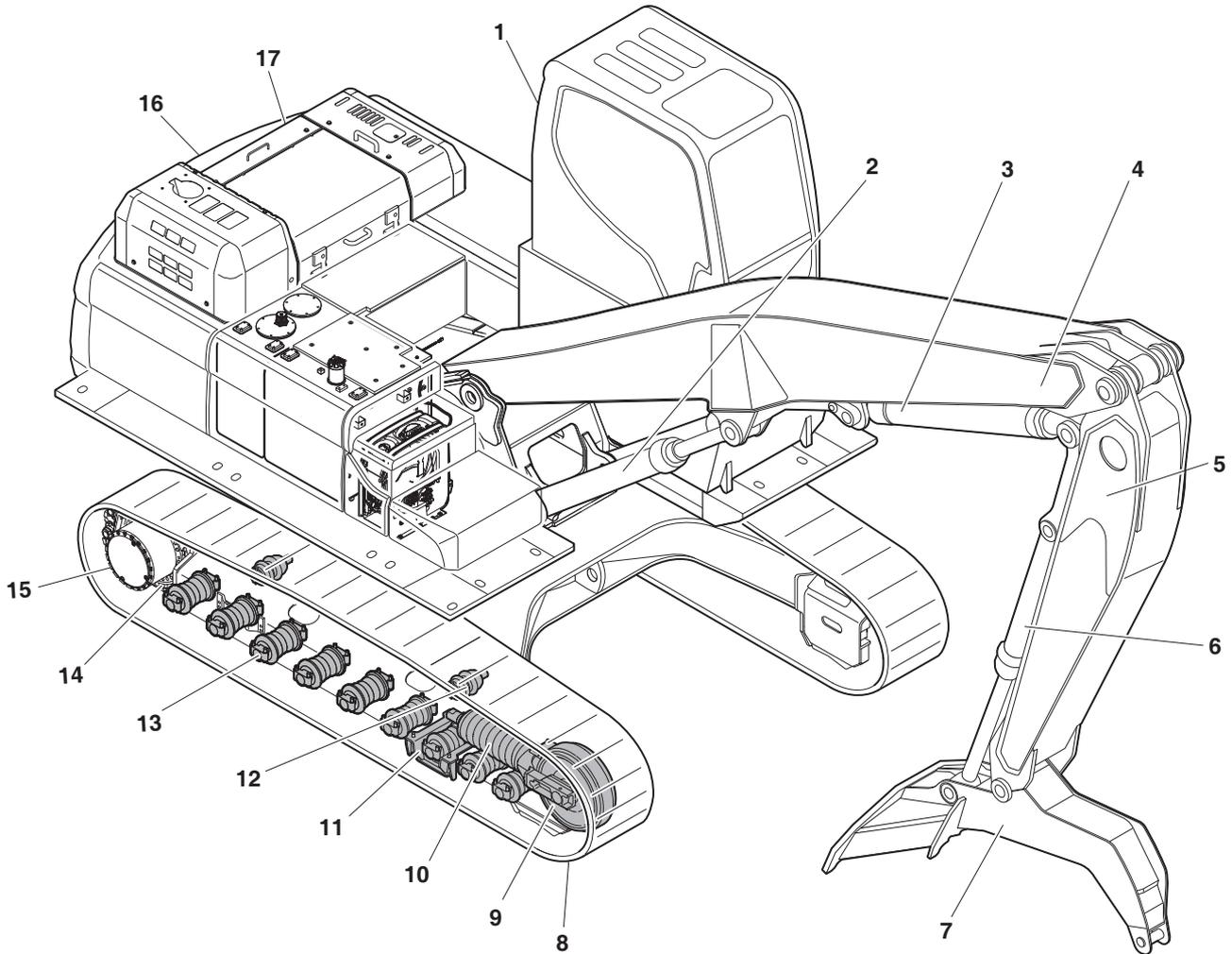


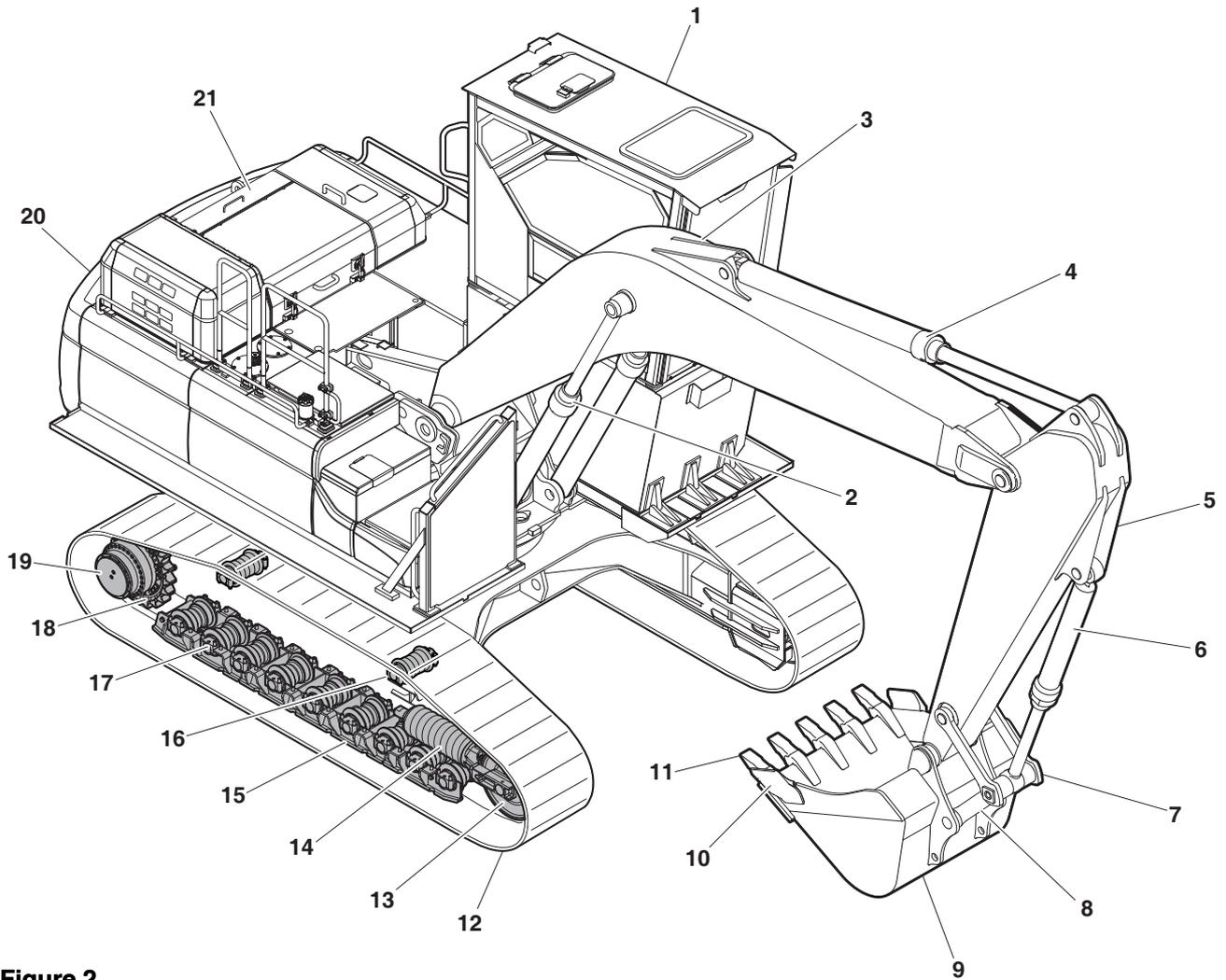
Figure 1

EX1500964

| Reference Number | Description         |
|------------------|---------------------|
| 1                | Cabin               |
| 2                | Hoist Cylinder      |
| 3                | Arm Cylinder        |
| 4                | Hoist               |
| 5                | Arm                 |
| 6                | Heel Cylinder       |
| 7                | Heel Rack           |
| 8                | Track Link and Shoe |
| 9                | Idler               |

| Reference Number | Description    |
|------------------|----------------|
| 10               | Track Adjuster |
| 11               | Track Guard    |
| 12               | Upper Roller   |
| 13               | Lower Roller   |
| 14               | Sprocket       |
| 15               | Travel Motor   |
| 16               | Counterweight  |
| 17               | Hood           |

# Road Builder

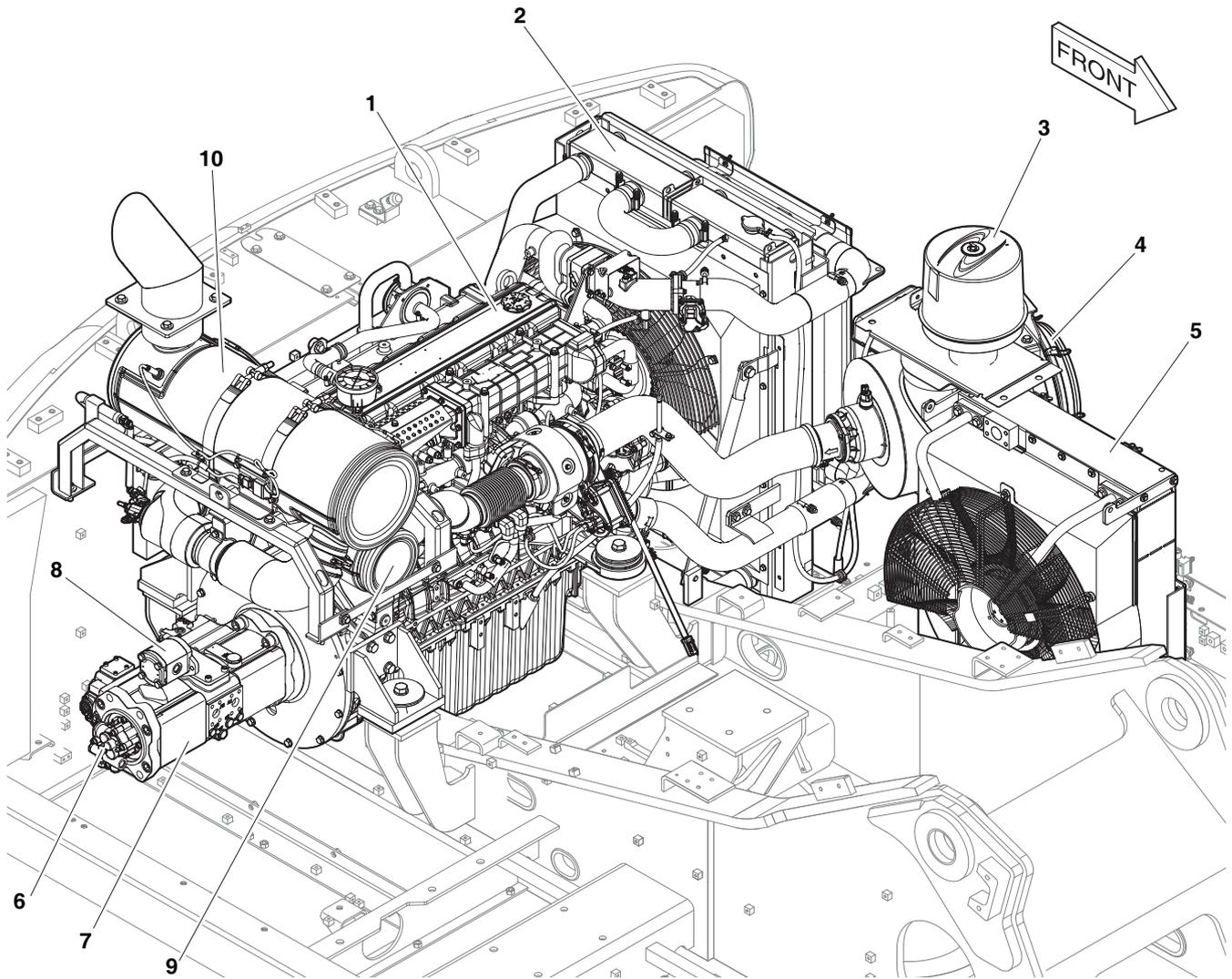


**Figure 2**

DS1902738

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

| Reference Number | Description         |
|------------------|---------------------|
| 12               | Track Link and Shoe |
| 13               | Idler               |
| 14               | Track Adjuster      |
| 15               | Track Guard         |
| 16               | Upper Roller        |
| 17               | Lower Roller        |
| 18               | Sprocket            |
| 19               | Travel Motor        |
| 20               | Counterweight       |
| 21               | Hood                |



DS1603107

**Figure 3**

| Reference Number | Description |
|------------------|-------------|
| 1                | Engine      |
| 2                | Radiator    |
| 3                | Precleaner  |
| 4                | Air Cleaner |
| 5                | Oil Cooler  |

| Reference Number | Description                           |
|------------------|---------------------------------------|
| 6                | Pilot Pump                            |
| 7                | Main Pump                             |
| 8                | Gear Pump (Rotating) -<br>If Equipped |
| 9                | DOC                                   |
| 10               | SCR                                   |

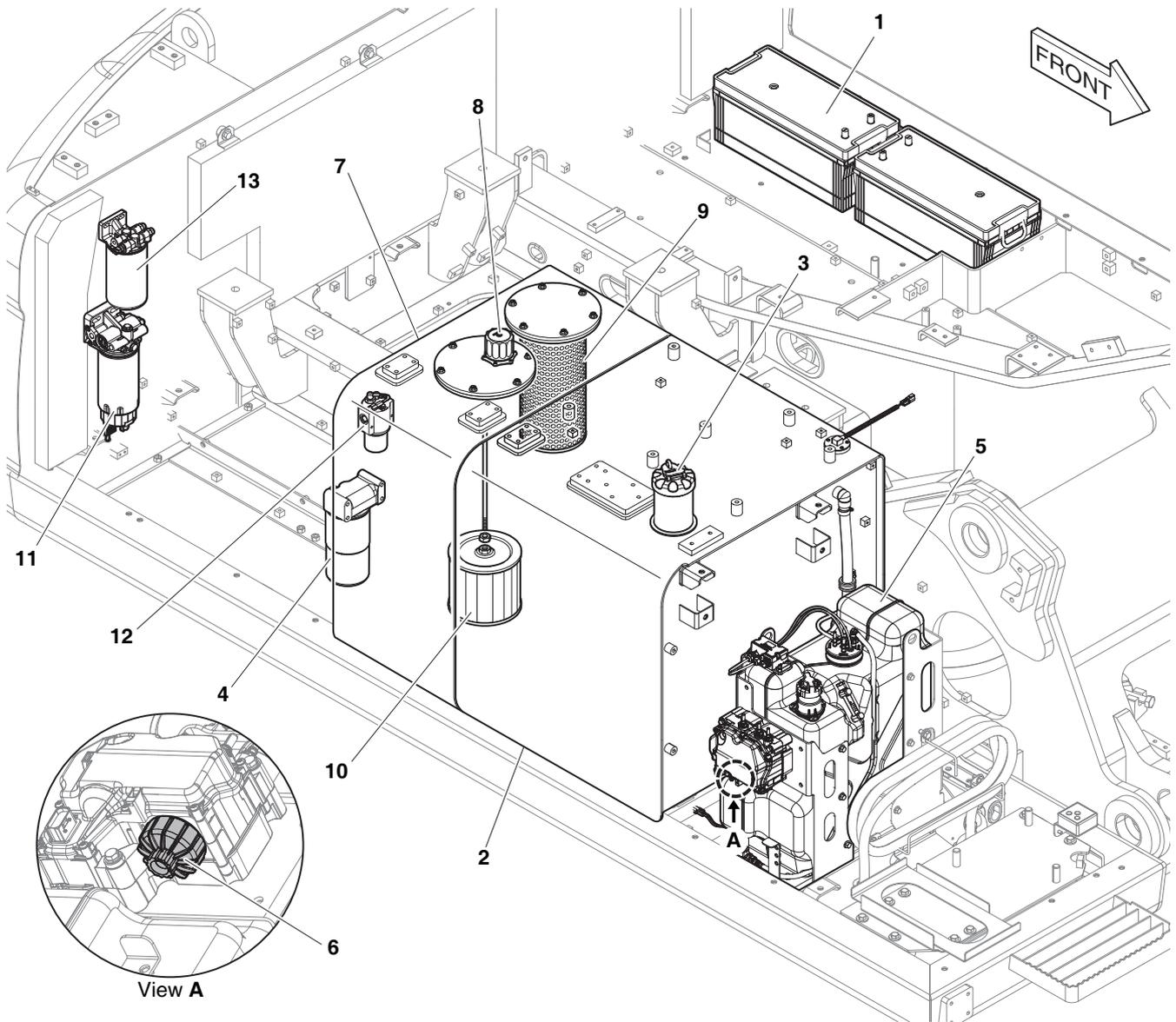
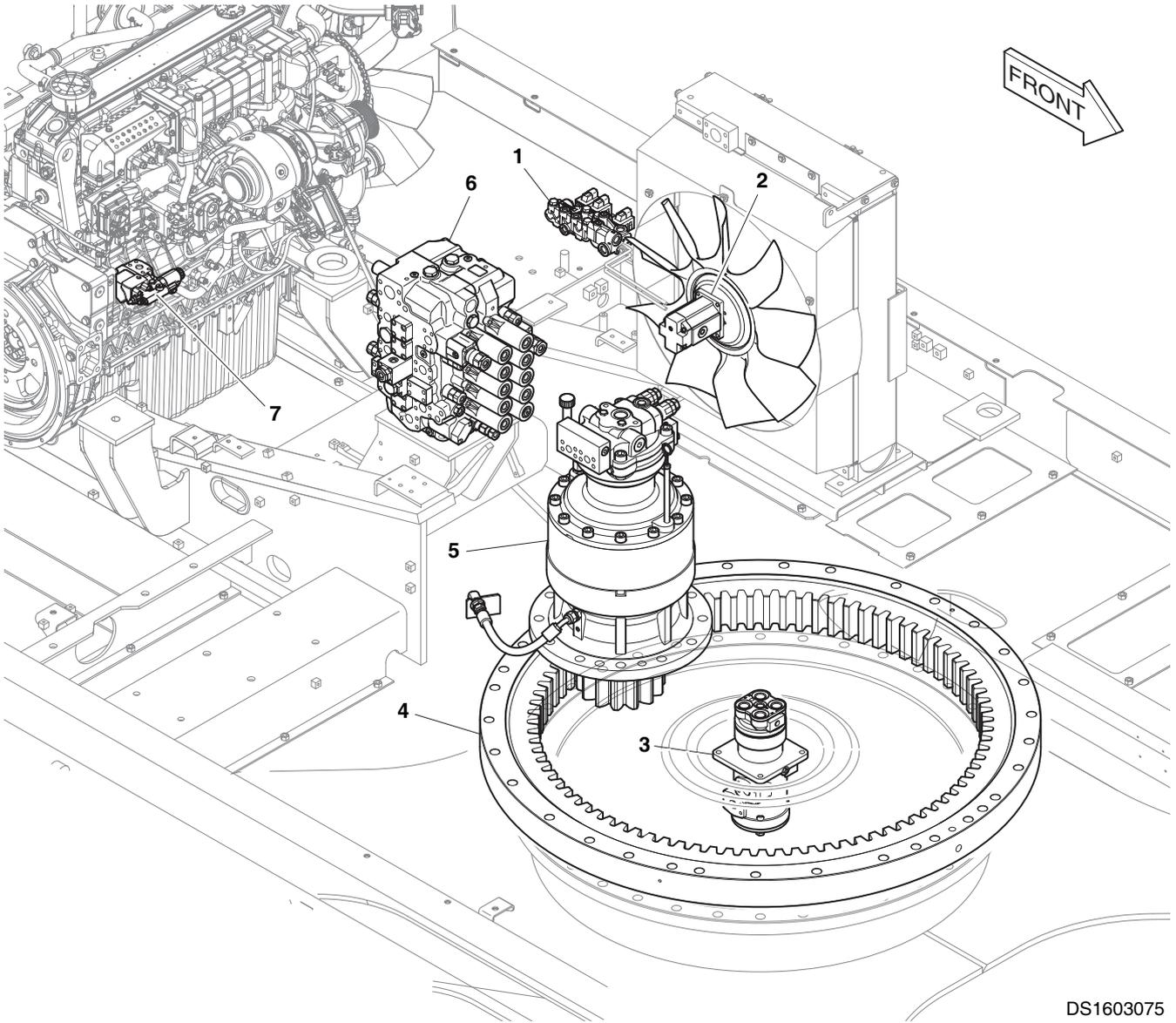


Figure 4

DS1603074

| Reference Number | Description         |
|------------------|---------------------|
| 1                | Battery             |
| 2                | Fuel Tank           |
| 3                | Fuel Cap            |
| 4                | Engine Oil Filter   |
| 5                | Urea Tank           |
| 6                | DEF (AdBlue) Filter |
| 7                | Hydraulic Oil Tank  |

| Reference Number | Description                         |
|------------------|-------------------------------------|
| 8                | Air Breather                        |
| 9                | Return Filter                       |
| 10               | Suction Filter                      |
| 11               | Pre Fuel Filter and Water Separator |
| 12               | Pilot Filter                        |
| 13               | Main Fuel Filter                    |



DS1603075

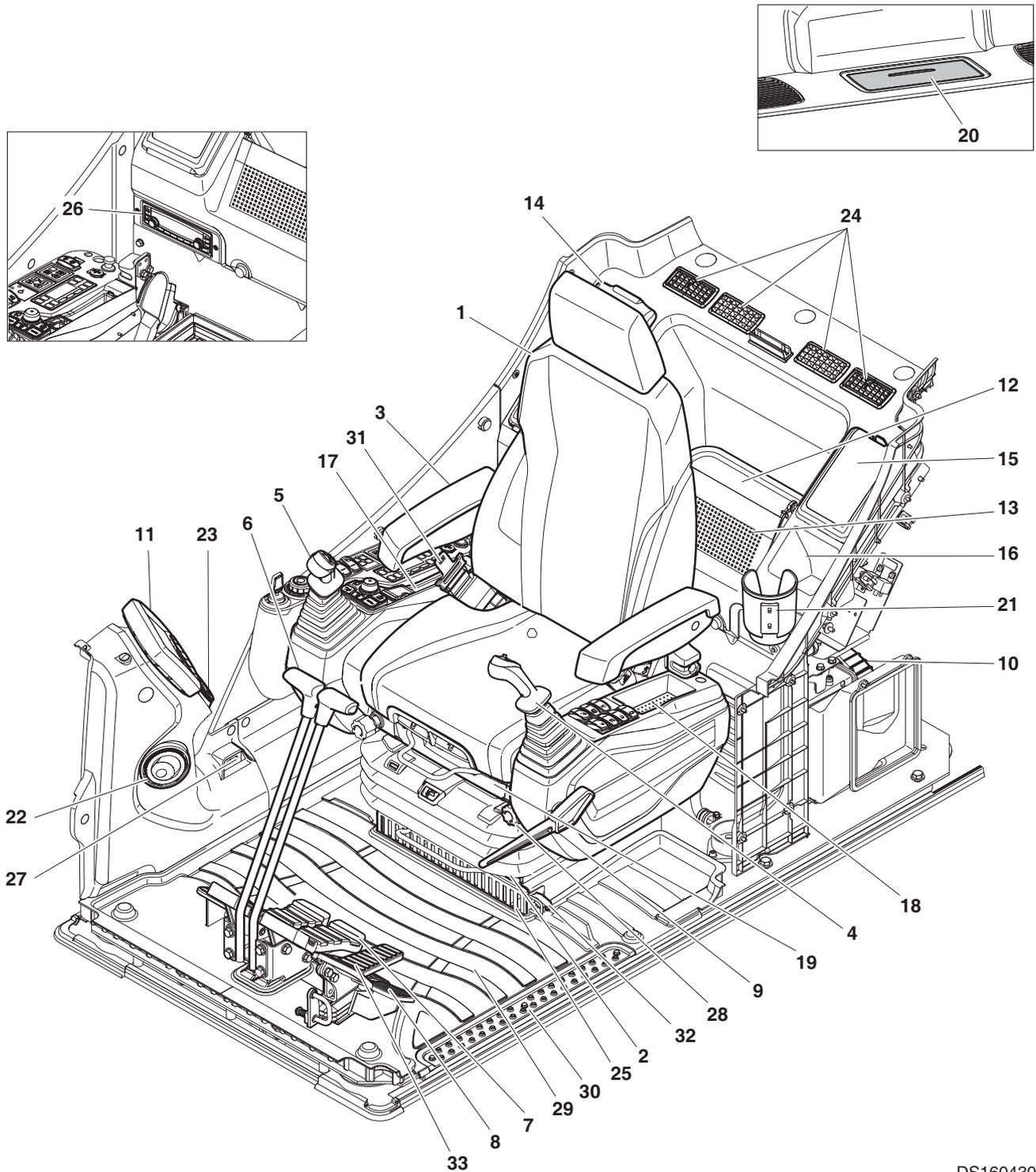
Figure 5

| Reference Number | Description    |
|------------------|----------------|
| 1                | Solenoid Valve |
| 2                | Fan Motor      |
| 3                | Center Joint   |
| 4                | Swing Bearing  |

| Reference Number | Description   |
|------------------|---------------|
| 5                | Swing Device  |
| 6                | Control Valve |
| 7                | Fan Pump      |

# OPERATOR'S AREA

## STD Cabin



DS1604309

Figure 6

# Oregon Cabin

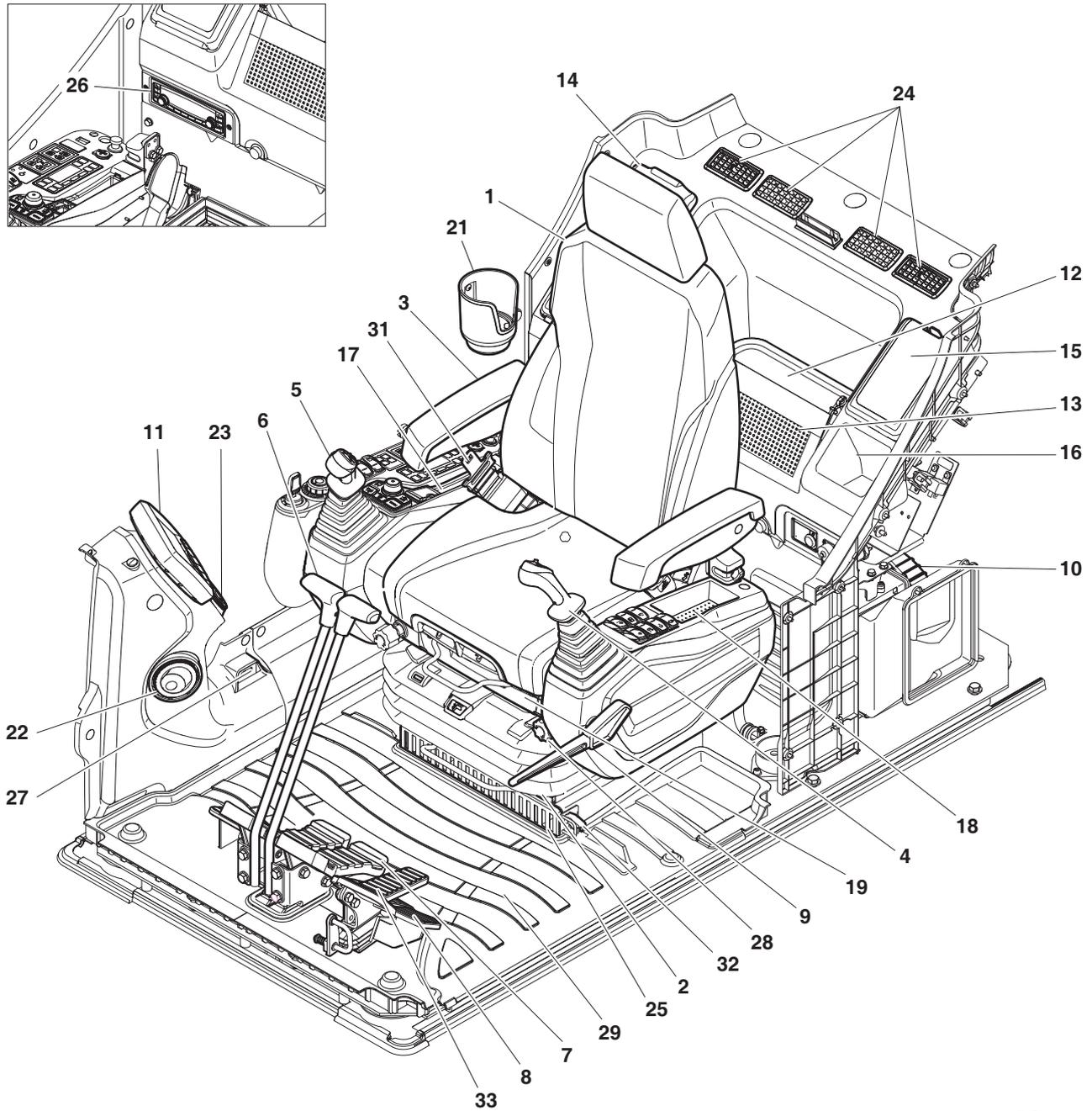


Figure 7

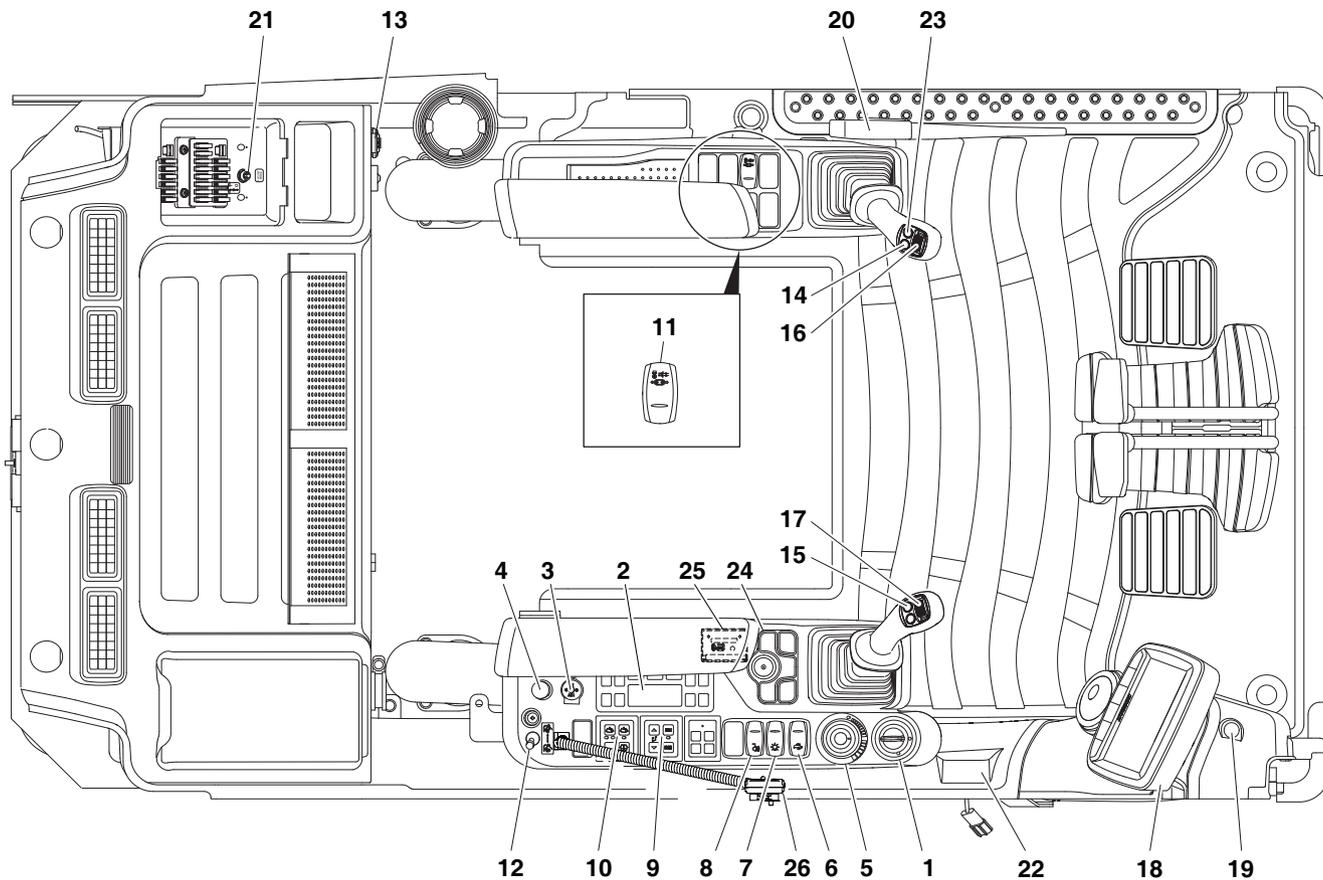
DS1604310

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

| Reference Number | Description                         |
|------------------|-------------------------------------|
| 18               | Storage Compartment (3)             |
| 19               | File Case                           |
| 20               | Sunglass Case                       |
| 21               | Cup Holder (PET)                    |
| 22               | Defroster Vent                      |
| 23               | Face Vent                           |
| 24               | Rear Vent                           |
| 25               | Foot Vent                           |
| 26               | Stereo                              |
| 27               | Hour Meter                          |
| 28               | Joystick Height Adjustment Knob     |
| 29               | Mat                                 |
| 30               | Step                                |
| 31               | Seat Belt                           |
| 32               | Engine Emergency Stop Switch        |
| 33               | Straight Travel Pedal (If Equipped) |

# OPERATIONAL CONTROLS AND PANELS

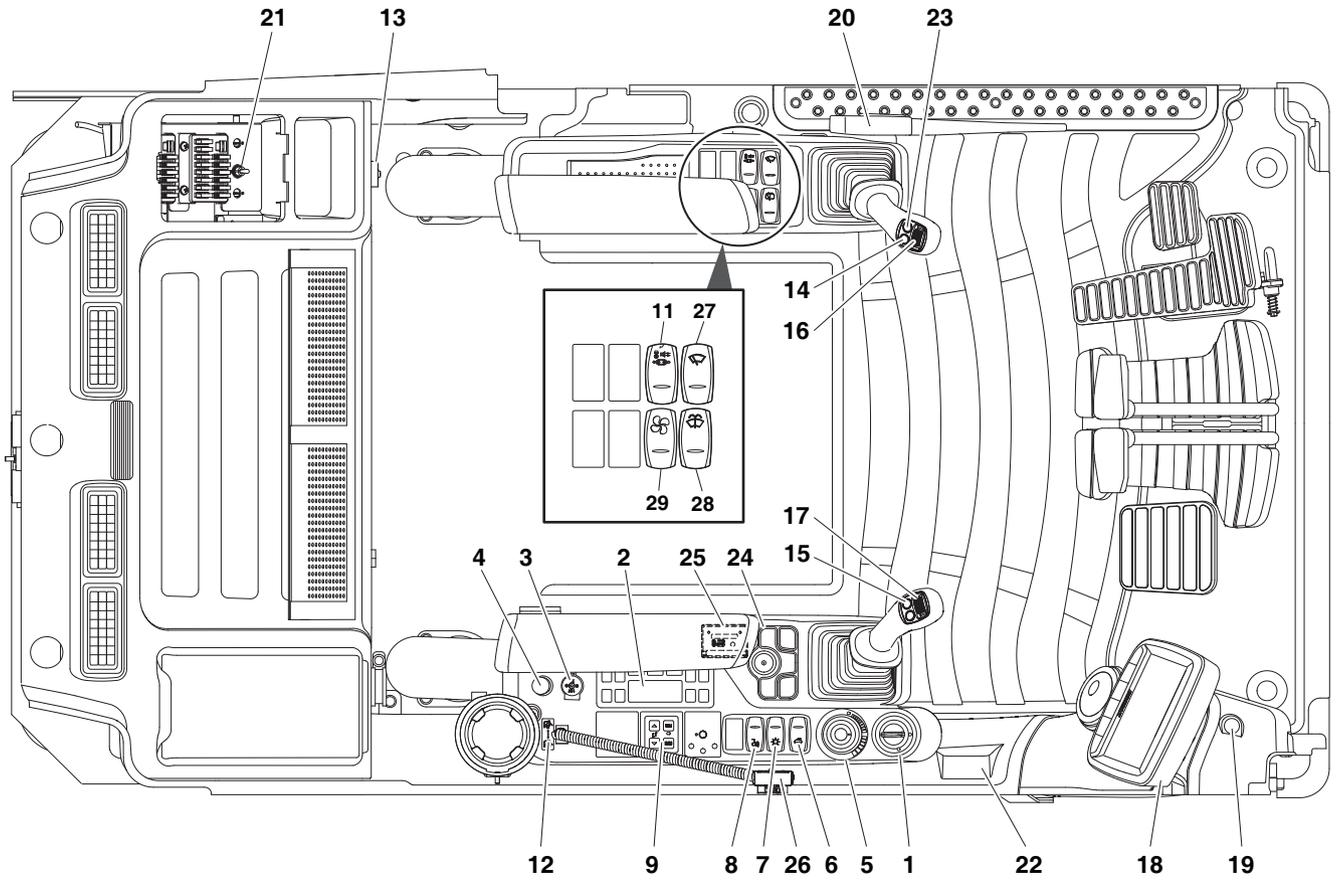
## STD Cabin



DS1902972

Figure 8

# Oregon Cabin



DS1902973

Figure 9

| Reference Number | Description                              |
|------------------|--|
| 1                | Starter Switch                           |
| 2                | Heater and Air Conditioner Control Panel |
| 3                | Power Socket for 12 V                    |
| 4                | Cigarette Lighter                        |
| 5                | Engine Speed Control Dial                |
| 6                | Travel Speed Selector Switch             |
| 7                | Light Switch                             |
| 8                | Cabin Work Light Switch                  |
| 9                | Audio Control Panel                      |
| 10               | Wiper Control Panel                      |
| 11               | Travel/Swing Alarm Switch                |
| 12               | Quick Coupler Switch (If Equipped)       |
| 13               | Power Socket for 12V (If Equipped)       |
| 14               | Horn Button                              |
| 15               | Booster Button                           |

| Reference Number | Description                       |
|------------------|-----------------------------------|
| 16               | Rotating Switch                   |
| 17               | Shear Switch                      |
| 18               | Display Monitor                   |
| 19               | Photo Sensor                      |
| 20               | Safety Lever                      |
| 21               | Auxiliary Mode Switch             |
| 22               | Hour Meter                        |
| 23               | One Touch Deceleration Button     |
| 24               | Selector Switch Control Panel     |
| 25               | Jack Assembly                     |
| 26               | Micro Phone (If Equipped)         |
| 27               | Wiper Switch (Oregon Cabin Only)  |
| 28               | Washer Switch (Oregon Cabin Only) |
| 29               | Fan Switch (Oregon Cabin Only)    |

# 1. Starter Switch

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

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

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

- Video, MP3
- Stereo
- Power Socket for 12 V

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

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

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

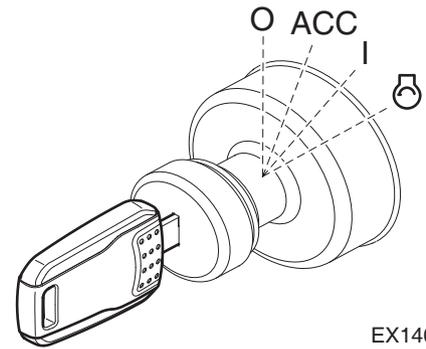


Figure 10

EX1402126



## WARNING

---

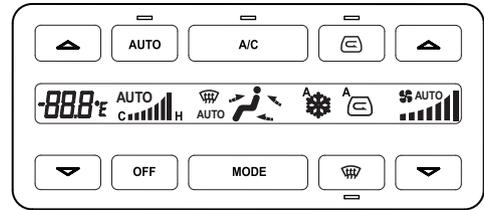
**AVOID DEATH OR SERIOUS INJURY**

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

---

## 2. Heater and Air Conditioner Control Panel

This panel is used to control air conditioner and heater in operator's cabin. Refer to "Heater and Air Conditioner Control Panel" on page 2-96, for more information.



DS2100103

Figure 11

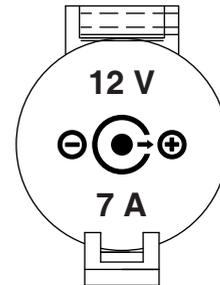
## 3. Power Socket for 12 Volt

This is a power socket for only 12V DC devices.

This socket can be used for charging a cellular phone or powering a small 12V DC electrical device.

Open the cap when using it.

**NOTE:** *Avoid damage to electrical system.  
This socket is designed for small electrical capacity devices only. Do not use this socket for large electrical capacity devices.*



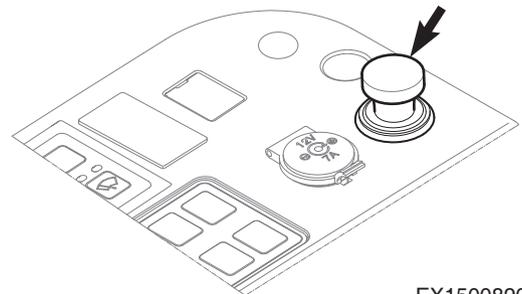
FG017015

Figure 12

## 4. Cigarette Lighter

Push the lighter all the way into the socket and release. After pushing it in, it will be ejected when it is heated. If it does not eject after a short time, pull it out and have it serviced.

**NOTE:** *This cigarette lighter is for 24V only. Never connect a 12V electrical device to the lighter.*



EX1500890

Figure 13

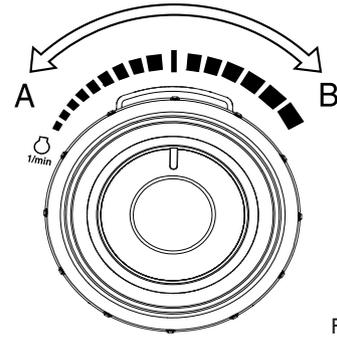
## 5. Engine Speed Control Dial

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

A Low Idle (Lowest engine speed).

B High Idle (Highest engine speed).

**NOTE:** *The auto idle system will automatically reduce engine speed to "LOW IDLE" approximately four seconds after all the control levers are in the "NEUTRAL" position. This system is designed to reduce fuel consumption and noise. See "4. Auto Idle Selector/Buzzer Stop Button" on page 2-24.*



FG018094

Figure 14

## 6. Travel Speed Selector Switch



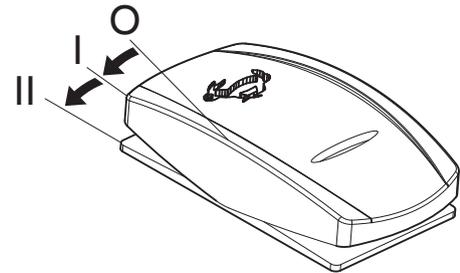
### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

This switch activates the automatic speed range for travel.

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



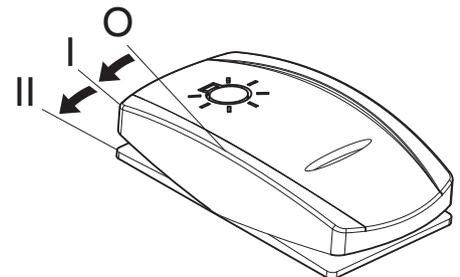
FG016016

Figure 15

## 7. Light Switch

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

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



FG016017

Figure 16



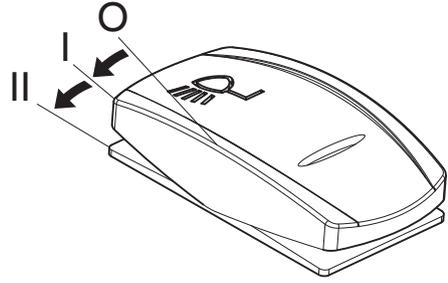
### NOTICE

**Do not leave display monitor or work lights "ON" when the engine is not running. Leaving lights "ON" with the engine stopped will discharge batteries.**

## 8. Cabin Work Light Switch

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

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

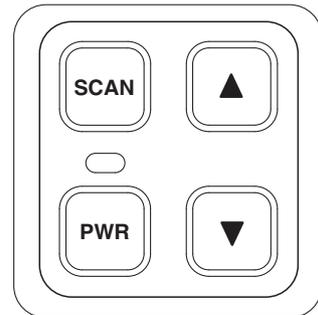


FG016019

Figure 17

## 9. Audio Control Panel

The audio system can be remotely controlled using this panel.



FG000018

Figure 18

### Power Button

Each time this power button is pressed, the audio system is turned either "ON" or "OFF".

If the audio system turns "ON", an indicator light above the button turns "ON".

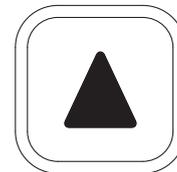


FG000019

Figure 19

### Increase Volume

Press the up button, to "INCREASE" volume.

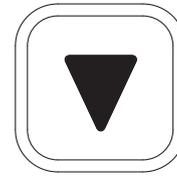


FG000020

Figure 20

### Decrease Volume

Press the down button, to "DECREASE" volume.



FG000021

Figure 21

### Scan Button

Manual Scan: When pressing scan button once, for less than half-a-second, the frequency will be moved up in sequence to the next available signal.

Auto Scan: When pressing scan button for more than a half-a-second, the frequencies are automatically scanned to the next higher one and will continue until button is again pressed to stop the scan.



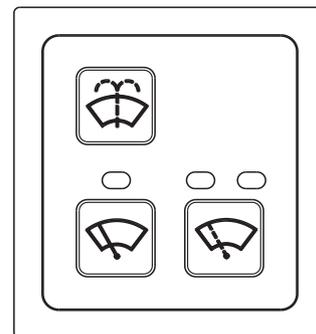
FG000022

Figure 22

## 10. Wiper Control Panel

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

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



FG000308

Figure 23

### Constant Speed Button

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

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



FG000241

Figure 24

## Intermittent Speed Button

Pressing button once (first time):

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

Pressing button again (second time):

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

Pressing button again (third time):

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

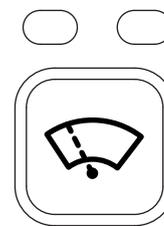


Figure 25

FG000242

## Windshield Washer Button

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

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

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

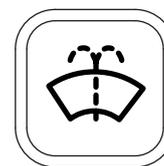


Figure 26

FG000243

## 11. Travel/Swing Alarm Switch

If unit is equipped with a travel/swing alarm, push this switch to active it whenever swinging or traveling.

- O. In this position, the travel/swing alarm system is turned "OFF".
- I. In this position, the travel alarm will only sound when the machine is traveling (moving).
- II. In this position, the travel alarm will sound while traveling and, if equipped with a swing alarm device, will also sound while swinging.

**NOTE:** If machine is only equipped with a travel alarm device, the alarm will not sound when swinging even if the switch is in the "II" position.

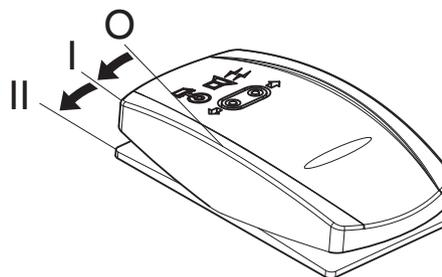


Figure 27

FG016022

## 12. Quick Coupler Switch (If Equipped)

This switch is used for engaging or releasing the attachment.

See "Quick Coupler Operation" for further information.



### WARNING

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**AVOID DEATH OR SERIOUS INJURY**

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

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

---

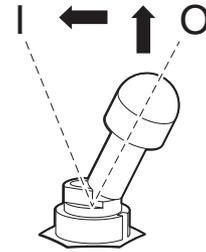


Figure 28

DS1903332

## 13. Power Socket for 12 Volt (If Equipped)

This is a power socket for only 12V DC devices.

This socket can be used for charging a cellular phone or powering a small 12V DC electrical device.

Open the cap when using it.

**NOTE:** *Avoid damage to electrical system. This socket is designed for small electrical capacity devices only. Do not use this socket for large electrical capacity devices.*

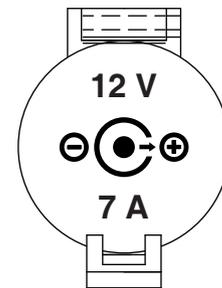


Figure 29

FG017015

## 14. Horn Button (Left-hand Work Lever)

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

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

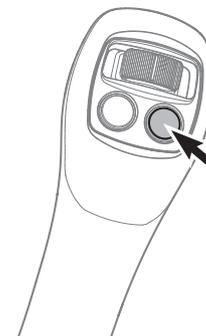


Figure 30

DS1601527

## 15. Booster Button (Right-hand Work Lever)

Press the left button on the top of the right-hand work lever (joystick) to boost the hydraulic pressure. Refer to the "Boost Mode" on page 3-43.

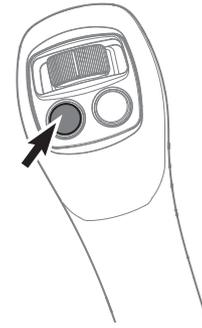


Figure 31

DS1601528

## 16. Rotating Switch

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

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

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



**CAUTION**

---

**AVOID INJURY**

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

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

---

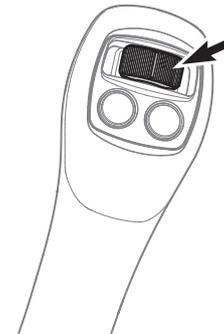


Figure 32

DS1601529

## 17. Shear Switch

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

**NOTE:** *This switch also interacts with the jog switch. See "3. Work Mode Selector Button" on page 2-23.*

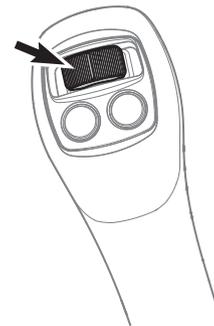


Figure 33

DS1601530



# CAUTION

---

## AVOID INJURY

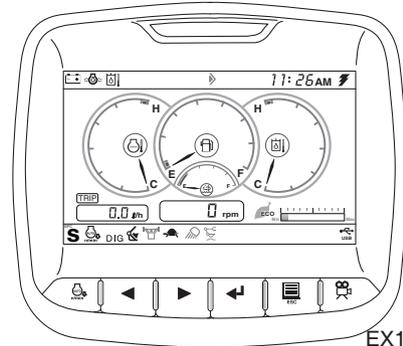
Before using any attachment in a work application, be sure to check its functional control.

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

---

## 18. Display Monitor

See "Display Monitor" on page 2-27.



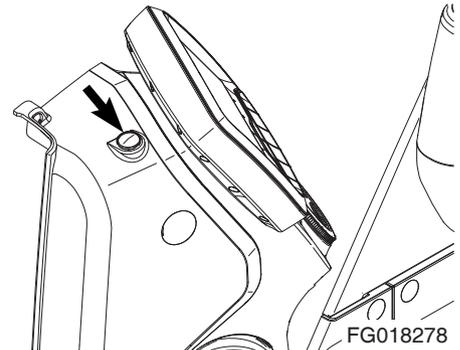
EX1301065

Figure 34

## 19. Photo Sensor

The photo sensor detects the radiant energy of the sun.

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

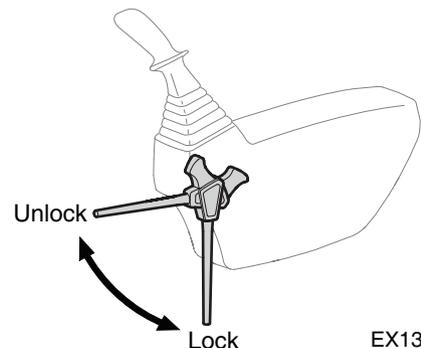


FG018278

Figure 35

## 20. Safety Lever

See "Safety Lever" on page 3-27.



EX1300566

Figure 36

## 21. Auxiliary Mode Switch

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

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



### NOTICE

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

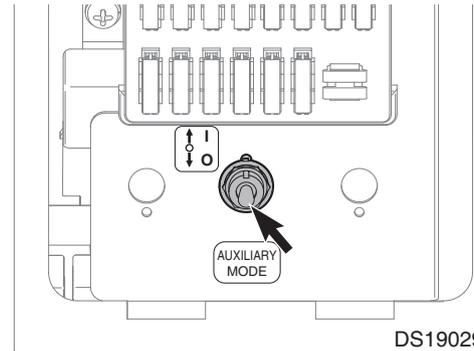


Figure 37

DS1902978

## 22. 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.

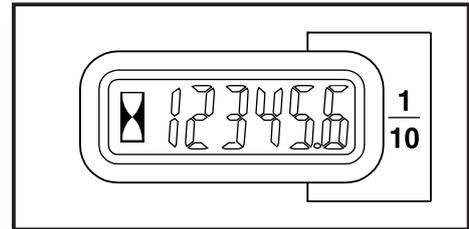


Figure 38

HAOA601L

## 23. One Touch Deceleration Button

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

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

When the button is pressed again, the engine speed will return to the setting of the engine speed control dial.

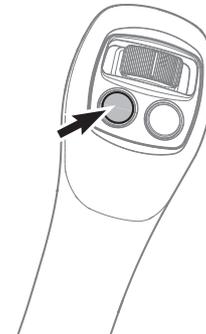


Figure 39

DS1601552

## 24. Selector Switch Control Panel

| Reference Number | Description                                  |
|------------------|--|
| 1                | Jog Switch                                   |
| 2                | Power Mode Selector Button                   |
| 3                | Work Mode Selector Button                    |
| 4                | Auto Idle Selector/<br>Buzzer Stop Button    |
| 5                | Camera Mode Selector/<br>Escape (ESC) Button |
| 6                | Multimedia Button                            |

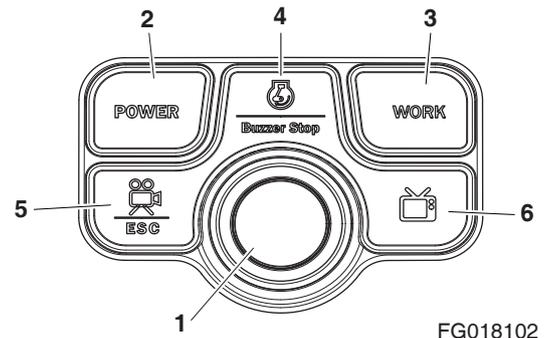


Figure 40

FG018102

### 1. Jog Switch

Press or turn the switch to select the menu or to change figures.

Engine speed can be changed according to the setting on the display monitor.

When a pop-up occurs, press the jog switch to remove it.

If this switch is pressed while on the camera screen, the screen will be divided into the windows according to the number of cameras. (If equipped)

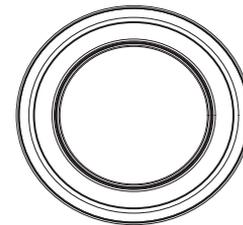


Figure 41

FG018103

### 2. Power Mode Selector Button

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

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

Place the selection bar by turning the jog switch and select the mode by pressing the jog switch.



Figure 42

FG018104

### 3. Work Mode Selector Button

Used to select the digging mode.

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

Place the selection bar by turning the jog switch and select the mode by pressing the jog switch.



Figure 43

FG018105

#### 4. Auto Idle Selector/Buzzer Stop Button

Auto Idle Function: When the auto idle system is activated, the engine will automatically reduce 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.

When the auto idle selector button is pushed to "ON" position, an indicator symbol on display monitor turns "ON".

When the auto idle selector button is pushed again, it is turned "OFF" and the engine speed will return to the setting of the engine speed dial and will remain at this speed despite control lever position, until engine speed dial is moved.

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



Buzzer Stop

FG018106

Figure 44

#### 5. Camera Mode Selector/Escape (ESC) Button

Camera window will appear when the button in the main window is operated.

The window will go back to the previous window when the button is operated in any other window than the main window (ESC).

If a pop-up window appears, pressing the button will remove pop-up.



FG018107

Figure 45

#### 6. Multimedia Button

Used to select window for video and music (MP3).



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

Listening to entertainment clips, such as video, music, etc., can cause an accident resulting in death or serious injury.

Do not play entertainment files when operating the machine.



FG018108

Figure 46

## 25. Jack Assembly

### 1. Hands-free Connector Jack

This jack is applied to Korean models only.

### 2. USB Port

Used for playing a video or MP3 file on the display monitor.

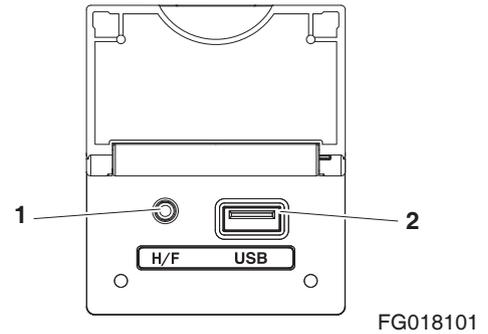


Figure 47

## 26. Micro Phone (If Equipped)

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

How to use the microphone:

### A. Siren

Turn switch (1, Figure 48) on the top to "ON" and set switch (2) on the bottom to the "ON" position the siren will be triggered.

### B. Microphone

Turn switch (1, Figure 48) on the top to "ON" and then press switch (3).

Turn switch (4, Figure 48) clockwise or counterclockwise to increase or decrease the volume.

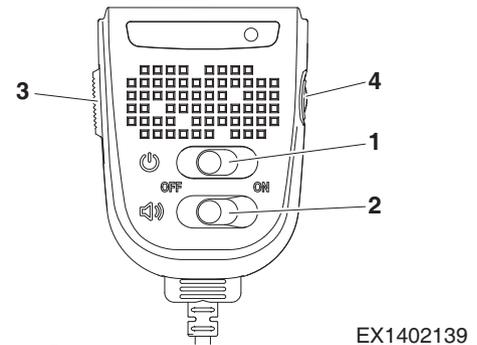


Figure 48

## 27. Wiper Switch (Oregon Cabin Only)

This switch is used to control the front window wiper.

O. In this position, windshield wiper is "OFF".

I. In this position, windshield wiper runs at an intermittent speed.

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

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

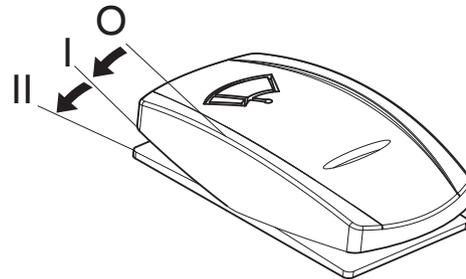
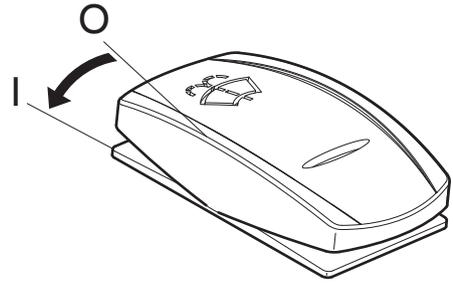


Figure 49

## 28. Washer Switch (Oregon Cabin Only)

- O. In this position, windshield washer is "OFF".
- I. In this position, windshield washer fluid sprays onto the windshield while running the wiper. When released, the switch returns to "O" (OFF) position.



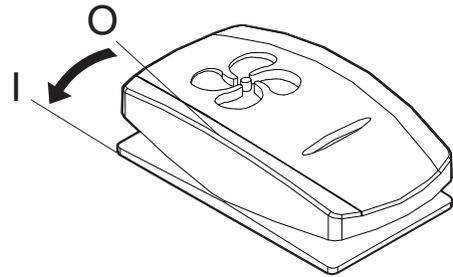
FG017855

Figure 50

## 29. Fan Switch (Oregon Cabin Only)

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

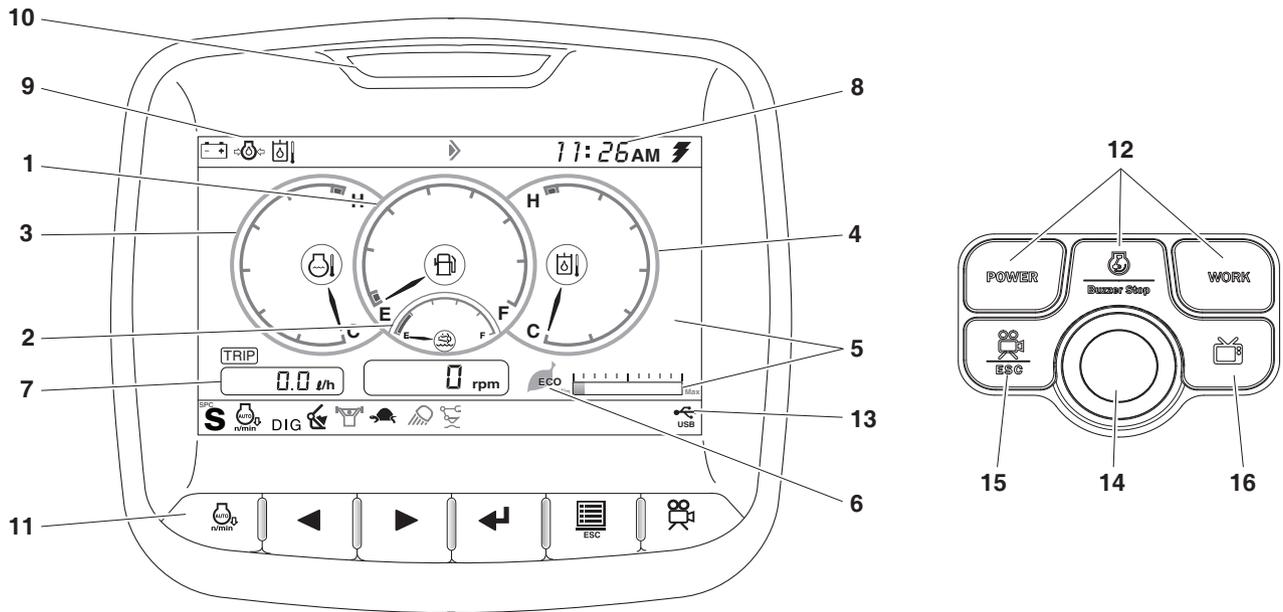
- O. In this position, the Fan is turned "OFF".
- I. In this position, the Fan turns "ON" and will start flashing.



DS1601341

Figure 51

# DISPLAY MONITOR



EX1300990

Figure 52

| Reference Number | Description                                      |
|------------------|--|
| 1                | Fuel Gauge                                       |
| 2                | DEF (AdBlue) Level Gauge                         |
| 3                | Engine Coolant Temperature Gauge                 |
| 4                | Hydraulic Oil Temperature Gauge                  |
| 5                | Multifunction Gauge and Graphic Information Area |
| 6                | ECO Gauge  |
| 7                | Trip Meter                                       |
| 8                | Digital Clock                                    |

| Reference Number | Description                      |
|------------------|----------------------------------|
| 9                | Display Warning Symbols          |
| 10               | Warning Light                    |
| 11               | Function Buttons                 |
| 12               | Mode Selector Buttons            |
| 13               | Selector Function Display        |
| 14               | Jog Switch                       |
| 15               | Camera Mode Selector/ ESC Button |
| 16               | Multimedia Selector Button       |

## Functional Check

When the engine starter switch is turned to "I" (ON) position, all gauge bands, switch/button indicator lights and warning lights will turn "ON" and the alarm buzzer will sound for about two (2) seconds.

During this functional check, a LOGO will appear on the multifunction gauge in the graphic information area (3 and 4, Figure 52).

## Password Activated

If a password has already been set and the system has been "LOCKED", the password display will appear on the screen once the functional check has been completed. Enter the password into the text area and then engage the starter.

**NOTE:** Refer to "Password Setting" on page 2-80, for further details.



## NOTICE

---

If the password does not match the stored password, the engine will not start.

---

### 1. Fuel Gauge

Shows remaining fuel quantity in tank.

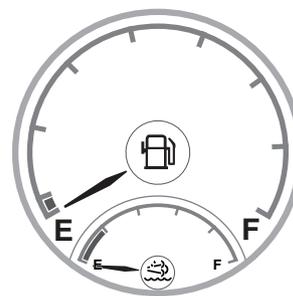
WHITE ZONE (□) - Indicates a normal fuel quantity.

RED ZONE (■) - Indicates that fuel level is low.

If the gauge pointer moves into the red zone, the fuel level symbol will turn "ON", and be displayed in the screen. Stop operation and immediately add fuel.

**NOTE:** See "9. Display Warning Symbols" on page 2-32, for location of this warning symbol and others.

Check the fuel level on firm and level ground.



EX1300964

Figure 53

### 2. DEF (AdBlue) Level Gauge

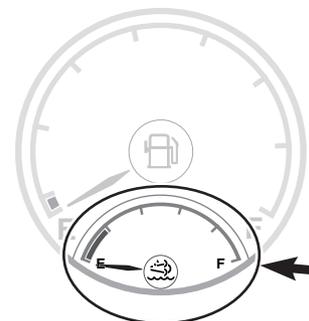
Shows remaining DEF (AdBlue) quantity in DEF (AdBlue) tank.

WHITE ZONE (□) - Indicates a normal DEF (AdBlue) quantity.

RED ZONE (■) - Indicates that DEF (AdBlue) level is low.

If gauge pointer moves into red zone, SCR gauge symbol will turn "ON," and be displayed in screen. Stop operation and immediately add DEF (AdBlue).

Check DEF level on firm and level ground.



EX1300999

Figure 54

### 3. Engine Coolant Temperature Gauge

The colored bands indicate the temperature of the engine coolant.

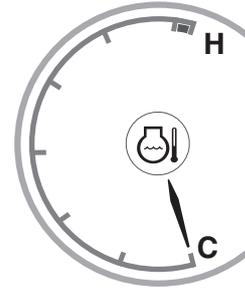
WHITE ZONE (□) - Indicates temperature is within the normal operating range.

RED ZONE (■) - Indicates temperature is too high.

During operation, the pointer must be in the white zone.

If the 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" 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 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.

When the temperature reaches the normal range, the engine speed will automatically recover.



EX1301000

Figure 55

### 4. Hydraulic Oil Temperature Gauge

The colored bands indicate the temperature of the hydraulic oil.

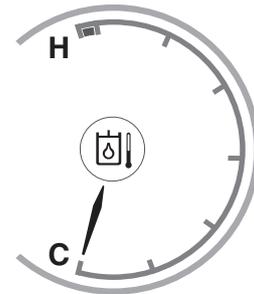
WHITE ZONE (□) - Indicates temperature is within the normal operating range.

RED ZONE (■) - Indicates temperature is too high.

During operation, the pointer must be in the white zone.

If the gauge pointer moves into the red zone, the hydraulic oil temperature symbol will turn "ON", and be display in the screen. Allow the engine to run at "LOW IDLE" until temperature gauge registers in the white zone again.

**NOTE:** See "9. Display Warning Symbols" on page 2-32, for location of this warning symbol and others.



EX1301001

Figure 56

## 5. Multifunction Gauge and Graphic Information Area

When the engine starter switch is turned to "I" (ON) position, a LOGO will appear on the display screen for about two seconds.

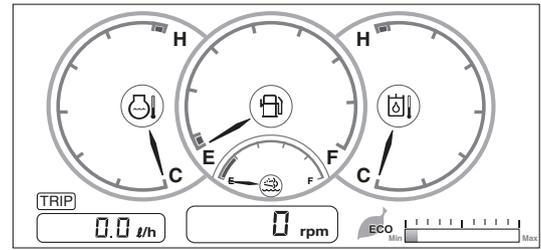
When the LOGO disappears, the multifunction gauge and graphic information screen will appear.

The engine rpm is normally displayed at the bottom of the screen when the starter switch is first turned "ON". A digital clock is located at the top of the display.

By using a combination of the mode selector buttons, information for filters and oils can also be displayed.

The display can also be set for the desired language.

Refer to the "User Menu" on page 2-54 for the language selection and information display sequences.



EX1301002

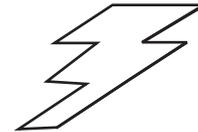
Figure 57

### Communication Indicator

Indicates the condition of communication between main controller and display monitor.

#### 1. Normal Condition:

The symbol (Figure 58) will sequentially move like lightening.



FG000047

Figure 58

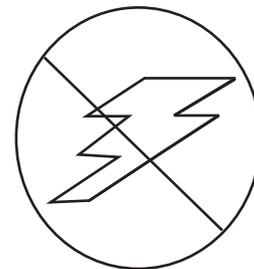
#### 2. Abnormal Condition:

If a communication error is generated between EPOS controller and display monitor, communication error warning symbol (Figure 59) will be displayed.

When this symbol is displayed, contact a HYUNDAI distributor.

**NOTE:** When starter switch is turned to "I" (ON) position during a state of communication error failure, the EPOS controller will default to the following modes.

Power mode: Standard mode  
Working mode: Digging mode  
Auto idle: "ON" (Selection state)



FG000048

Figure 59

### Engine Speed

The engine speed is numerically displayed.



EX1301378

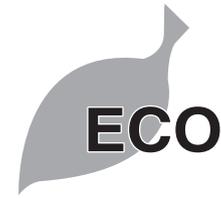
Figure 60

## 6. ECO Gauge

- A. ECO symbol: shows the workload when using the equipment.
- Green color: the green colored ECO symbol indicates that equipment is in normal operating condition.
  - Amber color: the amber colored ECO symbol indicates that equipment is a state of idling.
  - Red color: the red colored ECO symbol indicates rapid engine load or working with the equipment under load.
  - Gray color: the gray colored ECO symbol is displayed in other cases than above 3 color symbols.
- B. ECO gauge: shows the average fuel efficiency for 1 minute's operation.

A higher fuel consumption rate will drive this gauge closer to the max position.

- Green color gauge: fuel efficiency is in the economy mode.
- Amber color gauge: fuel efficiency is in the standard/power mode.
- Red color gauge: fuel efficiency is in the power plus mode.



EX1301004

Figure 61



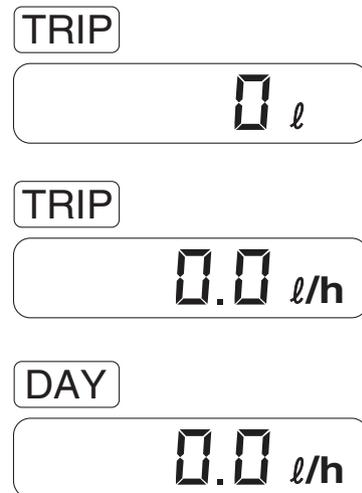
FG018120

Figure 62

## 7. Trip Meter

Real time fuel rate is numerically displayed.

A trip meter keeping track of fuel usage, operation time and average mileage and average daily mileage can be displayed through the trip meter settings.



EX1301003

Figure 63

## 8. Digital Clock

A digital clock, shows the current time. The displayed contents are as follows.

| Display | Description |
|---------|-------------|
| HH      | Hour        |
| mm      | Minute      |

Refer to the "User Menu" on page 2-54 for time setting.

HH:mm

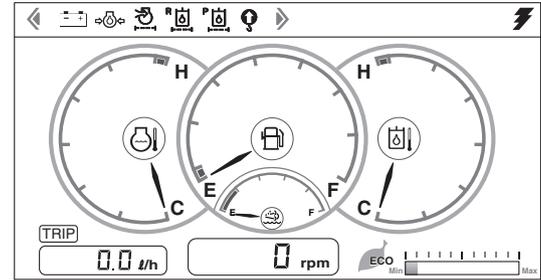
Figure 64

FG018262

## 9. Display Warning Symbols

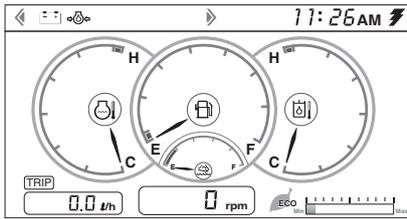
| Reference Number | Description   |
|------------------|---|
| 1                | Charge Warning Symbol   |
| 2                | Engine Oil Pressure Warning Symbol                                  |
| 3                | Engine Coolant Temperature Warning Symbol                           |
| 4                | Preheating Indicator Symbol   |
| 5                | Engine Check Warning Symbol   |
| 6                | Hydraulic Oil Overheat Warning Symbol                               |
| 7                | Fuel Shortage Warning Symbol  |
| 8                | Additional Fuel Tank Shortage Warning Symbol                        |
| 9                | Return Filter Clogged Warning Symbol                                |
| 10               | Air Cleaner Clogged Warning Symbol                                  |
| 11               | Water in Fuel Warning Symbol  |
| 12               | Quick Coupler Release System Activated Warning Symbol (If Equipped) |
| 13               | DEF (AdBlue) Low Level Warning Symbol                               |
| 14               | Overload Warning Symbol (If Equipped)                               |
| 15               | SCR Failure Warning Symbol  |
| 16               | Engine Stop Warning Symbol  |
| 17               | Machine Check Symbol  |
| 18               | Machine Stop Symbol   |
| 19               | DeSOx Warning Symbol  |
| 20               | SCR High Temperature Warning Symbol                                 |
| 21               | TMS Terminal Fault  |
| 22               | Engine Speed Limitation   |
| 23               | Engine Start Limitation   |
| 24               | GPS Antenna Failure   |
| 25               | GSM Antenna Failure   |
| 26               | Satellite Antenna Failure   |

**NOTE:** Symbols will appear across the top of display screen.



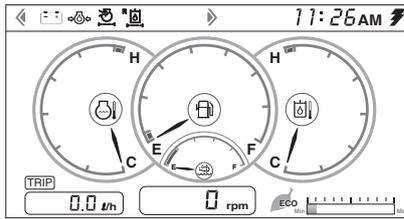
EX1301005

Figure 65



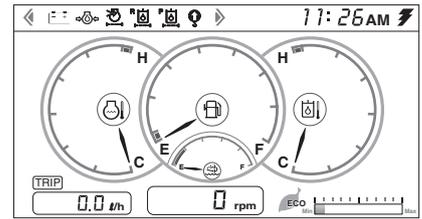
EX1301006

<2 kinds of warning symbols>



EX1301007

<4 kinds of warning symbols>



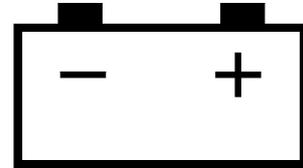
EX1301008

<6 kinds of warning symbols>

**Figure 66**

### 1. Charge Warning Symbol

This symbol indicates when the engine starter switch is turned "ON", and should go "OFF" after the engine starts. If it does not turn "OFF", stop engine immediately and determine the cause of the problem.

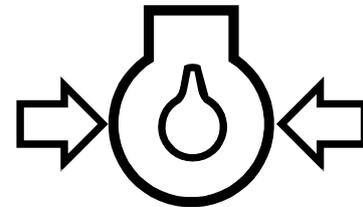


**Figure 67**

HAOA610L

### 2. Engine Oil Pressure Warning Symbol

This symbol indicates when the engine starter switch is turned "ON", and should go "OFF" after the engine starts. For example, if the engine oil pressure becomes too low, the light will turn "ON" and a warning buzzer will sound. If this happens, stop engine immediately and determine the cause of the problem. If work is continued when this light is "ON", it will result in serious engine damage.



**Figure 68**

HAOA620L



## NOTICE

**If work is continued when this light is "ON", it will result in serious engine damage.**

### 3. Engine Coolant Temperature Warning Symbol

If engine coolant overheats, this symbol appears on the screen an alarm will sound, and the engine speed will be automatically reduced, until coolant temperature drops. Do not turn engine "OFF" because this will cause coolant temperature to rise and can cause engine to seize up because of heat surge.

**NOTE:** *Check the engine coolant temperature gauge. If the 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" 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 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. When the temperature reaches the normal range, the engine speed will automatically recover.*

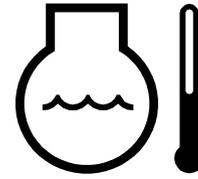


Figure 69

HAOD350L

### 4. Preheating Indicator Symbol

In cold weather this symbol indicates that engine preheat function is operating.

When this indicator symbol turns "OFF", it means that engine preheat cycle has been completed.



Figure 70

HAAE2000

### 5. Engine Check Warning Symbol

This symbol indicates when the engine needs to be checked.

**NOTE:** *If this symbol turns "ON" stop the machine and repair the cause of the fault.*

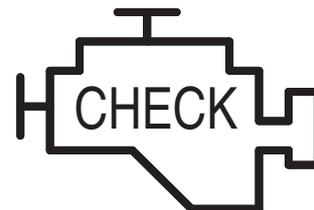
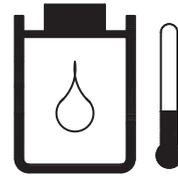


Figure 71

FG000045

## 6. Hydraulic Oil Overheat Warning Symbol

If the hydraulic oil temperature is too high, this symbol appears on the screen.



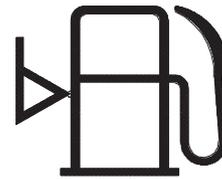
FG000056

Figure 72

## 7. Fuel Shortage Warning Symbol

If the fuel quantity is too low, this symbol appears on the screen.

If this symbol turns "ON", add fuel as soon as possible.



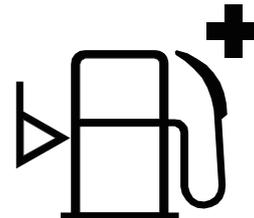
FG000057

Figure 73

## 8. Additional Fuel Tank Shortage Warning Symbol (If Equipped)

If the additional fuel tank quantity is too low, this symbol appears on the screen.

If this symbol turns "ON", add fuel as soon as possible.



DS2000791

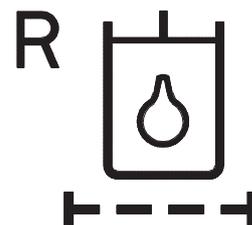
Figure 74

## 9. Return Filter Clogged Warning Symbol

This symbol indicates when the hydraulic return filter is clogged.

If this symbol is displayed, immediately stop operation and replace the return filter.

After the return filter has been serviced, restart machine operation to remove warning symbol.



FG000054

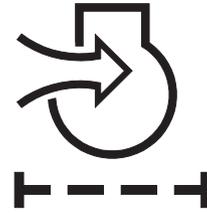
Figure 75

## 10. Air Cleaner Clogged Warning Symbol

This symbol indicates when the air cleaner is clogged.

If this symbol is displayed, immediately stop operation and replace or clean the air filter.

After the air filter has been serviced, restart machine operation to remove warning symbol.



FG000053

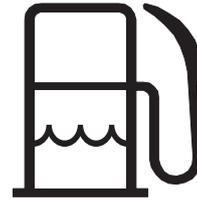
Figure 76

## 11. Water In Fuel Warning Symbol

This symbol indicates when the water is full in the fuel prefilter.

When this symbol appears, drain water from fuel prefilter as soon as possible.

**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.*



DS1603475

Figure 77

## 12. Quick Coupler Release System Activated Warning Symbol (If Equipped)

This symbol indicates when the quick coupler release system is activated..



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

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

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



FG002195

Figure 78

### 13. DEF (AdBlue) Low Level Warning Symbol - EPA

| Reductant Level | Warning Symbol                  | Torque Reduction*         |
|-----------------|---------------------------------|---------------------------|
| 20%             | Constant Symbol                 |                           |
| 10%             | Flashing Every 2 sec.           | Torque is reduced by 25%. |
| 5%              | Flashing Rapidly Every 0.5 sec. | Low idle only             |



Figure 79

FG019175

### DEF (AdBlue) Low Level Warning Symbol - EU

| Reductant Level | Warning Symbol                  | Torque Reduction*                                |
|-----------------|---------------------------------|--|
| 20%             | Constant Symbol                 | None   |
| 10%             | Flashing Every 2 sec.           | Torque is reduced by 25%.                        |
| 5%              | Flashing Rapidly Every 0.5 sec. | Torque is reduced by 50% and rated speed by 60%. |

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

### 14. Overload Warning Symbol (If Equipped)

If the overload warning switch is turned "ON", and this symbol appears on the screen and the warning buzzer sounds, that indicates that overloaded condition is occurring. Immediately reduce the load.




---

**AVOID DEATH OR SERIOUS INJURY**

If this warning appears on the screen and a warning buzzer sounds, reduce the load immediately. If you continue to work, tipping of the machine or damage to hydraulic components and structural parts could occur.

---

Figure 80

FG000253

## 15. SCR Failure Warning Symbol

This symbol indicates when SCR system needs to be checked.

**NOTE:** *If this symbol turns "ON", stop machine and repair cause of the problem.*



### Reaction to Faults in SCR System - EPA

| Time             | Warning Symbol                  | Torque Reduction *        |
|------------------|---------------------------------|---------------------------|
| Fault Detected   | Constant Symbol                 |                           |
| After 30 minutes | Constant Symbol                 | Torque is reduced by 25%. |
| After 1 hour     | Flashing Every 2 sec.           | Torque is reduced by 50%. |
| After 4 hours    | Flashing Rapidly Every 0.5 sec. | Low idle only             |

Figure 81

FG019176

If a new fault occurs within 40 hours of operation since the first fault, the warning symbol will come on. After 30 minutes of operation, the warning symbol will flash rapidly and engine torque will be reduced to 0% (low idling) within 30 minutes.

### Reaction to Blocked EGR Valve and Malfunction of the Monitoring - EU

| Time           | Warning Symbol                  | Torque Reduction *                               |
|----------------|---------------------------------|--|
| Fault Detected | Constant Symbol                 |  |
| 36 hours       | Constant Symbol                 | Torque is reduced by 25%.                        |
| 100 hours      | Flashing Rapidly Every 0.5 sec. | Torque is reduced by 50% and rated speed by 60%. |

### Reaction to Interruption of Dosing and Reagent Quality - EU

| Time           | Warning Symbol                  | Torque Reduction *                               |
|----------------|---------------------------------|--|
| Fault Detected | Constant Symbol                 |  |
| 10 hours       | Constant Symbol                 | Torque is reduced by 25%.                        |
| 20 hours       | Flashing Rapidly Every 0.5 sec. | Torque is reduced by 50% and rated speed by 60%. |

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**

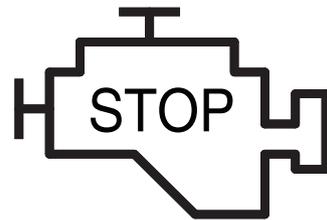
---

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.

---

**16. Engine Stop Warning Symbol**

If this warning symbol appears on the screen and a warning buzzer sounds, stop engine and service the emission control system immediately.



FG019003

Figure 82

**17. Machine Check Symbol**

Respective symbols light up when functions of the machine are not operating.

**NOTE:** *If a symbol is lit up, after moving the machine to a safe location, find the cause of the malfunction and perform necessary repairs.*



EX1301379

Figure 83

**18. Machine Stop Symbol**

A symbol will light up when there is a major defect with the machine.

**NOTE:** *If this symbol is lit up, immediately shut off the machine and call for the machine to be serviced.*



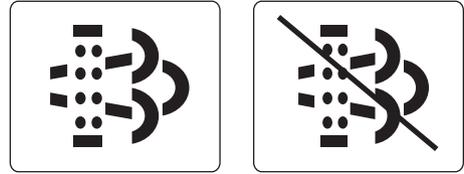
EX1301380

Figure 84

## 19. DeSOx Warning Symbol

The left-hand DeSOx symbol (Figure 85) turns "ON" when forced DeSOx is required, or during the manual (forced) DeSOx process. When the operator inhibits the DeSOx, the symbol will be displayed as shown in the right-hand view (Figure 85).

**NOTE:** *Run machine at "LOW IDLE" and do not stop engine until DeSOx cycle is completed. See "Emission Control System" on page 3-35 for more information.*



FG018399

Figure 85

---

### NOTICE

---

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

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

**NOTE:** *If the machine is moved or switched off during DeSOx, the DeSOx process will need to be restarted.*

## 20. Selective Catalytic Reduction (SCR) High Temperature Warning Symbol

---

### WARNING

---

#### AVOID DEATH OR SERIOUS INJURY

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

This SCR high temperature warning symbol is shown when DeSOx is in process.

Forced DeSOx - The symbol is amber color.

Active DeSOx - The symbol is green color.

**NOTE:** *Run machine at "LOW IDLE" and do not stop engine until DeSOx cycle is completed. See "Emission Control System" on page 3-35, for more information.*

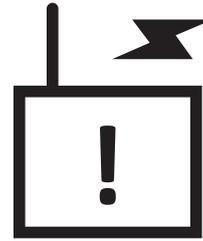


FG018398

Figure 86

**21. TMS Terminal Fault**

This symbol indicates when TMS Terminal failure occurs.

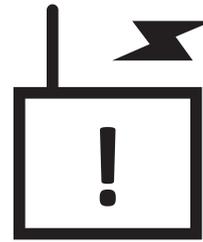


**Figure 87**

DS1702302

**22. Engine Speed Limitation**

This symbol indicates when engine speed is limited by TMS.

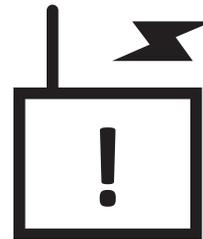


**Figure 88**

DS1702302

**23. Engine Start Limitation**

This symbol indicates when engine start is limited by TMS.



**Figure 89**

DS1702302

**24. GPS Antenna Failure**

This symbol indicates when GPS antenna has failed or it is disconnected.



**Figure 90**

DS1702303

## 25. GSM Antenna Failure

This symbol indicates when GSM antenna has failed or it is disconnected.



DS1702304

Figure 91

## 26. Satellite Antenna Failure

This symbol indicates when satellite antenna has failed or it is disconnected.



DS1702305

Figure 92

## 10. Warning Light

This warning light appears when the machine or engine needs to be checked.



---

If warning light appears, stop the machine and repair the cause of the problem.

---

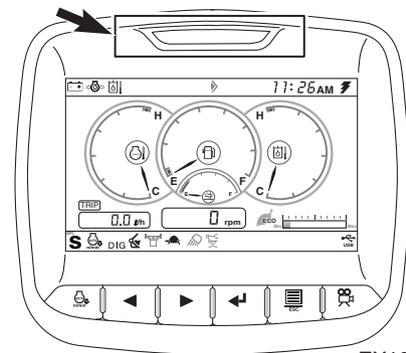


---

If necessary depending on the type of problem, contact your HYUNDAI distributor for repairs.

---

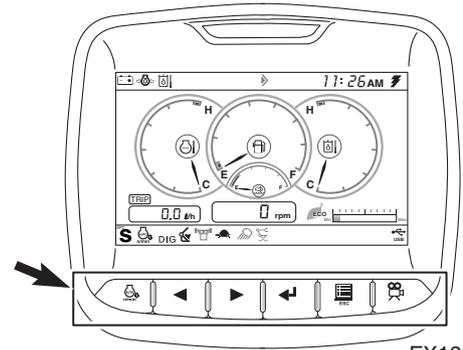
**NOTE:** For explanation of warnings see "Warning Pop-up Window" on page 2-51.



EX1301066

Figure 93

## 11. Function Buttons



EX1301009

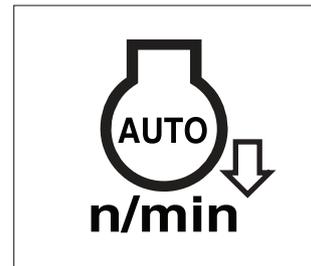
Figure 94

### 1. Auto Idle Selector Button

When the auto idle system is activated, the engine will automatically reduce speed to "IDLE" approximately four seconds after all the control levers are in the "NEUTRAL" position. This system is designed to reduce fuel consumption and noise.

When the auto idle selector button is pushed to "ON" position, an indicator light above it turns "ON".

When the auto idle selector button is pushed again, it is turned "OFF" and the engine speed will return to the setting of the engine speed dial and will remain at this speed despite control lever position, until engine speed dial is moved

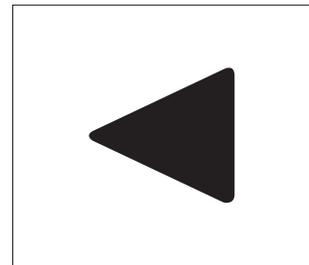


EX1301010

Figure 95

### 2. Up Arrow Button

Up arrow button (◀), is used to move a menu item "Up" or to "Left".

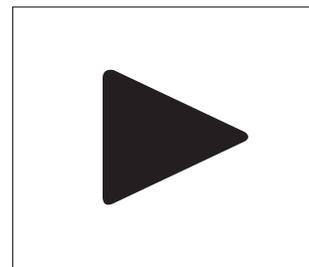


EX1301011

Figure 96

### 3. Down Arrow Button

Down arrow button (▶), is used to move a menu item "Down" or to "Right".

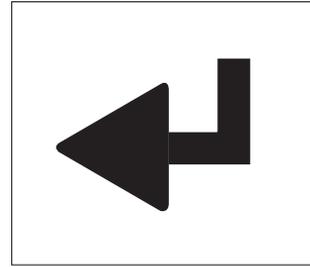


EX1301012

Figure 97

#### 4. Selector Button

Selector button (←), is used to move a menu or clear the operating hour of filter/oil.



EX1301013

Figure 98

#### 5. Display Selector Button (ESC - Escape)

Display selector button (☰), is used to change the displayed information on the screen. Each time the display selector button is pressed, the digital readout changes.

**NOTE:** When setting the main menu, this button is used as the menu/exit button (ESC). To access the menus the button must be pressed and held for three seconds.

**NOTE:** When this button is used for menu/exit button, it is used to access to main menu or return to a previous screen from each submenu.

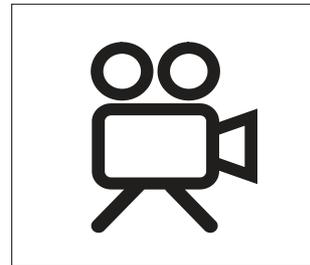


EX1301014

Figure 99

#### 6. Camera Mode Selector

Camera window will appear when the button in the main window is operated.



EX1301015

Figure 100

## 12. Mode Selector Buttons

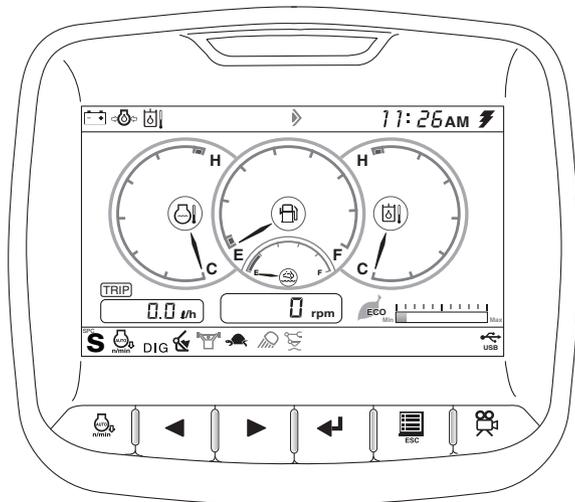
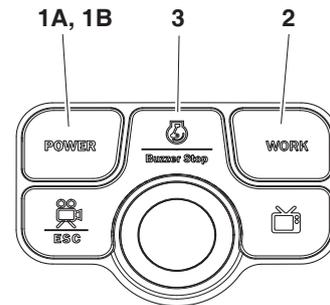


Figure 101



EX1301067

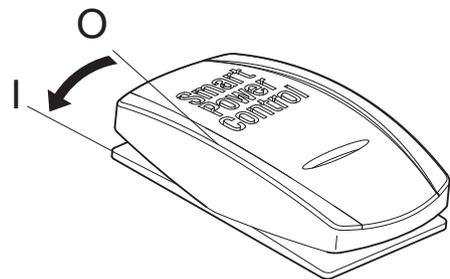
### 1A. SPC (Smart Power Control) Mode Selector Button

The SPC switch activates when the engine starter switch is turned "I" (ON).

When SPC mode is selected, SPC power plus mode, SPC power mode, SPC Standard mode and SPC economy mode can be used.

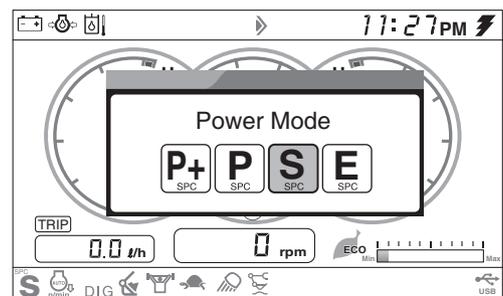
When the power button is pressed, the SPC Power mode select button is displayed in the main screen.

Different modes can be selected using the jog switch.



EX1301249

Figure 102



EX1301381

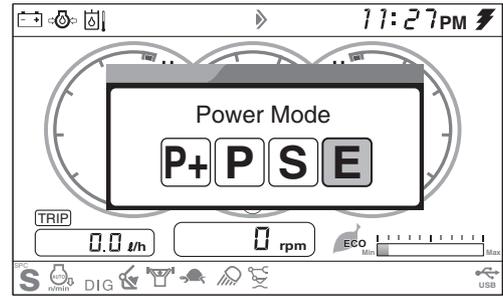
Figure 103

### 1B. Power Mode Selector Button

When the SPC switch (Figure 102) is pressed again, it turns "OFF" the SPC function, power plus mode, power mode, standard mode, or economy mode can be used.

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

Scroll through selection bar by turning jog switch and select mode by pressing jog switch.



EX1301028

Figure 104

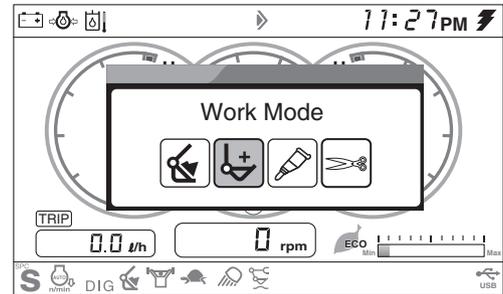
### 2. Work Mode Selector Button

Used to select the digging, lifting, or attachment mode.

Pressing the "Work Mode" selector button will display the available modes in the main window.

Scroll through selection bar by turning the jog switch and select the mode by pressing the jog switch.

Changing the starter switch from the "O" to "I" position will automatically reset the work mode to "Digging Mode".



EX1301027

Figure 105

### 3. Auto Idle Selector Button

When the auto idle system is activated, the engine will automatically reduce speed to "IDLE" approximately four seconds after all the control levers are in "NEUTRAL" position. This system is designed to reduce fuel consumption and noise.

When the auto idle selector button is pushed to "ON" position, an auto idle symbol will be displayed on the display monitor.

When the auto idle selector button is pushed again, it is turned "OFF" and the engine speed will return to the setting of the engine speed dial and will remain at this speed despite control lever position, until engine speed dial is moved.



Buzzer Stop

Figure 106

FG018106

## 13. Selector Function Display

See "Switch Operation Indication" on page 2-93.

## 14. Jog Switch

See "1. Jog Switch" on page 2-23.

See "Launch Menu" on page 2-48.

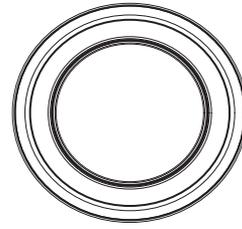


Figure 107

FG018103

## 15. Camera Mode Selector/ESC Button

See "5. Camera Mode Selector/Escape (ESC) Button" on page 2-24.

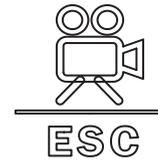


Figure 108

FG018107

## 16. Multimedia Selector Button

See "6. Multimedia Button" on page 2-24.



Figure 109

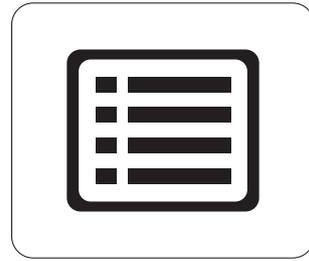
FG018108

## Launch Menu

Items that are frequently used from the display monitor are configured into a launch menu to improve accessibility of features of the equipment.

### 1. User Menu

Use this to access the user menu from the display monitor.



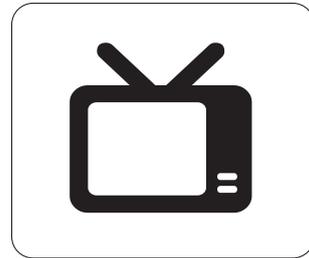
EX1301394

Figure 110

### 2. Entertainment Video

Use this launcher symbol to access the Video menu when using the video feature among the entertainment features.

**NOTE:** *This menu is activated when the USB device is connected to jack assembly.*



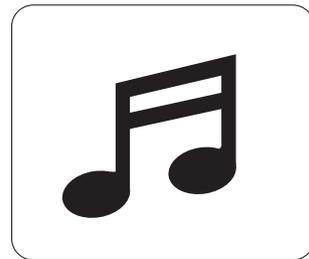
EX1301395

Figure 111

### 3. Entertainment MP3 Player

Use this launcher symbol to access the MP3 menu when using the MP3 feature among the entertainment features.

**NOTE:** *This menu is activated when the USB device is connected to jack assembly.*



EX1301396

Figure 112

#### 4. Confirmation of Warning Sign

Activated when the equipment malfunctions. Use this to see details of the equipment malfunction and how to deal with it.

**NOTE:** *This menu is activated when the failure information is displayed on the screen.*



EX1301397

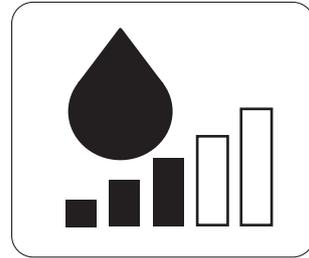
Figure 113

#### 5. Flow Rate Settings (Option)

This menu is activated when attachment options are installed.

After installing the attachment, use this to set a desired flow rate.

**NOTE:** *This menu is activated when the breaker mode or two way mode is selected.*

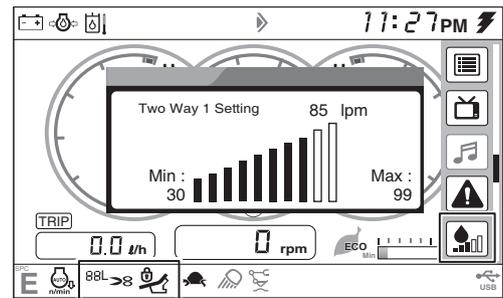


EX1301398

Figure 114

In the user menu, a desired flow rate value to be used can be selected from between preset minimum and maximum flow rates.

For example, if a user sets 99 lpm as a maximum flow rate and 30 lpm as a minimum flow rate in the user menu, the user can set the used flow rate anywhere between 99 lpm and 30 lpm.



EX1301402

Figure 115

#### 6. Power Mode

In equipment digging mode, power plus mode, power mode, standard mode and economy mode can be selected.

**NOTE:** *This menu is activated when the digging mode is selected.*



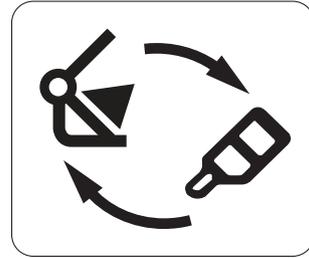
EX1301399

Figure 116

7. Work Mode

When optional equipment is installed on the equipment, digging mode, lifting mode, breaker mode and two way mode can be selected.

Breaker mode and two way mode are only activated when the options are installed.



EX1301400

Figure 117

8. Trip Meter

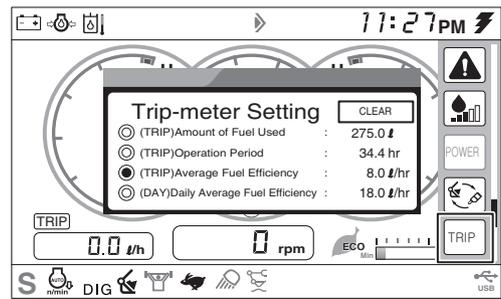
Use this to see fuel usage according to operation time, operation period, average mileage and daily average mileage.

Fuel usage and operation period are based on the last clear time.



EX1301401

Figure 118



DS1603030

Figure 119

# Warning Pop-up Window

When an alarm or warning is triggered, a pop-up window appears to describe it.

The pop-up window disappears when the warning symbol has disappeared or the ESC button or jog switch is pressed.

For multiple warnings and/or alarms, turn the jog switch to select the warning/alarm and read the relevant message.



---

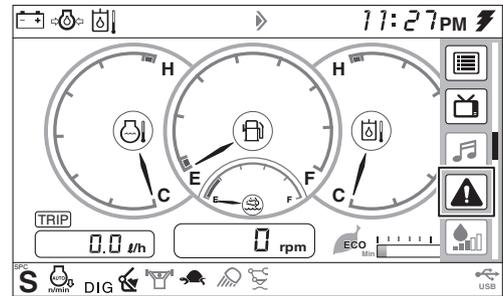
## AVOID DEATH OR SERIOUS INJURY

**If a warning pop-up window appears, stop operation and check the message. Do not read message while traveling or operating machine.**

---

### 1. Go to Warning Display

Turn the jog switch left or right or press the up and down arrow buttons on the dashboard to activate the launch menu.

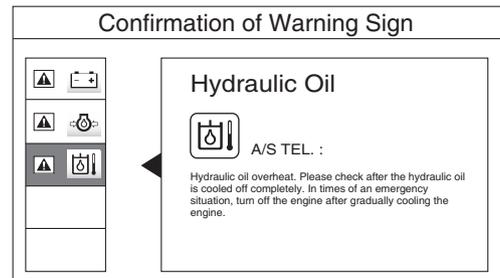


EX1301404

Figure 120

### 2. Enter Checking Mode

Move the cursor over the Confirmation of Warning Sign using the jog switch and click the jog switch to see details of the malfunction.

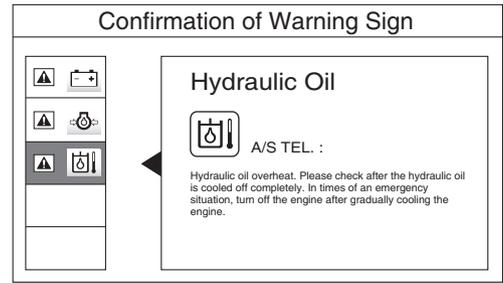


EX1301405

Figure 121

### 3. Read Warning Message

Check the warning message by moving the jog switch.

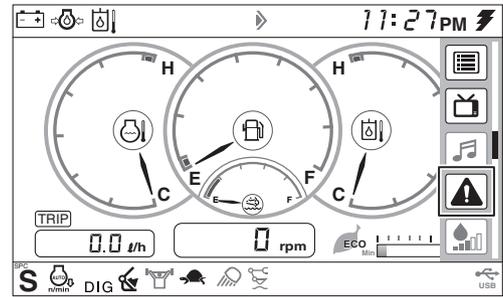


EX1301405

Figure 122

### 4. Delete Warning Pop-up

Press escape or jog switch to delete the warning pop-up window.



EX1301404

Figure 123

## Warning Pop-up Windows List

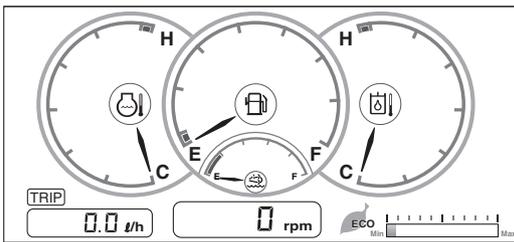
|    | <b>Warning</b>            | <b>Description</b>  |
|----|---------------------------|---|
| 1  | Charge                    | Check the battery charging system.  |
| 2  | Low E/G Oil Pressure      | Check the engine oil system.  |
| 3  | Coolant Overheat          | Coolant is overheated.<br>Service/repair the cooling system after fully cooled down.                    |
| 4  | Preheat                   | Being preheated.  |
| 5  | E/G Warning               | Check the engine system.  |
| 6  | Water in Fuel             | Drain the water in the fuel filter.   |
| 7  | Hydraulic Oil             | Hydraulic oil is overheated.<br>Service/repair the oil system after fully cooled down.                  |
| 8  | Fuel Empty                | Refuel.   |
| 9  | Air Cleaner Clogged       | Air cleaner is clogged. Check the air cleaner.  |
| 10 | Return Filter             | Return filter is clogged. Check the return filter.  |
| 11 | Brake Oil Pressure Low    | Brake oil pressure is too low. Check the brake system.  |
| 12 | Quick Coupler             | Quick coupler release system is activated. Check locking system to prevent attachment from falling off. |
| 13 | DEF Low Level             | Refill DEF (AdBlue).  |
| 14 | SCR Failure               | Check the SCR system.   |
| 15 | Machine Warning           | Check the machine system.   |
| 16 | TMS Terminal Fault        | Due to TMS terminal fault, engine start will be limited.<br>Please contact HYUNDAI service.             |
| 17 | Engine Speed Limitation   | Due to TMS, engine speed will be limited. Please contact HYUNDAI service.                               |
| 18 | Engine Start Limitation   | Due to TMS, engine start will be limited. Please contact HYUNDAI service.                               |
| 19 | GPS Antenna Failure       | GPS antenna not recognized; antenna has failed, or it is disconnected.                                  |
| 20 | GSM Antenna Failure       | GSM antenna not recognized; antenna has failed, or it is disconnected.                                  |
| 21 | Satellite Antenna Failure | Satellite antenna not recognized; antenna has failed, or it is disconnected.                            |

# USER MENU

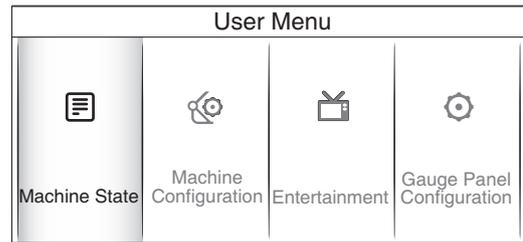
## User Menu - Access and Escape Methods

### Access Method

1. On the normal display screen, click on the jog switch to access the user menu screen.
2. Proceed to the user menu using the menu/esc button on the front of the dashboard.
3. Select the user menu from the launch menu.



<Normal Indication Monitor>



<Main Menu Monitor>

DS1601342

Figure 124

### Escape Method

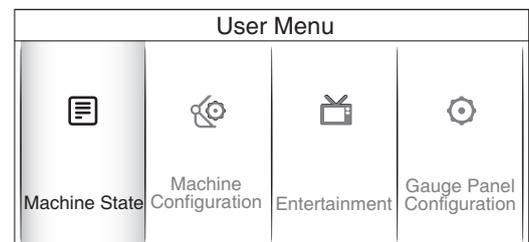
1. Press the ESC button to move to the normal display screen.
2. If 20 seconds have passed without the operation of the button, the normal display screen will be displayed.
3. Turning "OFF" the starter switch to cut off power, you will move to the normal display screen.

### User Menu

Turn the jog switch and move the cursor to see a reversed display on the desired menu. Then, click on the jog switch to select the menu.

**Machine State ↔ Machine Configuration ↔ Entertainment ↔ Gauge Panel Configuration**

Press the ESC button to return to the previous screen.



DS1601343

Figure 125



**WARNING**

**AVOID DEATH OR SERIOUS INJURY**

**Do not use machine state menu when traveling or operating.**

1. Machine State

This is used to check the current machine state, filter/oil information, machine information, etc.

Turn the jog switch and move the cursor to see a reversed display on the desired menu. Then, click on the jog switch to select the menu.

**Monitoring** ↔ **Filter/Oil Information** ↔ **Machine Information** ↔ **Fuel Efficiency Data**

Press the ESC button to return to the previous screen.

A. Monitoring

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

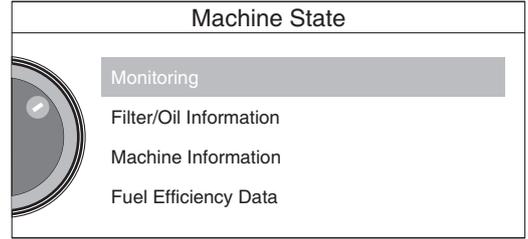
At the machine state, if the cursor is placed on Monitoring, click on the jog switch to display the Monitoring screen.

Press the ESC button to return to the previous screen.

B. Filter/Oil Information

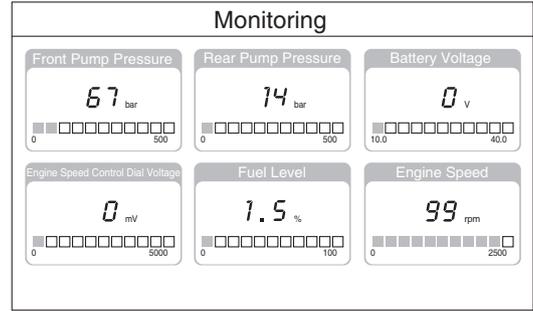
The screen displays the information on filter/oil use time, replacement period, and remaining time.

At the machine state, if the cursor is placed on the filter/oil information, click on the jog switch to display the filter/oil information.



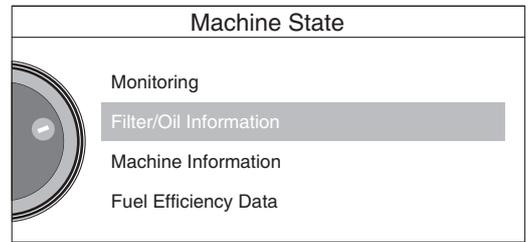
DS1601344

Figure 126



DS1601345

Figure 127



DS1601346

Figure 128

### Reset Method/Replacement Period Change Method

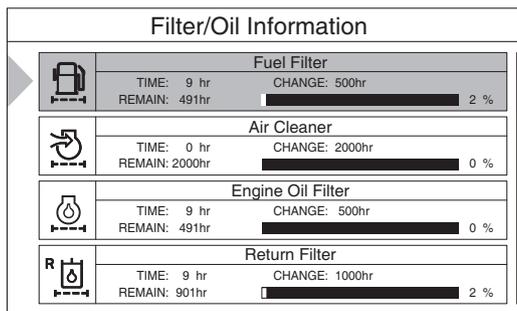
Move the cursor over the filter/oil item you wish to change using the jog switch or the ◀ and ▶ buttons on the front of the dashboard and click the jog switch or press the 'Enter' button on the front of the dashboard. A window for resetting/changing the filter/oil time will pop-up.

To reset the use time, move the cursor over 'clear' and click the jog switch or press the 'Enter' button on the front of the dashboard.

Turn the jog switch to locate it at YES. Then, click on the jog switch to reset the operation hour.

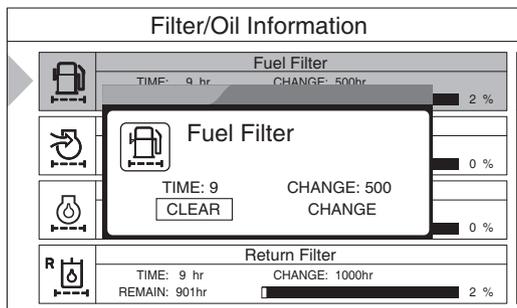
Turn the jog switch to locate it at NO. Then, click on the jog switch to allow the pop-up window to disappear without resetting the operation hour.

- The filter/oil use time shows the hours of operation after initializing the engine. It begins again with 0 hr after initialization the following the replacement of filter/oil.



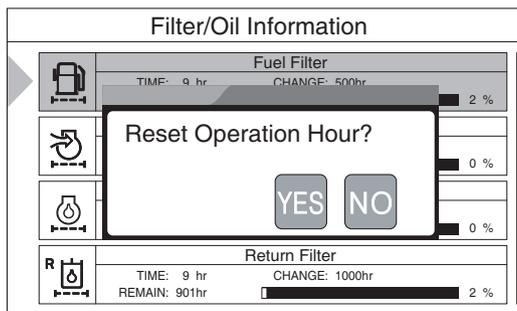
DS1601347

Figure 129



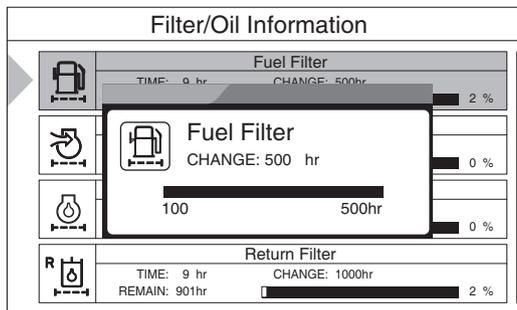
DS1601348

Figure 130



DS1601349

Figure 131



DS1601350

Figure 132

To change the filter/oil exchange period, move the cursor over 'change' in the window for resetting/ changing the filter/oil time and click the jog switch or press the 'Enter' button on the front of the dashboard.

After the exchange period change screen pops up, click the jog switch or press the 'Enter' button on the front of the dashboard and the exchange time will start flashing.

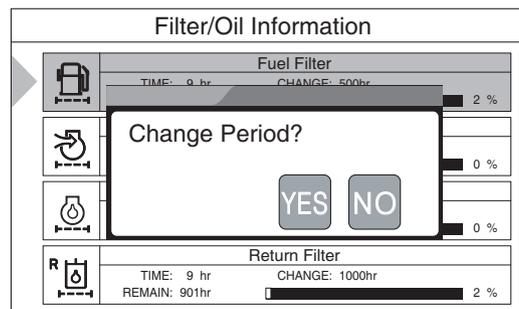
Next, change the exchange period using the jog switch or the ◀ and ▶ buttons on the front of the dashboard.

Then, turn the jog switch counterclockwise to reduce the period. Turn clockwise to extend the period.

With the replacement period change being completed, click on the jog switch to create a pop-up window to select the period change.

Turn the jog switch to locate it at YES. Then, click on the jog switch to change the replacement period.

Turn the jog switch to locate it at NO. Then, click on the jog switch to allow the pop-up window to disappear without the replacement period not being changed.



DS1601351

Figure 133

**Filter/Oil Period Setup Table**

Unit: hr

| Kind              | Replacement Period |                               |                      |
|-------------------|--------------------|-------------------------------|----------------------|
|                   | Basic Setup Value  | Minimum Available Setup Value | Change Value By Step |
| Fuel Filter       | 500                | 100                           | 50                   |
| Air Cleaner       | 2,000              | 1,000                         | 50                   |
| Engine Oil Filter | 500                | 100                           | 50                   |
| Return Filter     | 1,000              | 100                           | 50                   |
| Pilot Filter      | 1,000              | 100                           | 50                   |
| Engine Oil        | 500                | 100                           | 50                   |
| Hydraulic Oil     | 2,000              | 1,000                         | 50                   |
| Coolant           | 2,000              | 1,000                         | 50                   |

**Symbol Description**

| Filter/<br>Oil Name | Fuel Filter | Air Cleaner | ENG Oil<br>Filter | Return<br>Filter | Pilot Filter | ENG Oil | HYD. Oil | Coolant |
|---------------------|-------------|-------------|-------------------|------------------|--------------|---------|----------|---------|
| Icon                |             |             |                   |                  |              |         |          |         |

DS1701749

Figure 134

If the remaining time for filter/oil replacement is less than 10 hours, this pop-up window will be created. Press the ESC button or the jog switch to allow the pop-up window to disappear.



DS1601352

Figure 135

If the filter/oil replacement period is exceeded, this pop-up window will be created. Press the ESC button or the jog switch to allow the pop-up window to disappear.



## WARNING

**AVOID DEATH OR SERIOUS INJURY**

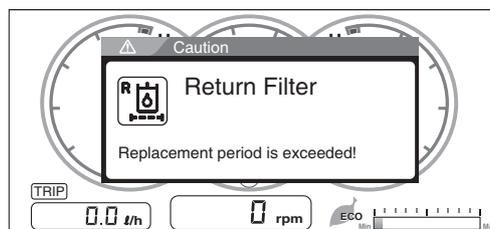
**Do not use machine state menu when traveling or operating.**

### C. Machine Information

This is used to check the machine name, engine type and attachment options.

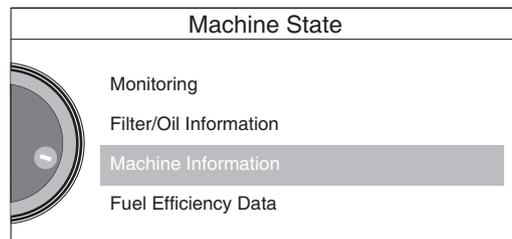
At the machine state, if the cursor is placed on the machine information, click the jog switch to access the machine information screen.

Click the ESC button to return to the previous screen.



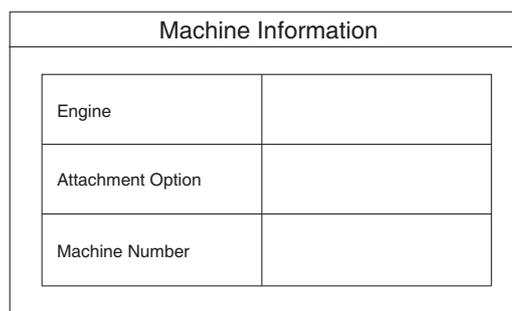
DS1601353

Figure 136



DS1601354

Figure 137

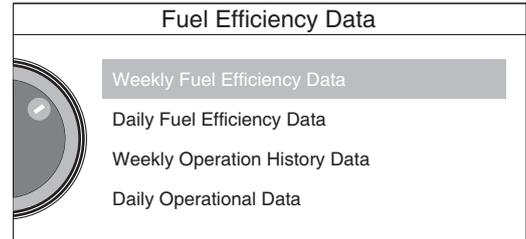


WE1500736

Figure 138

D. Fuel Efficiency Data

It is possible to check the weekly fuel efficiency data, daily fuel efficiency data, weekly operation history data and daily operation data.

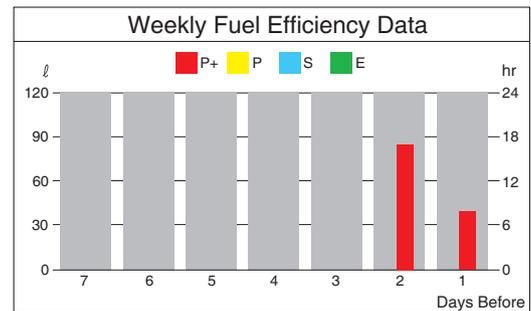


DS1601355

Figure 139

1) Weekly Fuel Efficiency Data

The amount of fuel used by each operating mode in a week can be checked.

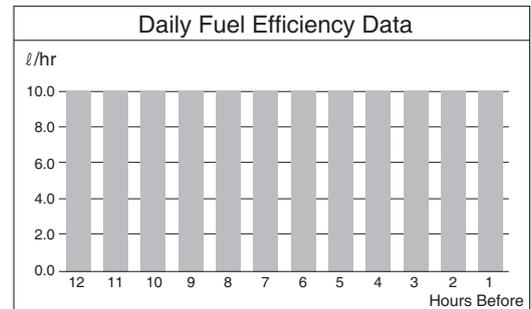


EX1402170

Figure 140

2) Daily Fuel Efficiency Data

The amount of fuel used in a day can be checked.



EX1402171

Figure 141

3) Weekly Operation History Data

The amount of fuel used, operating period and daily average fuel efficiency in a week can be checked.

| Weekly Operation History Data |                     |                  |                               |
|-------------------------------|---------------------|------------------|-------------------------------|
| Days Before                   | Amount of Fuel Used | Operation Period | Daily Average Fuel Efficiency |
| 1                             | 0 l                 | 9.1 hr           | 0.0 l/hr                      |
| 2                             | 0 l                 | 16.6 hr          | 0.0 l/hr                      |
| 3                             | 0 l                 | 0.0 hr           | 0.0 l/hr                      |
| 4                             | 0 l                 | 0.0 hr           | 0.0 l/hr                      |
| 5                             | 0 l                 | 0.0 hr           | 0.0 l/hr                      |
| 6                             | 0 l                 | 0.0 hr           | 0.0 l/hr                      |
| 7                             | 0 l                 | 0.0 hr           | 0.0 l/hr                      |

EX1402172

Figure 142

#### 4) Daily Operational Data

The operation period, average fuel efficiency and amount of fuel used in a day can be checked.

| Daily Operational Data  |          |
|-------------------------|----------|
| Operation Period        | 150.3 hr |
| Average Fuel Efficiency | 0.0 ℓ/hr |
| Amount of Fuel Used     | 0 ℓ      |

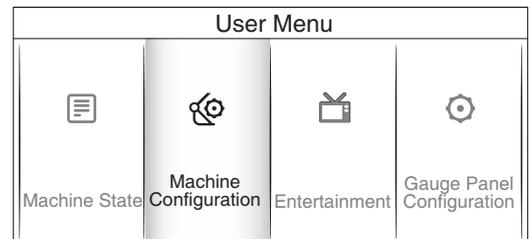
EX1402173

Figure 143

## 2. Machine Configuration

This is used when selecting the functions such as attachment setting, camera setting, emergency engine speed control dial, auto shut-off setting and option operation setting.

Turn the jog switch and move the cursor to see an reversed display on the desired menu. Then, click the jog switch to select the menu.

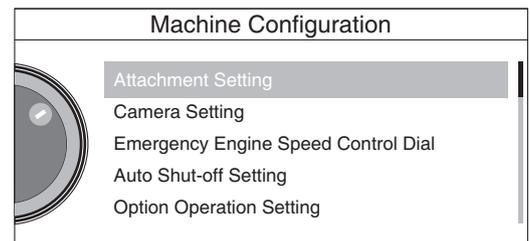


DS1601356

Figure 144

**Attachment Setting ↔ Camera Setting ↔ Emergency Engine Speed Control Dial ↔ Auto Shut-off Setting ↔ Option Operation Setting ↔ Other Setting ↔ Breaker Operation Time Setting**

Press the ESC button to return to the previous screen.



DS1601773

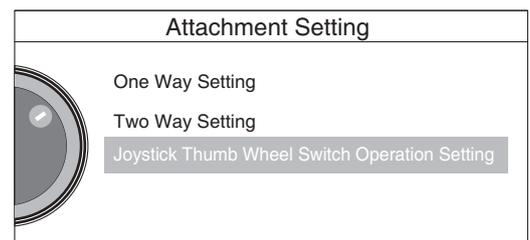
Figure 145

### A. Attachment Setting (If Equipped)

In this menu, performance of the one-way and two-way select and setting items can be selected.

**One Way Setting ↔ Two Way Setting ↔ Joystick Thumb Wheel Switch Operation Setting**

Press the ESC button to return to the previous screen.



DS1702201

Figure 146

## 1) One-way Select and Setting List

After proceeding to one-way setting, one-way select and setting screen will appear. When the cursor is placed on the list, operate the jog switch clockwise/counterclockwise to move the cursor.

Then, click on the jog switch to select one-way and setting item.

When turning the jog switch counterclockwise or pressing the Key 2 (◀), the cursor moves in the follows:

**One-way 1 Select** ← **One-way 1 Setting** ←  
**One-way 2 Select** ← **One-way 2 Setting** ←  
**One-way 3 Select** ← **One-way 3 Setting** ←  
**One-way 4 Select** ← **One-way 4 Setting** ←  
**One-way 5 Select** ← **One-way 5 Setting**

Once the cursor is placed on 1 Select, it does not move further to the left.

When turning the jog switch clockwise or pressing the Key 3 (▶), the cursor moves in the follows:

**One-way 1 Select** → **One-way 1 Setting** →  
**One-way 2 Select** → **One-way 2 Setting** →  
**One-way 3 Select** → **One-way 3 Setting** →  
**One-way 4 Select** → **One-way 4 Setting** →  
**One-way 5 Select** → **One-way 5 Setting**

Once the cursor is placed on 5 Setting, it does not move further to the right.

When the selection is completed, the "Select Complete!" pop-up window is displayed for 3 seconds, and the checkbox of the selected list is updated.

## 2) One-way Setting

The one-way setting screen is used to set up the max pressure, button type, max engine rpm and flow rate range.

When the cursor is placed on one-way setting button, click on the jog switch to access the one-way setting screen.

| One Way Setting |                                  |         |         |          |
|-----------------|----------------------------------|---------|---------|----------|
| No              | Selection                        | Setting | Flow    | Pressure |
| 1               | <input checked="" type="radio"/> | Set     | 240 lpm | 140 bar  |
| 2               | <input type="radio"/>            | Set     | 30 lpm  | 30 bar   |
| 3               | <input type="radio"/>            | Set     | 30 lpm  | 30 bar   |
| 4               | <input type="radio"/>            | Set     | 30 lpm  | 30 bar   |
| 5               | <input type="radio"/>            | Set     | 30 lpm  | 30 bar   |

DS1601775

Figure 147

| One Way Setting |                                  |         |         |          |
|-----------------|----------------------------------|---------|---------|----------|
| No              | Selection                        | Setting | Flow    | Pressure |
| 1               | <input checked="" type="radio"/> | Set     | 240 lpm | 140 bar  |
| 2               | <input type="radio"/>            |         |         | bar      |
| 3               | <input type="radio"/>            |         |         | bar      |
| 4               | <input type="radio"/>            |         |         | bar      |
| 5               | <input type="radio"/>            |         |         | bar      |

Select Complete!

DS1601776

Figure 148

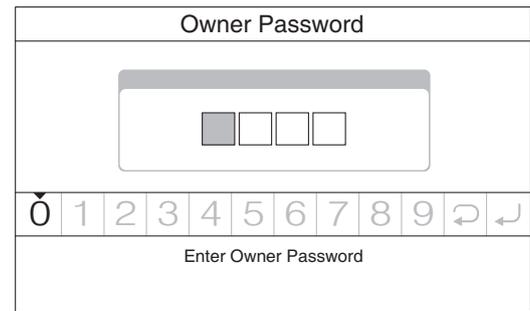
| One Way Setting |                       |         |         |          |
|-----------------|-----------------------|---------|---------|----------|
| No              | Selection             | Setting | Flow    | Pressure |
| 1               | <input type="radio"/> | Set     | 240 lpm | 140 bar  |
| 2               | <input type="radio"/> | Set     | 30 lpm  | 30 bar   |
| 3               | <input type="radio"/> | Set     | 30 lpm  | 30 bar   |
| 4               | <input type="radio"/> | Set     | 30 lpm  | 30 bar   |
| 5               | <input type="radio"/> | Set     | 30 lpm  | 30 bar   |

DS1601777

Figure 149

If the system is set up as the owner's password locked, access the attachment setting list screen by using owner's password input screen.

On the owner's password input screen, press the ESC button to return to the previous screen.



EX1301416

Figure 150

### Max Pressure

The maximum pressure of the one-way can be set.

The configurable max. pressure range is different by equipment.

The maximum pressure indication/setting resolution is 10 bar.

### Button Type

This item sets the applicability of the toggle of the breaker button when the breaker button is pressed once, and reset when pressed again.

If toggle is not selected, the breaker is only actuated while the breaker button is being pressed and held.

### Max E/G Limit

The maximum engine rpm of the equipment can be set.

The configurable maximum engine rpm range is different by equipment.

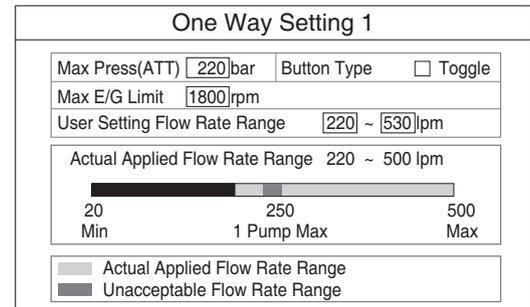
The maximum engine rpm setting resolution is 50 rpm.

### User Setting Flow Rate Range

User Setting Flow Rate Range enables the user to set the minimum and maximum flow rates for the attachment according to its specifications.

The minimum value can be set between the machine's minimum flow rate and the user's set maximum flow rate. Its setting resolution is 10 lpm.

The maximum value can be set between the user's set minimum flow rate and 1000 lpm. It should also be at least 50 lpm higher than the user's set minimum flow rate. Its setting resolution is 5 lpm.



DS1603031

Figure 151

## Actual Applied Flow Rate Range

Actual Applied Flow Rate Range is determined by the machine's possible flow rate range and the user's set flow rate range. Within this range, you can set the flow rate on the attachment setting pop-up of the Launch menu.

## Flow Rate Gauge

Flow Rate Gauge displays the flow rate range set for the machine. This range is from the minimum flow rate of the machine to the maximum flow rate which can be rendered by 2-pump operation.

Actual Applied Flow Rate Range is displayed in orange, and Unacceptable Flow Rate Range in gray.

The numbers at the bottom of the gauge indicate the minimum flow rate of the machine, the maximum flow rate in 1-pump operation, and the maximum flow rate in 2-pump operation, respectively.

### 3) Two-way Select and Setting List

After proceeding to two-way setting, two-way select and setting screen will appear.

When the cursor is placed on the list, operate the jog switch clockwise/counterclockwise to move the cursor.

Then, click on the jog switch to select two-way and setting item.

When turning the jog switch counterclockwise or pressing the Key 2 (◀), the cursor moves in the follows:

**Two-way 1 Select** ← **Two-way 1 Setting** ←  
**Two-way 2 Select** ← **Two-way 2 Setting** ←  
**Two-way 3 Select** ← **Two-way 3 Setting** ←  
**Two-way 4 Select** ← **Two-way 4 Setting** ←  
**Two-way 5 Select** ← **Two-way 5 Setting** ←

When the cursor is on the 1 select, it does not move further.

When turning the jog switch clockwise or pressing the Key 3 (▶), the cursor moves in the follows:

**Two-way 1 Select** → **Two-way 1 Setting** →  
**Two-way 2 Select** → **Two-way 2 Setting** →  
**Two-way 3 Select** → **Two-way 3 Setting** →  
**Two-way 4 Select** → **Two-way 4 Setting** →  
**Two-way 5 Select** → **Two-way 5 Setting** →

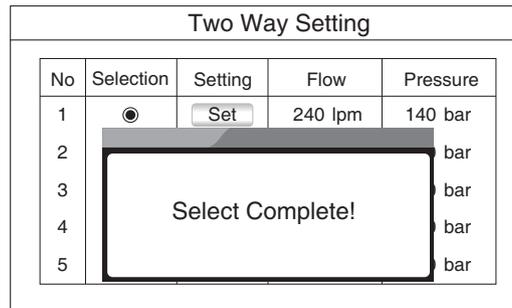
| Two Way Setting |           |         |         |          |
|-----------------|-----------|---------|---------|----------|
| No              | Selection | Setting | Flow    | Pressure |
| 1               | ●         | Set     | 240 lpm | 140 bar  |
| 2               | ○         | Set     | 30 lpm  | 30 bar   |
| 3               | ○         | Set     | 30 lpm  | 30 bar   |
| 4               | ○         | Set     | 30 lpm  | 30 bar   |
| 5               | ○         | Set     | 30 lpm  | 30 bar   |

DS1601779

Figure 152

When the cursor is on the 5 setting, it does not move further.

When the selection is completed, the "Select Complete!" pop-up window is displayed for 3 seconds, and the checkbox of the selected list is updated.



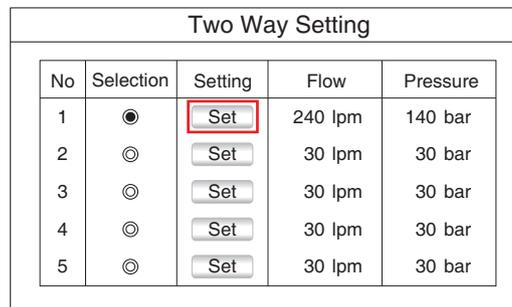
DS1601780

Figure 153

#### 4) Two-way Setting

The two-way setting screen is used to set up the max pressure, max engine rpm and flow rate range.

when the cursor is placed on two-way setting button, click on the jog switch to access the two-way setting screen.

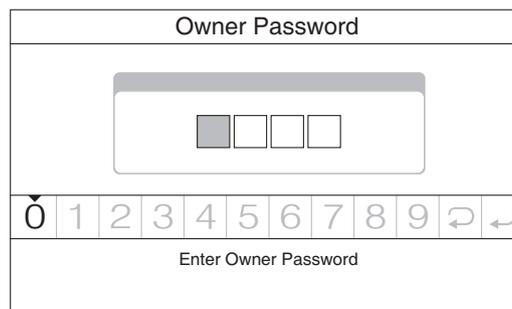


DS1601781

Figure 154

If the system is set up as the owner's password locked, access the attachment setting list screen by using owner's password input screen.

On the owner's password input screen, press the ESC button to return to the previous screen.



EX1301416

Figure 155

#### Max Pressure

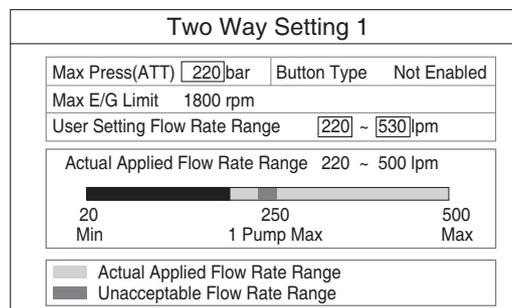
The maximum pressure of the two-way can be set.

The configurable max. pressure range is different by equipment.

The maximum pressure indication/setting resolution is 10 bar.

#### Button Type

As the button type is not used in two-way setting, it is displayed as not enabled.



DS1603032

Figure 156

### **Max E/G Limit**

The maximum engine rpm of the equipment can be set.

The configurable maximum engine rpm range is different by equipment.

The maximum engine rpm setting resolution is 50 rpm.

### **User Setting Flow Rate Range**

User Setting Flow Rate Range enables the user to set the minimum and maximum flow rates for the attachment according to its specifications.

The minimum value can be set between the machine's minimum flow rate and the user's set maximum flow rate. Its setting resolution is 10 lpm.

The maximum value can be set between the user's set minimum flow rate and 1000 lpm. It should also be at least 50 lpm higher than the user's set minimum flow rate. Its setting resolution is 5 lpm.

### **Actual Applied Flow Rate Range**

Actual Applied Flow Rate Range is determined by the machine's possible flow rate range and the user's set flow rate range. Within this range, you can set the flow rate on the attachment setting pop-up of the Launch menu.

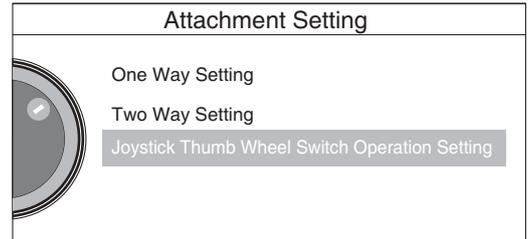
### **Flow Rate Gauge**

Flow Rate Gauge displays the flow rate range set for the machine. This range is from the minimum flow rate of the machine to the maximum flow rate which can be rendered by 2-pump operation.

Actual Applied Flow Rate Range is displayed in orange, and Unacceptable Flow Rate Range in gray.

The numbers at the bottom of the gauge indicate the minimum flow rate of the machine, the maximum flow rate in 1-pump operation, and the maximum flow rate in 2-pump operation, respectively.

5) Joystick Thumb Wheel Switch Operation Setting

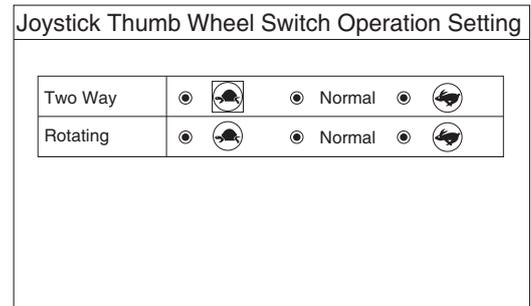


DS1702201

Figure 157

Sensitivity of two way or rotating thumb wheel switch can be set.

- : Soft
- Normal: Normal
- : Fast



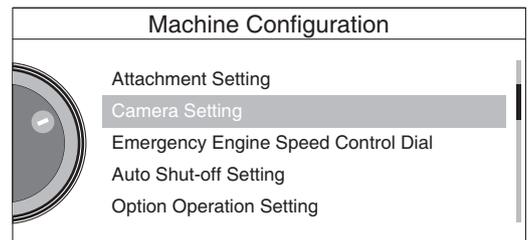
DS1604711

Figure 158

B. Camera Setting

The camera setting screen is designed to set up various cameras "ON/OFF" and normal/mirror.

From the machine configuration, select camera setting to access the camera setting list screen.



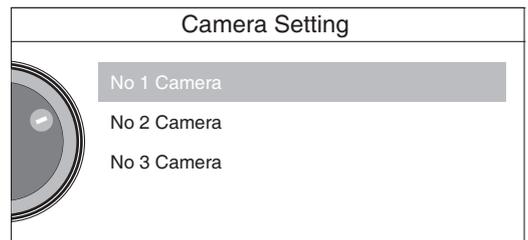
DS1601783

Figure 159

The camera setting list screen displays various camera states (ON/OFF, NORMAL/MIRROR).

Select a camera and click the jog switch to access the relevant camera setting screen.

Press the ESC button to return to the previous screen.

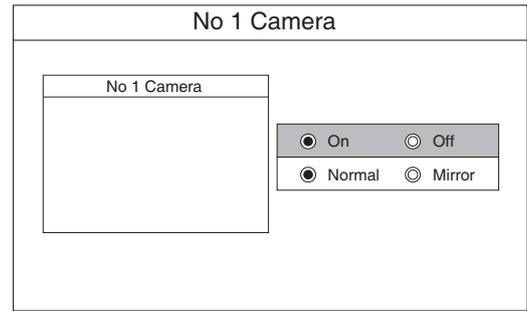


DS1601359

Figure 160

On the camera setting screen, set up the camera state (ON/OFF, NORMAL/MIRROR).

Also, see the actual image of the currently installed camera.



EX1301421

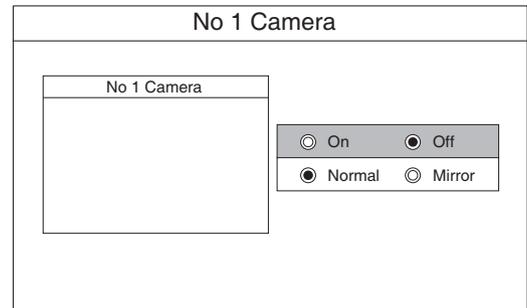
Figure 161

If a camera is not installed, the camera image section is shown as a blue screen.

If the cursor is placed on "ON/OFF", click on the jog switch to set up "ON" ↔ "OFF".

Turn the jog switch to locate the cursor at normal/mirror. Then, click on the jog switch to set up normal ↔ mirror.

**NOTE:** *The No 1 camera is fixed with the mirror mode. Therefore, normal/mirror mode selection is impossible.*



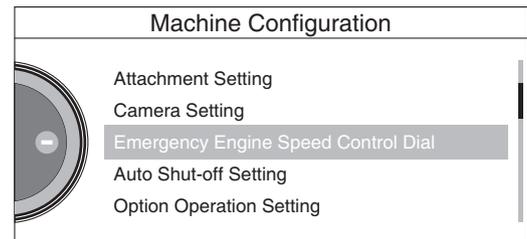
EX1301422

Figure 162

### C. Emergency Engine Speed Control Dial

The emergency engine speed control dial screen provides a method whereby to use the gauge panel's jog switch and control the engine rpm, replacing the engine control dial.

From the machine configuration, select the emergency engine speed control dial to access it.

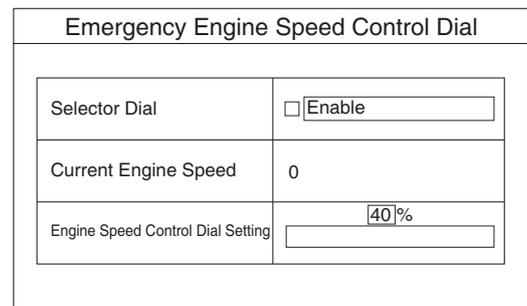


DS1601784

Figure 163

If you access the emergency engine speed control dial screen, the initial cursor is located at the selector dial.

If the selector dial is shown as disable, the cursor cannot be moved.



DS1601361

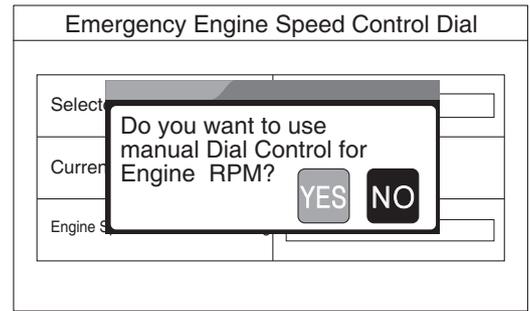
Figure 164

When the cursor is placed at the selector dial, if you click on the jog switch, a pop-up window will be created, saying "Do you want to use manual Dial Control for Engine rpm?".

Operate the jog switch and select "YES/NO" to determine whether to use jog shuttle for dial.

If you select "YES", then selector dial is enabled, causing the pop-up window to disappear.

If you select "NO", then selector dial remains disabled, causing the pop-up window to disappear.



DS1601362

Figure 165

If the selector dial is shown as enable, operate the jog switch clockwise and move the cursor to the setting rpm dial. When the cursor is placed at the setting rpm dial, click on the jog switch to cause the cursor to flicker, changing into an editing mode to set up the rpm dial. When the cursor is placed at the editing mode, operate the jog switch clockwise/counterclockwise, thus setting up the engine rpm.

When the cursor is at the editing mode, press the ESC button to disable the editing mode. When the cursor is not at the editing mode, press the ESC button to return to the previous screen.

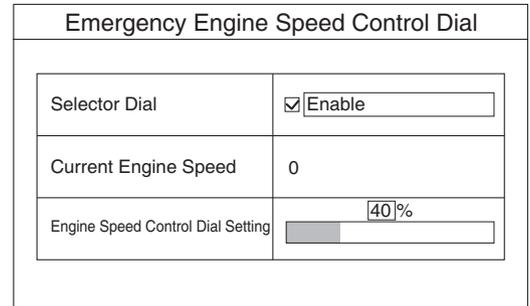
Before keying off the gauge panel or disabling the selector dial, control the engine rpm only with the shuttle of the gauge panel's jog shuttle.

#### D. Auto Shut-off Setting

**NOTE:** *This function is not available in some models.*

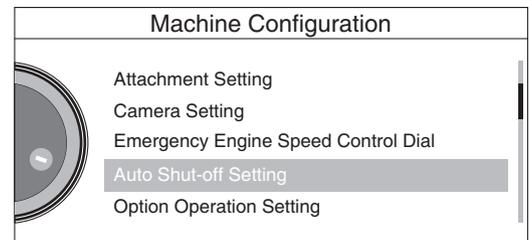
In the auto shut-off setting screen, the engine of the equipment can be set to shut off automatically when the equipment is not operated for a preset time.

Select auto shut-off setting in the machine settings and proceed to the setting screen.



DS1601363

Figure 166



DS1601785

Figure 167

In the auto shut-off setting screen, the cursor will initially be over auto shut-off function in use.

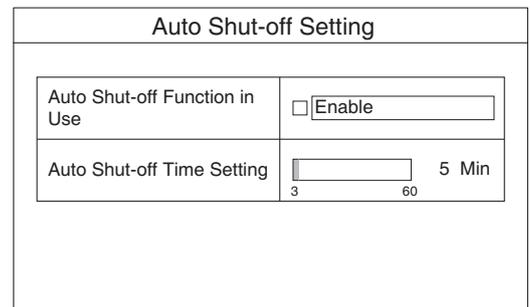
**NOTE:** *This feature is off in factory defaults.*

To use the feature, place the cursor over auto shut-off function in use and click the jog switch to select the feature.

The engine can be set to shut off automatically after a maximum of 60 minutes to a minimum of 3 minutes.

In factory defaults, the time is set to 5 minutes. Further, this feature is off in factory defaults.

The following conditions must be met if this feature is to be used.



DS1601365

Figure 168

## Auto Shut-off (ASD) Active Condition

|          | Input                  |                |                                 |                     |            |                |                 |             |                 | Output             |                              |                          |                            |
|----------|------------------------|----------------|---------------------------------|---------------------|------------|----------------|-----------------|-------------|-----------------|--------------------|------------------------------|--------------------------|----------------------------|
|          | Gauge Panel Menu       | Auto Idle Mode | DeSOx Switch (SCR Regen Signal) | Pilot Cutoff Switch | Engine rpm | Coolant Temp.  | Hydraulic Temp. | Dial Status | Time            | Signal             | Symbol                       | Pop-up                   | Alarm                      |
| Active   | ON                     | ON             | OFF                             | OFF                 | Low rpm    | More than 50°C | More than 20°C  | Normal      | at Setting Time | Engine Stop Signal | ASD Operating Indicator "ON" | 1 minute Before Stopping | 10 seconds Before Stopping |
| Deactive | Except Above Condition |                |                                 |                     |            |                |                 |             |                 | Time Count Reset   |                              |                          |                            |

When this feature is activated and the above conditions are met, "Engine will shut off" will pop up 1 minute before the engine shuts off.

Further, 10 seconds before the engine shuts off, the pilot buzzer will be activated to alert the user.



## WARNING

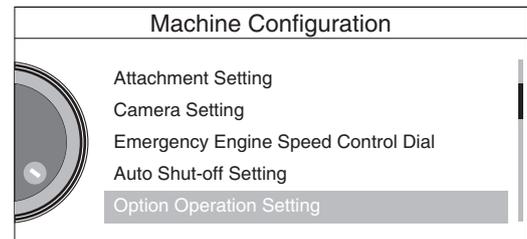
### AVOID DEATH OR SERIOUS INJURY

**When the auto shut-off feature is used, the engine shuts off automatically after the preset time, and thus particular care must be taken that no safety problems occur when it is used.**

#### E. Option Operation Setting (Option)

When the two-way option is installed, the operation input signal of the attachment can be set to be used through either the joystick or the hydraulic pedal in the option operation setting screen.

Select option operation setting in the machine settings and proceed to the settings screen.



DS1601786

Figure 169

'Joystick Thumb Wheel' and 'Option Pedal' can be selected in option operation settings.

#### Joystick Thumb Wheel

The one-way/two-way operation signal can be input as a joystick manipulation signal.

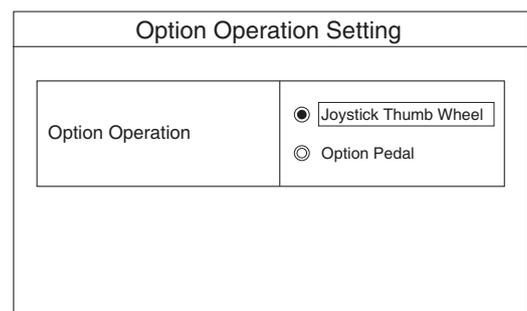
If this item is selected in a machine in which a hydraulic pedal is installed, the hydraulic pedal will be deactivated.

#### Option Pedal (Option)

This option is available only in machines with the two-way option with a hydraulic pedal installed.

The one-way/two-way operation signal can be input as a hydraulic pedal manipulation signal.

If this item is selected, the input signal of the joystick thumb wheel is deactivated.

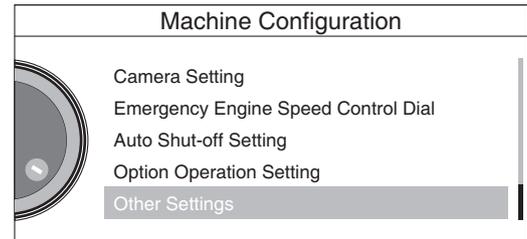


DS1603098

Figure 170

## F. Other Settings

The auto idle rpm is adjusted according to the ambient temperature to enhance heater performance in winter.



DS1603479

Figure 171

### Change Auto Idle RPM as the Temperature

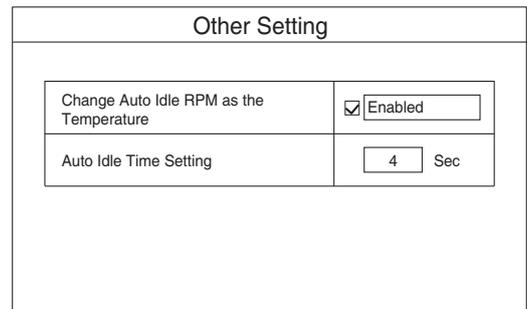
The default value is "Enable." When the ambient temperature is below 10°C, the auto idle rpm is set to 1100 rpm. It is set to 800 rpm with the ambient temperature over 10°C.

When disabling this menu item, the auto idle rpm is fixed to 800 rpm regardless of change in the ambient temperature.

### Auto Idle Time Setting

Operator can set the time for entering the auto idle mode.

- Default Time: 4 sec

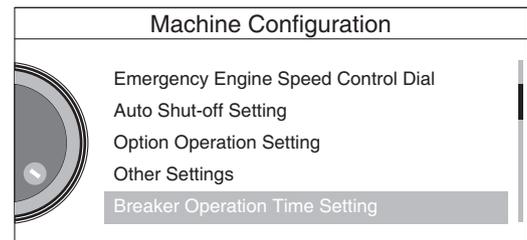


DS1702202

Figure 172

## G. Breaker Operation Time Setting

This machine limits the continuous operation time of the breaker in order to prevent damages to its components.

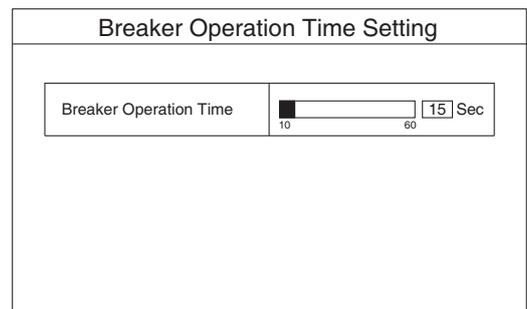


DS1601787

Figure 173

You can adjust this time limit in the page of Breaker Operation Time Setting.

- Setting Time Range: 10 - 60 sec
- Default Time: 15 sec

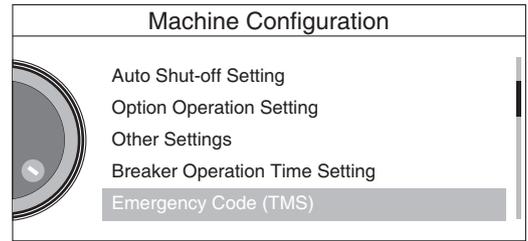


DS1601788

Figure 174

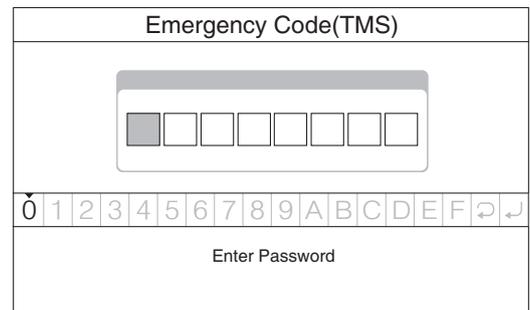
## H. Emergency Code (TMS)

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.



DS1702205

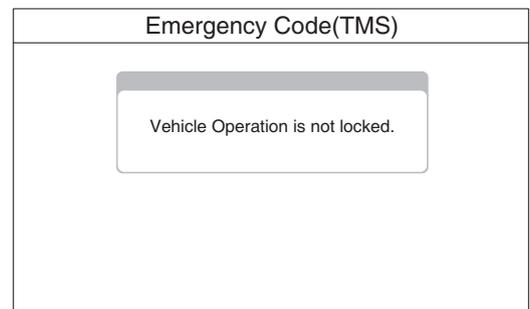
**Figure 175**



DS1701751

**Figure 176**

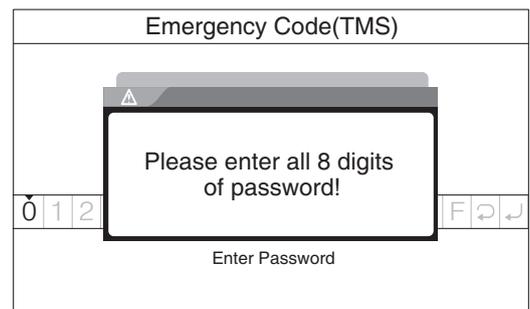
If you enter the menu when the machine is not locked, the screen will be shown as in Figure 177.



DS1701752

**Figure 177**

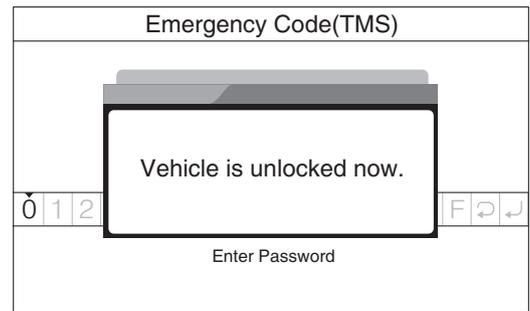
Pressing the Enter key without a 8-digit password typed in will prompt a pop-up as shown in Figure 178.



DS1701753

**Figure 178**

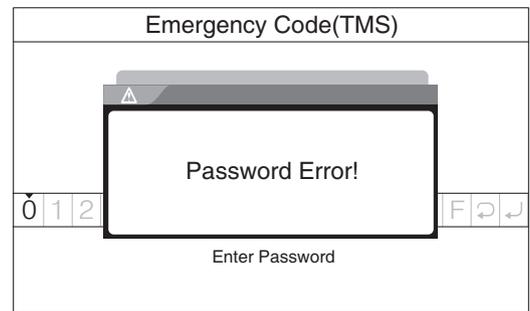
If you type in a 8-digit password and press Enter and that results in "Unlock Success" data from the TMS server, then a pop-up will appear as shown in Figure 179.



**Figure 179**

DS1701754

If you type in a 8-digit password and press Enter and that results in "Unlock Fail" data from the TMS server, then a "Password Error" pop-up will appear as shown in Figure 180.



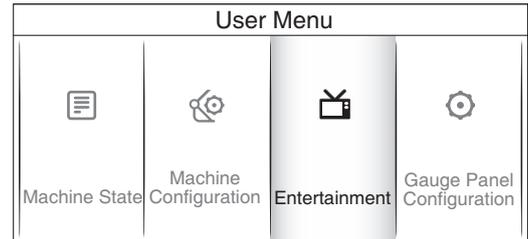
**Figure 180**

DS1701781

### 3. Entertainment

This menu is used to replay videos and MP3.

Turn the jog switch and move the cursor to see a reversed display on the desired menu. Then, click on the jog switch to select the menu.



DS1601367

Figure 181

#### Video ↔ MP3

Press the ESC button to return to the previous screen.



DS1601368

Figure 182

If the use of entertainment is limited, this pop-up window will be created.

To lift the use limits, you should change the limit setup in the Gauge Panel configuration.

The pop-up window will automatically disappear in 3 seconds. Press the ESC button or the jog switch to remove pop-up window.

For details, See "Gauge Panel Configuration" on page 2-80.

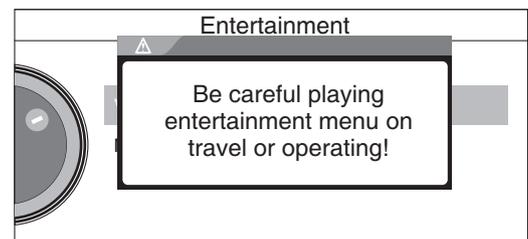


DS1601369

Figure 183

If the use of entertainment is not limited, this pop-up window will be created. The pop-up window will automatically disappear in 3 seconds.

Press the ESC button or the jog switch to remove pop-up window.



DS1601370

Figure 184



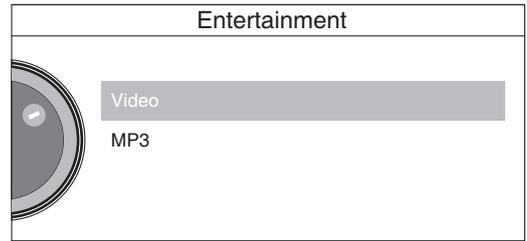
## WARNING

### AVOID DEATH OR SERIOUS INJURY

Listening to entertainment clips, such as video, music, etc., can cause an accident, resulting in death or serious injury. Do not play entertainment files when operating the machine.

A. Video

From the entertainment screen, select video to access it.



DS1601368

Figure 185

When there is no USB storage system, a pop-up window is displayed for 3 seconds, saying "USB Storage is not installed". and the video is not played.



DS1601371

Figure 186

When initially accessing the video player, the USB storage system file tree is displayed on the screen, operate the jog switch clockwise/counterclockwise to select and play a video.

If there is a video file that played last, it will automatically be replayed.



FG018511

Figure 187

If the format is not supported, a pop-up window is displayed for 3 seconds, saying "This file is not available!" and the video is not played.



EX1301451

Figure 188

Formats that can be supported are given below.

| Formats that can be supported |   |
|-------------------------------|---|
| File Type                     | AVI, MP4, MKV, MOV  |
| Supported Resolution          | 720*480, 720*384, 720*304, 704*448, 704*304, 640*480, 640*360, 640*272, 640*352, 672*288, 512*384, 576*432, 480*320, 480*360, 320*240 |
| Supported Video Codec         | H.264, MPEG4, Xvid, MPEG1/2   |
| Supported Audio Codec         | MP3   |
| Supported File Size           | Under 1.7 GB  |
| Supported USB Format          | FAT32   |

The screen composition of the video player is given below.

The top section displays the current playing time of the total playing time.

The screen center shows the video being played.

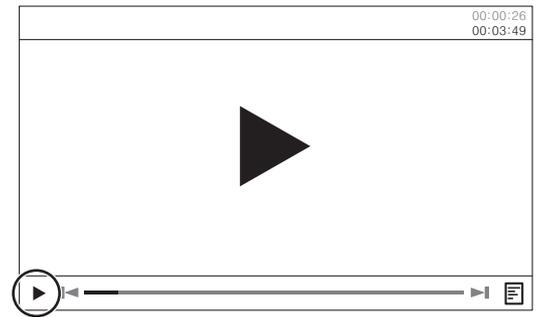
The bottom displays the video player function operation symbol and cursor.

The video player function operation symbol and jog switch are operated in the following order.

**Play/Pause** ↔ **Replay the Previous File** ↔ **Video Progress Bar** ↔ **Replay the Next File** ↔ **Video Files List**

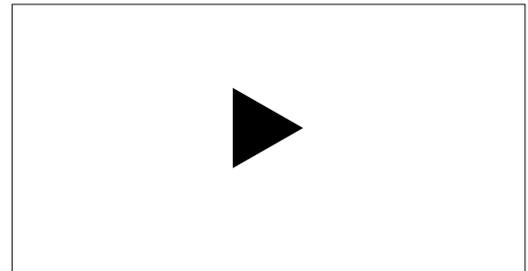
If no operation continues for more than 5 seconds, the video will automatically be converted into the whole screen.

On the whole screen, click on the jog switch or the ESC button to remove whole screen.



EX1301452

Figure 189



FG018214

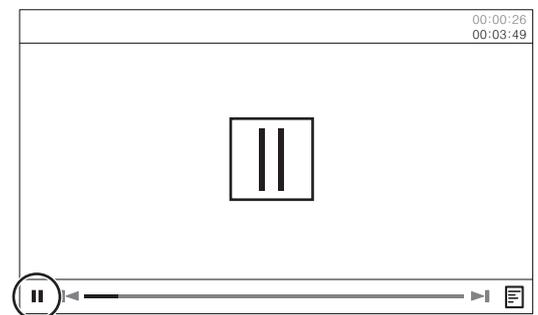
Figure 190

### Play/Pause

Locate the cursor on the play/pause symbol and click on the jog switch to execute the video's play/pause functions.

With the play being on, click on the jog switch to display the pause symbol at the center of the screen, thus allowing the video to pause.

With the pause being on, click on the jog switch to cause the pause symbol at the center of the screen to disappear, resuming the video playing.

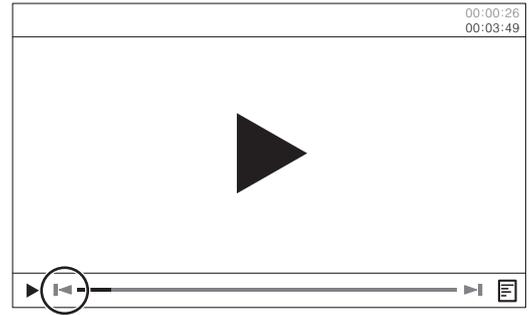


EX1301453

Figure 191

### Replay the Previous File

Locate the cursor at the replay the previous file symbol and click on the jog switch to replay the previous file.



EX1301454

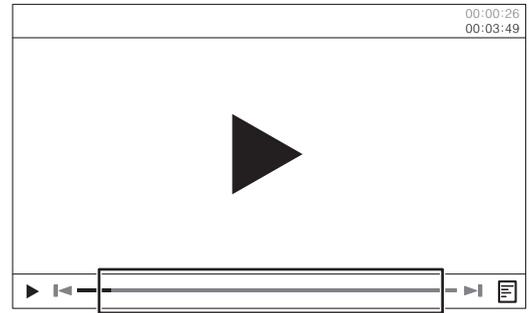
Figure 192

Locate the cursor at the video progress bar and click on the jog switch to convert into the fast forward/rewinding mode.

On the fast forward/rewinding mode, operate the jog switch clockwise/counterclockwise to conduct fast forward/rewinding.

Fast forward/rewinding can be conducted at an interval of 30 seconds per click during which the jog switch is turned.

On the fast forward/rewinding mode, press the ESC button to disable the fast forward/rewinding mode.

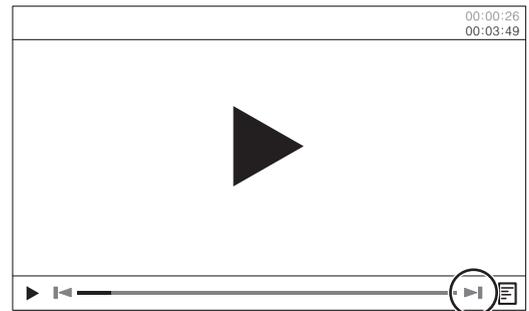


EX1301455

Figure 193

### Replay the Next File

Locate the cursor at the replay the next file symbol and click on the jog switch to replay the next file.

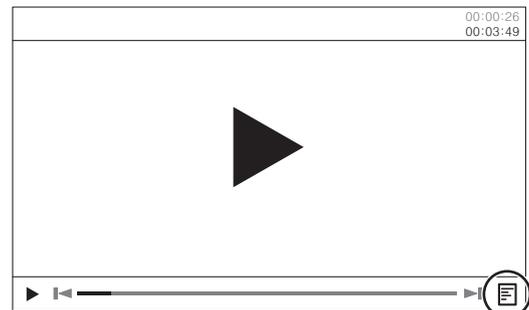


EX1301456

Figure 194

### Video Files List

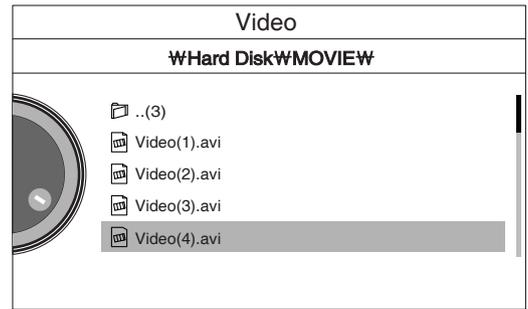
Locate the cursor at the video files list symbol and click on the jog switch to move to the video file list screen.



EX1301457

Figure 195

Select and replay a video.

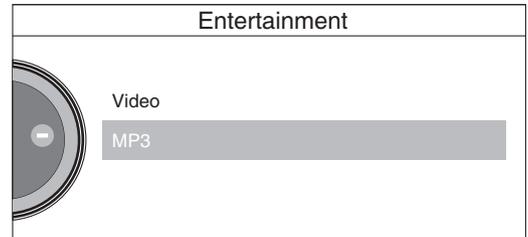


FG018557

Figure 196

**B. MP3**

From the entertainment screen, select MP3 to access it.



DS1601372

Figure 197

If there is no USB storage system, a pop-up window is displayed for 3 seconds, saying "USB Storage is not installed". and the MP3 player is not run.

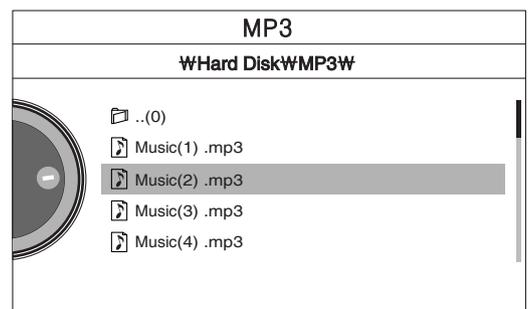


DS1601373

Figure 198

When initially accessing the MP3 player, the file tree screen of USB storage system is displayed. Operate the jog switch clockwise/counterclockwise to select and play an MP3 file.

If there is an MP3 file played last, the file will automatically be played.



FG018560

Figure 199

The screen composition of MP3 player is given below.

The top section displays the name of the file being played and the current playing time of the total playing time.

The screen center shows the album image of the file being played, the album name, the song name and the name of the next file to be played.

The bottom displays the MP3 player function operation symbol and cursor.

The MP3 player function operation symbol and jog switch are operated in the following order.

**Play/Pause** ↔ **Replay the Previous File** ↔ **MP3 Progress Bar** ↔ **Replay the Next File** ↔ **MP3 Files List** ↔ **Background MP3 Play**

### Play/Pause

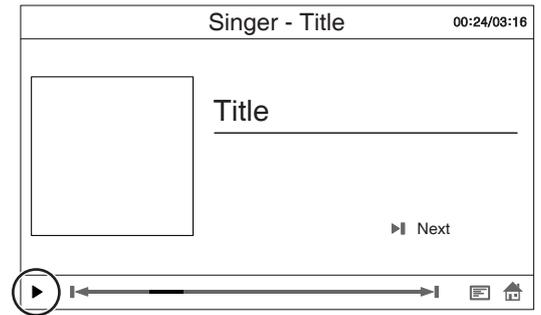
Locate the cursor at the play/pause symbol and click on the jog switch to execute the MP3 play/pause functions.

With play being on, click the jog switch to display the pause symbol at the center of the screen, causing the MP3 to pause.

With pause being on, click on the jog switch to cause the pause symbol at the center of the screen to disappear, resuming the MP3 playing.

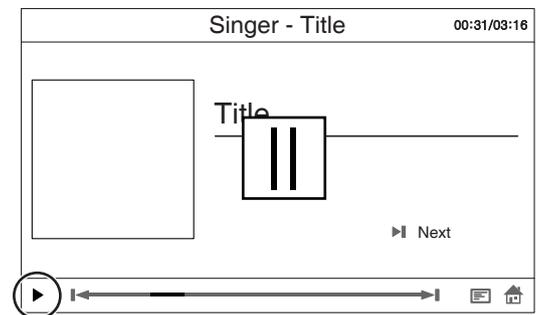
### Replay the Previous File

Locate the cursor at the replay the previous file symbol, and click on the jog switch to replay the previous file.



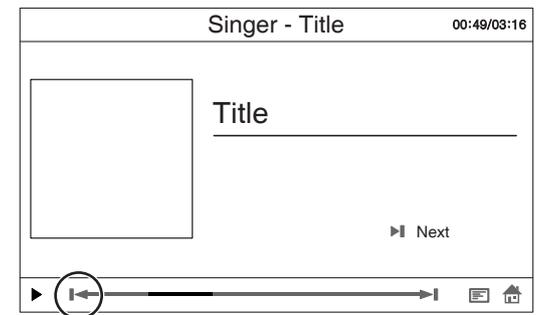
FG020124

Figure 200



FG020125

Figure 201



FG020126

Figure 202

### Fast Forward/Rewinding

Locate the cursor at the video progress bar and click on the jog switch to convert into the fast forward/rewinding mode.

On the fast forward/rewinding mode, operate the jog switch clockwise/counterclockwise to conduct fast forward/rewinding.

Fast forward/rewinding can be conducted at an interval of 30 seconds per click during which the jog switch is turned.

On the fast forward/rewinding mode, press the ESC button to disable the fast forward/rewinding mode.

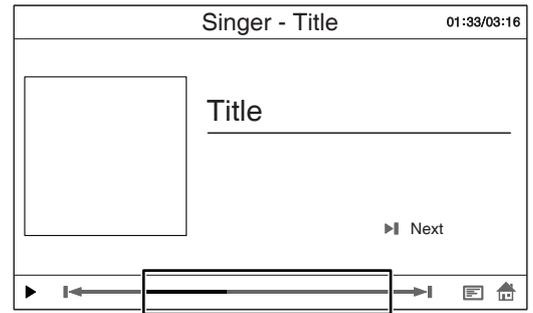
### Replay the Next File

Locate the cursor at the replay the previous file symbol and click on the jog switch to replay the next file.

### MP3 Files List

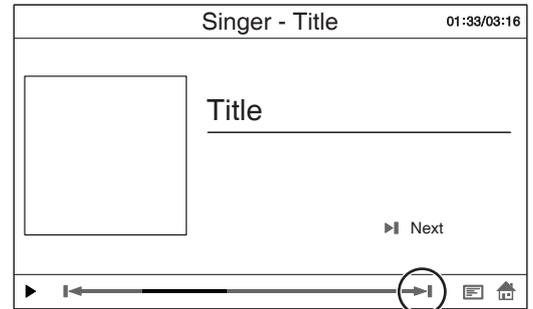
Locate the cursor at the MP3 files list symbol and click on the jog to move to the file list screen.

Select a file and replay the MP3.



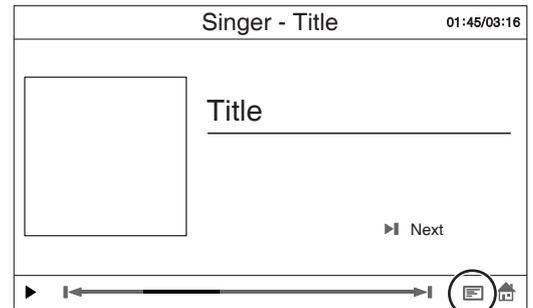
FG020127

Figure 203



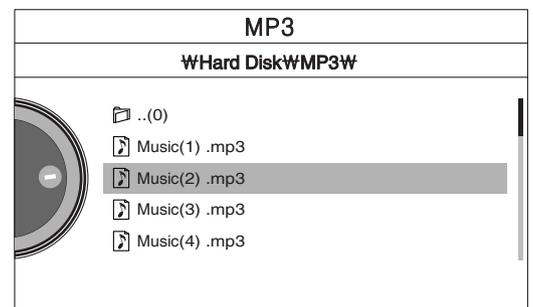
FG020128

Figure 204



FG020129

Figure 205

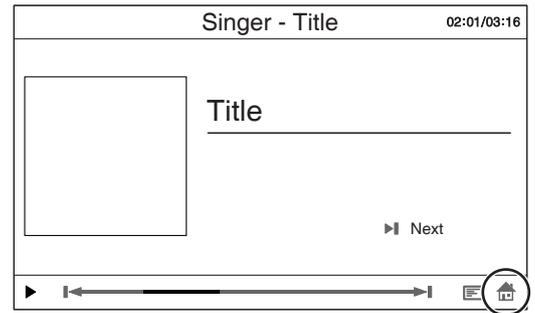


FG018560

Figure 206

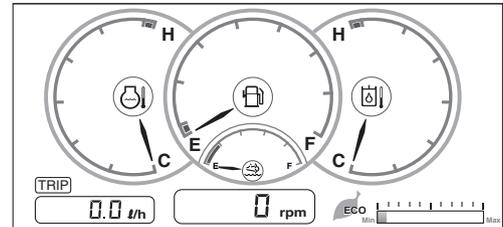
## Background MP3 Play

Position the cursor on the "HOME" button and pressing the jog switch, MP3 is played by the initial screen.



FG020130

Figure 207



DS1601374

Figure 208

## 4. Gauge Panel Configuration

This menu is used to set up password, brightness, default screen and time, and to input service phone number. Turn the jog switch and move the cursor to see a reversed display on the desired menu. Then, click on the jog switch to select the menu.

**Password Setting ↔ Brightness Setting ↔ Default Power Mode Setting ↔ Default Screen Setting ↔ Time Setting ↔ Service Phone Number Setting ↔ Unit Setting ↔ Language Setting ↔ Notification Setting ↔ Entertainment Use Setting**

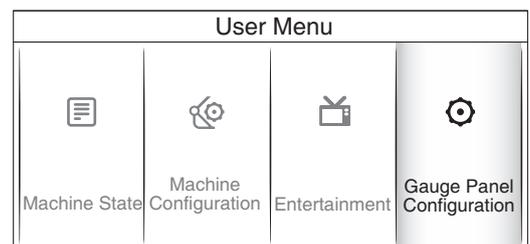
Press the ESC button to return to previous screen.

### A. Password Setting

#### Password Setting

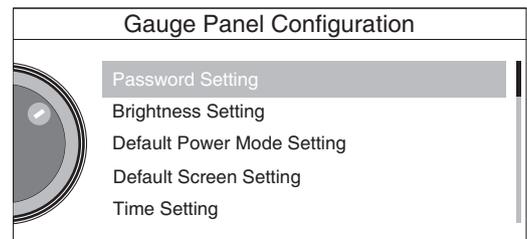
An owner passwords and operator passwords can be set (Only the owner password is selected in the default shipment state).

By using the password setting function, you can manage usage of operations and functions of the machine.



DS1601375

Figure 209



DS1601376

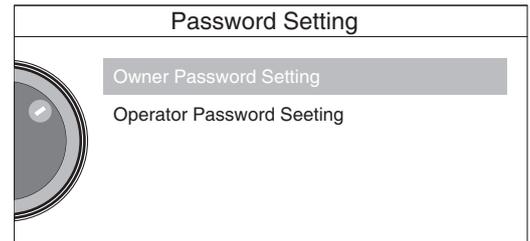
Figure 210

## Owner Password Setting

### 1) Selection

An owner password can be set for managing functions of equipment and use privileges of the equipment for different operators.

To set an owner password, place the cursor over Owner Password Setting in the settings screen and click the jog switch (or press "Enter" on the keypad).



DS1603033

Figure 211

### 2) Password entry

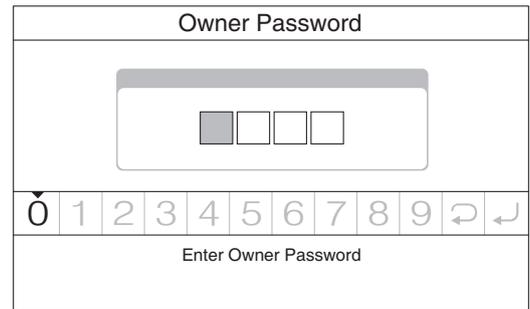
When the password entry screen appears, use the jog switch (or the keypad) to enter the password and move to the settings screen.

The default password is "1111".

#### How to enter the password

Rotate the jog switch to select digits from 0 to 9 below, and click Enter on the jog switch to input the password.

If the password is input incorrectly, use the ↶ button on the lower right to delete the input password.



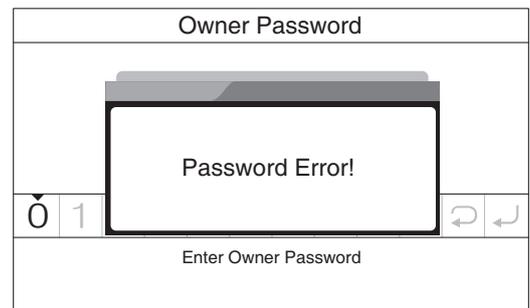
EX1301416

Figure 212



## NOTICE

**If the password is input incorrectly three times in a row, you will be redirected to the main screen and the system will not start for the next 10 minutes.**

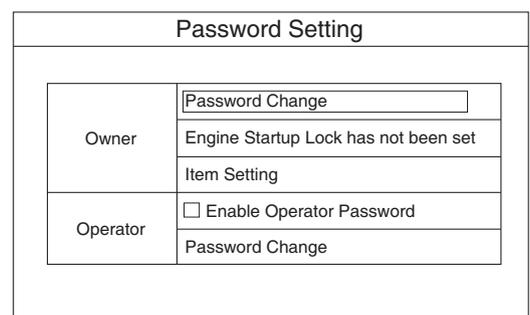


EX1301433

Figure 213

### 3) Structure

Owner password settings include password change, start-up restriction settings, function item settings, operator password use settings, and operator password change.



DS1603034

Figure 214

## Password change

To change the owner password, select password change with the jog switch (or the keypad).

EX1301435

Figure 215

When the owner password has been changed, "Password Set!" will pop-up.

DS1603035

Figure 216

## Item setting

Operator privileges and settings for engine start-up, attachment settings, and entertainment use settings can be set.

**NOTE:** *Permission, which gives certain operators permission to use certain features, can only be checked when use is checked.*

*In this case, the operator has the same privileges as the owner, and the operator's settings take precedence in equipment settings.*

**NOTE:** *This setting is off by default.*

- a) Engine startup  
Setting of password input upon operation of equipment.
- b) Attachment setting  
Setting of password input for attachment setting.
- c) Entertainment use setting  
Setting of password input for entertainment (video/MP3) use setting.

| Item                      | Enable Operator Password            | Permission                          |
|---------------------------|-------------------------------------|-------------------------------------|
| Engine Startup            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Attachment Setting        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Entertainment Use Setting | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |

DS1603036

Figure 217

### Engine start-up setting

By selecting "Engine Start-up" among item settings the reentry time for password entry upon start-up of the equipment can be set.

**NOTE:** *No password for start-up of the equipment is set by default.*

- a) Always  
Password is entered with each start-up.
- b) 1 min  
If the system is started again within 1 minute from key-off after the password is input, the password is not requested again.
- c) 5 min  
If the system is started again within 5 minutes from key-off after the password is input, the password is not requested again.

### Operator password setting

- a) Operator password use setting  
Sets use of the operator password.
- b) Operator password change  
After setting use privileges for the operator password, the owner can change the operator password.

### Operator Password Setting

- 1) Selection

If the owner checks operator password use in owner password setting, operator password setting will appear in the password setting screen so operator password can be set. (refer to "Owner Password Setting" on page 2-81).

To set a operator password, place the cursor over Operator Password Setting in the Password Setting screen and click the jog switch (or press "Enter" on the keypad).

- 2) Password entry

When the password input screen appears, input the password with the jog switch (or keypad) and move to the settings screen. (refer to "Owner Password Setting 2" on page 2-71.)

The default password is "1111".

| Password Setting |  |
|------------------|--|
| Owner            | Password Change<br><input checked="" type="radio"/> Always <input type="radio"/> 1min <input type="radio"/> 5min<br>Item Setting |
|                  | <input type="checkbox"/> Enable Operator Password<br>Password Change   |
| Operator         | Password Change  |

DS1603037

Figure 218

| Password Setting |   |
|------------------|---|
| Owner            | Password Change<br>Engine Startup Lock has not been set!<br>Item Setting        |
|                  | <input checked="" type="checkbox"/> Enable Operator Password<br>Password Change |
| Operator         | Password Change   |

DS1603038

Figure 219

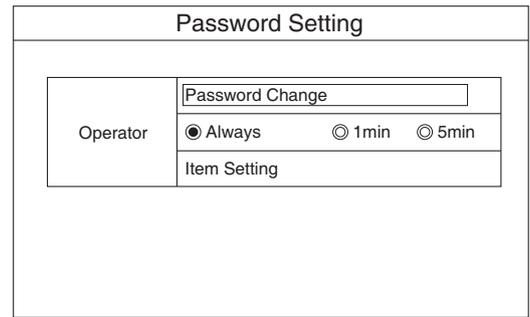
| Password Setting |   |
|------------------|---|
|                  | Owner Password Setting<br>Operator Password Setting |

DS1603039

Figure 220

### 3) Structure

Operator password settings include password change, start-up restriction settings, and function item settings.

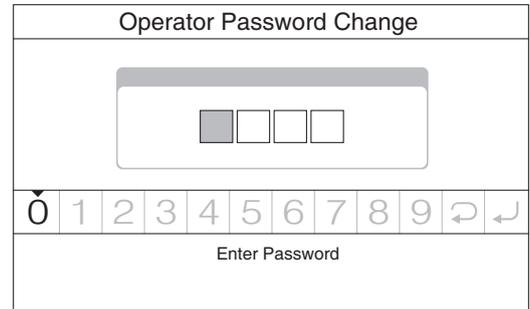


DS1603040

Figure 221

#### Password change

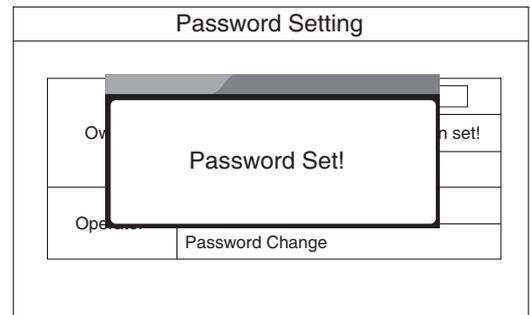
To change the operator password, select password change, and change the operator password using the jog switch (or keypad).



DS1603041

Figure 222

When the operator password is changed, "Password Set!" will pop-up.



DS1603042

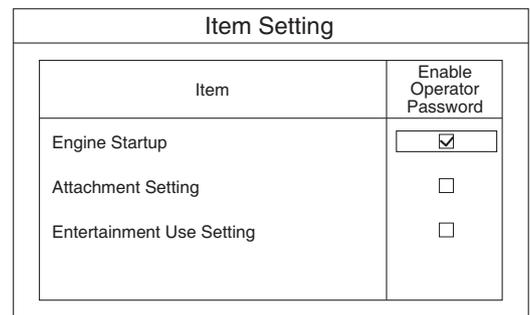
Figure 223

#### Item setting

Use of engine start-up, attachment setting, and entertainment use setting can be set.

**NOTE:** *This is only possible when permitted by the owner.*

- a) Engine startup  
Setting of password input upon operation of equipment.
- b) Attachment setting  
Setting of password input for attachment setting.
- c) Entertainment use setting  
Setting of password input for entertainment (video/MP3) use setting.



DS1603043

Figure 224

### Engine start-up setting

By selecting "Engine Start-up" among item settings the reentry time for password entry upon start-up of the equipment can be set.

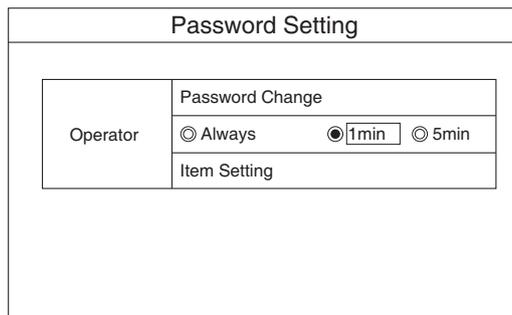
- a) Always  
Password is entered with each start-up.
- b) 1 min  
If the system is started again within 1 minute from key-off after the password is input, the password is not requested again.
- c) 5 min  
If the system is started again within 5 minutes from key-off after the password is input, the password is not requested again.

**NOTE:** *If the owner uses the engine start-up feature but does not permit the operator to use it, the operator cannot select whether to use the feature, but can select the password reentry time.*

### B. Brightness Setting

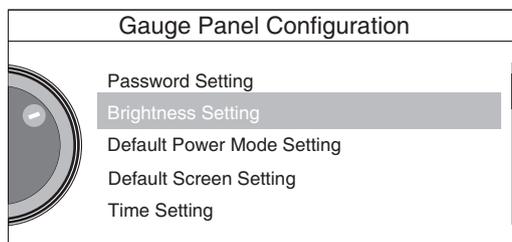
On the Gauge Panel configuration screen, when cursor is placed on brightness setting, click on the jog switch to display the screen brightness setting and camera brightness setting screen.

If you want to change the screen brightness, select the screen brightness setting to display the brightness adjustment screen.



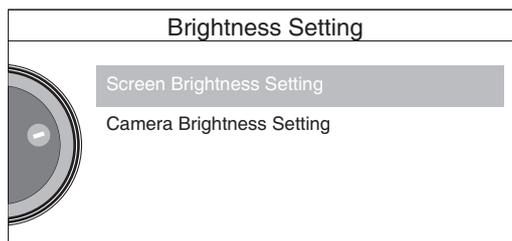
DS1603044

Figure 225



DS1601379

Figure 226



DS1601380

Figure 227

Turn the jog switch and adjust the brightness of 0 - 100% at an interval of 10%.

The screen brightness when manufactured is set as 80%.

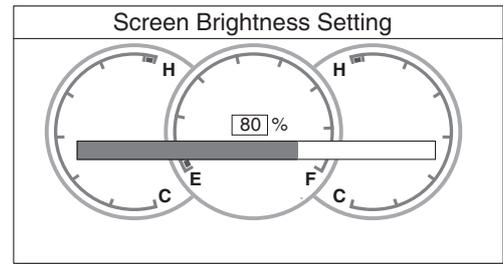
Press the ESC button to return to the previous screen.

**NOTE:** *It automatically adjusts the screen brightness to prevent overheating of the monitor.*

*When the warning pop-up window appears, the change of the brightness setting menu is disabled.*

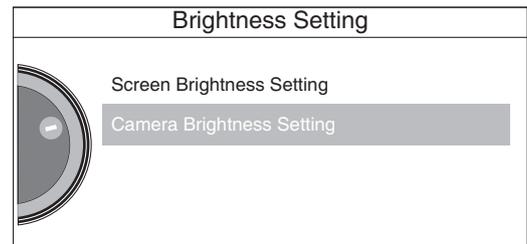
*When the monitor temperature drops below 90°C (194°F), the brightness of the monitor returns to the set brightness.*

If you want to change the camera screen brightness, select the camera brightness setting to display the camera screen brightness adjustment screen.



EX1404972

Figure 228



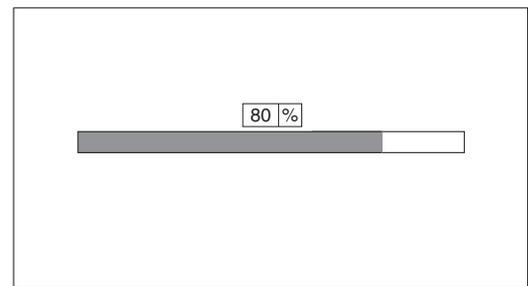
DS1601381

Figure 229

Turn the jog switch to adjust the brightness of 0 - 100% at an interval of 10%.

The camera screen brightness at the machine release time is set as 80%.

Press the ESC button to return to the previous screen.

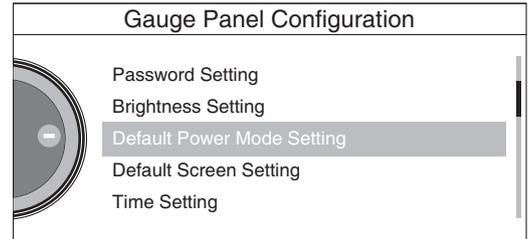


EX1404851

Figure 230

C. Default Power Mode Setting

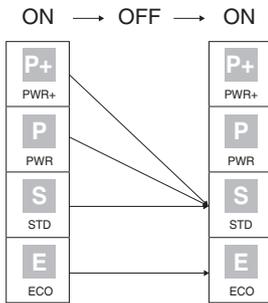
On the Gauge Panel configuration screen, when cursor is placed on default power mode setting, click on the jog switch to access the default power mode setting.



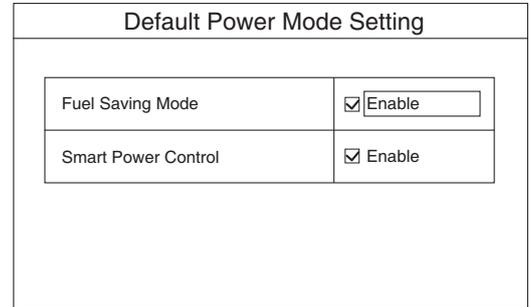
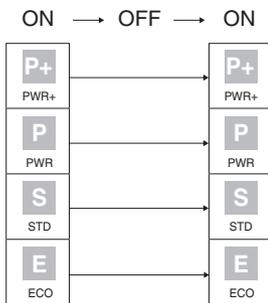
DS1603047

Figure 231

**Fuel Saving Mode is Enable**



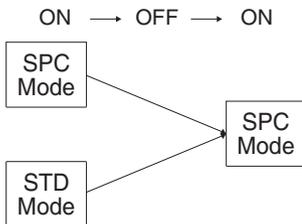
**Fuel Saving Mode is Disable**



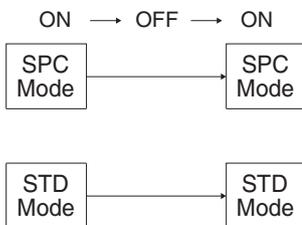
EX1301446

Figure 232

**Smart Power Control is Enable**

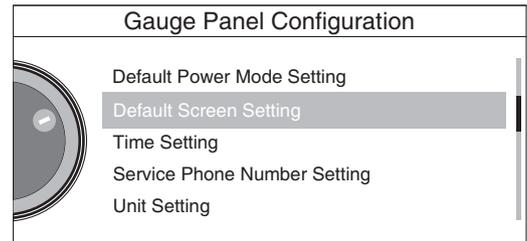


**Smart Power Control is Disable**



#### D. Default Screen Setting

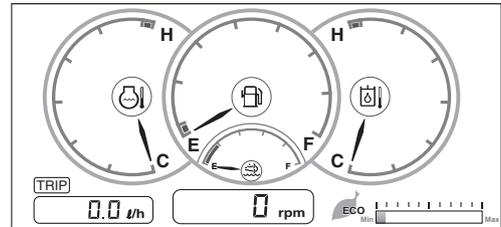
Sets the main screen display on the instrument panel.



DS1601384

Figure 233

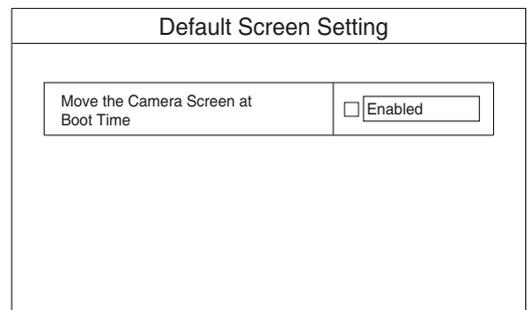
The initial screen shows basic information, including the fuel level, coolant temperature and hydraulic oil temperature.



DS1601385

Figure 234

Enter the "Default Screen Setting" menu and select "Enable" for this function. Then, the main screen shows the camera view next time the starter switch is turned to the ON position.



EX1402182

Figure 235



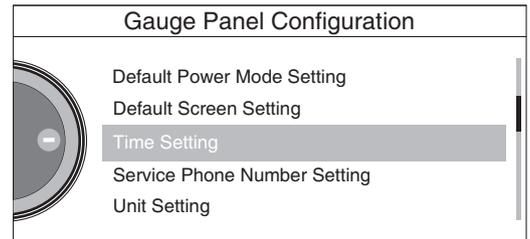
EX1402183

Figure 236

### E. Time Setting

On the Gauge Panel configuration screen, when cursor is placed on time setting, click the jog switch to access the time setting.

Turn the jog switch and locate the cursor at a target of change. Then, click on the jog switch to change the target.



DS1601386

Figure 237

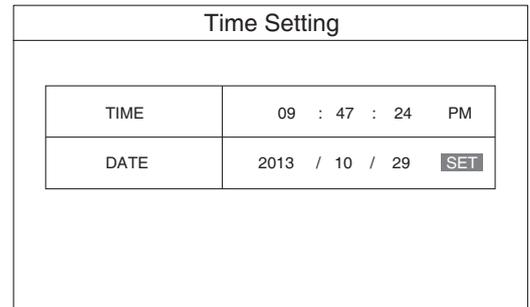
Turn the jog switch to change numbers of each item.

If the setup is completed, click on the jog switch to store the setup details.

When the time setting is completed, locate cursor to 'SET' and press the job switch.

If the SET button is not pressed, time setting would not be completed.

Press the ESC button to return to the previous screen.

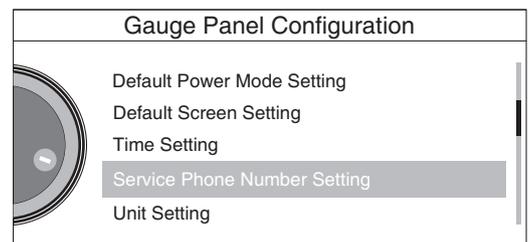


EX1301447

Figure 238

### F. Service Phone Number Setting

On the Gauge Panel configuration screen, when cursor is placed on service phone number setting, click on the jog switch to access the service phone number setting.

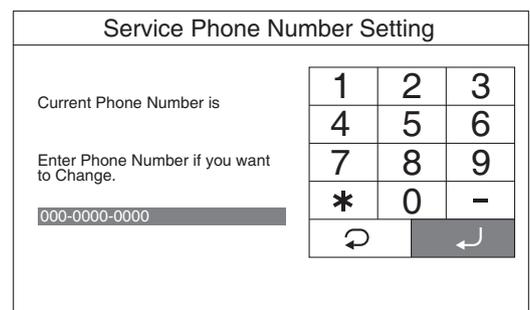


DS1601387

Figure 239

Turn the jog switch and locate the cursor at a desired number. Then, click on the jog switch to input the number. If number input is completed, press the ↵ key to enter the input phone numbers.

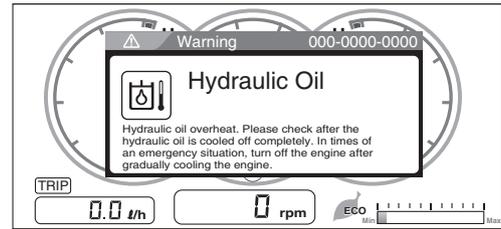
Use the ↶ key and delete erroneously input numbers.



EX1301448

Figure 240

When you input service phone numbers, if warning/ alarm is issued, check the input phone numbers in the pop-up window.

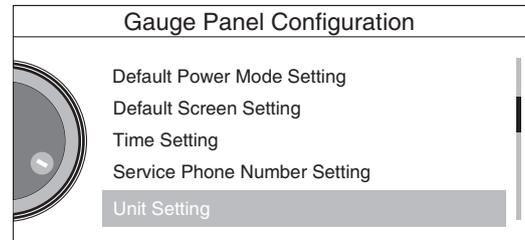


DS1601388

Figure 241

G. Unit Setting

On the Gauge Panel configuration screen, when cursor is placed on unit setting, click the jog switch to access the unit setting.



DS1601389

Figure 242

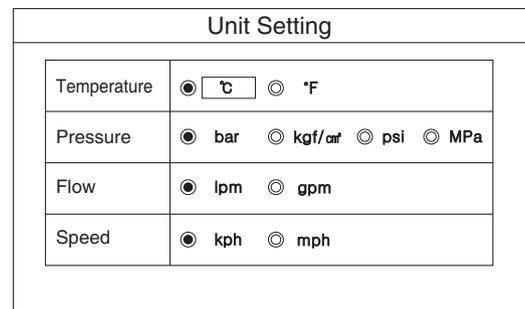
On the unit setting screen, change the units of temperature, pressure, flow rate, and speed. These figures at the machine release time are set as below:

Temperature: °C

Pressure: bar

Flow rate: lpm

Speed: kph

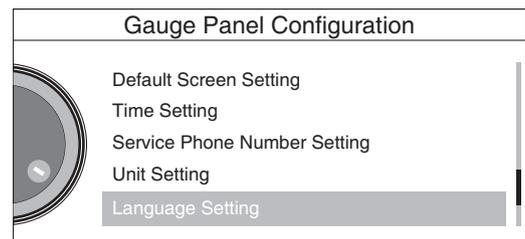


DS1603048

Figure 243

H. Language Setting

On the Gauge Panel configuration screen, when cursor is placed on language setting, click on the jog switch to access the language setting.



DS1601390

Figure 244

On the language selection screen, turn the jog switch and move the cursor to select a language. Then, click on the jog switch to adopt the selected language.

Press the ESC button to return to the previous screen.

| Language   |
|--|
| Korean, English, Chinese, Persian, Turkish, Indonesian, Polish, Arabic, Russian, Thai, Hindi, Japanese, French, German, Nederlands, Italian, Portuguese, Spanish, Finnish, Swedish, Norwegian, Danish, Vietnamese, Greek |

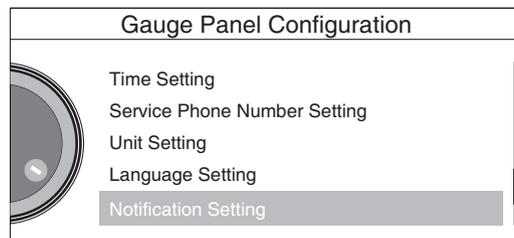


EX1301062

Figure 245

#### I. Notification Setting

On the Gauge Panel configuration screen, when cursor is placed on notification setting, click on the jog switch to access the notification setting.



DS1601391

Figure 246

Depending on the notification setting screen details, pop-ups are created on the main screen when warning/alarm is issued, when the switch is operated, and when the supplies replacement period expires.

On the notification setting screen, turn the jog switch and move the cursor to a desired location. Then, click on the jog switch to select enable or disable.

All notice items at the machine release time are set as Enable.

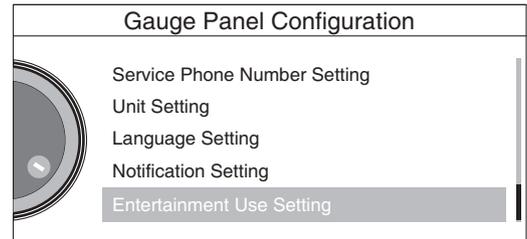
| Notification Setting            |  |
|---------------------------------|--|
| Warning Alarm Pop up            | <input checked="" type="checkbox"/> Enable |
| Maintenance Notification Pop up | <input checked="" type="checkbox"/> Enable |
|                                 |  |

EX1502448

Figure 247

## J. Entertainment Use Setting

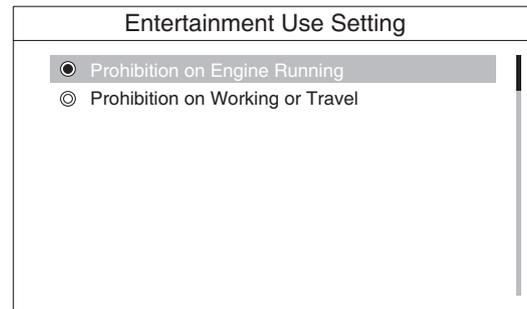
On the Gauge Panel configuration screen, when cursor is placed on entertainment use setting, click on the jog switch to access the entertainment use setting.



DS1601392

**Figure 248**

Depending on the entertainment use setting details, the use of video and MP3 is limited.



EX1301063

**Figure 249**

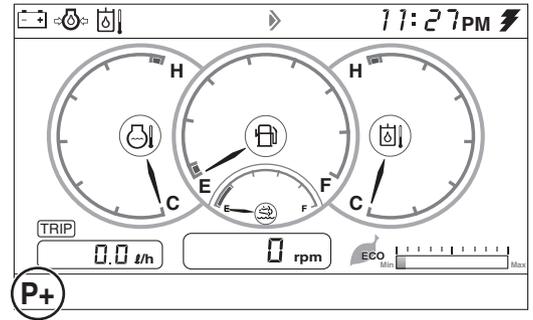
# Switch Operation Indication

## Enable

During the operation of switches for pressure increase, breaker, shear, travel, working light, parking, ram lock and quick coupler, this function indicates a relevant switch symbol at the left top or bottom. It displays the operation state on the screen.

## Operation Indication Examples

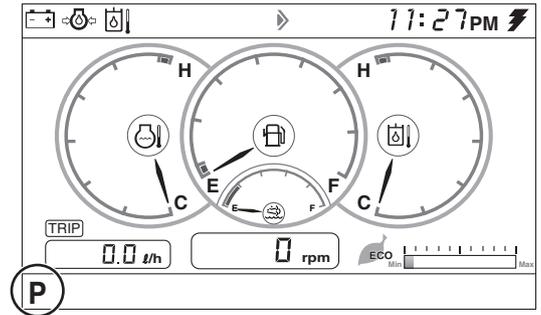
1. Power Plus Mode Selection



EX1301016

Figure 250

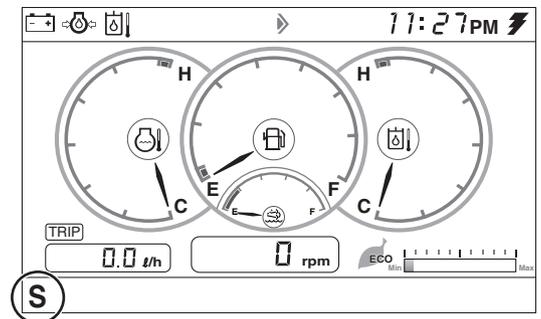
2. Power Mode Selection



EX1301017

Figure 251

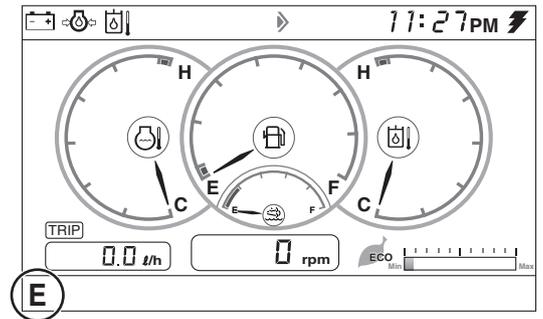
3. Standard Mode Selection



EX1301018

Figure 252

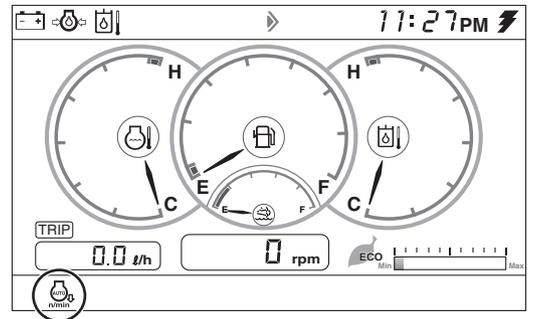
4. Economy Mode Selection



EX1301019

Figure 253

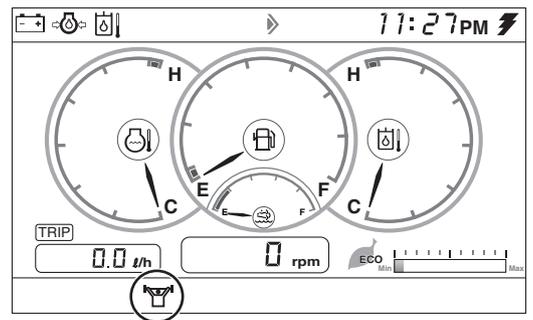
5. Auto Idle Selection



EX1301020

Figure 254

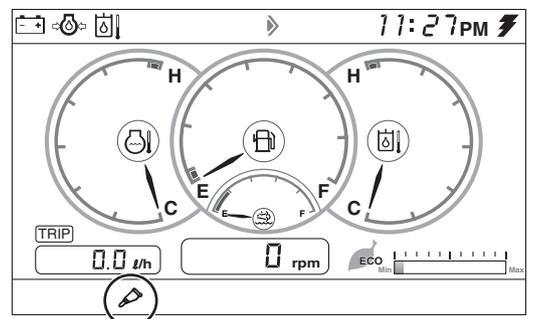
6. Power Boost Selection



EX1301021

Figure 255

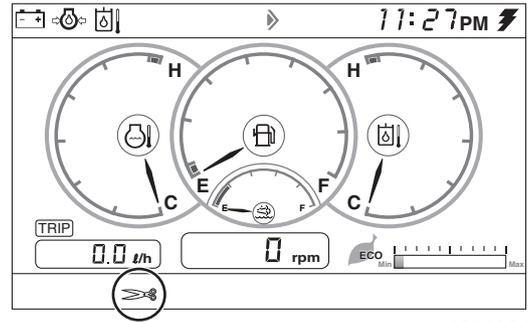
7. Breaker Selection (If Equipped)



EX1301022

Figure 256

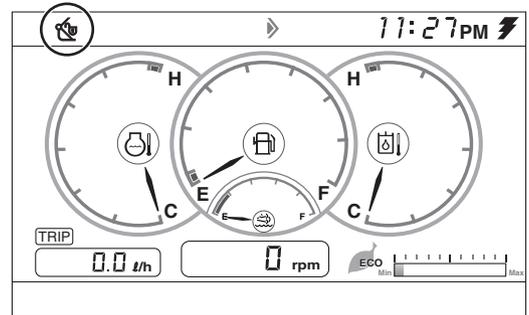
8. Shear Selection (If Equipped)



EX1301024

Figure 257

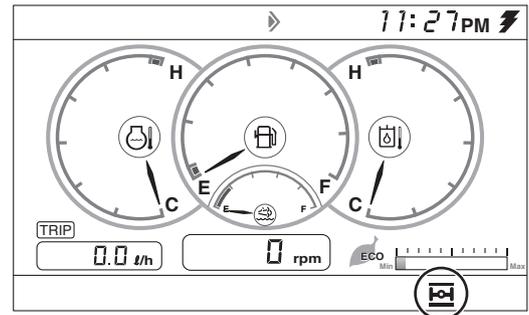
9. Quick Coupler Release System Activated (If Equipped)



EX1301023

Figure 258

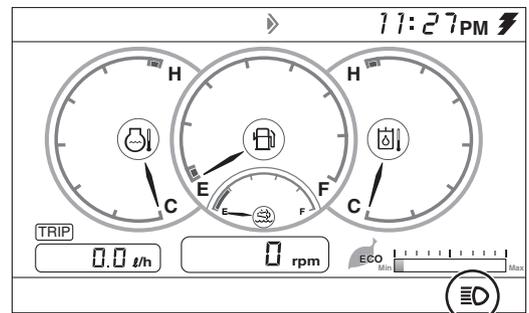
10. Ram Rock Operation Selection (Wheel Machine Only)



EX1301025

Figure 259

11. High Beam Light Selection (Wheel Machine Only)

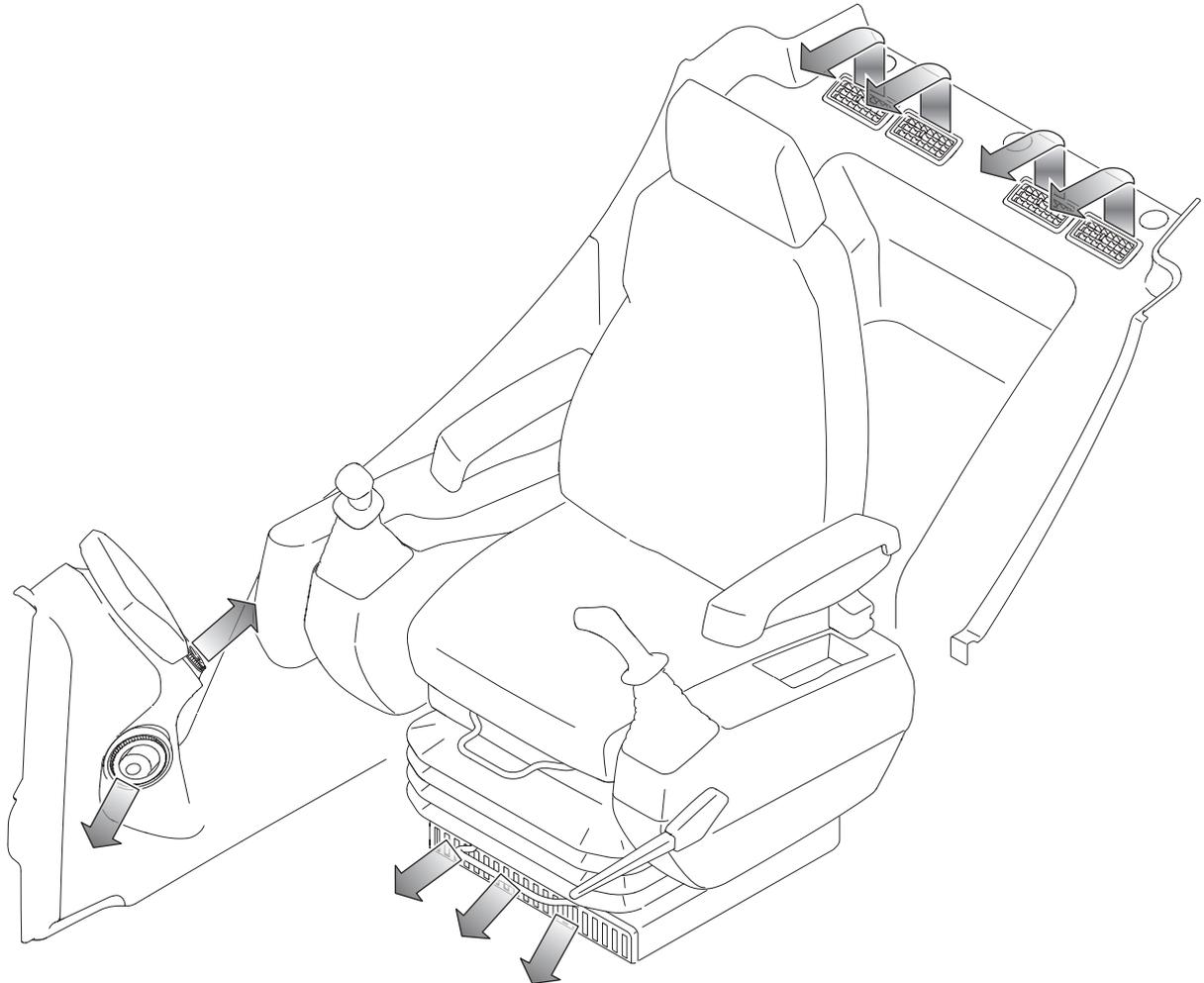


EX1301026

Figure 260

# HEATER AND AIR CONDITIONER CONTROL PANEL

## Location of Controls and Vents



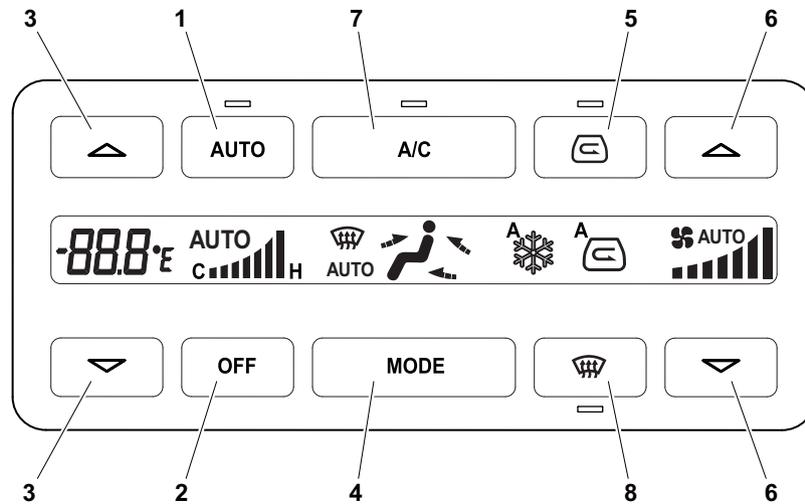
EX1300842

**Figure 261**

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

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

# Control Panel



DS2100099

Figure 262

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

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

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

## 1. Automatic Temperature Control Button

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

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

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

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

## 2. Off Button

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

### 3. Temperature Control Button

These buttons are used to control the cabin temperature.

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

Temperature setting is displayed on the LCD.

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

### 4. Mode Selector Button

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

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

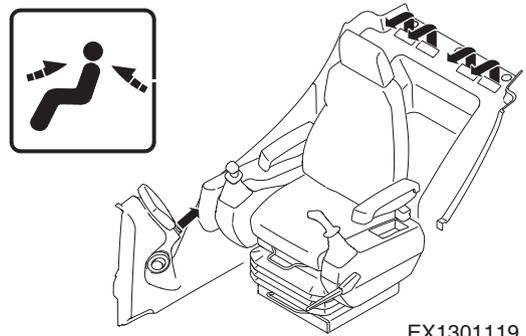


Figure 263

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

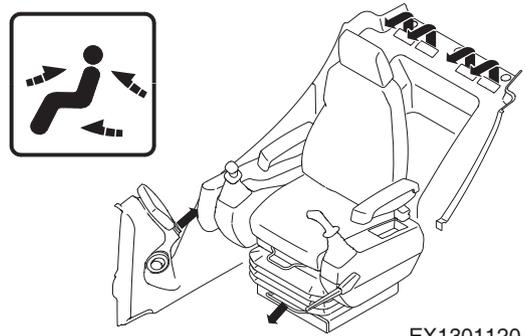


Figure 264

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

This mode is mainly used for heating.

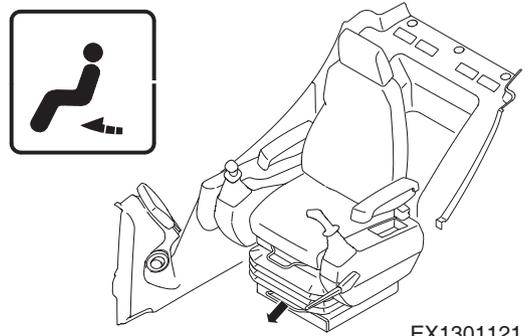


Figure 265

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

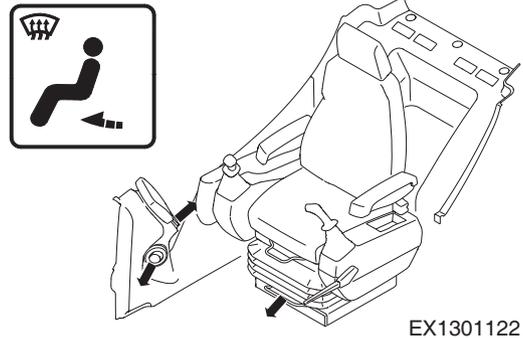


Figure 266

## 5. Air Inlet Selector Button

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

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

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

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



Figure 267

DS2100104

## 6. Fan Speed Selector Buttons

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

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

## 7. Air Conditioner Button

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

## 8. Defroster Button

Used to direct airflow to front window.

## 9. LCD Display

This display shows the current setting.

## Memory Function

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

## Additional Operating Instructions

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

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

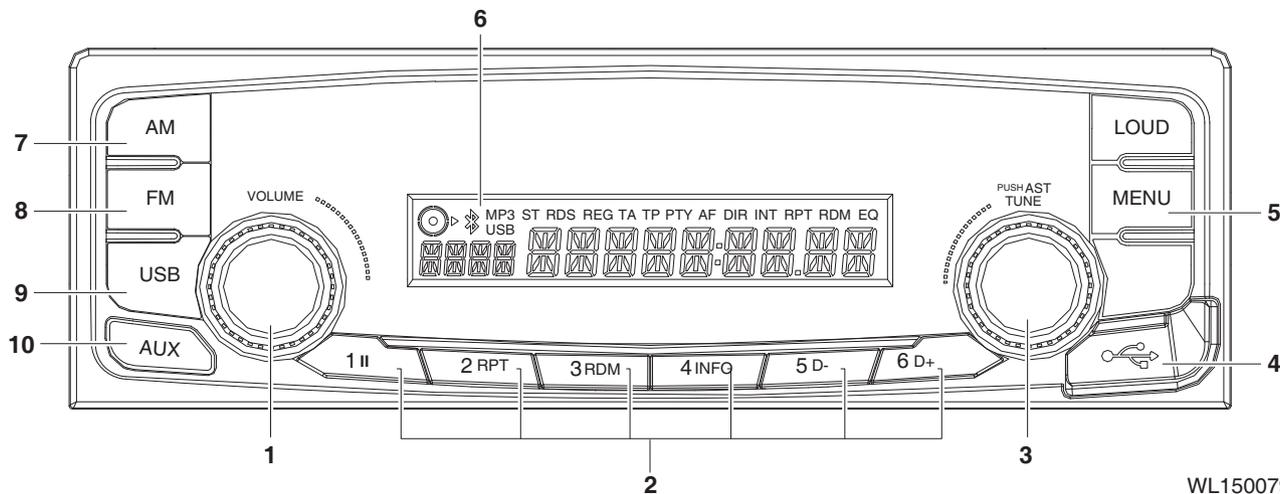
**NOTE:** *The blower button must be on "Three Bars".*

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

# STEREO

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

## Stereo



WL1500796

Figure 268

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

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

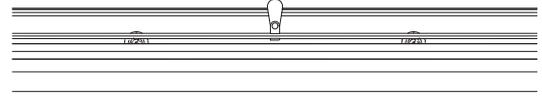
# MISCELLANEOUS ELECTRICAL DEVICES

## Cabin Light

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

The light will work despite starter switch position.

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



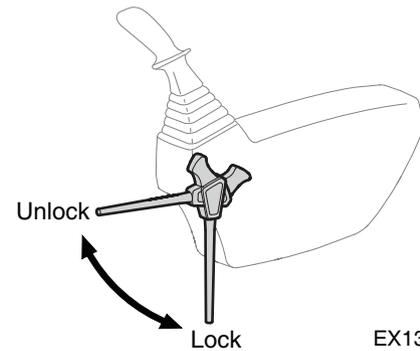
©

FG015827

Figure 269

## Safety Lever

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



EX1300566

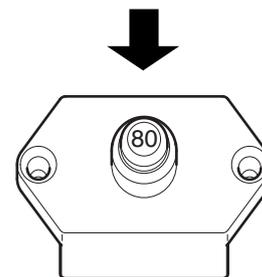
Figure 270

## Circuit Breaker (80 A)

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

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

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



FG018291

Figure 271

## Circuit Breaker (30 A)

A circuit breaker (30 A) is in the battery box.

If the engine does not crank, first check that starter switch is turned "ON" and no power is available (No indicator lights will light.).

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

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

Replace the circuit breaker if damage and investigate cause.

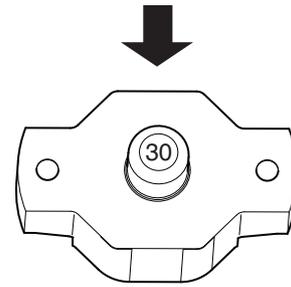


Figure 272

DS1601394



## 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 273) on the left side of the heater box. 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 Boxes" on page 4-93.

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.

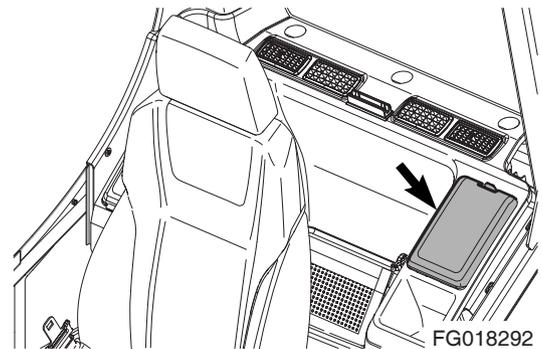


Figure 273



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

# SEAT ADJUSTMENT



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

Do not adjust the seat position while the machine is moving because a loss of control can occur. Always stop the machine, apply the parking brake, and then adjust the seat.

Always fasten your seat belt while operating machine.

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

## 1. Forward/Backward Adjustment

Holding lever (1, Figure 274), raise it up, move the seat to the desired position. Release lever to lock the seat in the selected position. Adjustment range is 180 mm (7.1 in).

## 2. Adjusting Height of Seat and Depth of Cushion

### Forward Tilt

Press the adjustment lever (3, Figure 274) to adjust the seat cushion angle. (0"/+4"/+8")

### Cushion Slide

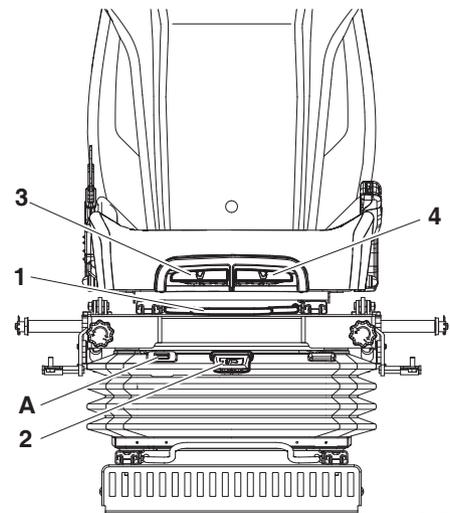
Press the adjustment lever (4, Figure 274), and adjust the seat cushion forward/backward by max. 50 mm, to fit with the length of the operator's thigh.

### Seat Height

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

Adjust height of seat by moving adjustment lever (2, Figure 274) up or down. Seat height can be adjusted by referring to the weight indication window (A, Figure 274) on the right.

- Green: Standard weight
- Red: Underweight or overweight



FG018572

Figure 274

### 3. Reclining Position Adjustment

Pulling up left lever (3, Figure 275) allows seat backrest to be moved forward or backward.

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

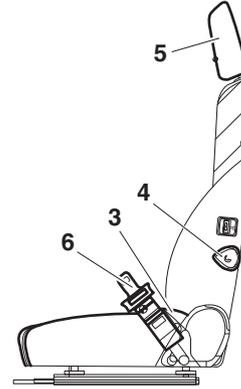
### 4. Lumbar Support Adjustment

A lumbar support is located in the seat back.

Turn the dial (4, Figure 275) counterclockwise to increase the force of the lumbar support.

### 5. Headrest

The headrest (5, Figure 275) can be adjusted forward/backward and up/down. Move it by holding both sides.



FG015815

Figure 275

### 6. Seat Belt



## WARNING

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#### 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 forestry 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.

---

## 2-Point Seat Belt

Insert belt end (1, Figure 276) into buckle (2, Figure 276). 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).

Press button (4, Figure 276) in buckle(2, Figure 276) and pull out belt (1, Figure 276).

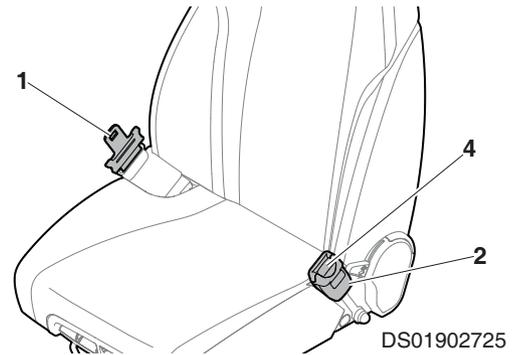


Figure 276

## 4-Point Seat Belt

Insert belt end (1, Figure 277) into buckle (2, Figure 277). Pull belt to check that belt end is locked into buckle.

Adjust belt(3, Figure 277) length so it is comfortably tight against operator's pelvic region (hipbone).

Press button (4, Figure 277) in buckle(2, Figure 277) and pull out belt (1, Figure 277).

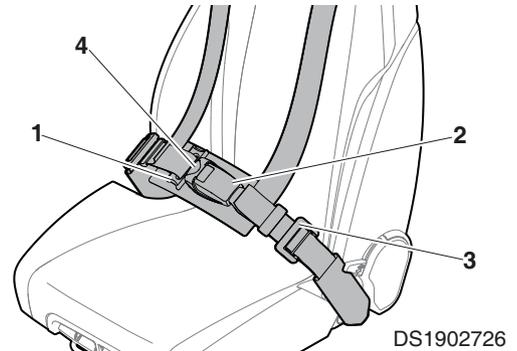


Figure 277

## 7. Left and Right Control Stand Adjustment

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

Holding lever (1, Figure 278), raise it up, set the seat to desired position. Release lever to lock seat in selected position.

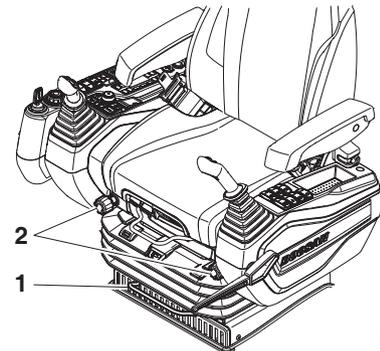


Figure 278

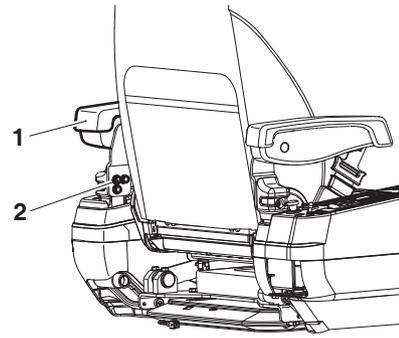
## 8. Left and Right Control Stand Height Adjustment

The left and right dials (2, Figure 278) at the lower part of the seat can be turned to adjust the elevation height of each control stand. ( $\pm 1.2$  in ( $\pm 30$  mm))

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

## 9. Adjusting Height/Angle of Armrest

It is possible to adjust height of armrest by removing three bolts (2, Figure 279) holding armrest to driver's seat, and moving armrest up or down by intervals of 0.8 in (20 mm), and then installing armrest. Lift armrest slightly (1, Figure 279) and rotate dial on bottom of support to left and right to adjust angle of armrest.



FG019076

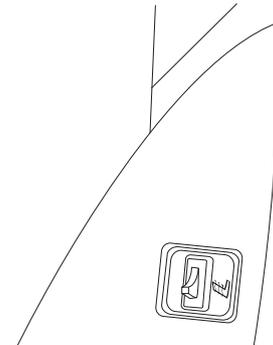
Figure 279

## 10. Heating Operator's Seat

The air suspension seat can be heated. The heater switch is found on left-hand side of seat back. To heat the seat, press and hold switch until desired heat level is obtained. When heating is not needed or seat is warmed, turn switch to "OFF" position.

The seat warmer has a primary thermostat that allows it to operate between 28° - 37°C (82° - 99°F). At 37°C (99°F) the primary thermostat stops heating the seat.

**NOTE:** *If the primary thermostat fails, there is a secondary (safety) thermostat that operates between 32° - 41°C (90° - 106°F). At 41°C (106°F) the secondary (safety) thermostat stops heating the seat. If the seat is heating up to a higher than normal temperature, have seat serviced immediately.*



FG015816

Figure 280

# ENGINE EMERGENCY STOP SWITCH

If the engine cannot stop when using the starter switch, it can be stopped by moving the engine emergency stop switch to "I" (EMERGENCY STOP) position.

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

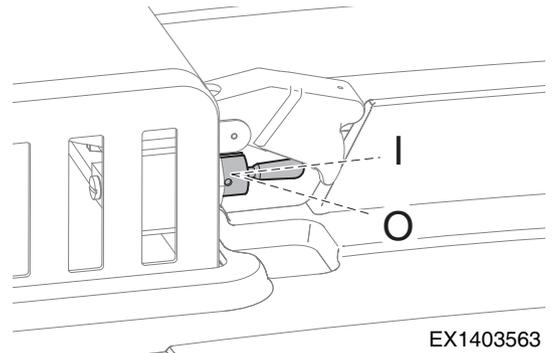


Figure 281

EX1403563

# EMERGENCY EXIT GLASS BREAKING TOOL (STD CABIN ONLY)

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

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

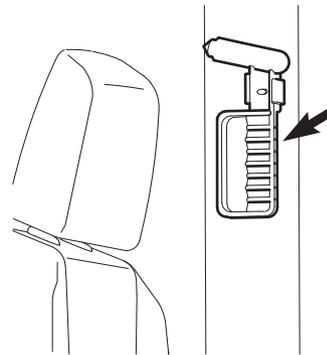


Figure 282

EX1300679



## WARNING

**AVOID DEATH OR SERIOUS INJURY**

**Protect your eyes when breaking the glass.**

# MISCELLANEOUS CONVENIENCE DEVICES

## Ceiling Cover (STD Cabin Only)

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

### Opening Ceiling Cover

1. Lower bucket or work tool to ground.
2. Move safety lever (Figure 36) to "LOCK" position.
3. Pull lock (1, Figure 284) in front center of ceiling cover and push it up with handle.

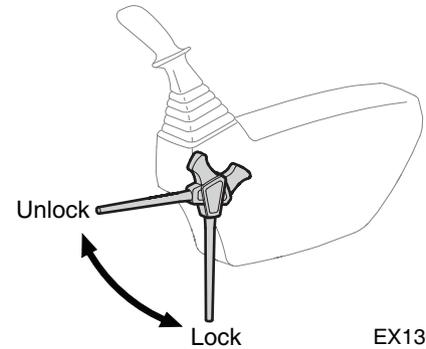


Figure 283

EX1300566

### Closing Ceiling Cover

1. Lower bucket or work tool to ground.
2. Move safety lever (Figure 36) to "LOCK" position.
3. Pull down cover with handle (Figure 284) so lock (1, Figure 284) can be locked into bracket in ceiling frame.

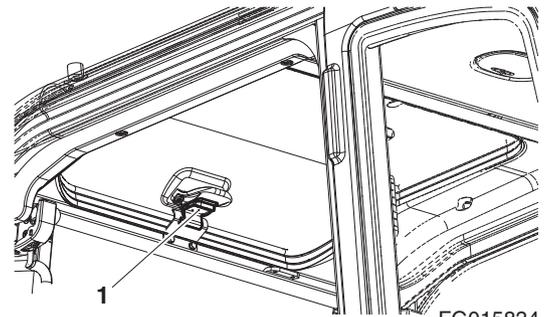


Figure 284

FG015834

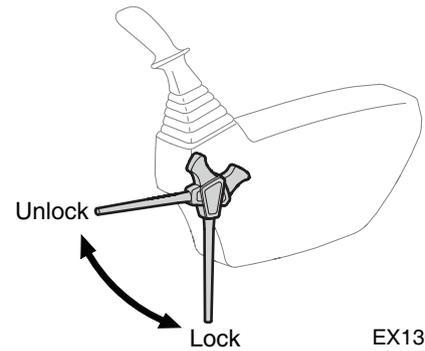
## Front Windows (STD Cabin Only)



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, move safety lever to "LOCK" position (Figure 285) and stop engine to prevent accidental activation of the work levers and controls.



EX1300566

Figure 285

### Front Upper Window

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

#### Opening Window



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

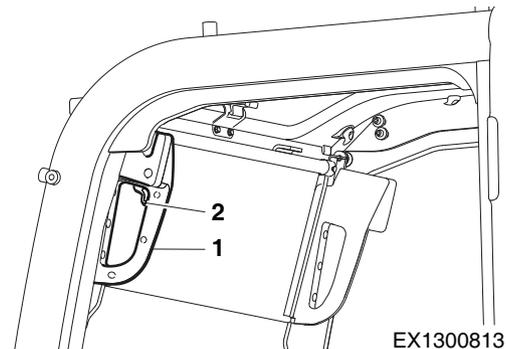
When storing front window in cabin roof, make sure both lock levers (2, Figure 286) are securely latched.

1. Lower bucket or work tool to ground.
2. Move safety lever (Figure 285) to "LOCK" position.
3. Set engine speed control dial to "LOW IDLE". Allow engine to idle for three - five minutes.
4. Stop engine by turning key to "O" (OFF) position.
5. Hold window handles (1, Figure 286), then pull lock levers (2, Figure 286) to release lock. The top of front window will come out.
6. Pull window up, and push it against lock pin at the rear of cabin. Make sure that it is securely latched.
7. Check that lock levers are securely latched in locked position.

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

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

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



EX1300813

Figure 286

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 **WARNING**

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**AVOID DEATH OR SERIOUS INJURY**

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

---

1. Lower bucket or work tool to ground.
2. Move safety lever (Figure 285) to "LOCK" position, and stop engine.
3. Holding upper handles (1, Figure 287) of front window with left and right-hand, pull lock levers (2, Figure 287) to release lock.
4. Push window forward, and lower it slowly.
5. When bottom of window, reaches top of the front bottom window, push front window to engage lock (2, Figure 287).
6. Check that lock levers are securely latched in lock position.

**Front Bottom Window**

Opening Window

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

1. Open front top window and secure it to ceiling. Press button to open levers on both sides (left and right), and lift bottom window (1, Figure 288) in direction of arrow.
2. Set bottom window in rubber holders (2, Figure 289) behind operator's seat. Secure window with left and right levers (3, Figure 289) with push button (4, Figure 289).

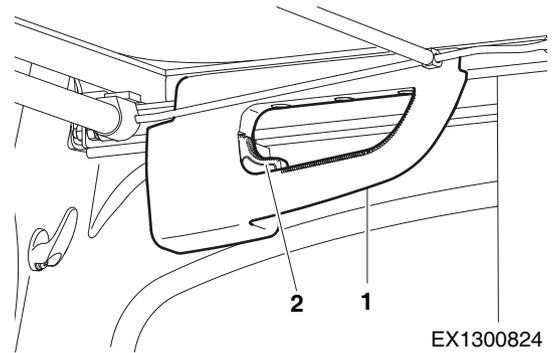
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 **NOTICE**

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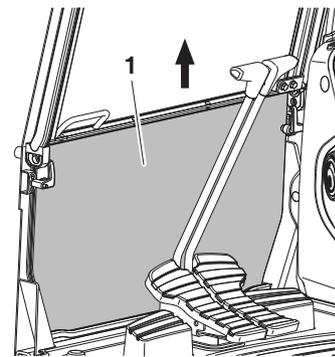
**Keep hands dry when handling a window. Never drop window or let it come into contact with other parts of machine.**

---



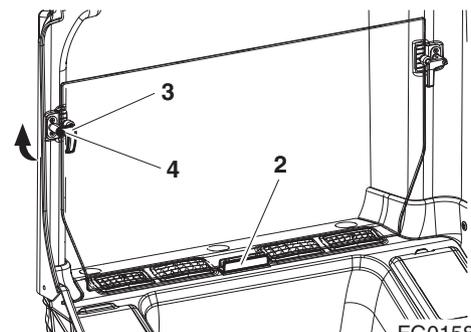
**Figure 287**

EX1300824



**Figure 288**

FG018574



**Figure 289**

FG015840

## Closing Window

Reverse the removal procedure.

---

# NOTICE

---

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

---

## Door Side Latch (STD Cabin Only)

1. The door side latch (1, Figure 290) is used to secure door to side of cabin when it is opened.

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

2. To release door from side of cabin, push latch lever (2, Figure 291) down. The latch lever is to the left of operator's seat.

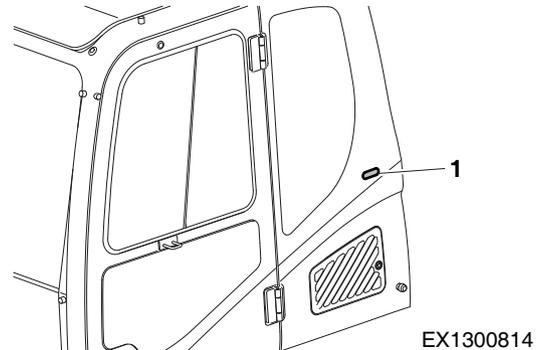


Figure 290

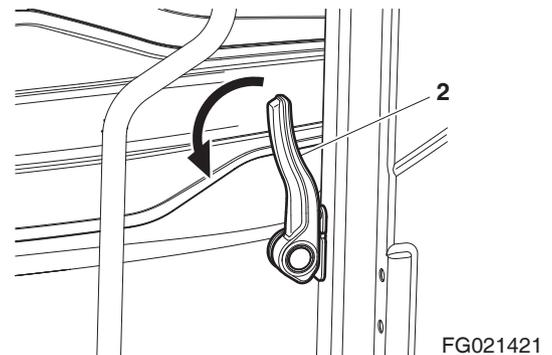


Figure 291

## Cabin Riser Access Door

This compartment allows access to cabin tilt bolts and cylinder.

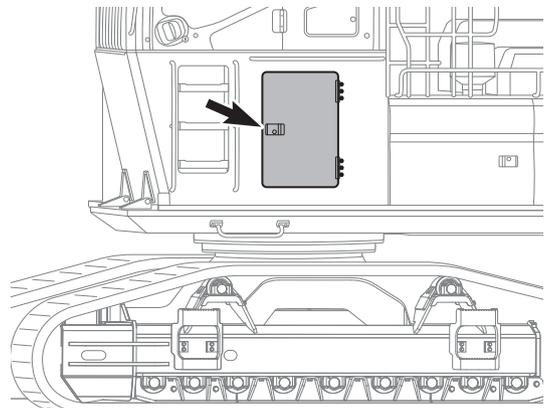


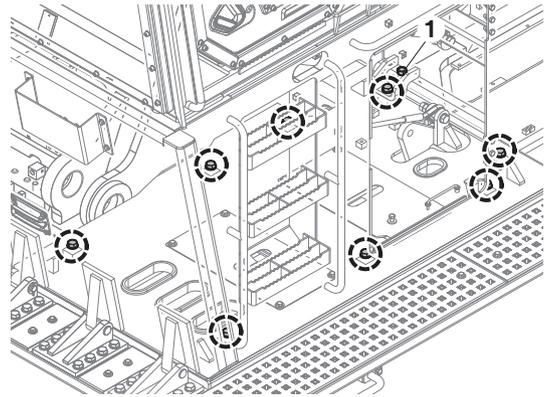
Figure 292

## Tilt Cabin

A tilt cabin is provided for transportation or maintenance purposes. Refer to "Transportation" on page 5-1 for operational information.

1. Loosen the 8 bolts in cabin riser. (Figure 293)

**NOTE:** For the storage of removed bolts, you can screw them into the nuts (1, Figure 293) attached nearby.

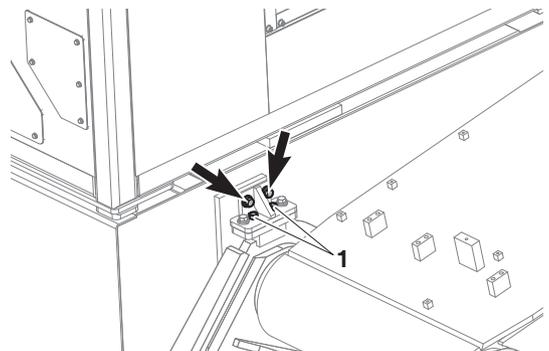


DS1602746

Figure 293

2. Loosen the 2 bolts on right side of cabin riser. (Figure 294)

**NOTE:** For the storage of removed bolts, you can screw them into the nuts (1, Figure 294) attached nearby.



DS1602747

Figure 294

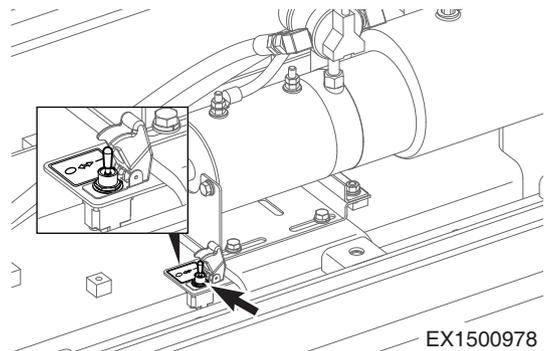
3. Move electric switch (Figure 295) at "I" (ON) position and turn tilting lever (Figure 296) to the left during movement. This operation should be controlled simultaneously.



### WARNING

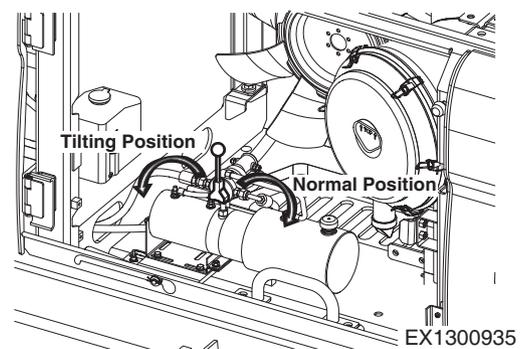
**AVOID DEATH OR SERIOUS INJURY**

Normally switch must be at "O" (OFF) position. Unless, hot pressured oil may spurt.



EX1500978

Figure 295



EX1300935

Figure 296

## Cabin Storage Compartments

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

The large compartment (1, Figure 297) is for storing nonperishable items.

The covered other one (2, Figure 297) is interconnected with the air conditioner. It can be supplied with either warm or cool air when air conditioner is turned "ON". The small compartment (3, Figure 297) is for storing small items. A net storage bag (4, Figure 297) is added.

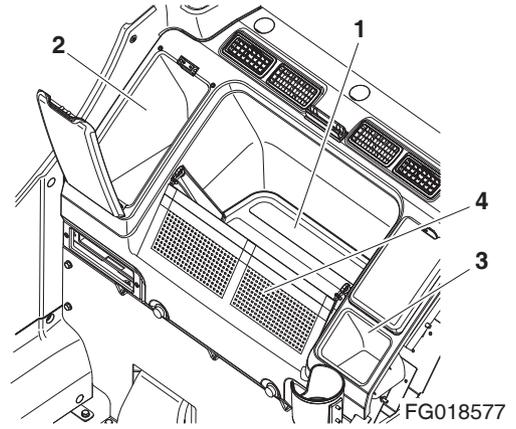


Figure 297

There is a separate small tray on left side (5, Figure 298) and right side (6, Figure 298) of operator's seat.

A document storage case (7, Figure 298) which can store up to A4-size documents is prepared.

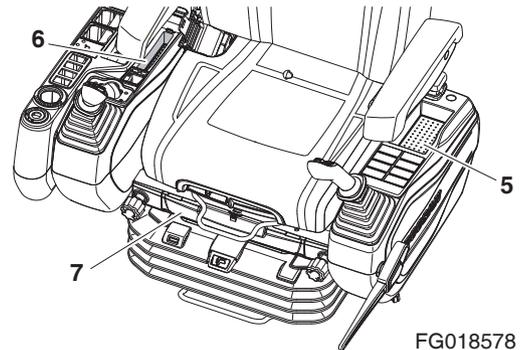


Figure 298

## Sunglasses Case (STD Cabin Only)

The sunglasses storage case (1, Figure 299) is on the center top of the rear wall of the operator cabin.

Keep this case lid closed before and after use.

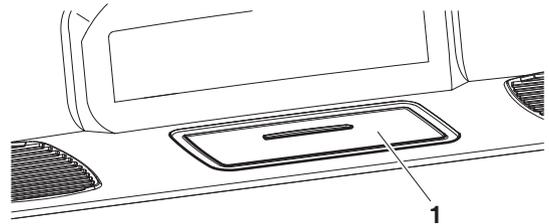


Figure 299

## Sun Visor (STD Cabin Only)

The forestry machine has two sun visors.

### Front Window Visor

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

When wanting to reduce the amount of sunlight coming in the front window, pull bar (1, Figure 300) down.

When not wanting protection, hold bar with left-hand and push release button (2, Figure 300) with right-hand. This will allow visor to retract.

**NOTE:** *Do not allow visor to roll backup without holding it. Not holding it can result in damage to visor and retract mechanism.*

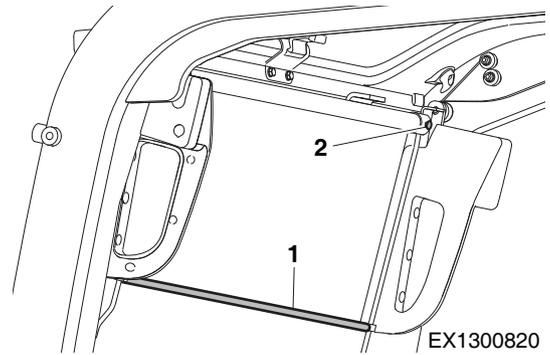


Figure 300



## CAUTION

### AVOID INJURY

Keep your head away from the retracting area of visor.

### Ceiling Window Visor

When you wish to use visor, pull handle on bar (1, Figure 301) to middle holders (2, Figure 301) or the end holders (3, Figure 301). Hook bar on holders to secure visor in place.

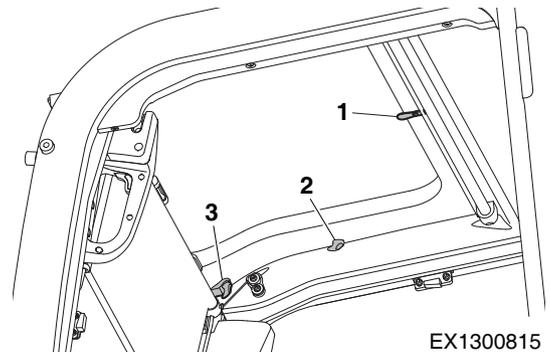


Figure 301

Pull visor to release it. It will return to its original position.

**NOTE:** *Do not allow visor to roll backup without holding it. Not holding it can result in damage to visor and retract mechanism.*



## CAUTION

### AVOID INJURY

Keep your head away from the retracting area of visor.

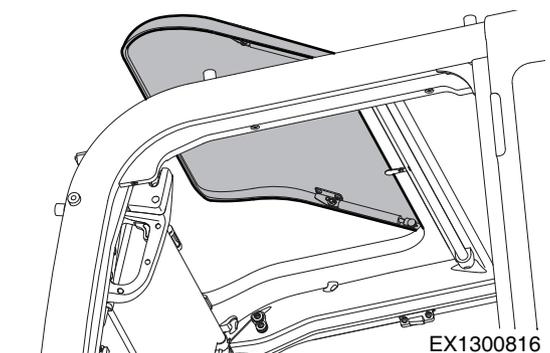


Figure 302

## Cup Holder

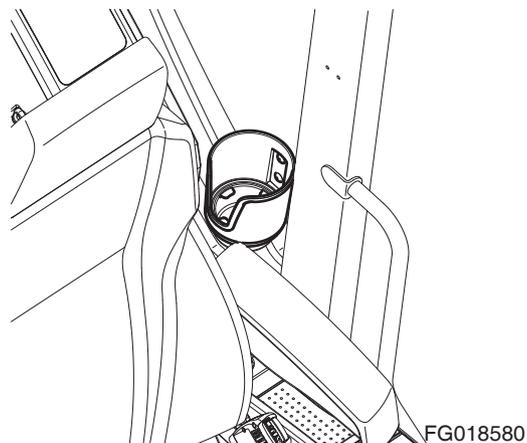
There is a rubber cup holder inside operator's cabin. Use it to keep your cup firmly in place.



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

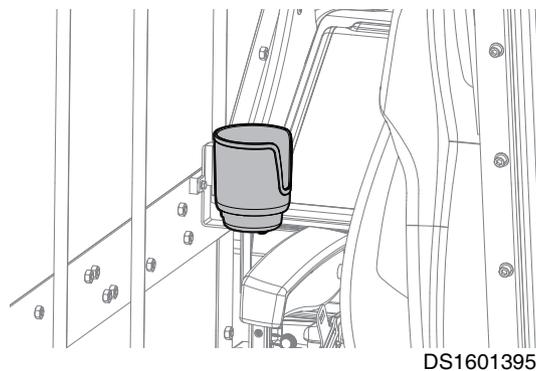
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### STD Cabin



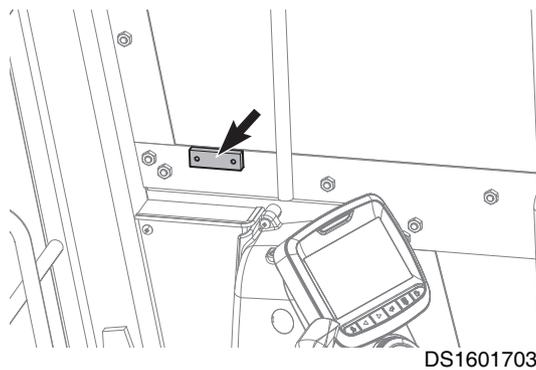
**Figure 303**

### Oregon Cabin



**Figure 304**

Operator can change a position of the cup holder. (Figure 305)



**Figure 305**

## Mirror (Oregon Cabin Only)

There is a mirror inside operator's cabin. It is used to check front lower part of machine.

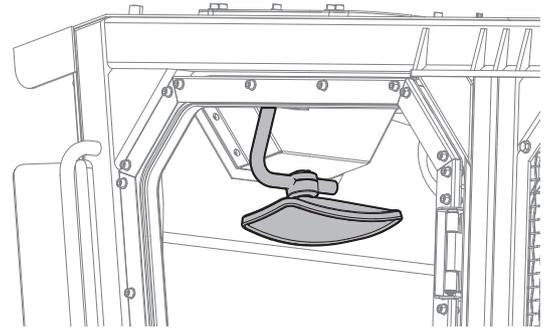


Figure 306

DS1601704

## Document Delivery Hole (Oregon Cabin Only)

It is possible to pass a simple paper through a document delivery hole (Figure 307).

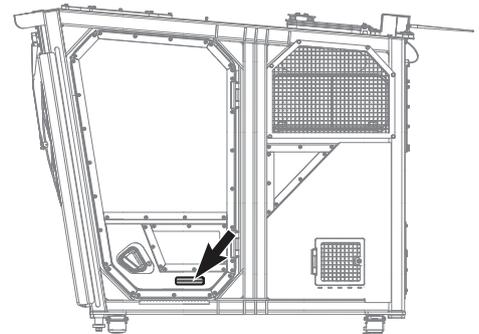


Figure 307

DS1601705

# MISCELLANEOUS ACCESS COVERS AND DOORS

## Side Door

Open side access door and slide prop rod (1, Figure 308) in slot (2) until it locks at end of slot.

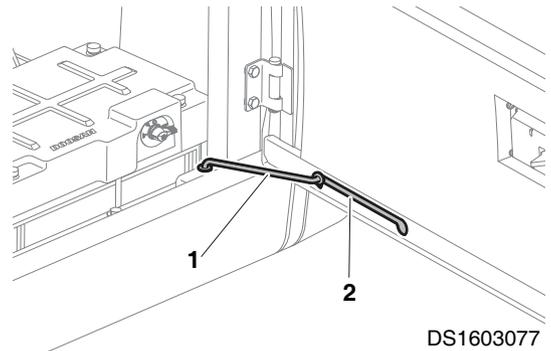


Figure 308

## Storage Box Door

### Opening

Open cover and slide rod (1, Figure 309) in slot (2) until it locks in notch at end of slot to support cover.

### Closing

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

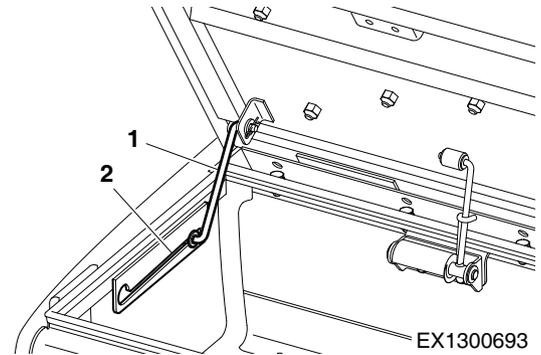


Figure 309



## WARNING

**UNSUPPORTED DOOR CAN FALL CAUSING  
DEATH OR SERIOUS INJURY**

- To open door:
  - 1) Hold door firmly.
  - 2) Lift door slowly until locking device engages.
- To close door:
  - 1) Hold door firmly.
  - 2) Press locking device to disengage.
  - 3) Lower door slowly.

## Engine Cover

First, loosen the 2 bolts on the bonnet for radiator. (Figure 310)

Second, open cover and slide prop rod (1, Figure 311 and Figure 312) in slot (2) until it locks in notch at end of slot to support cover.

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

**NOTE:** Tightening torque: 108 N.m (11 kg.m, 80 ft lb)

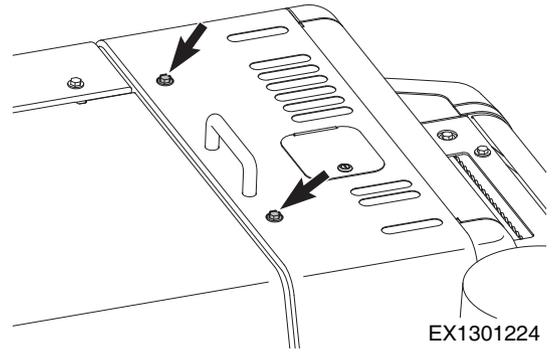


Figure 310

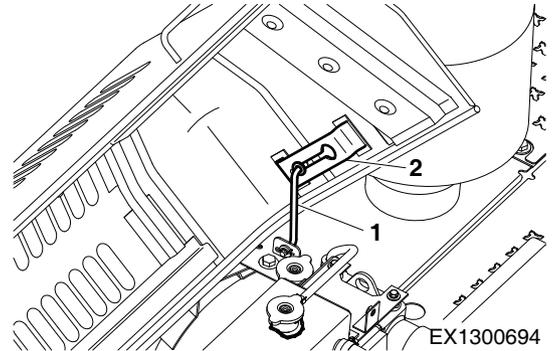


Figure 311

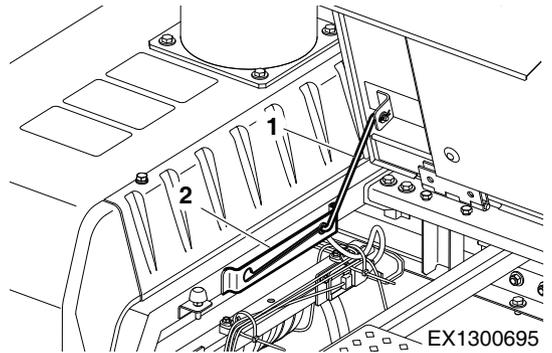


Figure 312



# Operation

## TO OPERATE A NEW FORESTRY MACHINE

All HYUNDAI forestry 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, rear view camera and lights.
  - Clean and check monitor, switches and gauges in the cabin.
2. Cleaning
  - Remove dirt and debris from around engine, radiator, oil cooler and battery.
  - Check and remove flammable material around muffler, turbocharger, battery or other high temperature components.
  - Clean and inspect fins of radiator, oil cooler, CAC (Charged Air Cooler), fuel cooler and condenser.
3. Engine system
  - Check for coolant and oil leakage around the engine and cooling system.
  - Check engine emission control system.

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

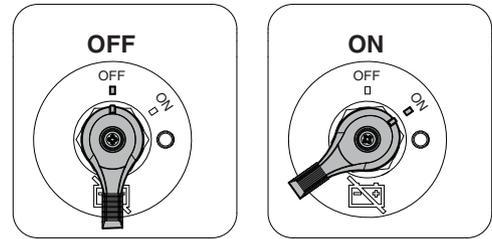
## Checks Before Starting Engine

Before starting engine, inspect the following items. If any problem is found, repair it before machine operation. If the oil, fuel or coolant level are below the "LOW" mark, add it. For detail method, see "10 Hour / Daily Service" on page 4-27.

1. Grease boom, arm and front attachment pins.
2. Check engine oil level.
3. Check level of hydraulic oil tank.
4. Check fuel level.
5. Check DEF (AdBlue) level.
6. Check oil level of swing reduction gear.
7. Clean dust net in front of oil cooler and intercooler.
8. Check cooling system and refill as required.
9. Check level of window washer liquid.
10. Inspect the bucket teeth and side cutters for signs of wear.
11. Inspect engine fan blade.
12. Check air intake system.
13. Inspect seat belt for any damage and proper operation.
14. Inspect the structure for cracks and faulty welds.
15. Check the operation of all switches.
16. Check the operation of all exterior lights, horn, travel alarm/swing alarm (if equipped), rear view camera and control console indicator and monitor lights.

## Operational Checks Before Starting Engine

1. Turn battery disconnect switch to "ON" position (Figure 1).



EX1500481

Figure 1



### WARNING

---

#### AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, move the safety lever to "LOCK" (Figure 2) position and stop engine to prevent accidental activation of the work levers and controls.

---

2. Move safety lever to "LOCK" position (Figure 2).
3. Fasten seat belt. Check for proper operation and condition.
4. Set all operation levers in "NEUTRAL".

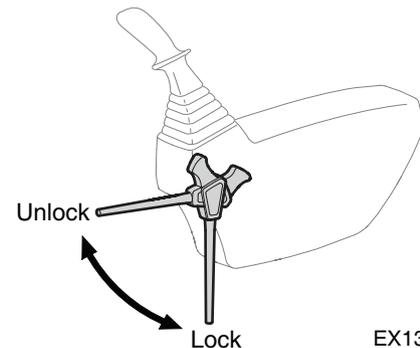
**NOTE:** *Be careful not to move any switches when starting engine.*

5. Rotate the starter switch to "I" (ON) position (Figure 3). Check all indicator lights. Warning buzzers will sound for about two seconds. After two seconds, all lights except the following will turn "OFF".

**NOTE:** *Quick coupler release system has a different buzzer sound.*

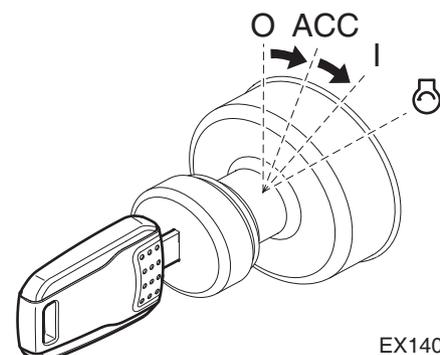
- Charging warning light
- Engine oil pressure warning light
- Engine coolant temperature gauge
- Fuel gauge
- Hydraulic oil temperature gauge
- Engine rpm (0 rpm) digital readout

**NOTE:** *If all the indicator lights do not come "ON" when the key is first turned, there is a problem.*



EX1300566

Figure 2



EX1402154

Figure 3

# Engine Start

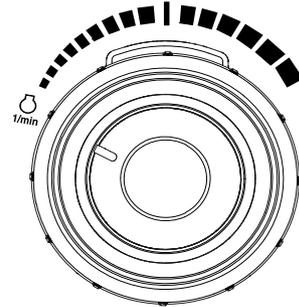


## WARNING

### AVOID DEATH OR SERIOUS INJURY

Sound the horn prior 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" (Figure 4). If control dial is at "HIGH IDLE", the engine will accelerate suddenly and cause damage to the engine.
3. Sound horn.

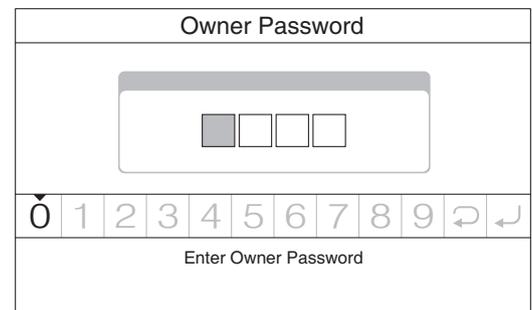


FG018152

Figure 4

4. Turn starter switch to "I" (ON) position.
5. Enter password.

**NOTE:** If the security system is "LOCKED", a four-digit password will be required to start the engine. If the system is "UNLOCKED", no password will be required and this display screen will not appear.



EX1301416

Figure 5

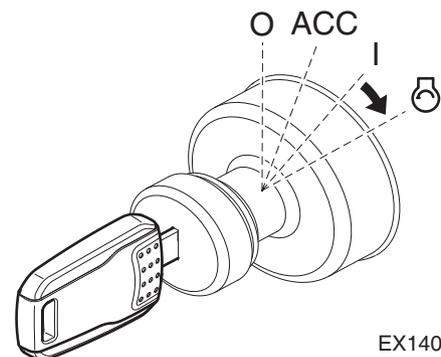
6. Turn starter switch to "START" position (Figure 6). Engine should start in approximately five (5) seconds.



## NOTICE

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

7. After engine has started, release key. Key will return to "I" (ON) position (Figure 6).
8. Follow procedures in "Hydraulic System Warm-up" on page 3-23.



EX1402153

Figure 6

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

Normal indicators are:

| No. | Instrument Panel Light or Gauge    | Indicator Reading |
|-----|------------------------------------|-------------------|
| 1   | Engine Coolant Temperature Gauge   | White Range       |
| 2   | Fuel Gauge                         | White Range       |
| 3   | Hydraulic Oil Temperature Gauge    | White Range       |
| 4   | DEF (AdBlue) Level Gauge           | White Range       |
| 5   | Charging Warning                   | OFF               |
| 6   | Engine Oil Pressure Warning        | OFF               |
| 7   | Engine Coolant Temperature Warning | OFF               |
| 8   | Engine Check Warning               | OFF               |

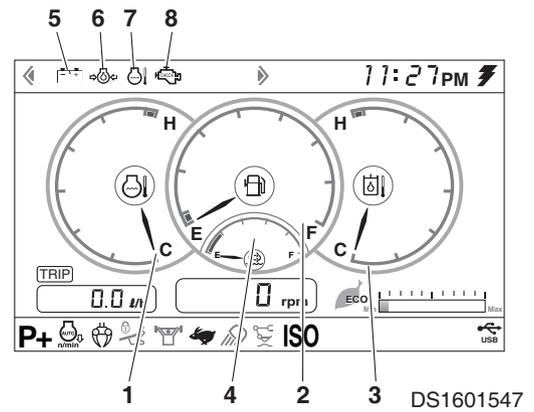


Figure 7

10. Check color of exhaust smoke.
- No color or light blue - Engine is running in good condition.
  - Black - Incomplete combustion. Check cause.
  - White or dark blue - Engine is burning engine oil. Check cause.
11. Check for usual engine vibration and noises. If any are heard or felt, investigate cause.

**NOTE:** *If engine coolant temperature gauge pointer moves into the red zone, the engine coolant temperature warning light will turn "ON", a warning buzzer will sound, and the engine speed will be automatically reduced. Allow the engine to run at low idle speed until temperature gauge registers in the white zone again. When the white zone is reached, allow the engine to idle for an additional three - five (3 - 5) minutes before stopping the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allowing the engine to idle will dissipate heat. Check the coolant level, look for a loose fan belt, inspect for debris around radiator, etc.*

12. Even if the engine starts, wait for the engine oil pressure monitor light to turn "OFF". Do not touch the control levers or control pedal while the engine oil pressure monitor light is "ON".

---

 **NOTICE**

---

**If the engine oil pressure monitor light does not turn "OFF", after 4 to 5 seconds have passed, stop engine immediately. Check the oil level, check for leakage of oil, and take necessary corrective action.**

---

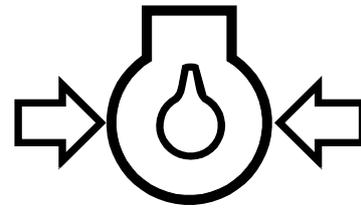


Figure 8

HAOA620L

**After start limit logic**

Below 15 degree, machine has the limit logic of the engine rpm to protect the engine.

| Engine Temp.<br>(°C) | Time After Start (sec.) |       |       |       |       |
|----------------------|-------------------------|-------|-------|-------|-------|
|                      | 6                       | 15    | 100   | 400   | 600   |
| -10                  | 1,000                   | 1,200 | 1,400 | 1,800 | 1,950 |
| 5                    | 1,200                   | 1,500 | 1,900 | 2,000 | 2,400 |
| 15                   | 1,500                   | 1,900 | 2,400 | 2,400 | 2,400 |

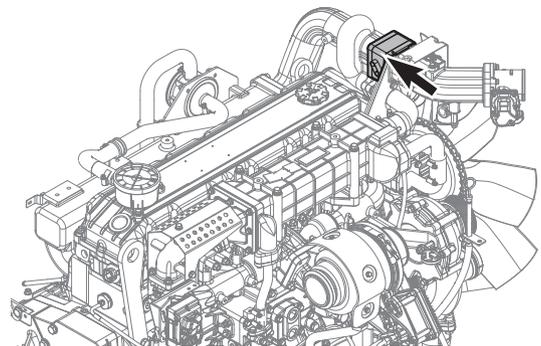
**Cold Weather Starting**

**Engine Pre-heater**

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

Operating Condition

The preheating function of the engine pre-heater starts at a coolant or fuel temperature of 20°C (68°F).



DS1603049

Figure 9

## Operation Logic

1. To facilitate low-temperature start, turn the starter switch to "ON" to operate the preheating function. The preheating light is displayed on the instrument panel for up to 20 seconds after the key is turned on, and preheating starts automatically. Keeping the key on for a certain period of time based on the temperature is recommended for the preheating.

| Coolant Temperature or Fuel Temperature (Lowest of the Two) | Maintaining Time       |
|---|------------------------|
| 0 - 20°C (32 - 68°F)  | Linear Proportionality |
| below 0°C (32°F)  | 20 sec                 |

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

## Operation Procedure

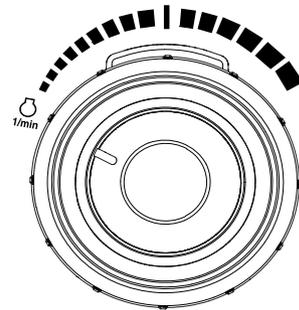


# WARNING

### AVOID DEATH OR SERIOUS INJURY

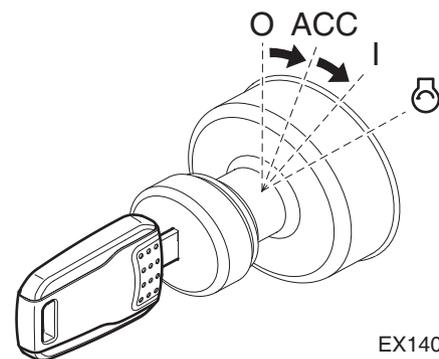
**DO NOT USE STARTING FLUIDS. The preheat system could cause the starting fluid to explode.**

1. Perform all steps in "Operational Checks Before Starting Engine".
2. Set engine speed control dial to "LOW IDLE" (Figure 10). If control dial is at the "HIGH IDLE", the engine will accelerate suddenly and damage the engine.
3. Sound horn.



FG018152

Figure 10



EX1402154

Figure 11

- Turn starter switch to "I" (ON) position (Figure 11). When preheat cycle is completed, the preheat indicator light (1, Figure 12) will turn "OFF".

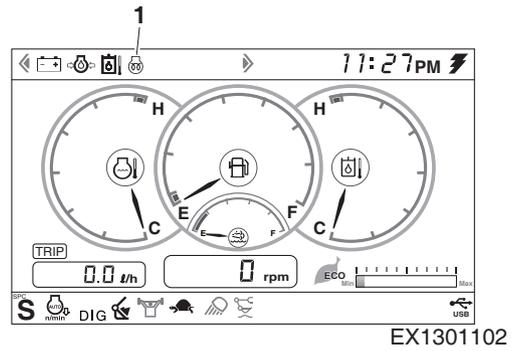


Figure 12

- After the preheat completion, immediately turn starter switch to "START" position (Figure 13). Engine should start in approximately five (5) seconds.



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

- After engine has started, release key. Key will return to "I" (ON) position (Figure 13).
- After the engine starts, check all operating indicators to make sure that all engine systems (oil pressure, coolant, etc.) are in the normal operating range. If any problems are noticed, stop engine.
- Follow "Hydraulic System Warm-up" procedures in this section. (See page 3-23)

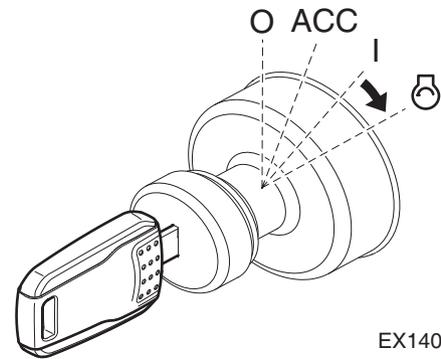


Figure 13

EX1402153

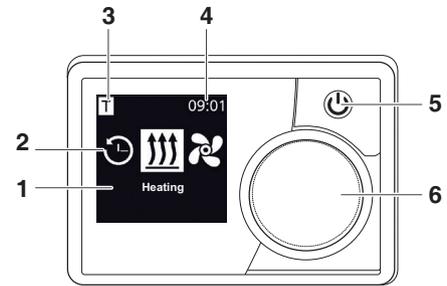
## Engine Coolant Heater (If Equipped)

The engine coolant heater helps start-up and operation of the engine and equipment at temperatures below -20°C (-4°F).

### Overview

#### Control Element and Menu Structure

| Reference Number | Description                            |
|------------------|--|
| 1                | Menu Name                              |
| 2                | Menu Symbol                            |
| 3                | Activated Time Settings                |
| 4                | Hour                                   |
| 5                | Quick Start Button with Status Display |
| 6                | Control Knob                           |

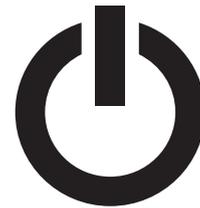


DS1601397

Figure 14

#### Buttons and Control

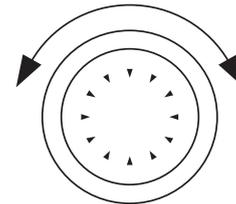
Quick start button with status display. (backlight)



DS1601398

Figure 15

Control knob (turn/push button) for selection and confirmation of the selected functions.



DS1601399

Figure 16

## Status Display

Status of the heater is indicated using the color backlight of the quick start button.

| Status  | LED Backlight |           |
|---|---------------|-----------|
| Heating mode  | Green         | Permanent |
| Ventilation mode  | Blue          | Permanent |
| Switched off heater-control element is activated                  | White         | Permanent |
| Error-no heating mode   | Red           | Flashing  |
| Preprogrammed heating mode- control element in stand-by mode*     | Green         | Flashing  |
| Preprogrammed ventilation mode- control element in stand-by mode* | White         | Flashing  |

\* If a user does not make any entry using the control element for 60 seconds and the heater is switched off then the control element will go into the stand-by mode (display and LED are switched off).

## Operating and Setting



### WARNING

---

**AVOID DEATH OR SERIOUS INJURY**

**Danger of explosion caused by the fumes and dust and hazardous substances.**

---

---



### WARNING

---

**AVOID DEATH OR SERIOUS INJURY**

**Inhaling poisonous gases in the enclosed rooms.**

---

## Start Display after Switching On

The following information about the connected heater and control element is shown in the start display:

- Name of the connected control element
- Name of the connected heater
- Software version of the connected control element
- Hardware version of the connected control element

The view returns to the main menu after 1.5 seconds.



DS1601400

**Figure 17**

## Heating Set-up

### 1. Switching on the heater using quick start button

"Quick start" function enables heating by simply pressing the button.

Operation time can be initially set. Instruction manual and description of the settings can be found in the chapter "Setting the quick start".

- Quick start button is programmed for heating.

#### A. Press quick start button.

Heating starts functioning.

Heating symbol and preset remaining operation time appear in the display.

Quick start button shows green light.



DS1601401

**Figure 18**

### 2. Switching on the heater through heating menu

- Heating symbol has been selected in the main menu.



DS1601402

**Figure 19**

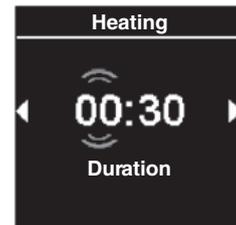
#### A. Press the control knob.

Operation time flickers in the display.

#### B. Turn the control knob to choose the duration of "an hour".

By means of turning the control knob in a clockwise direction one can select and activate maximum duration.

#### C. Press the control knob to confirm selection.



DS1601403

**Figure 20**

- D. Turn the control knob to choose duration of "a minute".



DS1601404

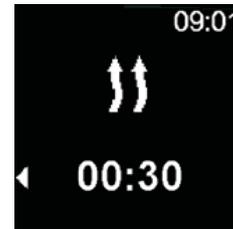
Figure 21

- E. Press the control knob to confirm selection.

Heating starts functioning.

Heating symbol and preset remaining operation time appear in the display.

Quick start button shows green light.



DS1601405

Figure 22

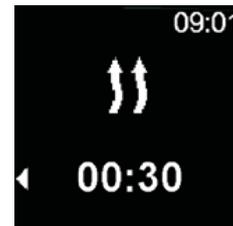
3. Adjusting the remaining operation time during functioning

- The heater is in the heating mode.

During use the remaining operation time can be only reduced. One cannot make any changes from the minimum duration which amounts to 10 minutes. Increasing the operation time is possible only after performing switching off and restarting the device earlier.

- A. Turn the control knob to adjust the desired remaining operation time.

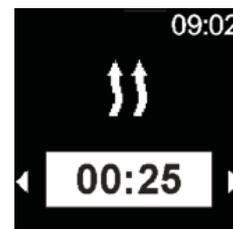
By means of turning the control knob in counterclockwise direction one can shorten remaining operation time.



DS1601405

Figure 23

- B. Press the control knob within 5 seconds to confirm selection.



DS1601406

Figure 24

#### 4. Switching off heating

- The heater is in the heating mode.

##### A. Press quick start button.

The main menu appears in the display.

Backlight of quick start button changes its color from green into white color.



Figure 25

DS1601407

### Timer Programming

There is a possibility of programming the time settings 7 days in advance. The heater switches on automatically at the programmed time. There is a possibility of saving up to 3 time settings per day and altogether up to 21 time settings.

Depending on the used variant of MultiControl device and application case (e.g. in a car, in a truck, on the boat, etc.), the number of actively available timers can fluctuate. There are maximum 21 active timers available.

#### 1. Creating and enabling timers

- Time and current day of week are set.
- The heater is switched off.
- "Timer" symbol has been selected in the main menu.



Figure 26

DS1601408

##### A. Press the control knob.

"Add timer" message (if no timer has been saved yet) appears in the display.

##### B. Press the control knob to add new timer.

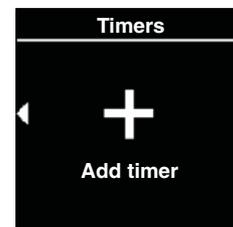
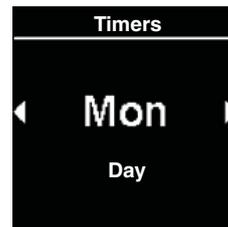


Figure 27

DS1601409

- C. Turn the control knob to choose "Day".
- D. Press the control knob to confirm selection.



**Figure 28**

DS1601410

- E. Turn the control knob to choose the start time of "an hour".
- F. Press the control knob to confirm selection.



**Figure 29**

DS1601411

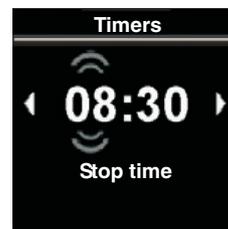
- G. Turn the control knob to choose the start time of "a minute".
- H. Press the control knob to confirm selection.



**Figure 30**

DS1601412

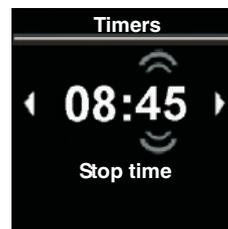
- I. Turn the control knob to choose the stop time of "an hour".
- J. Press the control knob to confirm selection.



**Figure 31**

DS1601413

- K. Turn the control knob to choose the stop time of "a minute".
- L. Press the control knob to confirm selection.



**Figure 32**

DS1601414

- M. Turn the control knob to choose the desired operation mode ("heating").

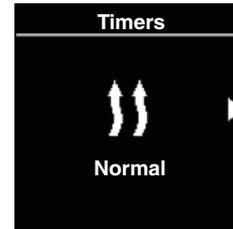


Figure 33

DS1601415

The programmed timer is saved and shown in the display.

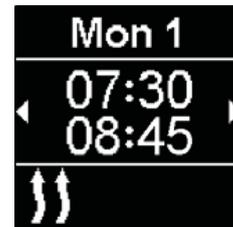


Figure 34

DS1601416

- N. Press the control knob to activate the programmed timer.

"Activate" message appears in the display.

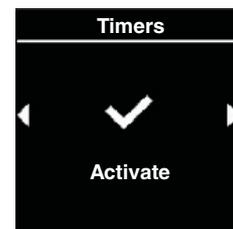


Figure 35

DS1601417

- O. Press the control knob to confirm selection.

Numbering of timers is established according to programming sequence. Activated time setting is marked by white bars. "T" symbol appears in the main menu. Quick start button flashes green when timer with heating is active but the display is off. Quick start button flashes blue when timer with ventilation is active but the display is off.



Figure 36

DS1601423

2. Deactivation, editing and removal of the programmed timer

- "Timer" symbol has been selected in the main menu.

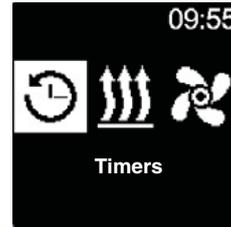


Figure 37

DS1601418

- A. Press the control knob.

Stored timers appear in the display. Timers are arranged in chronological order according to days/hours. Next active timer is displayed as the first one.

- B. Turn the control knob to choose the desired "Timer".  
C. Press the control knob to confirm selection.



Figure 38

DS1601423

- D. Turn the control knob to choose operation (activate/deactivate/edit/delete).

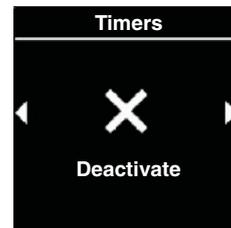


Figure 39

DS1601419

3. Removing all programmed timers

- "Timer" symbol has been selected in the main menu.



Figure 40

DS1601408

- A. Press the control knob.

The stored timers appear in the display.



Figure 41

DS1601423

- B. Turn the control knob clockwise until "Delete all" message is shown in the display.

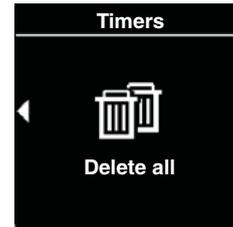


Figure 42

DS1601420

- C. Press the control knob to confirm selection.  
"OK" is shown in the display.

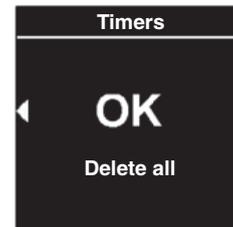


Figure 43

DS1601421

- D. Press the control knob to confirm selection.  
All programmed timers have been removed. The main menu is shown in the display.



Figure 44

DS1601422

### Quick Start Settings of Water Heaters

1. Setting heating
- "Settings" symbol has been selected in the main menu.

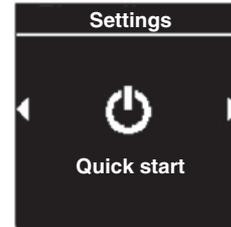


Figure 45

DS1601424

- A. Press the control knob.
- B. Press the control knob to choose "Quick start" submenu.

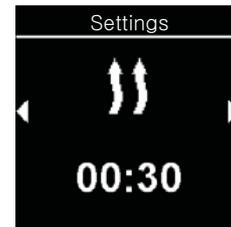
Heating mode appears in the display.



**Figure 46**

DS1601425

- C. Press the control knob to confirm selection.  
Duration flickers in the display.



**Figure 47**

DS1601426

- D. Turn the control knob to choose the duration of "an hour".

By means of turning the control knob in a clockwise direction one can select and activate maximum duration.

- E. Press the control knob to confirm selection.



**Figure 48**

DS1601454

- F. Turn the control knob to choose the duration of "a minute".

- G. Press the control knob to confirm selection.

Quick start button is configured using the appropriate settings.



**Figure 49**

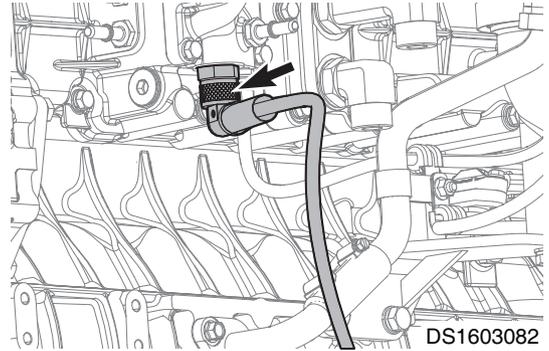
DS1601455

For a detailed explanation, refer to the provided CD.

## Plug Heater (If Equipped)

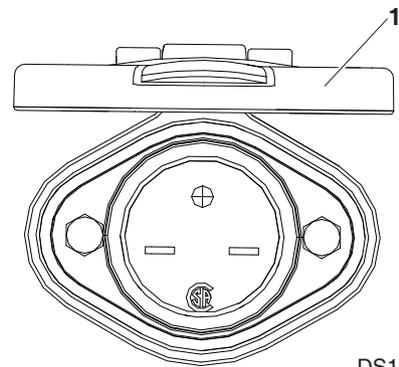
**NOTE:** When temperature drops below  $-25^{\circ}\text{C}$ , recommend to Use the Plug Heater.

1. Installing the plug heater
  - A. Open the flip cover. (1, Figure 51)
  - B. Connect extension cord to the receptacle at the flip cover.
  - C. Route the cord to any convenient point and tie cord down to prevent damages and strain. Keep cord away from hot surfaces and moving object.



**Figure 50**

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



**Figure 51**

DS1603083

## Starting Engine with a Booster Cable

---

### WARNING

---

#### AVOID DEATH OR SERIOUS INJURY

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



Figure 52

HAOA440L

---

### NOTICE

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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 53) are mounted.
2. Connect one end of red cable (1, Figure 53) 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 non-series connected positive (+) terminals.
3. Connect one end of black cable (2, Figure 53) to the negative (-) terminal of the booster batteries (3), and then make ground connection to the upper frame (5) of the

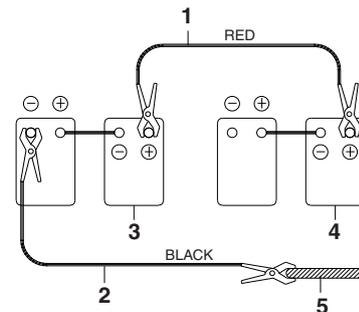


Figure 53

ARO0440L

machine to be started with the other end of black (-) cable (2, Figure 53).

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

4. Start the engine.

### Disconnecting Booster Batteries

1. Disconnect black negative (-) cable (2, Figure 53) from the machine frame (5) first.
2. Disconnect the other end of black negative (-) cable (2, Figure 53) from the booster batteries (3).
3. Disconnect red positive (+) cable (1, Figure 53) from the booster batteries (3).
4. Disconnect red positive (+) cable (1, Figure 53) from the machine batteries (4).

## Hydraulic System Warm-up



---

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

---

The correct operating temperature of the hydraulic oil is 50° - 80°C (120° - 175°F). Make sure to follow the procedures listed here for hydraulic fluid warm-up.

1. Run engine for approximately five (5) minutes set at the middle of the speed range, without a load.

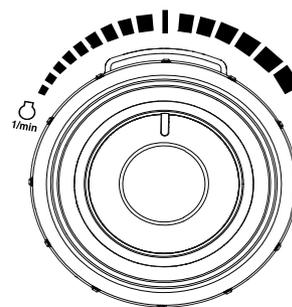


Figure 54

FG018151

2. Move safety lever (Figure 55) to "UNLOCK" position.

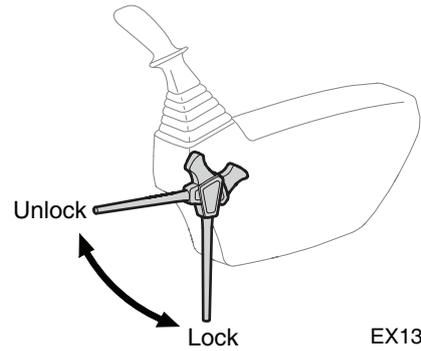


Figure 55

EX1300566

3. Slowly cycle boom, arm and bucket cylinders about five times without a load to circulate the oil through the system. Do this for five (5) minutes.
4. Check for clearance and fully raise the front attachment. Swing clockwise three (3) revolutions. Swing counterclockwise three (3) revolutions.
5. Travel forward and reverse at low speed for two (2) revolutions of the drive sprocket.

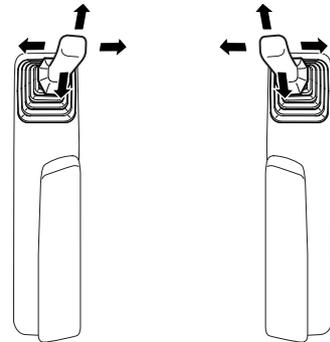


Figure 56

FG018384

## Hydraulic System Warm-up – Cold Weather

1. Run engine at "LOW IDLE" (no load) for five (5) minutes (Figure 57).

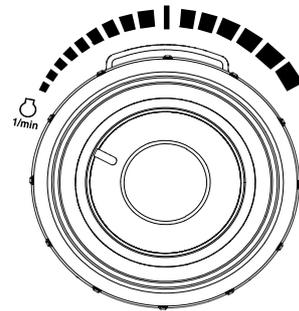


Figure 57

FG018152

2. Run engine for approximately five (5) minutes set at the middle of the speed range, without a load (Figure 58).

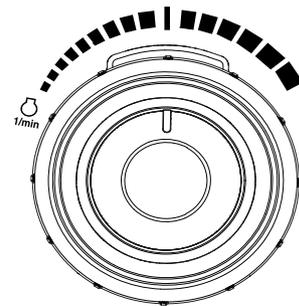
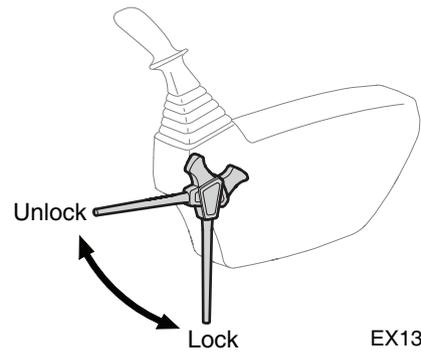


Figure 58

FG018151

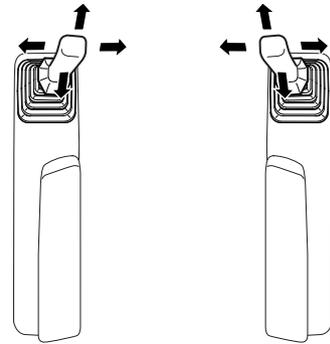
3. Move safety lever (Figure 59) to "UNLOCK" position.



EX1300566

**Figure 59**

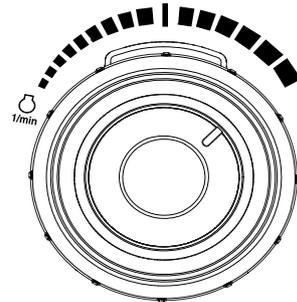
4. Slowly cycle boom, arm and bucket cylinders about five (5) times without a load to circulate the oil through the system. Do this for five (5) minutes.



FG018384

**Figure 60**

5. Set engine speed control dial to "HIGH IDLE" (Figure 61).
6. Repeat Step 4 for five (5) minutes. If working speeds continue to be slow, continue to operate but use extreme caution because machine function may be erratic.
7. Check for clearance and fully raise the front attachment. Slowly swing clockwise three (3) revolutions. Slowly swing counterclockwise three (3) revolutions.
8. Travel forward and reverse at low speed for two (2) revolutions of the drive sprocket.



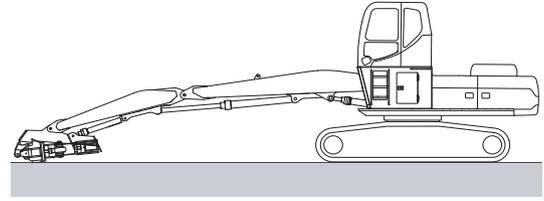
FG018154

**Figure 61**

## Stopping Engine

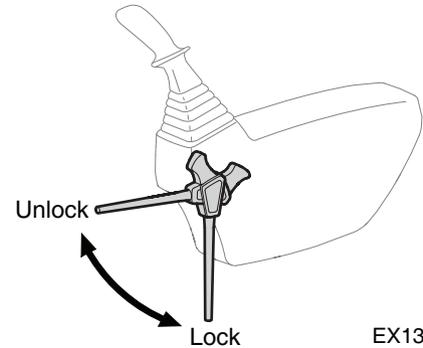
**NOTE:** Allow engine to idle for three - five (3 - 5) minutes before stopping the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allowing the engine to idle will allow the engine to cool down.

1. Park machine on firm and level ground.
2. Lower front end attachment to ground and make sure all operating controls are in "NEUTRAL".
3. Move safety lever to "LOCK" position (Figure 63).



EX1300557

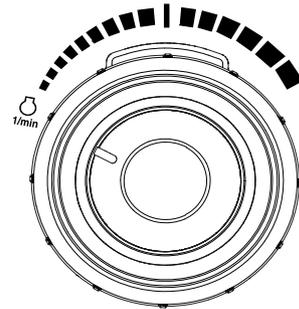
Figure 62



EX1300566

Figure 63

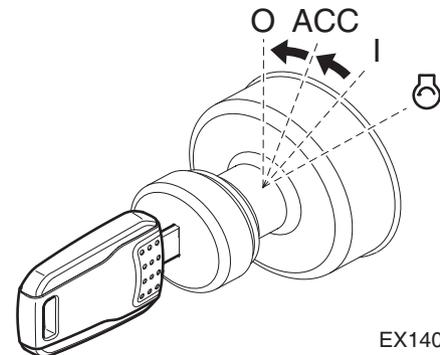
4. Set engine speed control dial to "LOW IDLE" (Figure 64). Allow engine to idle for three - five (3 - 5) minutes.



FG018152

Figure 64

5. Stop engine by turning key to "O" (OFF) position (Figure 65).
6. Remove key from starter switch.



EX1402155

Figure 65

## Checks and Maintenance After Stopping Engine

1. Park the machine on dry and hard ground.
2. Repair forestry 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.

## SAFETY LEVER



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

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

1. Move safety lever (Figure 66) down into "LOCK" position. When safety lever is in the "LOCK" position, the front attachment, work controls, swing and travel movement will be disabled.

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

2. Move safety lever (Figure 66) to "UNLOCK" position, by pulling it up before starting work.

**NOTE:** When the engine is not running, but the safety lever is in "UNLOCK" and the starter key is turned "ON", moving the work levers (joysticks) can result in movement of the work equipment. The charged accumulators in the system will provide pilot pressure for control valve spool movement.

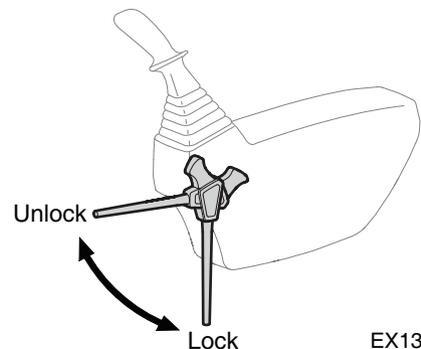


Figure 66

EX1300566

# TRAVEL

---



## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

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

## Automatic Travel Speed Control

---



## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

Do not change the travel mode while traveling. Always use speed mode "O" when traveling down a slope. Do not change to speed modes indicated "I" or "II" while going down a slope. Only change travel mode after coming to a complete stop.

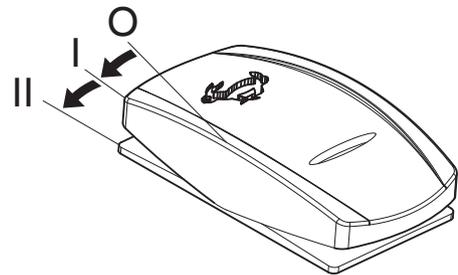
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Two travel speed ranges can be selected by using the travel speed selector switch on the control panel (Figure 67).

"O" (LOW) - In this position low travel speed and a higher torque are selected.

"I" (HIGH) - In this position high travel speed and a lower torque are selected.

"II" (AUTOMATIC) - Setting the control at the "II" position enables the machine to change to a different speed range automatically. This change happens automatically depending on the hydraulic oil pressure in the travel circuit. When hydraulic oil pressure rises, the travel speed is automatically set to low. An example is if the machine is traveling on a flat, solid surface, the higher speed range would be used. When a slope is encountered, the speed drops and the travel circuit hydraulic pressure rises, causing the control circuit to shift to the higher torque, lower speed range.



FG016016

Figure 67

## Travel Control Lever Operation

1. To travel straight (Figure 68), push both travel control levers/pedals fully forward or backwards. The farther the levers/pedals are pressed, the faster the travel speed.

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

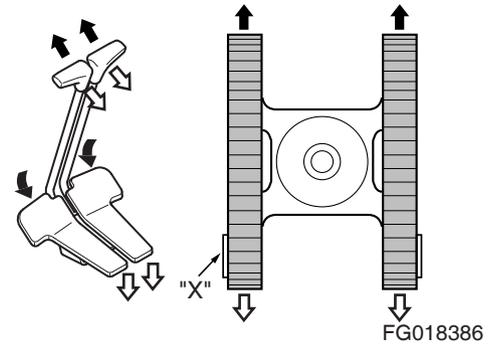


Figure 68

2. Pivot turns (Figure 69) are made by rotating only one track forward or backward. The machine will pivot on the nonmoving track.

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

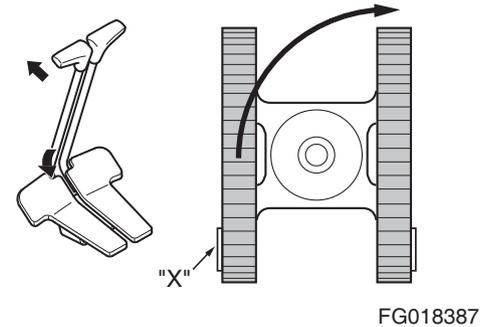


Figure 69

3. Spin turns (counterrotation) (Figure 70) are made by rotating one track forward and one track backward. The machine will spin around its center point.

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

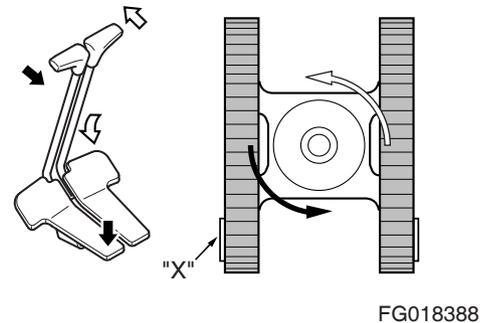


Figure 70

4. Stopping travel (Figure 71) - Returning travel levers to "NEUTRAL" position will automatically apply brakes and stop forestry machine.

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

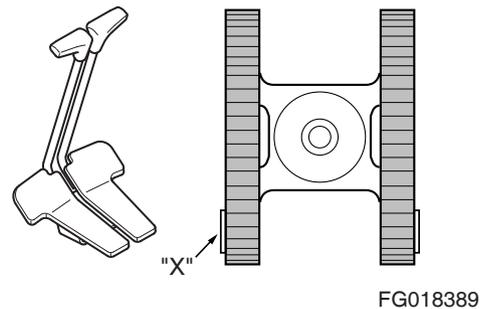
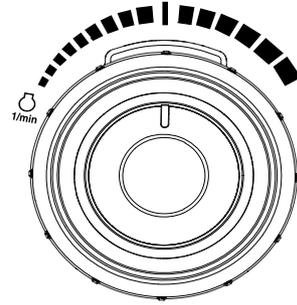


Figure 71

## General Travel Instructions

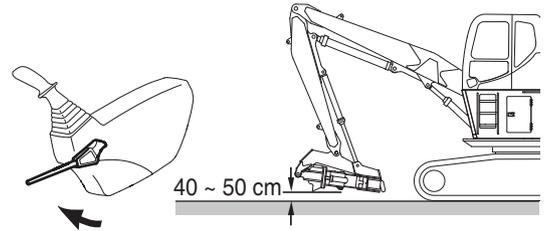
1. Set engine speed control dial (Figure 72) on desired speed.



FG018151

Figure 72

2. Move safety lever to "UNLOCK" position, and folding the front, raise it 40 ~ 50 cm (16 ~ 20 in) above ground. See Figure 73.



EX1300552

Figure 73

3. When possible, travel on firm and level ground. Avoid sudden movements and sharp turns.
4. When traveling on rough ground, travel at a slow speed (1.0 ~ 1.5 km/h (0.62 ~ 0.93 MPH)). Reduce engine speed, to avoid shock loading the equipment. Be careful that an excessive force is not added to equipment by climbing on rocks.



EX1300697

Figure 74

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



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

Operator should pay attention when traveling backward on a slope.

Never turn or travel across a slope.

Travel straight up or down the slope.

Choose a safe alternate route before climbing a slope.

If forestry machine starts to slip or becomes unstable, lower the bucket or work tool immediately into the ground, using it as a brake.

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

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

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

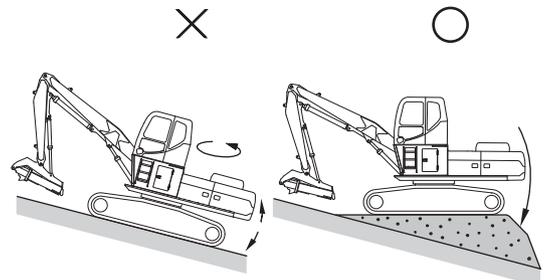
See Figure 75.

Do not travel on slopes more than 30° because of risk of roll-over.

6. Travel straight up or down slopes, never diagonally across the slope. See Figure 76 and Figure 77. Extend the arm and lower the boom to keep the heel about 20 ~ 30 cm (8 ~ 12 in) off the ground. If the machine starts to slide or becomes unstable, lower the bucket or work tool to regain control. If the engine stalls, lower the bucket or work tool, make sure that all controls are in the "NEUTRAL" position and restart the engine.

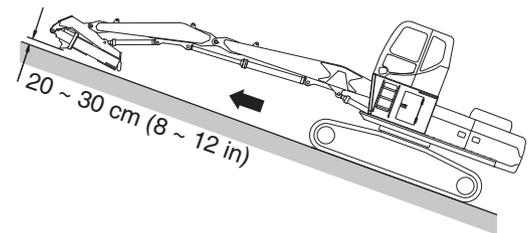
**NOTE:** Even though engine stops on a slope, do not operate swing control. The hydraulic accumulators can cause the unit to swing.

**NOTE:** Do not open or close operator's door on a slope. Make sure door is latched.



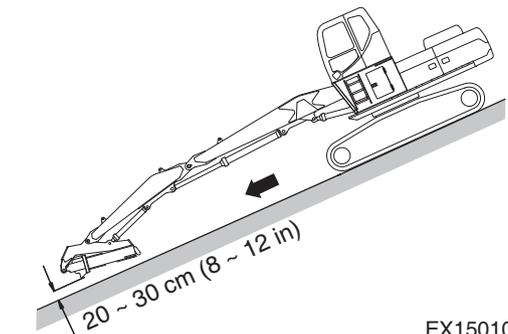
EX1300663

Figure 75



EX151079

Figure 76



EX1501080

Figure 77

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



## NOTICE

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When using the boom and arm to lift any portion of the machine, roll the bucket or work tool until round base is against the ground. The angle of the arm to the boom must be at 90°.

---

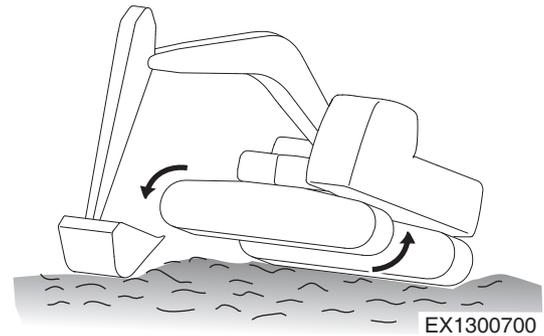


Figure 78

Make sure that material buildup has been cleared. See Figure 78 and Figure 79.

8. The forestry machine can travel in water that comes up to center of upper carriage rollers. Make sure that footing is solid so the machine will not sink. See "Working in Water" on page 3-51.

**NOTE:** *If the machine is submerged to the point that water or mud gets into the swing bearing or center joint, stop machine operation. Remove machine from the submerged location to firm, dry ground. Do not operate until proper inspection and maintenance have been completed. Refer to the Shop Manual or contact your HYUNDAI distributor.*

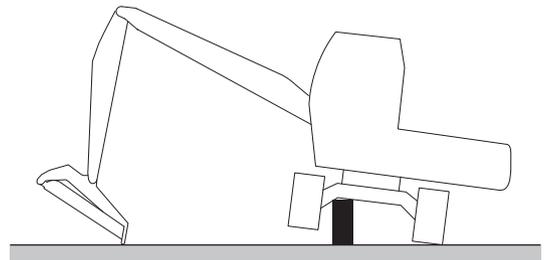


Figure 79

## Straight Travel Pedal (If Equipped)

### **WARNING**

#### AVOID DEATH OR SERIOUS INJURY

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

#### Operating

1. Forward
2. Reverse

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

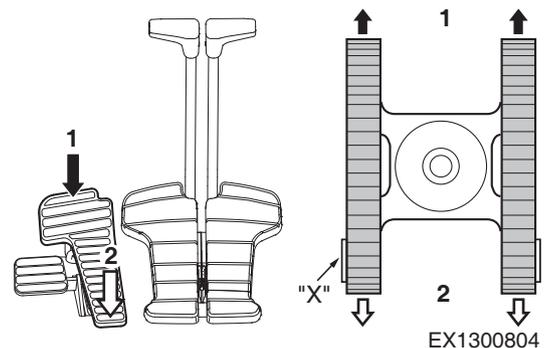


Figure 80

#### Locking Pedal

When straight travel pedal is not needed, the pedal can be locked by using the prop rod (1, Figure 81) locking device.

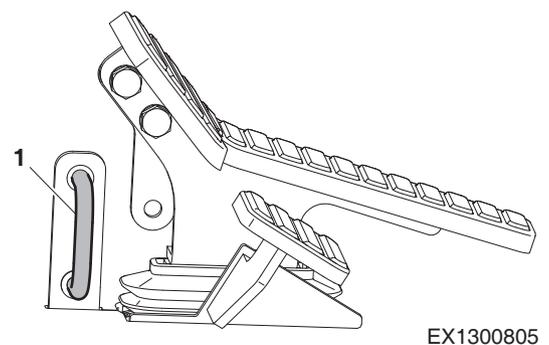
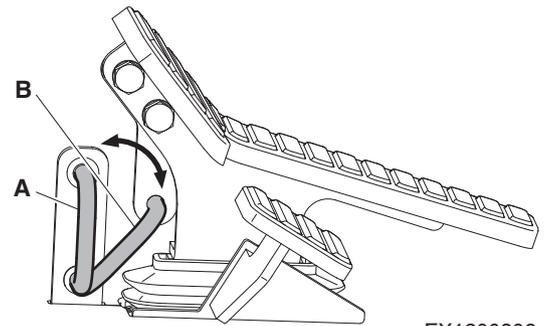


Figure 81

Locking is completed when the top end of the prop (1) is positioned into pedal hole.

- A. Location for "UNLOCKING" (Figure 82).
- B. Location for "LOCKING" (Figure 82).



EX1300806

**Figure 82**

# 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.

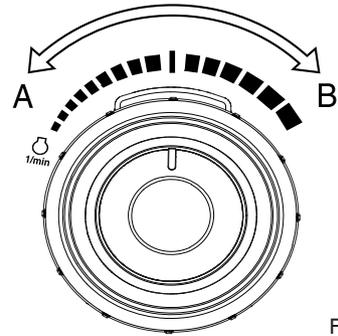


Figure 83

FG018094

## 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.

### Reaction at Low Reductant Level

DEF (AdBlue) Low Level Warning Symbol - EPA

| Reductant Level | Warning Symbol                  | Torque Reduction *        |
|-----------------|---------------------------------|---------------------------|
| 20%             | Constant Symbol                 |                           |
| 10%             | Flashing Every 2 sec.           | Torque is reduced by 25%. |
| 5%              | Flashing Rapidly Every 0.5 sec. | Low idle only             |



Figure 84

FG019175

## DEF (AdBlue) Low Level Warning Symbol - EU

| Reductant Level | Warning Symbol                  | Torque Reduction *                               |
|-----------------|---------------------------------|--|
| 20%             | Constant Symbol                 | None   |
| 10%             | Flashing Every 2 sec.           | Torque is reduced by 25%.                        |
| 5%              | Flashing Rapidly Every 0.5 sec. | Torque is reduced by 50% and rated speed by 60%. |

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

## Reaction to Faults in SCR System - EPA

| Time             | Warning Symbol                  | Torque Reduction *        |
|------------------|---------------------------------|---------------------------|
| Fault Detected   | Constant Symbol                 |                           |
| After 30 minutes | Constant Symbol                 | Torque is reduced by 25%. |
| After 1 hour     | Flashing Every 2 sec.           | Torque is reduced by 50%. |
| After 4 hours    | Flashing Rapidly Every 0.5 sec. | Low idle only             |

If a new fault occurs within 40 hours of operation since the first fault, the warning symbol will come on. After 30 minutes of operation, the warning symbol will flash rapidly and engine torque will be reduced to 0% (low idling) within 30 minutes.

## Reaction to Blocked EGR Valve and Malfunction of the Monitoring - EU

| Time           | Warning Symbol                  | Torque Reduction *                               |
|----------------|---------------------------------|--|
| Fault Detected | Constant Symbol                 |  |
| 36 hours       | Constant Symbol                 | Torque is reduced by 25%.                        |
| 100 hours      | Flashing Rapidly Every 0.5 sec. | Torque is reduced by 50% and rated speed by 60%. |

## Reaction to Interruption of Dosing and Reagent Quality - EU

| Time           | Warning Symbol                  | Torque Reduction *                               |
|----------------|---------------------------------|--|
| Fault Detected | Constant Symbol                 |  |
| 10 hours       | Constant Symbol                 | Torque is reduced by 25%.                        |
| 20 hours       | Flashing Rapidly Every 0.5 sec. | Torque is reduced by 50% and rated speed by 60%. |

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.**

---

## DeSOx

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 DeSOx.

The DeSOx 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 DeSOx process manually according to the following procedure. If the process is successfully performed, the warning light goes off.



---

### AVOID DEATH OR SERIOUS INJURY

Exhaust gas temperature and exhaust system components are very hot during DeSOx. 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 DeSOx.

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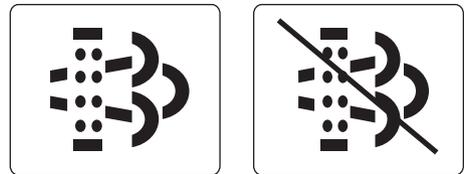
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### AVOID DEATH OR SERIOUS INJURY

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

---

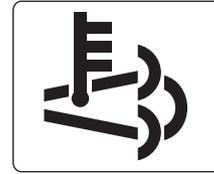
1. DeSOx light: light turns "ON" when DeSOx is required, or during the DeSOx process. When the operator inhibits DeSOx, the symbol will be displayed as shown in the right-hand view of Figure 85.



FG018399

Figure 85

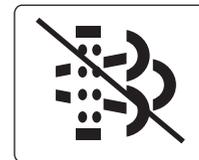
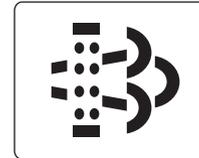
- The high temperature warning light turns "ON" as shown in Figure 86 to alert the operator of hot engine exhaust gases.



FG018398

Figure 86

- Manual (forced) DeSOx and inhibit switch: the upper symbol in Figure 87 is shown when the operator selects manual (forced) DeSOx with the switch. When the operator inhibits DeSOx, the lower symbol will be displayed as shown in Figure 87.



FG018400

Figure 87

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

### Active DeSOx

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

Active DeSOx can occur anytime the engine is running, while operating the machine or when the machine is parked. During DeSOx, the DeSOx 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 DeSOx, 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) DeSOx

The DeSOx is manually (forced) activated by the operator when the operator chooses to start the DeSOx process. Manual (forced) DeSOx may be required if the operator "inhibits" the active DeSOx 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) DeSOx by the operator.

1. Park machine in a well ventilated area and away from flammable materials.
2. Set up machine in the following manner:
  - A. Operate machine until engine coolant and oil temperatures are above 40°C (104°F).
  - B. Set engine speed to "LOW IDLE".
  - C. Put transmission lever in "NEUTRAL" and engage parking brake (Wheel excavator only).
3. Move safety lever to "LOCK" position.
4. Activate DeSOx switch (Figure 88) to start DeSOx process.

**NOTE:** *Regeneration light on monitor (Figure 89) will be "ON".*

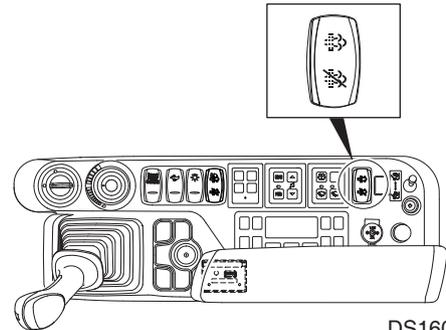
**NOTE:** *DeSox switch should be pushed 3 - 8 sec for DeSOx.  
If puch time is over 16 sec, fault code would be displayed on monitor.*

Engine speed will gradually increase from "LOW IDLE" to 1,800 rpm and DeSOx process will then start.

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

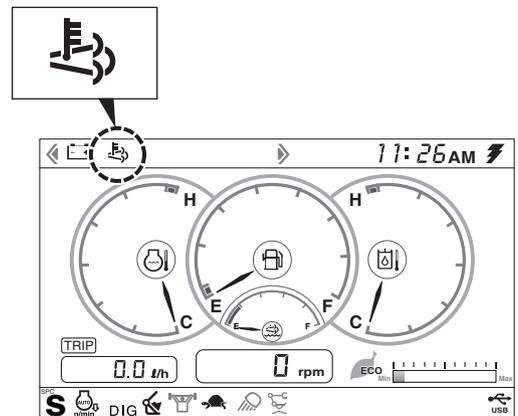
When DeSOx stops, DeSOx and high temperature warning lights will turn "OFF".

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



DS1603050

Figure 88



DS1603239

Figure 89

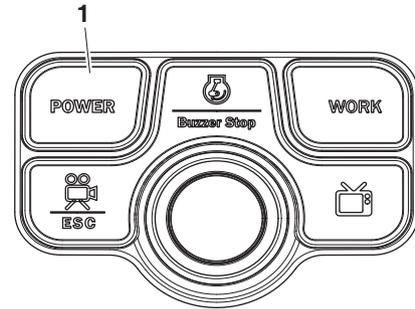
## Mode Selection

More efficient work can be done by choosing a proper power and work mode combination, suitable to type of work and conditions. Use the mode selection according to the following guide.

### Power Mode

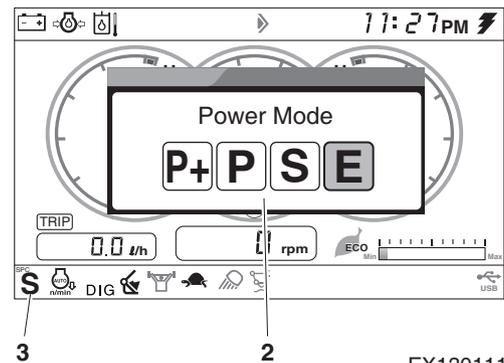
1. When the starter switch is turned "ON" the power mode is automatically defaulted to the standard setting.
2. Select a proper power mode using button (1, Figure 90) before starting work.
3. When the power mode button (1, Figure 90) is pressed, instrument panel displays a power mode selection pop up menu (2, Figure 91).

When power mode is selected, symbol (3, Figure 91) shows on screen.



FG018157

Figure 90



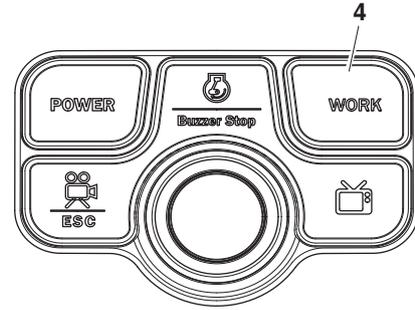
EX1301115

Figure 91

| Mode            | Selection Point  |
|-----------------|--|
| Power Plus Mode | <ul style="list-style-type: none"> <li>• Heavy work.</li> <li>• Maximize production with full Power.</li> </ul>                |
| Power Mode      | <ul style="list-style-type: none"> <li>• Fast work.</li> <li>• Work in a short period of time.</li> </ul>                      |
| Standard Mode   | <ul style="list-style-type: none"> <li>• General work.</li> <li>• Optimize speed and fuel consumption.</li> </ul>              |
| Economy Mode    | <ul style="list-style-type: none"> <li>• Light work.</li> <li>• Minimize fuel consumption.</li> <li>• Reduce noise.</li> </ul> |

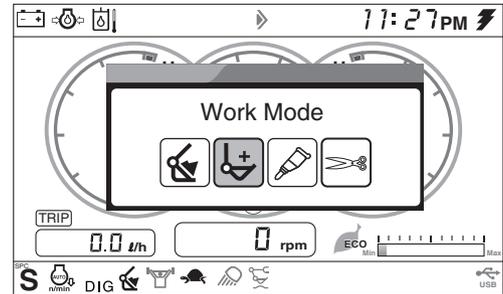
## Work Mode

1. When the starter switch is turned "ON" the work mode is automatically defaulted to digging mode.
2. Select a proper work mode using button (4, Figure 92) before starting working.  
(Digging/Lifting/Breaker/Shear Mode)



FG018372

Figure 92

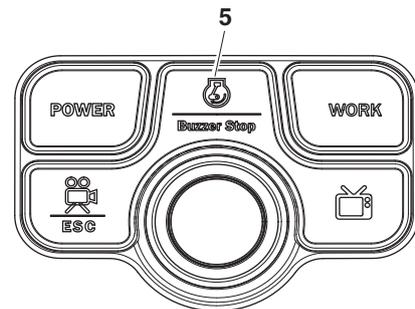


EX1301116

Figure 93

## Auto Idle Mode

1. The system will automatically reduce engine speed to idle speed approximately four (4) seconds after all the control levers are in the "NEUTRAL" position. When any lever is operated, engine speed is automatically returned to the preselected range.
2. When the starter switch is turned "ON", the work mode is automatically defaulted to "AUTO IDLE".
3. When the symbol is turned "ON", the auto idle function is activated. Deactivate the auto idle function by again pressing the auto idle selector button (5, Figure 94). Now the symbol will be turned "OFF".



FG018440

Figure 94



## WARNING

### AVOID DEATH OR SERIOUS INJURY

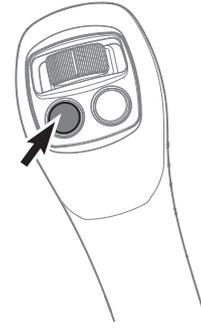
Turn "OFF" auto idle function when performing work in close operating areas, i.e., working in a narrow area and loading/unloading on or off a trailer.

## Boost Mode

1. Power boost switch is used to achieve maximum digging force.
2. The power boost is activated when the left button is pressed on the top of right-hand work lever (joystick).

**NOTE:** *Power boost mode does not affect forward and reverse travel.*

**NOTE:** *Do not use this switch for more than seven (7) seconds.*



**Figure 95**

DS1601528

## Work Levers (Joysticks) (ISO Pattern)



### WARNING

AVOID DEATH OR SERIOUS INJURY

Check surrounding area before swinging. When operating a lever while in auto idle, proceed with caution because the engine speed will increase rapidly. Keep bystanders away.

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

This equipment is manufactured using the lever control pattern described in ISO standards. Do not change valving, hoses, etc., that would change this control pattern. The boom, arm and bucket movements and swing direction of work levers (joysticks) are as follows:

#### Left-hand Work Lever (Joystick) (Figure 96 and Figure 97)

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

**NOTE:** The swing brake is spring applied and hydraulically released. It is always engaged when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.

**NOTE:** When operating the arm, it may stop momentarily. When the arm is operated, the weight of the arm can cause it to move faster than the amount of oil being supplied.

#### Right-hand Work Lever (Joystick) (Figure 96 and Figure 99)

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

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

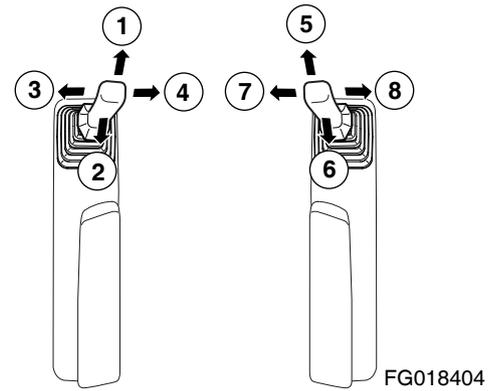


Figure 96

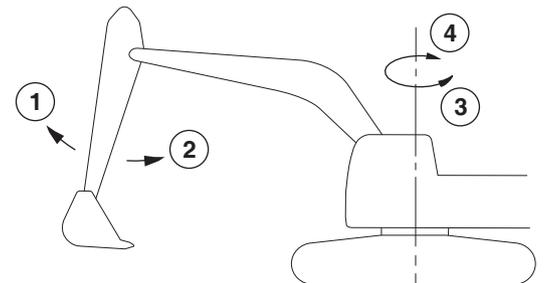


Figure 97

EX1300701

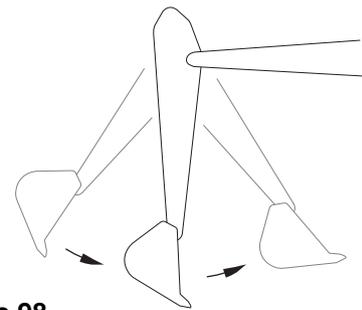


Figure 98

EX1300702

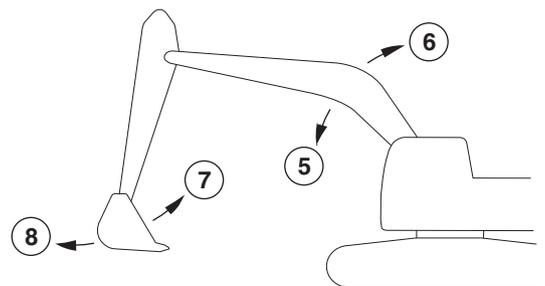


Figure 99

EX1300703

# Change Machine Control Pattern By Selector Valve (If Equipped)



## WARNING

### AVOID DEATH OR SERIOUS INJURY

Check surrounding area before swinging. When operating a lever while in auto idle, proceed with caution because the engine speed will increase rapidly. Keep bystanders away.

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

The machine control pattern can easily be changed to the ISO pattern or to the BHL pattern by changing the position of the selector valve (if equipped). Use the following procedure to change the position of the select valve.

The selector valve is located in the rear of the cabin.

1. Rotate spool to the ISO position or to BHL position.
2. A control pattern symbol shows on the display screen.

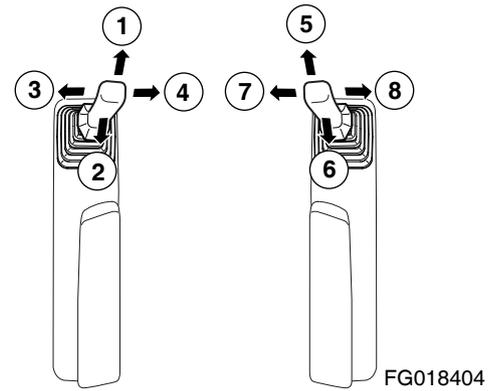
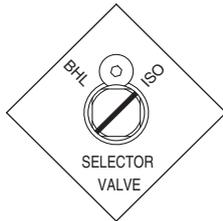
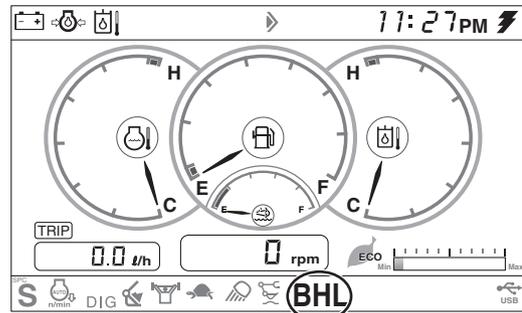
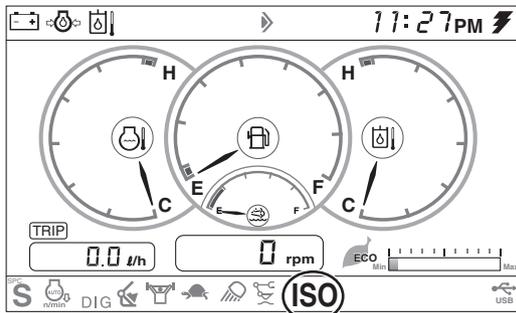
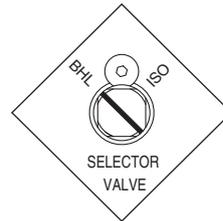


Figure 100

<ISO Pattern>



<BHL Pattern>



EX1301158

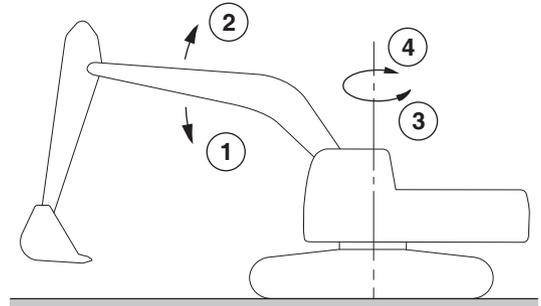
Figure 101

## Work Levers (Joysticks) (BHL Pattern)

### Left-hand Work Lever (Joystick) (Figure 100 and Figure 102)

1. Boom down
2. Boom up
3. Left swing
4. Right swing

**NOTE:** The swing brake is spring applied and hydraulically released. It is always engaged when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.



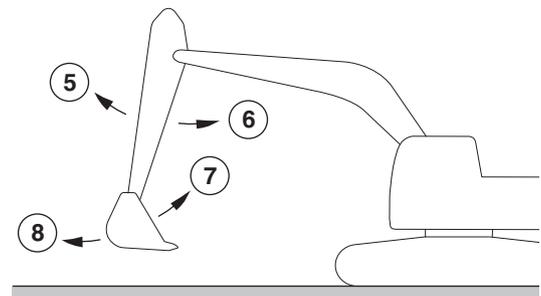
EX1300704

Figure 102

### Right-hand Work Lever (Joystick) (Figure 100 and Figure 103)

5. Arm dump
6. Arm crowd
7. Bucket crowd
8. Bucket dump

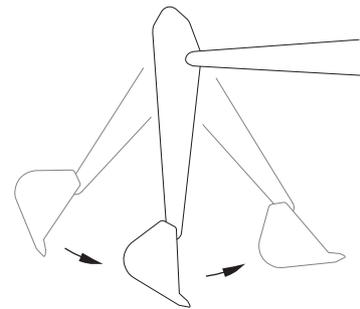
**NOTE:** Even after stopping the engine, the front can be lowered to the ground by the operating work lever (joystick) by moving safety lever to "UNLOCK" position and turning starter switch "ON".



EX1300705

Figure 103

**NOTE:** When operating the arm, it may stop momentarily. When the arm is operated, the weight of the arm can cause it to move faster than the amount of oil being supplied.



EX1300702

Figure 104

## Smart Power Control (SPC)

The SPC mode is implemented by engine speed control and pump torque control.

### 1. Smart engine speed control

This mode enhances fuel efficiency by reducing engine speed in the low load range to appropriate level through variable engine speed control which is carried out by detecting actual engine load and the operator's control action for heavy load operations, such as boom up and arm crowd.

- Heavy load: increase engine speed → maximize work performance
- Low load: decrease engine speed → maximize fuel efficiency

### 2. Smart pump torque control

This mode reduces smoke and increases fuel efficiency by reducing unnecessary engine load through optimized control of pump torque in accordance with the engine torque.

# OPERATING PRECAUTIONS

---



## WARNING

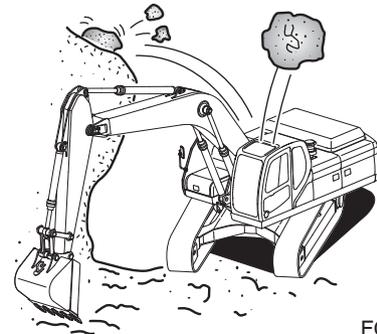
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### AVOID DEATH OR SERIOUS INJURY

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

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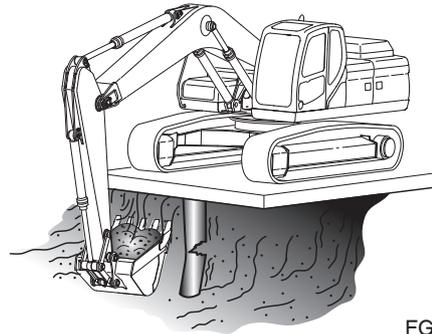
1. Before starting work, inspect terrain and soil conditions. Level ground and drain area if necessary.
2. Install window guards when working where there is a possibility of falling rocks or other objects.



FG018409

Figure 105

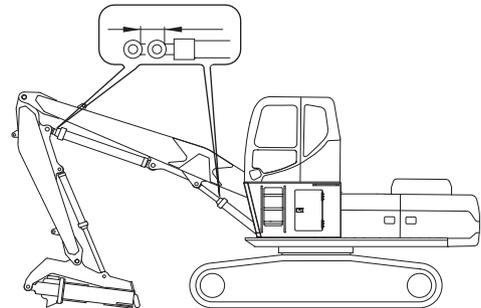
3. Check strength of supported structures in advance before working on them. If insufficient, reinforce it. If any doubt exists about structural strength, refuse to operate unit.
4. It is possible that boom, arm or bucket or work tool may come into contact with the upper or lower structure of the machine. There are digging conditions which could allow this to happen.



FG018410

Figure 106

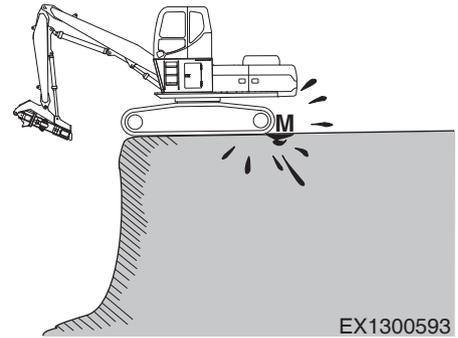
5. Do not continually "bottom out" the hydraulic cylinders. Machine damage can occur if the cylinders are fully extended or retracted.
6. When working on soft or muddy ground, make sure that the machine is not sinking.



EX1300592

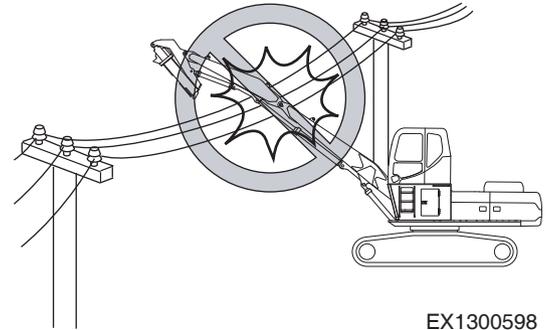
Figure 107

- When working close to the worked edge or drop off, make sure that the machine is sitting on is solid. Keep the travel motors to the rear. See Figure 108.



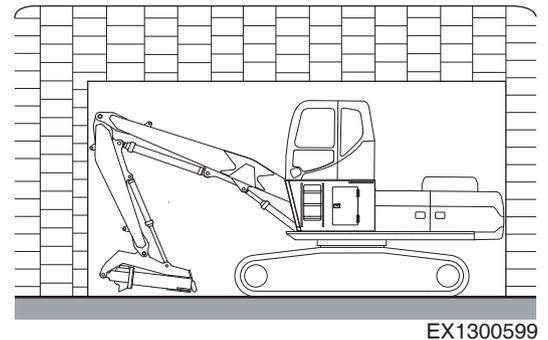
**Figure 108**

- Make sure there is adequate clearance from overhead electrical supply lines. See Figure 109.



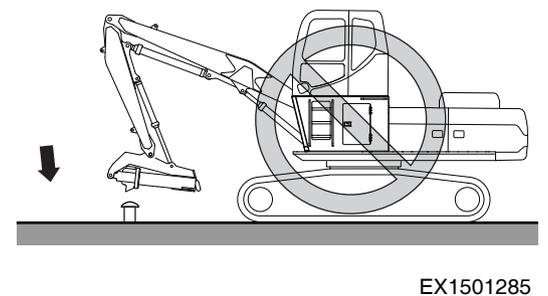
**Figure 109**

- If the working is in an underground location or in a building, make sure there is adequate overhead clearance and there is adequate ventilation. See Figure 110.



**Figure 110**

- Do not use the grapple as a hammer or ramming device. This is dangerous and causes damage to the front attachment. See Figure 111.
- Do not attempt to lift the machine by forcing the boom down. In some cases it may be necessary to lift the machine for track extension. This is permissible but, the grapple assembly must always be vertical to the ground and aligned with the arm so there is no bending of the grapple shaft.
- Do not attempt to use the loader to pull heavy objects or stumps by use of the machine drive.



**Figure 111**

13. Do not use the grapple rotation control to stop the rotation of large logs or loads. This circuit is protected by crossover reliefs which do allow stopping the rotation of the empty grapple, but continuous use of this feature for large loads can cause rotation motor failures.
14. Do not swing hoist or brake unnecessarily fast. All can cause accidents.
15. **ADDITIONAL PRECAUTIONS MAY BE NECESSARY, DEPENDING ON CONDITIONS AT THE WORK SITE.** The manufacturer has no direct control over machine application, operation, inspection lubrication, or maintenance. Therefore conformance with **GOOD SAFETY PRACTICE** in these areas are the responsibility of the user.
16. Do not swing a log out of bind or swing-hammer a log into the saddle of a load. This can cause sever structural damage.
17. Do not allow anyone to ride the attachment or the load. This is an extremely dangerous practice.

## **Always Observe These Precautions**

If the hydraulic fluid escapes, the attachment can fall immediately, endangering anything below. Make sure the blocking or solid ground (not the hydraulic oil) is actually supporting the attachment (or loader).

Release system pressure before attempting to make adjustments or repairs. Consult the manufacturer's instructions for procedures. **PRESSURE MUST BE RELEASED CORRECTLY. REMEMBER,** Pressure can be maintained in the hydraulic and air circuits long after the engine has been stopped.

## Working in Water



### NOTICE

When working in water, do not exceed a slope of more than 15°. If the slope is over 15°, the rear part of the upper structure will be immersed in water, resulting in radiator fan and engine damage.

When working in water, do not operate in water higher than the center of upper track roller(s) (1, Figure 113).

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

If water gets into swing gear housing, drain water immediately by removing lower inspection cover. Apply new grease.

After working in water, purge old grease from bucket or work tool pins.

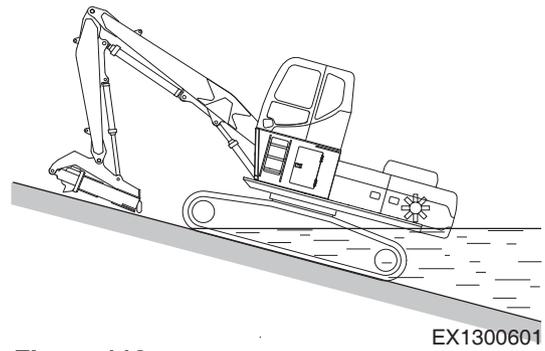


Figure 112

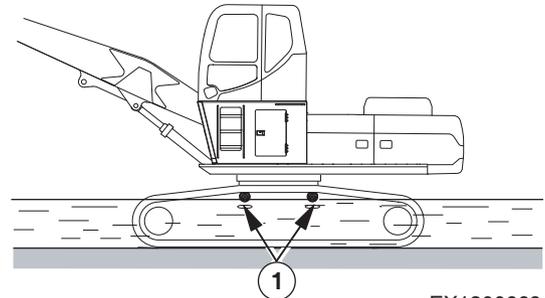


Figure 113

## Escaping From Mud

Be very careful to avoid getting stuck in mud.

### Track On One Side Stuck

**NOTE:** When using the boom or arm to raise the machine, always have the bottom of the bucket or work tool in contact with the ground. The angle between the boom and arm must be 90° ~ 110°.

*The same applies when using the bucket or work tool installed in the reverse direction.*

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

### Tracks On Both Sides Stuck

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

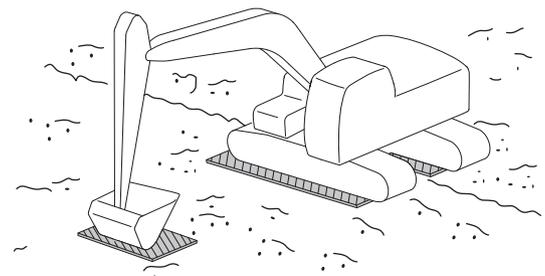


Figure 114

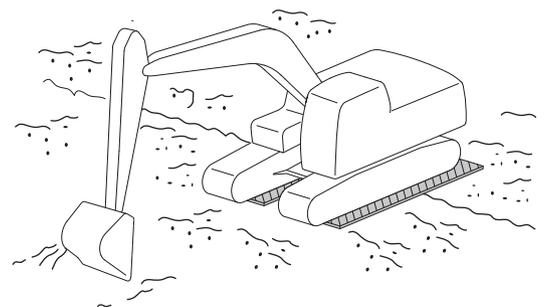


Figure 115

EX1300601

EX1300669

EX1300722

EX1300723

# PARKING FORESTRY MACHINE



## WARNING

### AVOID DEATH OR SERIOUS INJURY

Park machine on firm and level ground. Avoid parking on slopes. If forestry machine must be parked on a slope, block tracks or wheels and place heel in ground. See Figure 116.

1. Park machine on firm and level ground. Lower bucket or work tool to ground as shown in Figure 117.

2. Set engine speed control dial on "LOW IDLE".

3. If you move the operation lever unintentionally, it can cause accidental movement of the work group on attachment. Before leaving operator's seat, move safety lever to "LOCK" position. Stop engine.

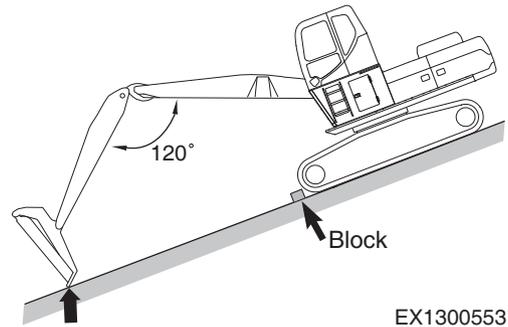


Figure 116

EX1300553

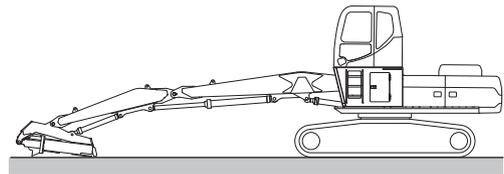


Figure 117

EX1300554

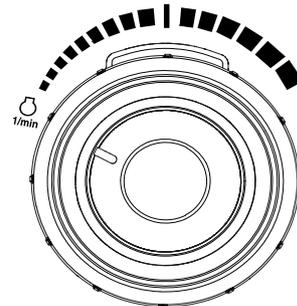


Figure 118

FG018152

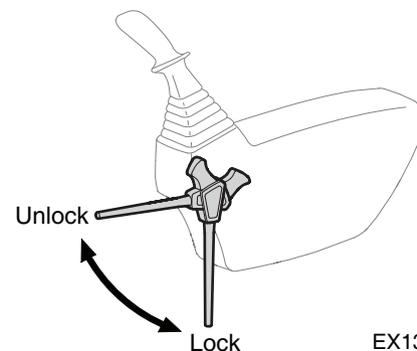


Figure 119

EX1300566

# TOWING PROCEDURE



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

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

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

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

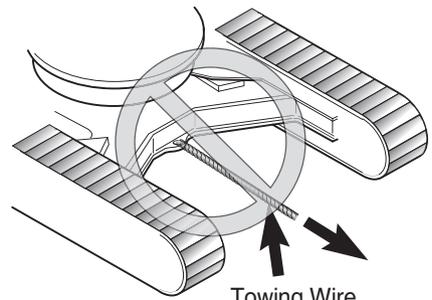
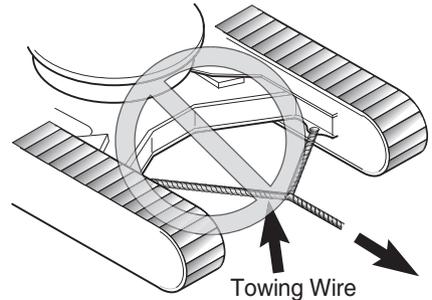
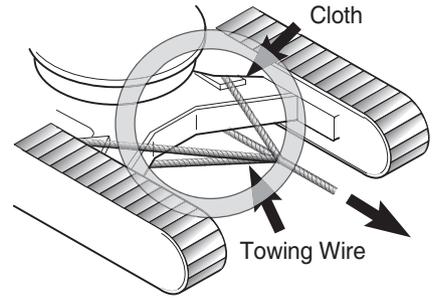
Insert protective material such as thick cloths between track frame and wire rope (cable) to prevent the wire rope from being damaged.



## 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).



EX1400132

Figure 120

## Rotating Operation

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

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

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



## WARNING

### AVOID DEATH OR SERIOUS INJURY

Before using any attachment in a work application, be sure to check its functional control. Make sure that desired movement or action is being activated by the control, e.g. opening/closing, clockwise/counterclockwise, crowd/dump, etc.

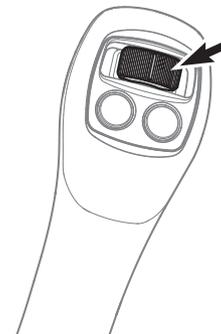


Figure 121

DS1601529

# OPERATION UNDER ABNORMAL CONDITIONS

**NOTE:** See "Maintenance in Special Conditions" on page 4-109 for other recommendations.

## 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  $-25^{\circ}\text{C}$ , recommend to Use the Plug Heater.

1. Preheat the engine before startup. Wait 3 - 4 seconds after preheating until voltage of the battery returns, and then actuate the key switch.
2. 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  $-10^{\circ}\text{C}$ , effectiveness of the battery is reduced accordingly. Insulation of the battery prevents this reduction, and supports improvement of starting power of the starter.



## WARNING

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### BATTERY EXPLOSION CAN CAUSE DEATH OR SERIOUS INJURY

**Never attempt to directly heat the battery with open fire.**

---

3. Keep engine in good mechanical condition for easy starting and good performance during adverse weather.
4. Use engine oil with proper specifications for expected temperatures. Refer to "Table of Recommended Lubricants" on page 4-21, in this manual or Shop Manual for details.
5. Always keep the fuel tank fully filled after completion of operation. 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 due to formation of wax in fuel, make sure that wax formation point of fuel is lower than atmospheric temperature.

6. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-17, in this manual or lubrication chart on machine.



## **WARNING**

---

### **FUEL TANK EXPLOSION CAN CAUSE DEATH OR SERIOUS INJURY**

**Never attempt to heat the fuel tank with an open flame.**

---

7. 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.
8. 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.
9. Clean off all mud, snow and ice to prevent freezing. Cover machine with a tarp if possible, keep ends of tarp from freezing to ground.

## **Operation in Extreme Heat**

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

1. Make frequent inspections and services of fan and radiator. Check coolant level in radiator. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block cooling passages.
  - Formation of scale and rust in cooling system occurs more rapidly in extremely high temperatures. Change antifreeze each year to keep corrosion inhibitor at full strength.
  - If necessary, flush cooling system periodically to keep passages clear. Avoid use of water with a high alkali content which increases scale and rust formation.

2. Check level of battery electrolyte daily. Keep electrolyte above plates to prevent damage to batteries. Use a slightly weaker electrolyte solution in hot climates. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries and store in a cool place.



## NOTICE

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

---

3. Service fuel system as directed in "Check Fuel Level" on page 4-31 and "Check for Leaks in Fuel System" on page 4-31, 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 4-17, 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 4-17. 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 4-17, in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

## Operation at High Altitudes

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

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

## Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

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

# 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.

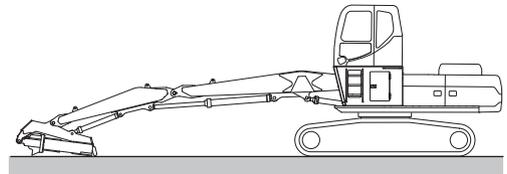
After the machine has been positioned for storage and the engine stopped, perform the following operations:

## Before Storage

Keep the forestry machine in the position shown in Figure 122 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 forestry machine to be fully charged and stored.
- Inspect the coolant recovery tank and radiator to make sure the antifreeze level in the system is correct. Make sure that antifreeze concentration is enough for the lowest temperature anticipated during storage.
- Seal all external openings (i.e. engine exhaust outlet, crankcase and hydraulic breather, fuel vent line, etc.) with tape wide enough to cover the opening, regardless of size.

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



EX1300554

**Figure 122**

## During Storage

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

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

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

# 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.

### **HYUNDAI Genuine Replacement Parts**

Use HYUNDAI genuine parts specified in Parts Book as replacement parts.

### **HYUNDAI Genuine Lubricants**

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

### **Windshield Washer Fluid**

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

### **Fresh and Clean Lubricants**

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

### **Check Drained Oil and Used Filter**

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

### **Fuel Strainer**

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

## **Welding Instructions**

- Cut off power. Wait for approximately one minute after turning off engine starter switch key, and then turn battery disconnect switch to "OFF" position.
- Do not apply more than 200 V continuously.
- Connect grounding cable within 1 m (3.3 ft) of area to be welded. If grounding cable is connected near instruments, connectors, etc., instruments can be damaged.
- If a seal or bearing happens to come between part being welded and grounding point, change grounding point to avoid these types of parts.
- Do not use area around work equipment pins or hydraulic cylinders as grounding point.

## **Do Not Drop Things Inside Machine**

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

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

## **Dusty Work Site**

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

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

## **Avoid Mixing Lubricants**

If a different brand or grade of oil has to be added, drain all old oil before adding new brand or grade of oil.

Never mix different brands or grades of oil.

## **Locking Inspection Covers**

Lock inspection cover securely into position with lock bar. If inspection or maintenance is performed with inspection cover not locked in position, it could fall and cause injury.

## Hydraulic System - Air Bleeding

When hydraulic equipment has been repaired or replaced, or hydraulic piping has been removed and installed again, air must be bled from circuit. For details, see "Venting and Priming Hydraulic System" on page 4-107.

## 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 "Change Wiper Blade and Front Cabin Light" 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.

## Change Wiper Blade and Front Cabin Light

When changing wiper blade or front cabin light, tilt a cabin and then replace with new one.

See "Tilt Cabin" on page 2-113 for cabin tilting.

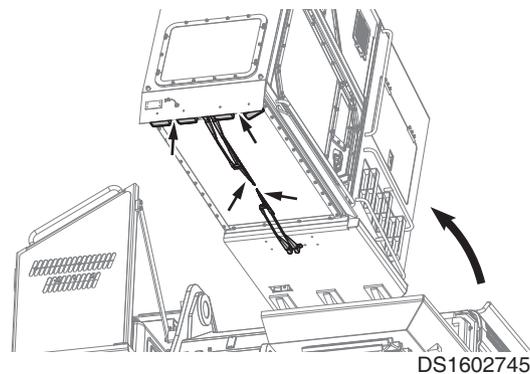


Figure 1

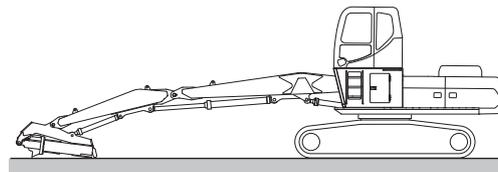
## Safety Precautions

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

# MACHINE SETUP POSITION FOR MAINTENANCE

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

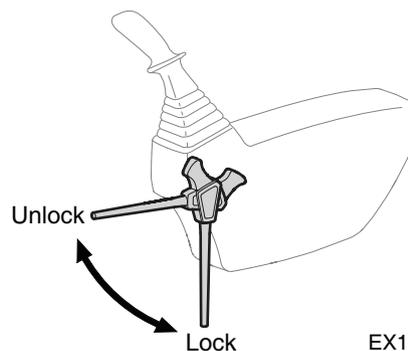
1. Position the machine on even, firm and level ground.
2. Put attachment on ground.



EX1300554

Figure 2

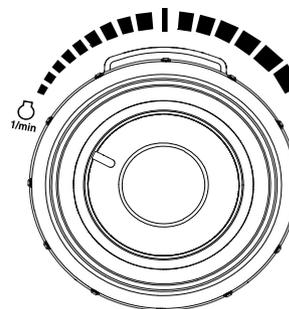
3. Move safety lever to "LOCK" position.



EX1300566

Figure 3

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.



FG018152

Figure 4

5. Stop engine by turning key to "O" (OFF) position. After releasing hydraulic system and tank pressure, remove starter switch key.

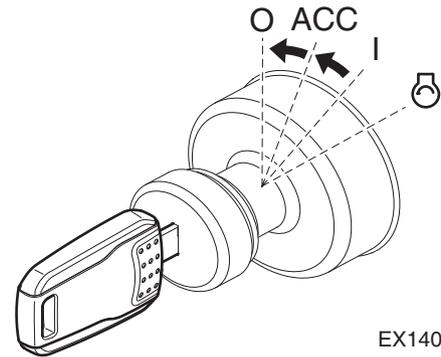


Figure 5

EX1402155

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.

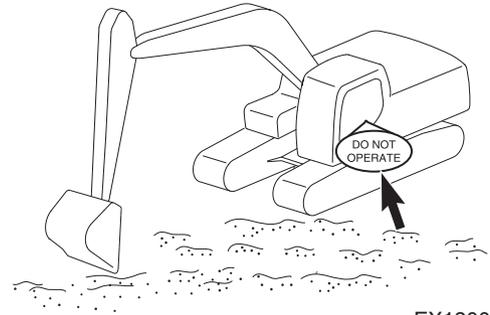


Figure 6

EX1300740

# MAINTENANCE HANDLING ACCESS

## Entering/Leaving/Climbing On Machine



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

Never grasp control lever to get ON/OFF.

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

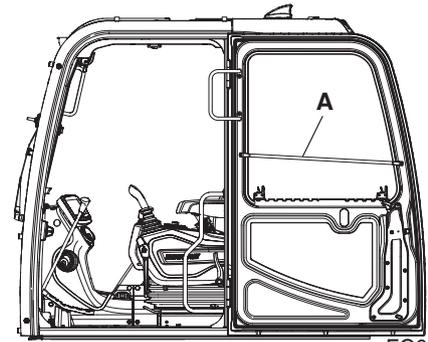
Use three-point grip, i.e. two hands and one foot or two feet and one hand.

Always face machine.

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

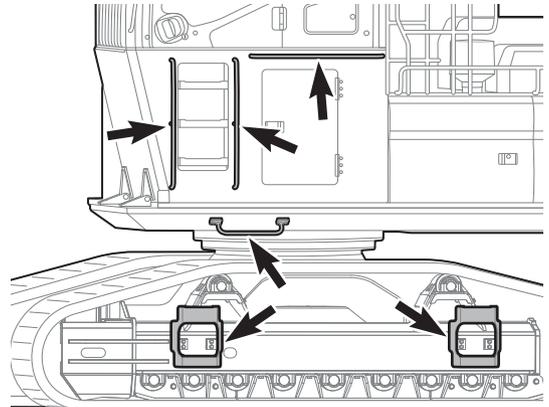
Clean your boots and wipe your hands before getting on the machine. Always wear proper footgear.

Do not use hand grip (A, Figure 7) of cabin door as a support when entering, leaving or climbing the machine. It is not strong enough to be used as a support. It should only be used for closing the door.



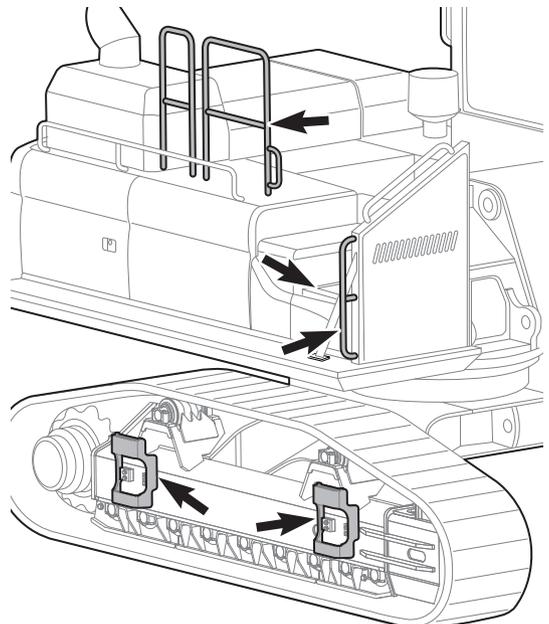
FG021268

Figure 7



EX1500971

Figure 8



EX1500972

Figure 9

# 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 HYUNDAI 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

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**Ultra Low Sulfur Diesel (ULSD) fuel 0.0015 percent ( $S \leq 15$  ppm (mg/kg)) sulfur is required by regulation for use in engines certified to nonroad Tier 4 standards (U.S. EPA Tier 4 certified) and that are equipped with exhaust aftertreatment systems.**

**European ULSD 0.0010 percent ( $\leq 10$  ppm (mg/kg)) sulfur fuel is required by regulation for use in engines certified to European Nonroad Stage IIIB and newer standards and are equipped with exhaust aftertreatment systems.**

---

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 HYUNDAI factory defects. Therefore the cost of repairs would not be covered by a HYUNDAI 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.
- HYUNDAI 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.

| <b>Non-permitted Container Materials for Storing DEF (AdBlue)</b>   |
|---|
| 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   |

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

## Engine Oil

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

HYUNDAI engine oils that meet API CJ-4 are required for use in the applications listed below.

HYUNDAI 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 HYUNDAI warranty for your machine.

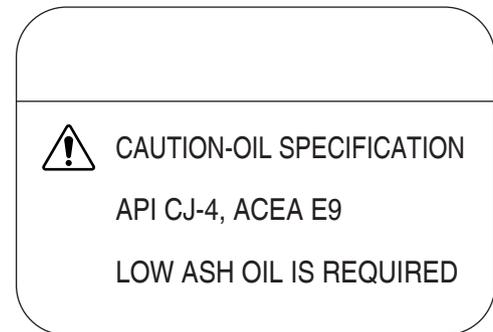
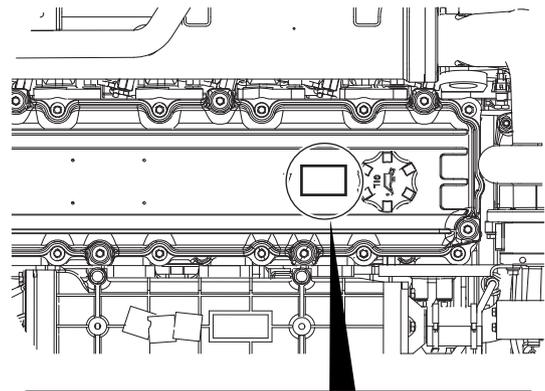
Other systems may apply.

Therefore the cost of repairs would not be covered by a HYUNDAI 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.



FG020979

Figure 10

## 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.  
HYUNDAI machines are supplied with HYUNDAI coolant. HYUNDAI 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 HYUNDAI antifreeze solution.  
When using HYUNDAI coolant, there is no need to use a corrosion resistor. For details, see "Engine Cooling System" on page 4-96.
- 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 4-96 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 HYUNDAI coolant to water differs according to ambient temperature.  
For details of ratio when mixing, see "Antifreeze Concentration Tables" on page 4-98.  
HYUNDAI 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 HYUNDAI pure antifreeze is not available, the antifreeze specification provided on the "Type of antifreeze" 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 4-17.  
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 HYUNDAI distributor.
- Do not open packages of spare filters until just before they are to be used.
- Always use HYUNDAI genuine filters.

# ELECTRICAL SYSTEM MAINTENANCE

- If electrical equipment becomes wet or covering of wiring is damaged, this will cause an electrical short circuit and result in improper machine operation. Do not wash inside of operator's cabin with water. When washing the machine, be careful not to let water get into electrical components.
- Service relating to the electrical system is: checking fan belt tension, checking damage or wear to the fan belt, and checking battery electrolyte level.
- Never install any electric components other than those specified by HYUNDAI.
- External electromagnetic interference can cause malfunction of the control system controller. Before installing a radio receiver or other wireless equipment, contact your HYUNDAI 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 "13. Power Socket for 12 Volt (If Equipped)" on page 2-19.  
Do not connect the optional power source to a fuse, starter switch, or battery relay.

# RECOMMEND FUEL, COOLANT, AND LUBRICANT

- Lubrication is an important part of preventive maintenance. To keep your machine in the best condition for long periods of time, it is essential to follow the instructions given in this manual.
- Failure to follow these recommendations can result in shortened life or excess wear of the engine, power train, cooling system, and/or other components.
- Commercially available lubricant may be good for the machine, but it can also cause harm. HYUNDAI 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 HYUNDAI distributor.
- Only use Ultra Low Sulfur Diesel (ULSD) fuel and API CI-4/ACEA E5, E7 or 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 4-17 makes lubrication work much easier and reduces the risk of forgetting lubrication intervals.



### NOTICE

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**Wipe off grease fittings and grease gun before greasing to prevent sand and dirt particles from penetrating into components.**

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## Symbols for "Lubrication and Service Chart"

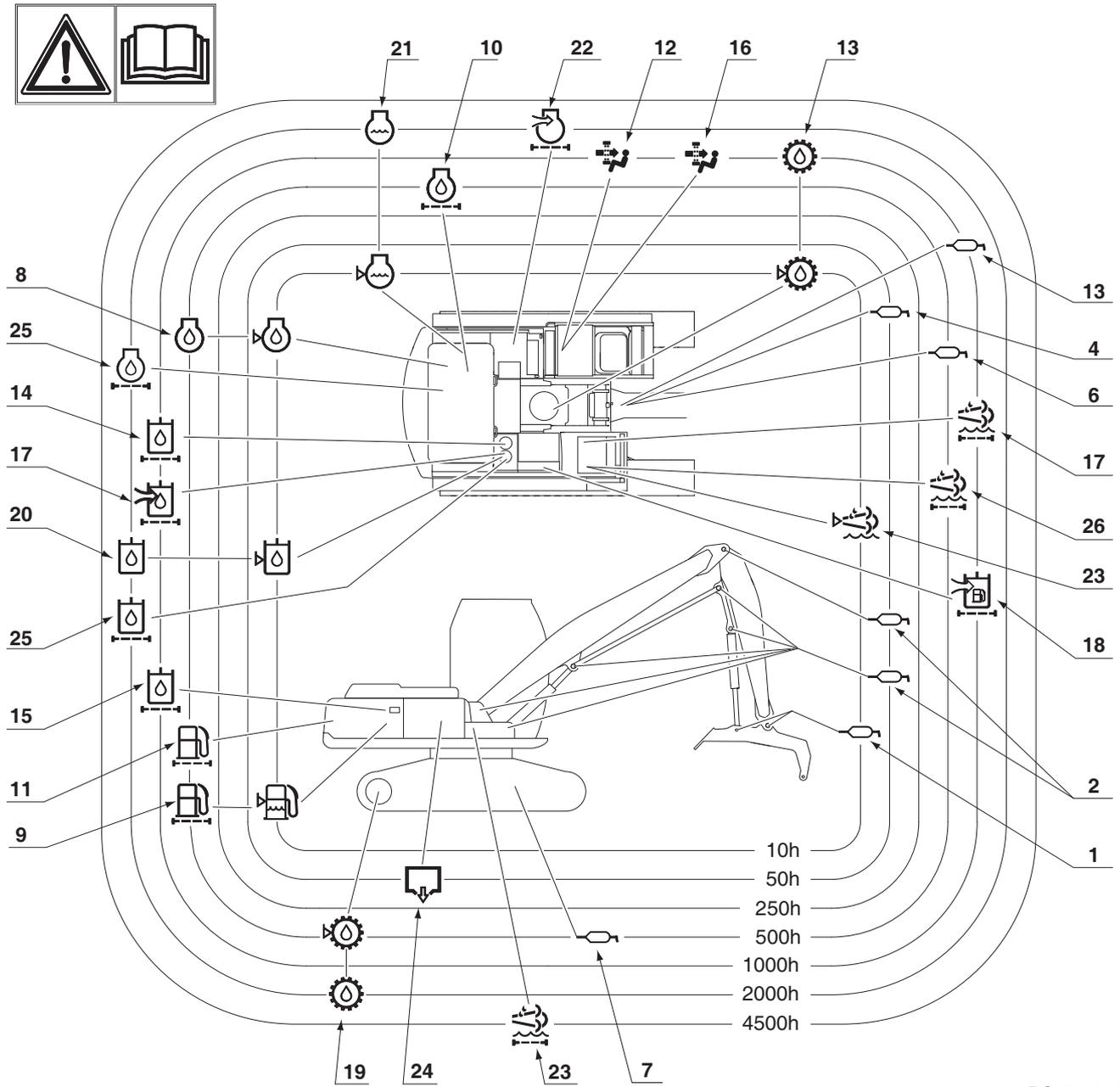
The lubrication and service chart is on the inside of the battery box cover. The symbols used in the lubrication and service chart are illustrated in the following table.

| Symbol  | Description                            |
|---|--|
|    | Lubrication                            |
|    | Gear Oil (Swing Device, Travel Device) |
|    | Engine Oil                             |
|    | Engine Oil Filter                      |
|    | Hydraulic Oil                          |
|    | Hydraulic Oil Filter                   |
|    | Hydraulic Oil Tank Breather            |
|   | Coolant                                |
|  | Air Cleaner Filter                     |

| Symbol   | Description            |
|--|------------------------|
|   | Fuel Filter            |
|   | Water Separator        |
|   | Air Conditioner Filter |
|   | Drain Water            |
|   | Fuel Cap Filter        |
|   | DEF (AdBlue)           |
|   | DEF (AdBlue) Filter    |
|  | Level Check            |

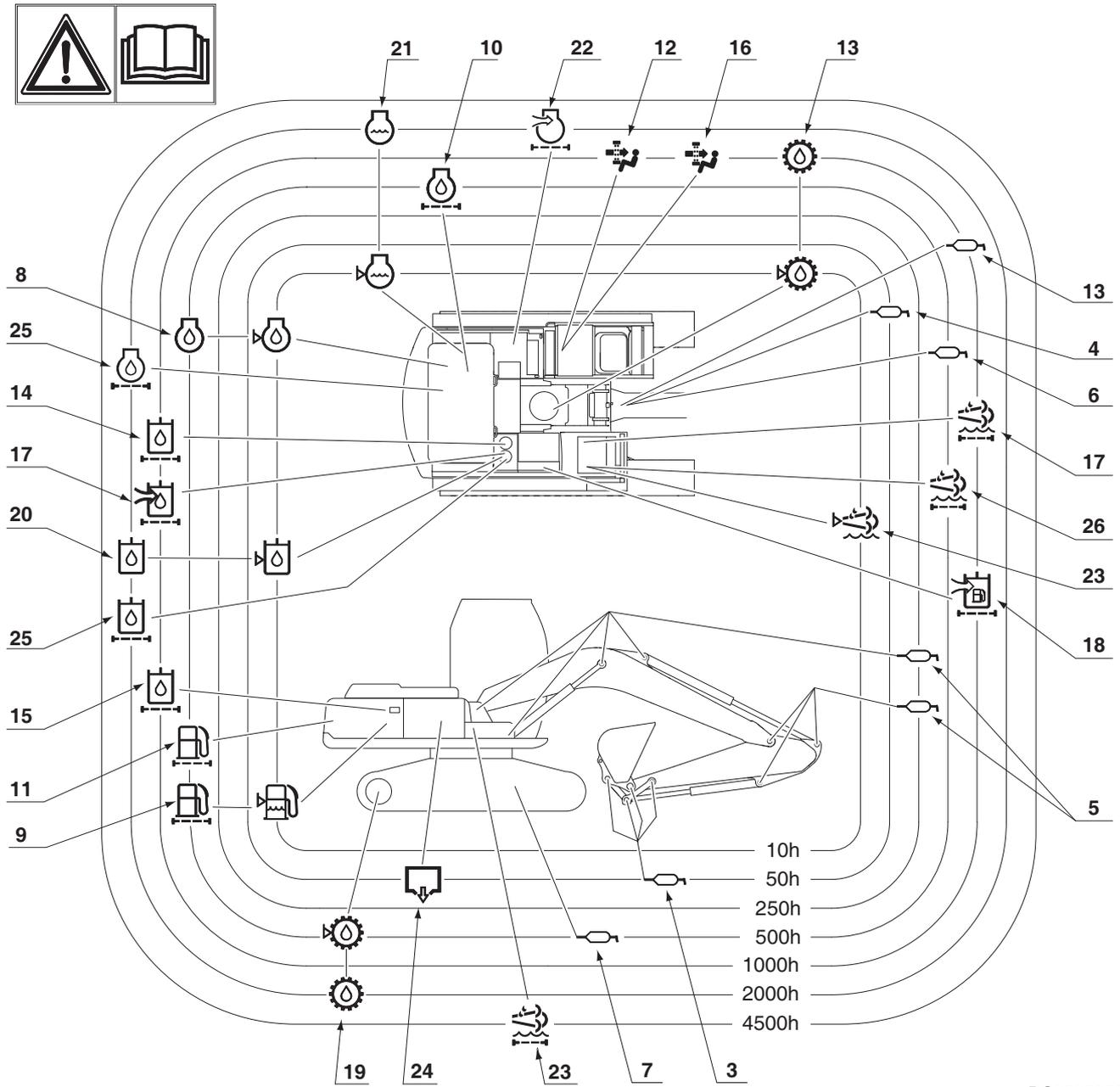
# Lubrication and Service Chart

## Log Loader



DS2000816

Figure 11



DS2000800

Figure 12

| SERVICE DATA |                                     |               |               |        |                       |     |     |      |      |      |
|--------------|-------------------------------------|---------------|---------------|--------|-----------------------|-----|-----|------|------|------|
| No.          | Items to Check                      |               | Service       | Qty.   | Service Interval (hr) |     |     |      |      |      |
|              |                                     |               |               |        | 10                    | 50  | 250 | 500  | 1000 | 2000 |
| 1            | Arm, Heel Joint Pin                 | Log Loader    | Grease        | 3      |                       |     |     |      |      |      |
| 2            | Boom, Arm Joint Pin                 |               | Grease        | 11     | F100                  | W10 |     |      |      |      |
| 3            | Arm, Bucket Joint Pin               | Road Builder  | Grease        | 6      | F100                  | W10 |     |      |      |      |
| 4            | Swing Bearing                       |               | Grease        | 3      |                       | W10 |     |      |      |      |
| 5            | Boom, Arm Joint Pin                 | Road Builder  | Grease        | 11     | F100                  |     | W10 |      |      |      |
| 6            | Pinion Gear (Swing)                 |               | Grease        | 1      |                       |     |     |      |      |      |
| 7            | Track Spring                        |               | Grease        | 2      |                       |     |     | W10  |      |      |
| 8            | Engine Oil                          |               | Engine Oil    | 42 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           | Air Conditioner Filter (Outer)      |               | Element       | 1      |                       |     |     | C    |      |      |
| 13           | Swing Reduction Gear                |               | Grease        | 1      |                       |     |     |      | W10  |      |
|              |                                     |               | Gear Oil      | 7 L    | V                     |     |     | F    |      |      |
| 14           | Hydraulic Oil Return Filter         |               | Element       | 1      |                       |     | F   |      |      |      |
| 15           | Pilot Filter                        |               | Element       | 1      |                       |     | F   |      |      |      |
| 16           | Air Conditioner Filter (Inner)      |               | Element       | 1      |                       |     |     | C    |      |      |
| 17           | Hydraulic Oil Tank Breather*        |               | Element       | 1      |                       |     |     |      |      |      |
| 18           | Fuel Cap Filter                     |               | Element       | 1      |                       |     |     |      |      |      |
| 19           | Travel Reduction Gear               |               | Gear Oil      | 2x6L   |                       |     |     | F, V |      |      |
| 20           | Hydraulic Oil Tank**                |               | Hydraulic Oil | 165 L  | V                     |     |     |      |      |      |
| 21           | Radiator                            | With Riser    | Coolant       | 50.9 L | V                     |     |     |      |      |      |
|              |                                     | Without Riser | Coolant       | 49.5 L | V                     |     |     |      |      |      |
| 22           | Air Cleaner (Outer)                 |               | Element       | 1      |                       |     |     | C    |      |      |
|              | Air Cleaner (Inner)                 |               | Element       | 1      |                       |     |     |      |      |      |
| 23           | DEF (AdBlue) Filter                 |               | Element       | 1      |                       |     |     |      |      |      |
| 24           | Fuel Tank                           |               | Diesel        | 490 L  | V                     | D   |     |      |      |      |
| 25           | Hydraulic Oil Suction Strainer      |               | Strainer      | 1      |                       |     |     |      | C    |      |
| 26           | DEF (AdBlue) Tank                   |               | DEF           | 62 L   | V                     |     |     |      |      |      |
| 27           | Radiator Core                       |               | Core          | 1      |                       |     |     | C    |      |      |
| 28           | Fuel cooler Core                    |               | Core          | 1      |                       |     |     | C    |      |      |
| 29           | Oil Cooler Core                     |               | Core          | 1      |                       |     |     | C    |      |      |
| 30           | Intercooler Core                    |               | Core          | 1      |                       |     |     | C    |      |      |
| 31           | Aircon Condenser Core               |               | Core          | 1      |                       |     |     | C    |      |      |

**V:** Maintenance and Refill. / **C:** Cleaning. / **D:** Drain Water. / **F:** First Time Exchange Only.  
**F100:** Every 10 Hours For First 100 Hours. / **W10:** Every 10 Hours If Operating In Water.  
: Replacement On Every Interval.

**NOTE:** For additional service items see list of "Maintenance Intervals" on page 4-24.

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

\*\* : The replacement intervals of hydraulic oil and filter depend upon amount of time hydraulic breaker is being used. These service intervals must be followed as opposed to regularly scheduled maintenance.

# FLUID CAPACITIES

| Component                    |                     | Capacity                   |                            |
|------------------------------|---------------------|----------------------------|----------------------------|
| Engine                       | Oil Pan with Filter | 42 L<br>(11.1 U.S. gal.)   |                            |
|                              | Cooling System      | With Riser                 | 50.9 L<br>(13.4 U.S. gal.) |
|                              |                     | Without Riser              | 49.5 L<br>(13.1 U.S. gal.) |
| Fuel Tank                    |                     | 490 L<br>(129.4 U.S. gal.) |                            |
| DEF (AdBlue) Tank            |                     | 62 L<br>(16.4 U.S. gal.)   |                            |
| Hydraulic Oil                | Tank Level          | 165 L<br>(43.6 U.S. gal.)  |                            |
|                              | System              | 340 L<br>(89.8 U.S. gal.)  |                            |
| Travel Reduction Gear (Each) |                     | 6 L<br>(1.6 U.S. gal.)     |                            |
| Swing Reduction Gear (Each)  |                     | 7 L<br>(1.8 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 HYUNDAI 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 4-17 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 |                     |    |    |     |        |  |
| Swing Drive Case   | Gear Oil         |                     |     |     |           | SAE 90 and API GL5        |               |                     |    |    |     |        |  |
| Final Drive Case   |                  |                     |     |     |           | 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 | 1) ASTM D975 No. 2  |  |  |  |  |  |  |  |  |  |
|  |             | ASTM D975 No. 1   |  |  |  |  |  |  |  |  |  |
| Grease Fitting   | Grease      | DIN 51502 KP-1K-30 / NLGI No.1  |  |  |  |  |  |  |  |  |  |
|  |             | DIN 51502 KP-2K-10 / NLGI No.2  |  |  |  |  |  |  |  |  |  |
|  |             | DIN 51502 KP-3K-10 / NLGI No.3  |  |  |  |  |  |  |  |  |  |
| Cooling System   | Coolant     | <p>Add Antifreeze<br/> 1) (50% antifreeze - 50% distilled water)<br/> (Note that mixing ratio is for reference purpose only, and is not an absolute standard.)<br/> Make sure to use Öçl \ aâ-s genuine antifreeze. If Öçl \ aâ-s genuine antifreeze is not available, see the "Type of Antifreeze" page.</p> |  |  |  |  |  |  |  |  |  |
| 1) Installed at factory.   |             |   |  |  |  |  |  |  |  |  |  |
| 2) (5W40) - Recommended for use at extremely low temperature below -20°C.  |             |   |  |  |  |  |  |  |  |  |  |
| 3) (10W40) - Filled at factory. HYUNDAI genuine engine oil is recommended for use.   |             |   |  |  |  |  |  |  |  |  |  |
| 4) (15W40) - HYUNDAI genuine engine oil is recommended for use.  |             |   |  |  |  |  |  |  |  |  |  |
| 5) (Engine oil) - Engine oil must meet API CI-4/ACEA E5, E7 or API CJ-4/ACEA E9.   |             |   |  |  |  |  |  |  |  |  |  |
| 6) Hydraulic oil change interval is 4,000 hours, only when HYUNDAI Genuine Oil is used. If other brands of oil is used, guaranteed change interval is 2,000 hours. Note that oil grade is for reference purpose only, and is not an absolute standard. |             |   |  |  |  |  |  |  |  |  |  |
| <b>API:</b> American Petroleum Institute.  |             |   |  |  |  |  |  |  |  |  |  |
| <b>ACEA:</b> Association des Constructeurs Européens d'Automobiles.  |             |   |  |  |  |  |  |  |  |  |  |
| <b>ASTM:</b> American Society of Testing and Materials.  |             |   |  |  |  |  |  |  |  |  |  |
| <b>ISO:</b> International Organization for Standardization.  |             |   |  |  |  |  |  |  |  |  |  |
| <b>NLGI:</b> National Lubricating Grease Institute.  |             |   |  |  |  |  |  |  |  |  |  |
| <b>SAE:</b> Society of Automotive Engineers.   |             |   |  |  |  |  |  |  |  |  |  |
| <b>DIN:</b> Deutsche Industrie Normen  |             |   |  |  |  |  |  |  |  |  |  |

## NOTICE

**Do not mix oils from different manufacturers. HYUNDAI 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

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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.

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## NOTICE

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We recommend using genuine HYUNDAI 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.

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- **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 |
|--|------|
| <b>10 Hour / Daily Service</b>   |      |
| Grease Arm and Heel Joint Pins   | 4-27 |
| Grease Boom, Arm and Front Attachment Pins (for first 100 hours)   | 4-28 |
| Check Engine Oil Level   | 4-29 |
| Check for Leaks in Hydraulic System  | 4-29 |
| Check Level of Hydraulic Oil Tank  | 4-30 |
| Check for Leaks in Fuel System   | 4-31 |
| Check Fuel Level   | 4-31 |
| Check DEF (AdBlue) Tank  | 4-33 |
| Check Water Separator & Pre Fuel Filter (Fuel Prefilter) and Drain Water As Required   | 4-34 |
| Check Oil Level of Swing Reduction Gear  | 4-35 |
| Clean Dust Net in Front of Oil Cooler and Radiator   | 4-36 |
| Check Cooling System and Refill As Required  | 4-37 |
| Check Level of Window Washer Liquid  | 4-37 |
| Inspect Bucket Teeth and Side Cutters for Signs of Wear  | 4-38 |
| Inspect Cooling Fan Blade  | 4-38 |
| Check Air Intake System and Emission Control System Components   | 4-39 |
| Inspect Seat Belt for Proper Operation   | 4-39 |
| Inspect Rear View Camera for Proper Operation (If Equipped)  | 4-39 |
| Inspect Mirrors for Damage and Adjust and Clean as Required  | 4-40 |
| Inspect Structure for Cracks and Faulty Welds  | 4-40 |
| Check Operation of All Switches and Travel Alarm (If Equipped)   | 4-40 |
| Check the Operation of Safety Lever  | 4-40 |
| Check Operation of All Exterior Lights, Horn and Control Console Indicator and Display Monitor   | 4-41 |
| Start Engine, Check Starting Ability, and Observe Exhaust Color at Start-up and at Normal Operating Temperature. Listen for Any Abnormal Sounds. | 4-41 |
| Check Operation of All Controls and Linkages   | 4-42 |
| <b>50 Hour / Weekly Service</b>  |      |
| Perform All Daily Service Checks   | 4-43 |
| Grease Boom and Arm Joint Pins   | 4-43 |
| Grease Arm and Bucket Joint Pins   | 4-47 |
| Grease Swing Bearing   | 4-48 |
| Drain Water and Sediment from Fuel Tank  | 4-49 |
| Drain Water and Sediment from Additional Fuel Tank (If Equipped)   | 4-49 |
| Inspect the Track Assemblies for Proper Tension and Loose, Worn or Damaged Parts (Links, Shoes, Rollers, Idlers)                                 | 4-49 |
| <b>250 Hour / Monthly Service</b>  |      |
| Perform All Daily and 50 Hour Service Checks   | 4-50 |

| <b>SERVICE ITEM</b>  | <b>PAGE</b> |
|--|-------------|
| Grease Boom and Arm Joint Pins   | 4-50        |
| Replace Hydraulic Oil Return Filter (After First 250 Hours)                              | 4-52        |
| Change Pilot Filter (After First 250 Hours)  | 4-52        |
| Inspect Pins and Bushings of the Front End Attachments for Signs of Wear                 | 4-52        |
| Check Fluid Levels in Batteries  | 4-52        |
| Inspect for Any Loose or Missing Nuts and Bolts  | 4-52        |
| Inspect Fuel System Hose Clamps  | 4-52        |
| <b>500 Hour / 3 Month Service</b>  |             |
| Perform All Daily, 50 and 250 Hour Service Checks  | 4-53        |
| Grease Swing Gear and Pinion   | 4-53        |
| Change Engine Oil and Filter   | 4-54        |
| Check and Clean Air-conditioning Inner Filter  | 4-55        |
| Clean Air-conditioning Outer Filter  | 4-57        |
| Clean Radiator, Oil Cooler, Intercooler, Fuel Cooler and Air Conditioner Condenser Cores | 4-59        |
| Clean Outer Filter of Air Cleaner  | 4-60        |
| Change of Water Separator and Pre Fuel Filter (Fuel Prefilter)                           | 4-62        |
| Change Main Fuel Filter  | 4-63        |
| Check Oil Level in Travel Reduction Gear (One on Each Side of Unit)                      | 4-64        |
| Change Oil in Travel Reduction Gear (One on Each Side of Unit) (After First 500 Hours)   | 4-65        |
| Change Oil in Swing Reduction Gear (Drain and Refill After First 500 Hours)              | 4-65        |
| <b>1,000 Hour / 6 Month Service</b>  |             |
| Perform All Daily, 50, 250 and 500 Hour Service Checks                                   | 4-66        |
| Grease Swing Reduction Gear  | 4-66        |
| Change Hydraulic Oil Tank Breather Filter  | 4-66        |
| Replace Hydraulic Oil Return Filter  | 4-67        |
| Change Pilot Filter  | 4-68        |
| Change Oil in Swing Reduction Gear   | 4-69        |
| Change Air-conditioning Inner Filter   | 4-70        |
| Change Air-conditioning Outer Filter   | 4-71        |
| Change Fuel Cap Filter   | 4-73        |
| <b>2,000 Hour / Yearly Service</b>   |             |
| Perform All Daily, 50, 250, 500 and 1,000 Hour Service Checks                            | 4-75        |
| Replace Outer and Inner Air Cleaner Filters  | 4-75        |
| Change Radiator Coolant  | 4-77        |
| Hydraulic Oil Exchange and Suction Strainer Cleaning                                     | 4-79        |
| Change Oil in Travel Reduction Gear (One on Each Side of Unit)                           | 4-81        |
| Check Alternator and Starter**   | 4-82        |
| Check All Rubber Antivibration Shock Mounts  | 4-82        |
| Perform and Record Results of Cycle Time Tests   | 4-82        |
| Inspect Machine to Check for Cracked or Broken Welds or other Structural Damage          | 4-82        |

| <b>SERVICE ITEM</b>   | <b>PAGE</b> |
|---|-------------|
| Check, Adjust Valve Clearance**   | 4-82        |
| Check Head Bolt Torques   | 4-82        |
| <b>4,000 Hour / Biennial Service</b>  |             |
| Major Parts - Periodic Replacement  | 4-83        |
| <b>4,500 Hour / Biennial Service</b>  |             |
| Change DEF (AdBlue) Filter  | 4-84        |
| <b>12,000 Hour / 6 Year Service</b>   |             |
| Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN)) | 4-87        |

\*\* These checks need to be completed by an authorized HYUNDAI distributor.

# 10 HOUR / DAILY SERVICE

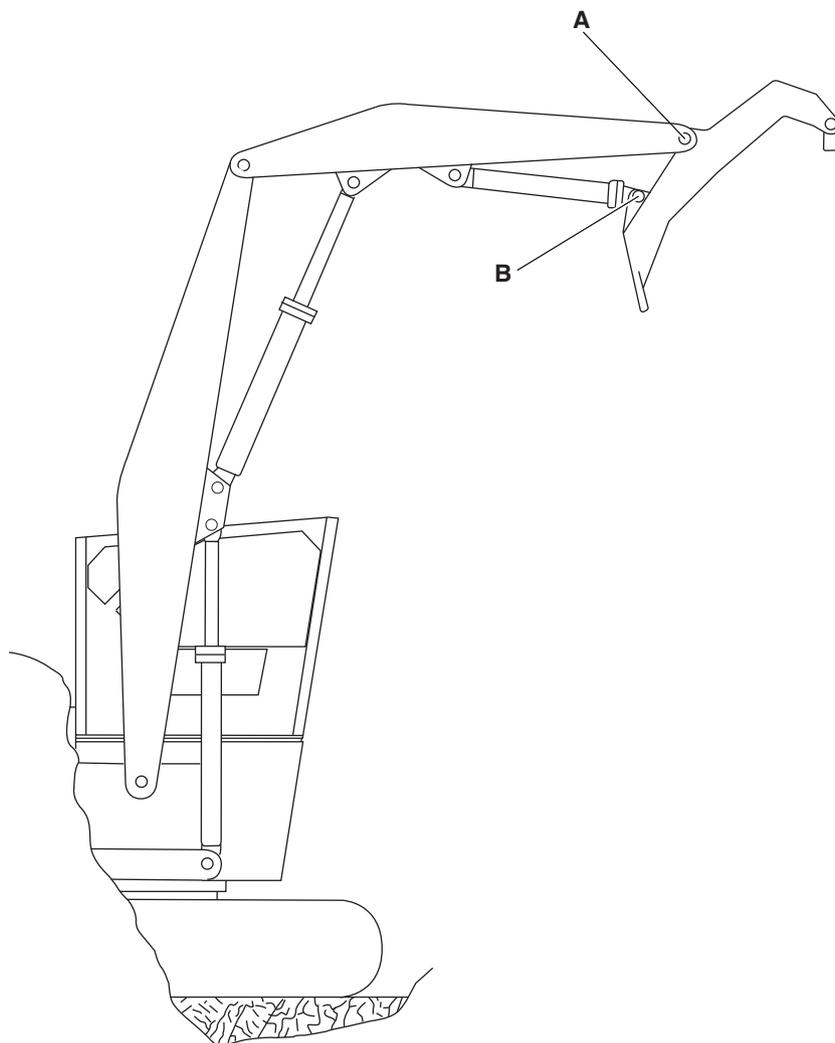
## Grease Arm and Heel Joint Pins

Grease every 10 hours.

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

- Position machine on firm and level ground as shown below and lower the front attachment to the ground and stop engine.
- Press the grease fitting and inject grease with the grease gun on the marked point.
- After greasing, clean off the old grease that has been purged.

### Log Loader



DS1601468

Figure 13

| Reference Number | Description       |
|------------------|-------------------|
| A                | Arm Pin (1 Point) |

| Reference Number | Description             |
|------------------|-------------------------|
| B                | Heel Cylinder (1 Point) |

- A. Arm Pin (1 Point)
  - Arm To Heel Rack (2 Points)

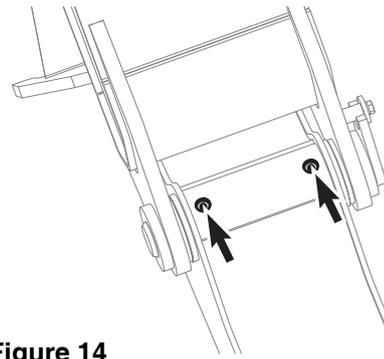


Figure 14

EX1501286

- B. Heel Cylinder (1 Point)
  - Head (1 Point)

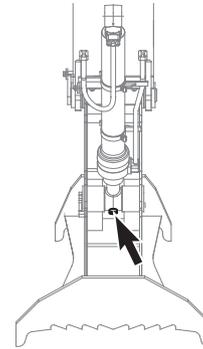


Figure 15

EX1501287

## Grease Boom, Arm and Front Attachment Pins (for first 100 hours)

Grease every 10 hours for first 100 hours and every 50 or 250 hours thereafter (See page 4-47) (See page 4-52).

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

## Check Engine Oil Level



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

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

1. Stop engine and wait for fifteen minutes. This will allow all oil to drain back to oil pan.
2. Remove dipstick (1, Figure 16) and wipe the oil off with a clean cloth.
3. Insert dipstick fully in oil gauge tube, then take it out again.
4. Engine oil level must be between "HIGH" and "LOW" marks on dipstick.

**NOTE:** If oil is above "HIGH" mark on dipstick, oil must be drained to return oil to proper level.

5. Add oil through engine oil fill cap (2, Figure 16), if the oil level is below the "LOW" mark.

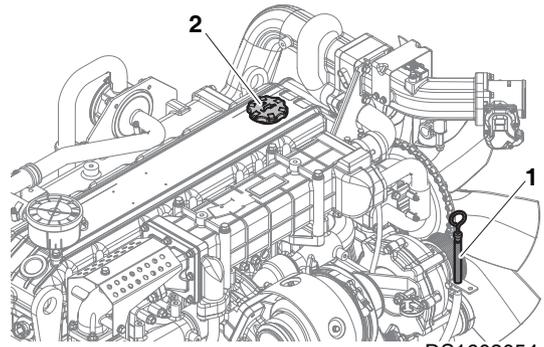


Figure 16

DS1603054

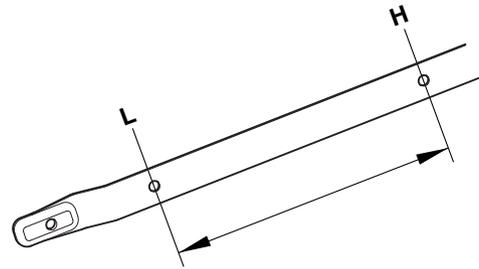


Figure 17

FG000616

## Check for Leaks in Hydraulic System

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

## Check Level of Hydraulic Oil Tank



### AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow system to cool before attempting to service any hydraulic components.

The hydraulic tank is pressurized. Tip breather cap up slowly to allow the pressurized air to vent. After the pressure has been released, remove service covers.

1. Park machine on firm and level ground. Lower boom and position bucket or work tool on ground as shown in Figure 19.
2. Move engine speed to "LOW IDLE".

3. Move safety lever to "LOCK" position.
4. Have a second person, check hydraulic oil level gauge by opening right access door. Oil level must be between marks on sight gauge.

5. If the level is below "L" mark add oil.
  - A. Stop engine.
  - B. The hydraulic tank is pressurized. Tip breather cap up slowly to allow the pressurized air to vent.
  - C. Remove upper cover of the hydraulic tank and add oil.

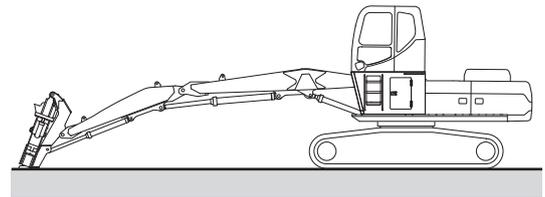


Do not fill above "H" mark on sight gauge. Overfilling can result in damage to equipment and oil leaking from hydraulic tank because of expansion.



ARO1760L

Figure 18



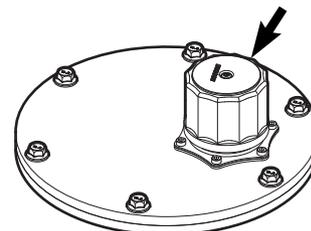
EX1300555

Figure 19



FG020182

Figure 20



FG020183

Figure 21

---

**!** **NOTICE**

---

**When refilling the oil, use the same hydraulic oil as the system is filled with.**

---

6. If oil level is above the "H" mark drain oil.
    - A. Stop engine and wait for the hydraulic oil to cool down.
    - B. Drain the excess oil from drain plug (Figure 22) at the bottom of the tank into an approved container, using a hose at the point (plug).
- 

**!** **NOTICE**

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

**Disconnect the drain hose and install the protecting cap.**

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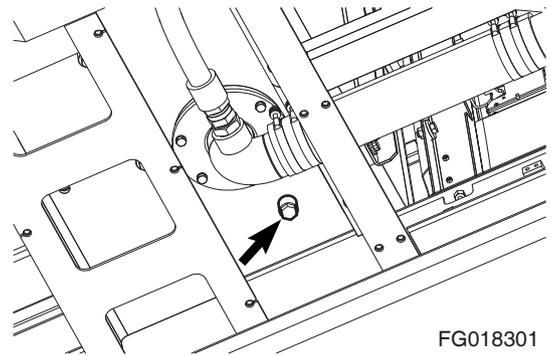


Figure 22

FG018301

## Check for Leaks in Fuel System

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

## Check Fuel Level

---

**!** **WARNING**

---

**AVOID DEATH OR SERIOUS INJURY**

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

**Immediately clean up any spilled fuel.**

---

**!** **WARNING**

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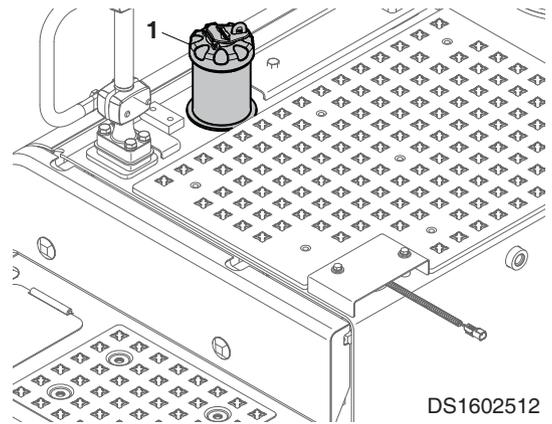
**AVOID DEATH OR SERIOUS INJURY**

**Stop engine when refueling.**

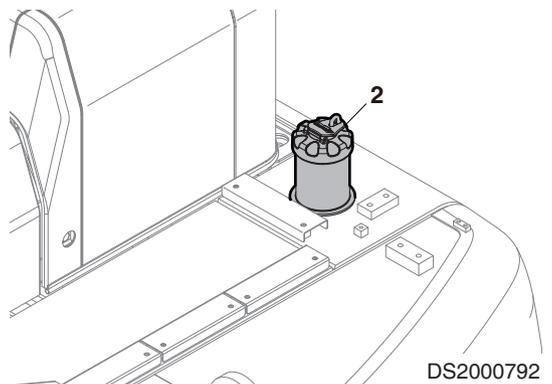
**Turn engine coolant heater "OFF" before filling fuel, to prevent a fire or explosion.**

---

1. At end of each workday, fill fuel tank. Add fuel through fuel fill tube (1, Figure 23). If the machine is equipped with an additional fuel tank, fill (2, Figure 24) with fuel as well. When working at a temperature of 0°C (32°F) or higher, use ASTM No. 2-D or its equivalent. At temperatures below 0°C (32°F) use ASTM No. 1-D or its equivalent.
2. Make sure that fuel fill hose is grounded to the forestry machine before fueling begins.



**Figure 23**



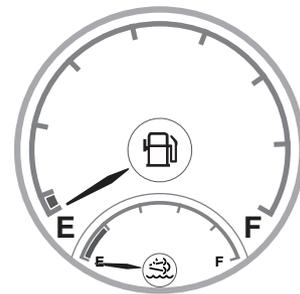
**Figure 24**

3. Check the amount of fuel in the tank by fuel gauge of gauge panel. If the machine is equipped with an additional fuel tank, the remaining fuel level in the additional fuel tank can be checked in the Monitoring Menu in the User Menu.

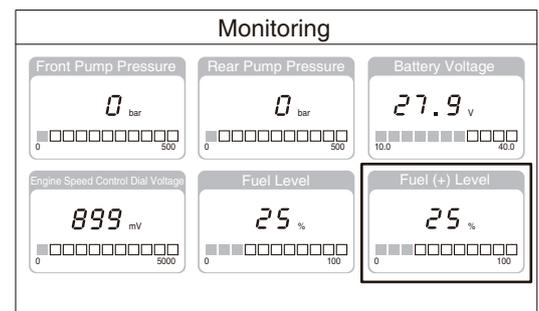
**NOTE:** See "Fluid Capacities" on page 4-20, for capacity.

4. The forestry machine may be equipped with the optional battery operated fuel fill pump. The pump assembly is in the hydraulic pump compartment. Put the suction hose of the pump into the fuel resupply tank. Turn the switch in the pump compartment "ON", and the fuel will be pumped into the forestry machine fuel tank.

**NOTE:** See "Fuel Transfer Pump (If Equipped)" on page 4-99, for further information.



**Figure 25**

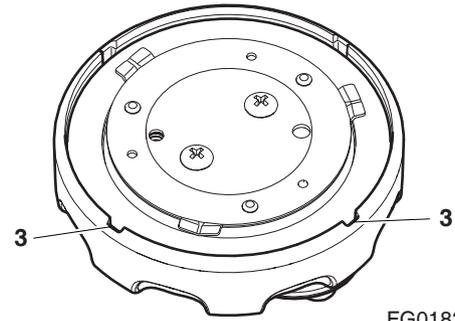


**Figure 26**

5. Do not overfill the tank.
6. Securely tighten cap after fueling.

**NOTE:** If breather holes (3, Figure 27) in cap are clogged, a vacuum may form inside the tank preventing proper fuel flow to engine. Keep holes in fuel cap clean.

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



FG018302

Figure 27

## Check DEF (AdBlue) Tank

1. At end of each workday, fill DEF (AdBlue) tank. Add the DEF (AdBlue) through DEF (AdBlue) fill cap (1, Figure 28).

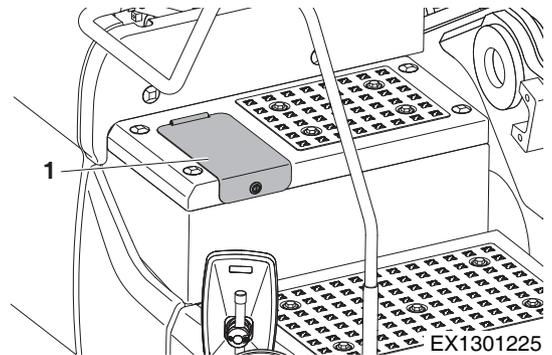


### NOTICE

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

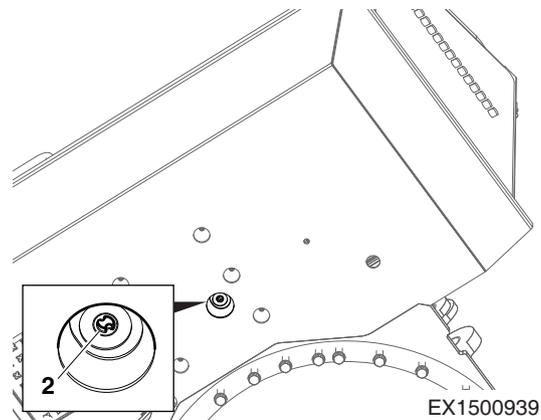
If impurities get in the tank, drain the whole DEF (AdBlue) through the drain hole (2, Figure 29).

2. Securely tighten cap after filling.



EX1301225

Figure 28



EX1500939

Figure 29

## Check Water Separator & Pre Fuel Filter (Fuel Prefilter) and Drain Water As Required

**NOTE:** If water in fuel warning symbol (Figure 30) on display monitor comes "ON", drain the collected water in fuel prefilter.

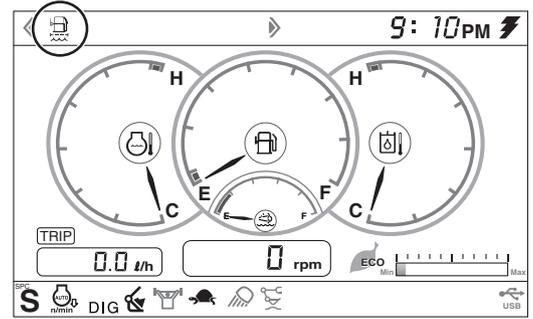
**NOTE:** If operator leave the machine with no measure for 30 minutes after the water in fuel warning light up, the engine power will be derated.

1. A fuel prefilter is inside the right rear side access door.
2. Open the access door on right rear side of the machine.

3. It is necessary to drain collected water if bowl is full of water or sediment.
4. Position a small container under fuel prefilter. Drain water or sediment by opening drain valve (2, Figure 32) on bottom of bowl (1).

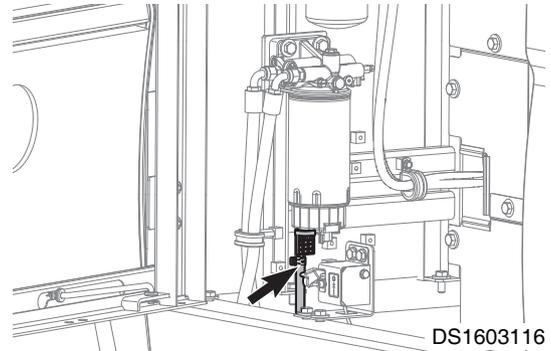
**NOTE:** Dispose of drained fluids in compliance with all applicable environmental regulations.

5. Close drain valve.



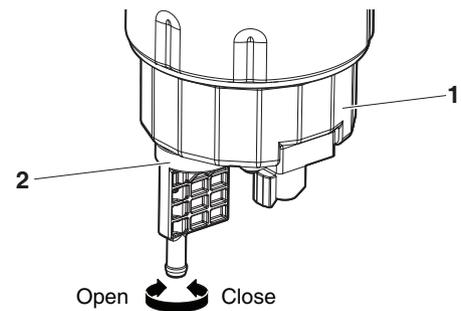
EX1301104

Figure 30



DS1603116

Figure 31



DS1603117

Figure 32

## Check Oil Level of Swing Reduction Gear



### AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool. Before fully removing any motor case inspection, port plug, etc., loosen the plug slightly to allow pressurized air to escape.

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

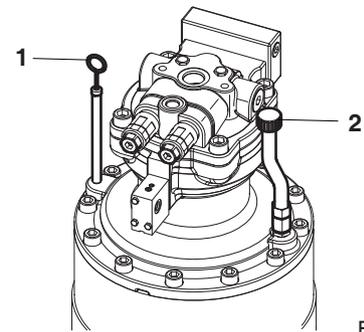
1. Remove dipstick (1, Figure 33) and wipe the oil from the dipstick with a cloth.
2. Insert dipstick (1, Figure 33) fully into dipstick tube.
3. When dipstick is pulled out, oil level must be between "HIGH" and "LOW" marks on dipstick.

**NOTE:** If oil is above "HIGH" mark on dipstick, some must be drained to proper level.

4. If the oil does not reach the "L" mark on the dipstick, add oil through fill port (2, Figure 33).

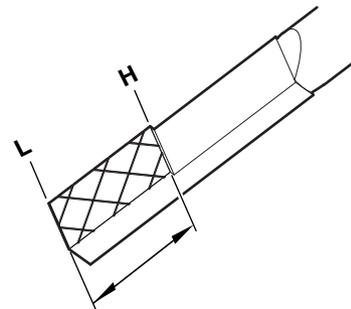
5. If the oil level exceeds the "H" mark on the dipstick, release the drain plug (3, Figure 35). Drain the excessive oil into an approved container.

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



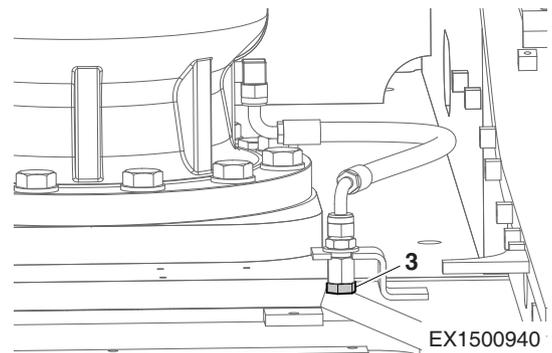
FG018305

Figure 33



FG000419

Figure 34



EX1500940

Figure 35

## Clean Dust Net in Front of Oil Cooler and Radiator

---

### NOTICE

If running forestry machine in dusty area, check dust net everyday and clean it if dirty.

---

### WARNING

#### AVOID DEATH OR SERIOUS INJURY

If using compressed air or water to clean the dust net, wear safety goggles for proper eye protection.

---

#### Oil Cooler

1. Remove the top cover of the oil cooler.
2. Remove the dust net using its handle.
3. Clean with compressed air or water.

#### Radiator

1. Open rear left door and engine cover.
2. Loosen wing bolt(s) and remove dust net.
3. Clean with compressed air or water.

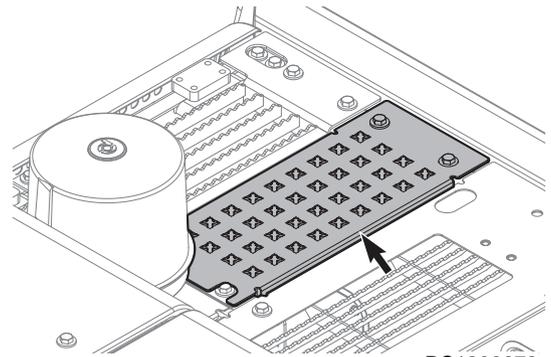


Figure 36

DS1900679

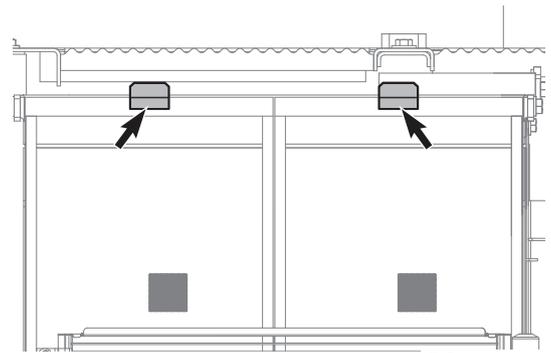


Figure 37

DS1900680

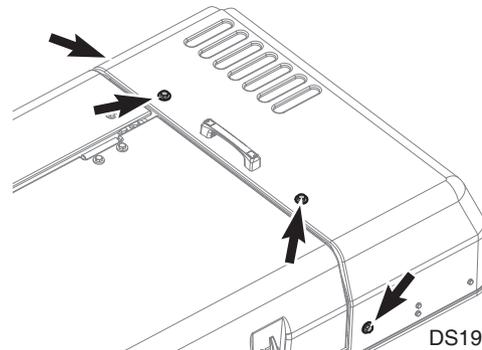


Figure 38

DS1900493

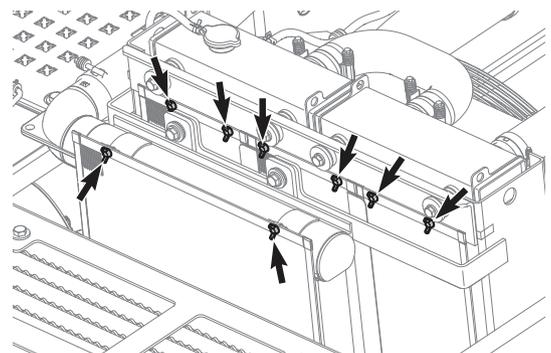


Figure 39

DS1603119

## Check Cooling System and Refill As Required



### AVOID DEATH OR SERIOUS INJURY

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

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

**NOTE:** Do not mix ethylene glycol and propylene glycol antifreeze together.  
See "Engine Cooling System" and "Types of Antifreeze" page for further details.

1. When the engine is cold, remove radiator cap and check the coolant level inside the radiator. Do not rely on the level of coolant in the coolant recovery tank. Refill radiator as required. Refer to coolant concentration table. (See page 4-98)
2. Check to make sure that coolant transfer line from the coolant recovery tank to the radiator is free and clear of obstructions, or is not pinched.
3. Check the level of coolant in the coolant recovery tank. The normal cold engine fluid level must be between "FULL" and "LOW" marks on tank.
4. If the coolant is below the "LOW" mark, add genuine part of 50% concentration coolant to the tank.

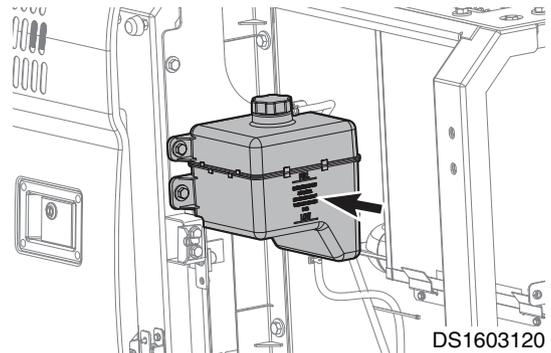
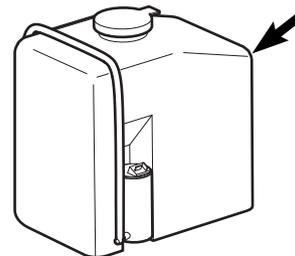


Figure 40

## Check Level of Window Washer Liquid

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

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



FG020184

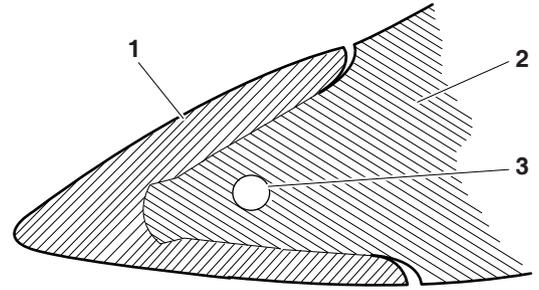
Figure 41

## Inspect Bucket Teeth and Side Cutters for Signs of Wear

1. Inspect the bucket teeth daily to make sure that tooth wear or breakage has not developed.
2. Do not allow the replaceable bucket teeth to wear down to the point that bucket adapter is exposed. See Figure 42.

**NOTE:** *These instructions are only for HYUNDAI OEM buckets. If you are using other manufacturers' buckets, refer to their specific instructions.*

| Reference Number | Description |
|------------------|-------------|
| 1                | Point       |
| 2                | Adapter     |
| 3                | Pin         |



HAOE870L

Figure 42

## Inspect Cooling Fan Blade



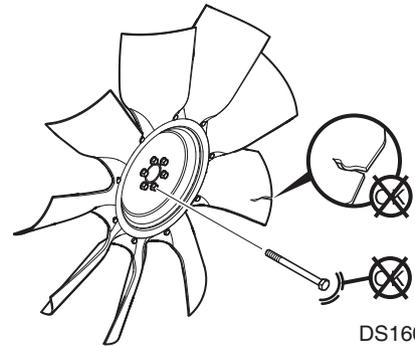
### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

**NOTE:** *Manually rotate the crankshaft by using a wrench on the accessory drive pulley nut.*

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



DS1603121

Figure 43

## Check Air Intake System and Emission Control System Components

---

### **WARNING**

---

**AVOID DEATH OR SERIOUS INJURY**

Hot engine components can cause burns.

**Avoid contact with hot engine components**

---

1. Park the machine on a firm and level surface, lower the attachment to the ground, move safety lever to "LOCK" position, and stop engine.
  2. Check the engine intake hose and hose bands for damage and tightness.
  3. Check the exhaust pipe and several exhaust system components, and check the V-clamp tightness to prevent leaking gases.
  4. If damaged, wrinkled, or loose, replace or retighten or contact your nearest HYUNDAI distributor.
- 

### **NOTICE**

---

**Severe engine damage will result from running with unfiltered air.**

**Do not operate engine if any leaks or damage are found on air intake system.**

---

## Inspect Seat Belt for Proper Operation

See "Seat Belt" on page 1-36 for further information.

## Inspect Rear View Camera for Proper Operation (If Equipped)

---

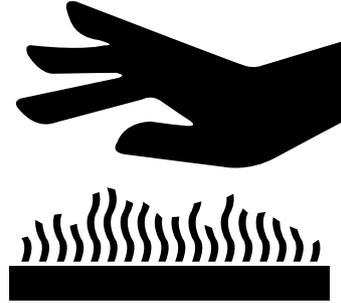
### **WARNING**

---

**AVOID DEATH OR SERIOUS INJURY**

**When accessing the rear view camera, use an external ladder or platform to prevent slipping and falling. The counterweight and engine hood should not be used as a maintenance platform.**

---



HAOA050L

Figure 44

## Inspect Mirrors for Damage and Adjust and Clean as Required

## Inspect Structure for Cracks and Faulty Welds

1. During the daily walk-around inspection and when greasing the machine, look for any visible damage to the machine. Repair or replace any damaged parts before operating the machine.

## Check Operation of All Switches and Travel Alarm (If Equipped)

1. Verify the working condition of all switches before starting the engine.

## Check the Operation of Safety Lever

A pilot cutoff switch has a pivoting safety lever that deactivates the work group, swing and travel control functions.

When the safety lever is moved down into "LOCK" position, the work group, swing and travel control functions are deactivated.

When the safety lever is moved up into "UNLOCK" position, the work group, swing and travel control functions can be operated.



### WARNING

---

**AVOID DEATH OR SERIOUS INJURY**

The **PILOT CUTOFF SWITCH (safety lever)** must deactivate the work group, swing and travel control functions when the safety lever is moved down into "LOCK" position.

Contact your **HYUNDAI** distributor immediately if the controls do not deactivate. **DO NOT MODIFY THE SYSTEM.**

---

### Inspection and Maintenance of the Pilot Cutoff Switch

1. Check for and keep bystanders away from the work area. Sit in operator's seat and fasten seat belt.
2. Start engine and move safety lever up into "UNLOCK" position.
3. Operate the work group (joystick) levers in all directions to check that boom, arm, bucket (or other attachment) and swing functions operate correctly. Also, check that travel controls operate properly.

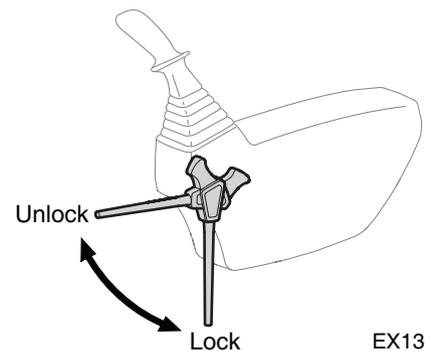


Figure 45

EX1300566

**NOTE:** *Hydraulic system must be warmed up to operating temperatures.*

4. Raise the boom and arm so the bucket (or other attachment) is about 1 m (3 ft.) off the ground.
5. Move the safety lever down into "LOCK" position to deactivate the work group and travel functions. Move the work group (joystick) levers. There must be no movement of the boom, arm, and attachment or swing functions when the controls are moved.
6. With the safety lever still in the "LOCK" position, move the travel controls. There must be no movement of the forestry machine tracks.
7. Move safety lever up into "UNLOCK" position. Raise the boom so the bucket (or other attachment) is about 3 m (10 ft.) off the ground. Operate the work group (joystick) lever to lower the boom slowly. While boom is lowering, move the safety lever down into "LOCK" position. Boom movement must stop. Repeat these steps for arm, bucket (attachment), swing and travel functions.
8. Lower work group to the ground and stop engine.

**NOTE:** *If the PILOT CUTOFF SWITCH (safety lever) does not deactivate the work group and travel functions as described above or if any parts are damaged, bent or missing, contact your HYUNDAI distributor immediately for service. DO NOT MODIFY THE SYSTEM.*

## **Check Operation of All Exterior Lights, Horn and Control Console Indicator and Display Monitor**

1. Turn engine starter switch to "I" (ON) position and observe all the indicator lights.
2. Restore operation of any light bulbs that do not turn "ON" now.
3. Sound the horn. Repair or replace if required.
4. Turn "ON" and inspect all exterior work lights. Replace any monitors, burned-out bulbs or cracked or broken housings or lenses.

## **Start Engine, Check Starting Ability, and Observe Exhaust Color at Start-up and at Normal Operating Temperature. Listen for Any Abnormal Sounds.**

## Check Operation of All Controls and Linkages

---



### NOTICE

---

Cold weather operation requires that operator fully warm up the hydraulic oil before beginning machine operation. Follow all warm up instructions listed in the Operating Instruction section of this manual. Make sure to cycle oil through all the components, including all cylinders, both travel motors and the swing motor. Cold hydraulic oil in the lines and components needs to be warmed before beginning full operation. If this is not done, damage to the cylinders or hydraulic motors can occur.

---

1. With the engine at rated speed, operate all the controls.
2. Follow cold weather hydraulic system warm-up procedures.
3. Note any slow operations or unusual movements. Determine the cause and repair before operating.

# 50 HOUR / WEEKLY SERVICE

## Perform All Daily Service Checks

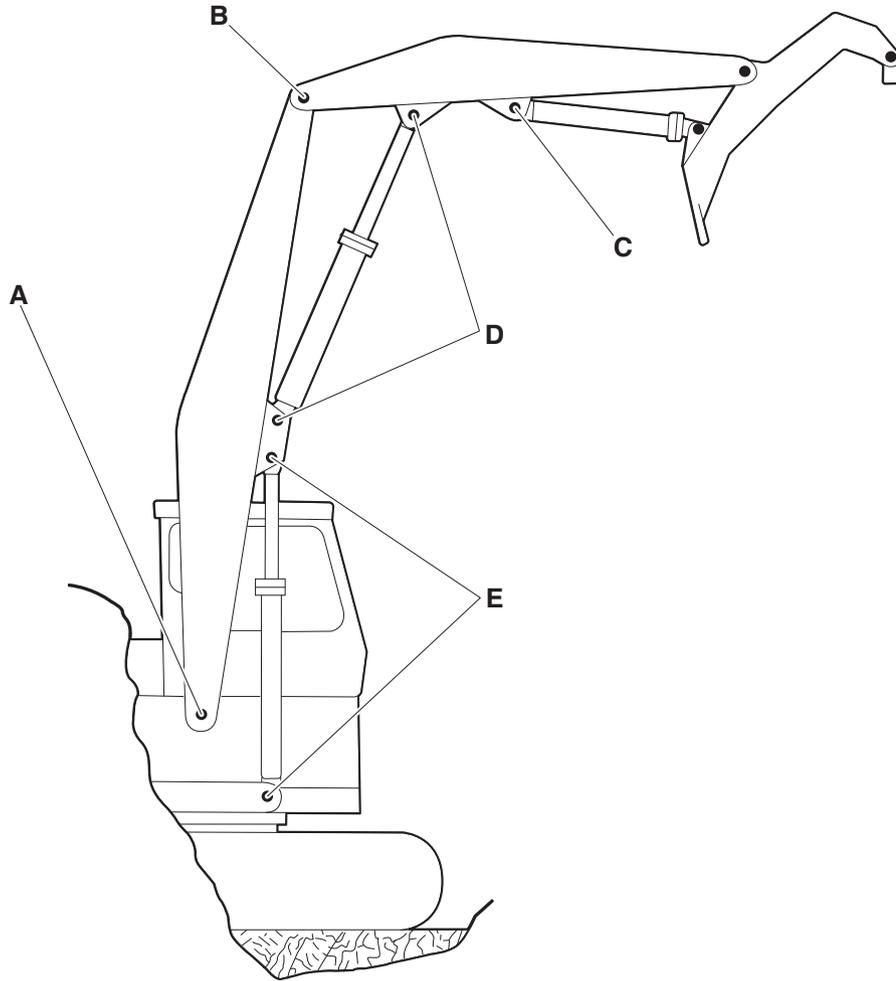
### Grease Boom and Arm Joint Pins

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

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

- Position machine on firm and level ground as shown below and lower the front attachment to the ground and stop engine.
- Press the grease fitting and inject grease with the grease gun on the marked point.
- After greasing, clean off the old grease that has been purged.

# Log Loader



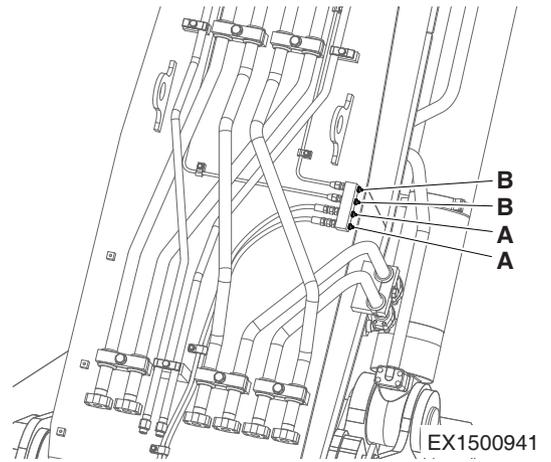
DS1902729

Figure 46

| Reference Number | Description               |
|------------------|---------------------------|
| A                | Boom Foot Pins (2 Points) |
| B                | Arm Pins (2 Points)       |
| C                | Heel Cylinder (1 Point)   |

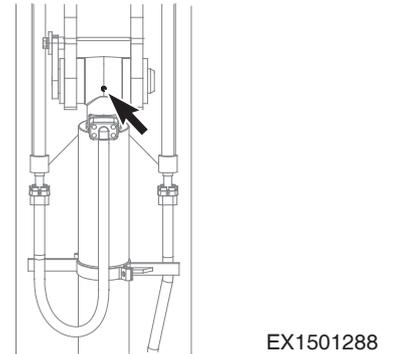
| Reference Number | Description               |
|------------------|---------------------------|
| D                | Arm Cylinders (2 Points)  |
| E                | Boom Cylinders (4 Points) |

- A. Boom Foot Pins (2 Points)
- B. Arm Pins (4 Points)
  - Boom To Arm (2 Points)



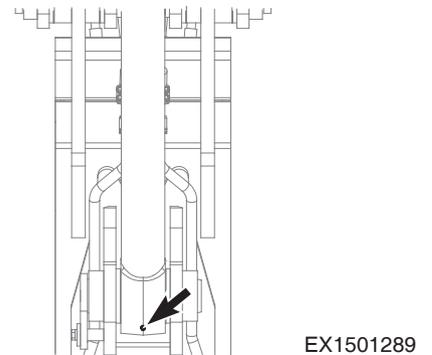
**Figure 47**

- C. Heel Cylinder (1 Point)
  - Head (1 Point)



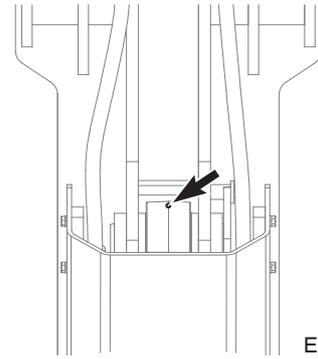
**Figure 48**

- D. Arm Cylinders (2 Points)
  - Rod (1 Point)



**Figure 49**

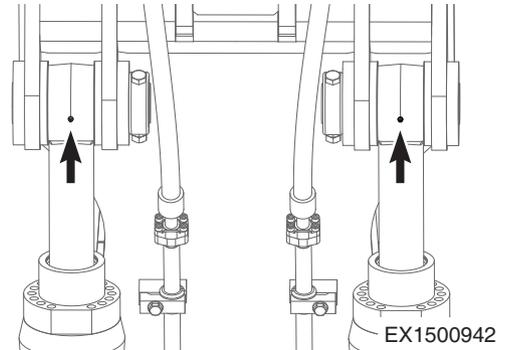
- Head (1 Point)



**Figure 50**

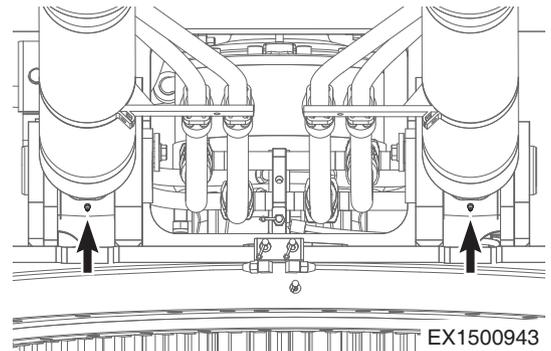
**E. Boom Cylinders (4 Points)**

- Rod (2 Points)



**Figure 51**

- Head (2 Points)



**Figure 52**

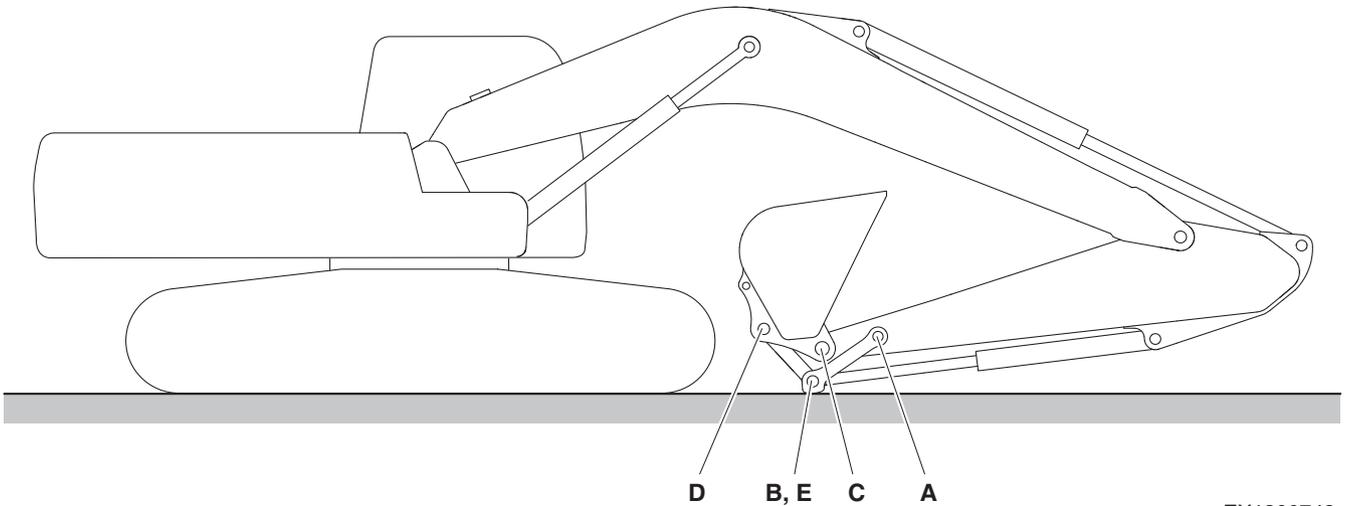
## Grease Arm and Bucket Joint Pins

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

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

- Position machine on firm and level ground as shown below and lower the front attachment to the ground and stop engine.
- Press the grease fitting and inject grease with the grease gun on the marked point.
- After greasing, clean off the old grease that has been purged.

### Road Builder



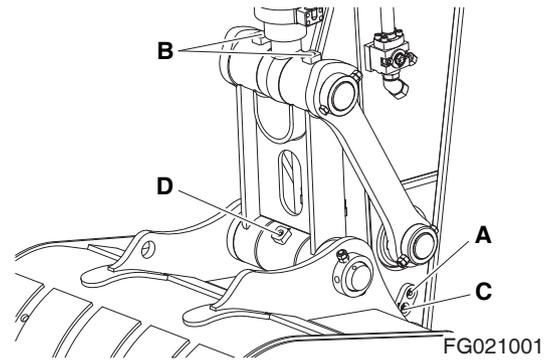
EX1300742

Figure 53

| Reference Number | Description                    |
|------------------|--------------------------------|
| A                | Arm Link Joint Pin (1 Point)   |
| B                | Link Joint Pin (2 Points)      |
| C                | Arm Bucket Joint Pin (1 Point) |

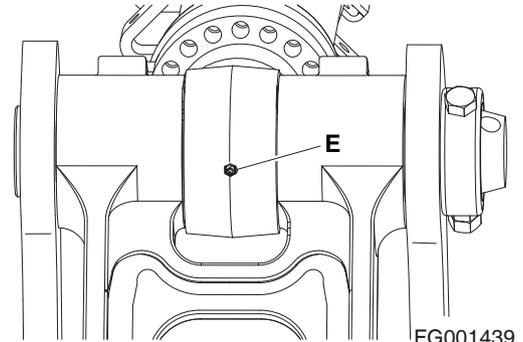
| Reference Number | Description                       |
|------------------|-----------------------------------|
| D                | Bucket Link Joint Pin (1 Point)   |
| E                | Bucket Cylinder Rod Pin (1 Point) |

- A. Arm link joint pin (1 point)
- B. Link joint pin (2 points)
- C. Arm bucket joint pin (1 point)
- D. Bucket link joint pin (1 point)



**Figure 54**

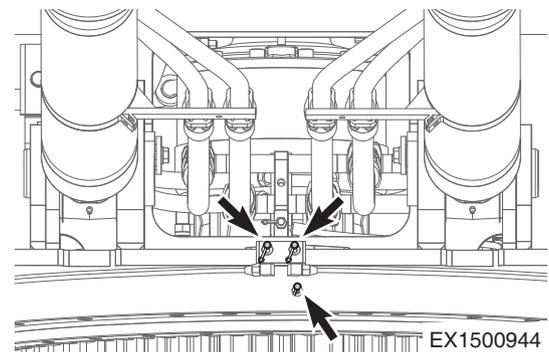
- E. Bucket cylinder rod pin (1 point)



**Figure 55**

## Grease Swing Bearing

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. There are three grease fittings for the swing bearing. Do not over lubricate. Purge old grease with new. Remove all purged grease.



**Figure 56**

## Drain Water and Sediment from Fuel Tank

1. Perform this procedure before operating the machine.
2. Open the pump compartment door to drain water or sediment from fuel tank.
3. Drain water and sediment from bottom of fuel tank into an approved container.

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

**NOTE:** *Always completely fill fuel tank at end of each workday to prevent condensation from forming on the inside walls of the tank.*

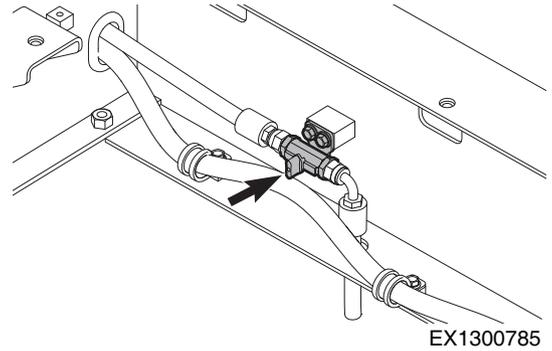


Figure 57

## Drain Water and Sediment from Additional Fuel Tank (If Equipped)

1. Perform this procedure before operating the machine.
2. Open the pump compartment door to drain water or sediment from fuel tank.
3. Drain water and sediment from bottom of fuel tank into an approved container.

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

**NOTE:** *Always completely fill fuel tank at end of each workday to prevent condensation from forming on the inside walls of the tank.*

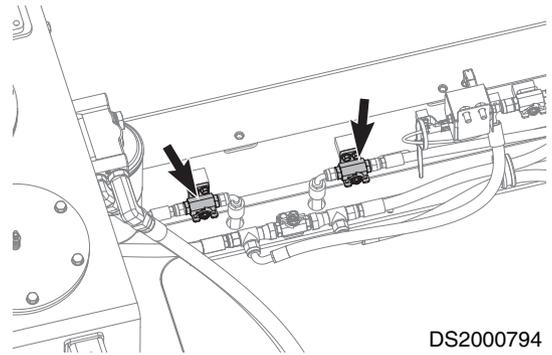


Figure 58

## Inspect the Track Assemblies for Proper Tension and Loose, Worn or Damaged Parts (Links, Shoes, Rollers, Idlers)

1. Do a daily walk-around inspection of all components including the track assemblies. Look for missing, damaged or excessively worn parts. See "Track Tension (IF EQUIPPED TYPE 1)" on page 4-103.
2. Jack up each track and perform the two speed travel motor test.

# 250 HOUR / MONTHLY SERVICE

## Perform All Daily and 50 Hour Service Checks

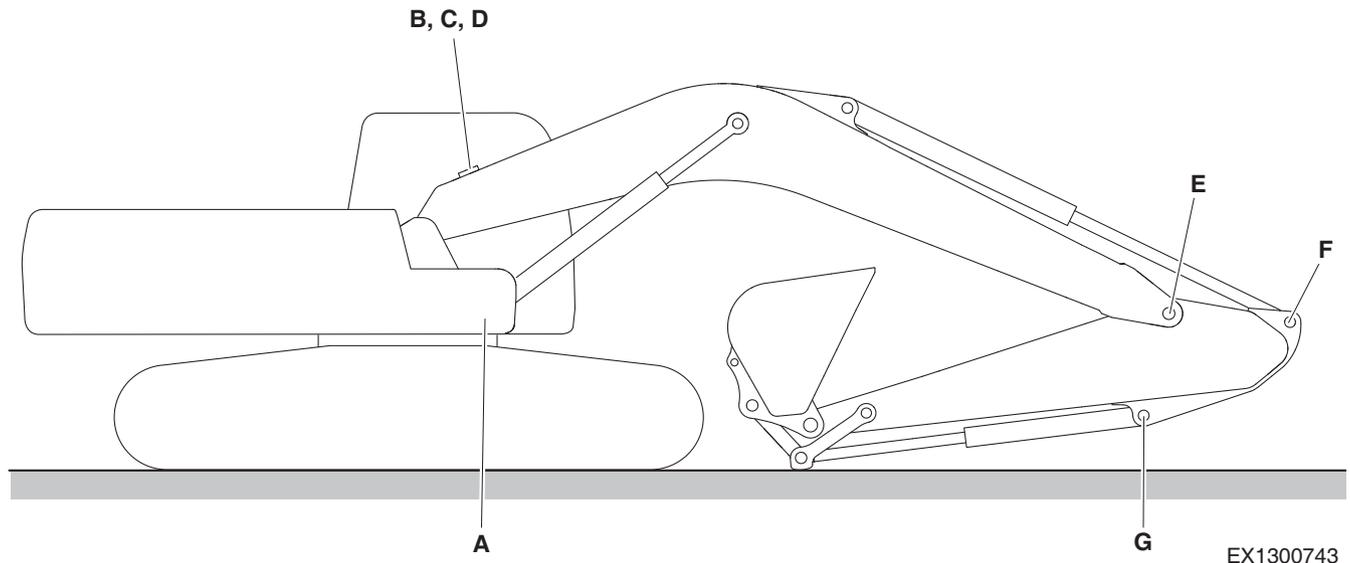
### Grease Boom and Arm Joint Pins

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

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

- Position machine on firm and level ground as shown below and lower the front attachment to the ground and stop engine.
- Press the grease fitting and inject grease with the grease gun on the marked point.
- After greasing, clean off the old grease that has been purged.

### Road Builder



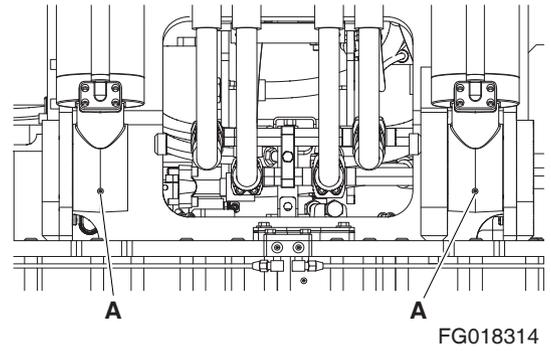
EX1300743

Figure 59

| Reference Number | Description                       |
|------------------|-----------------------------------|
| A                | Boom Cylinder Head Pin (2 Points) |
| B                | Boom Foot Pin (2 Points)          |
| C                | Boom Cylinder Rod Pin (2 Points)  |
| D                | Arm Cylinder Head Pin (1 Point)   |

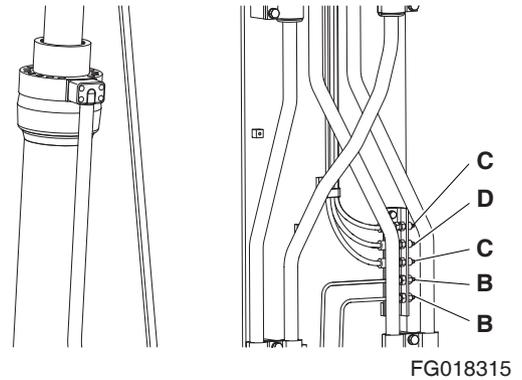
| Reference Number | Description                        |
|------------------|------------------------------------|
| E                | Boom Arm Joint Pin (2 Points)      |
| F                | Arm Cylinder Rod Pin (1 Point)     |
| G                | Bucket Cylinder Head Pin (1 Point) |

- A. Boom cylinder head pin (2 points)



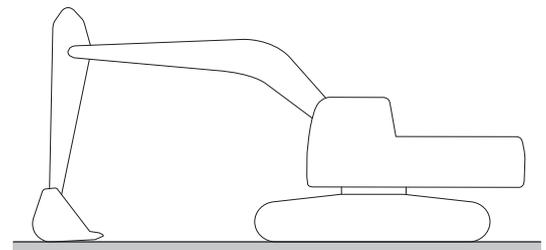
**Figure 60**

- B. Boom foot pin (2 points)
- C. Boom cylinder rod pin (2 points)
- D. Arm cylinder head pin (1 point)



**Figure 61**

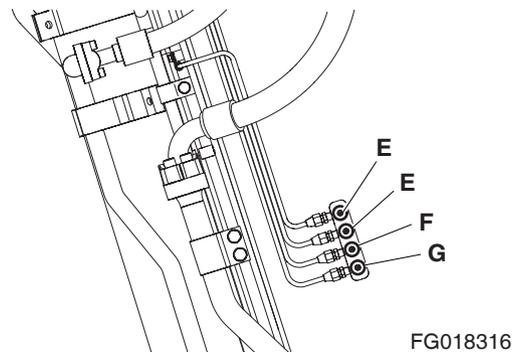
**NOTE:** *For greasing the boom foot pin, grease it while keeping the position shown Figure 59 the first time, and then grease it once more after lowering the boom to put slight pressure on the surface shown Figure 62.*



EX1300684

**Figure 62**

- E. Boom arm joint pin (2 points)
- F. Arm cylinder rod pin (1 point)
- G. Bucket cylinder head pin (1 point)



**Figure 63**

## **Replace Hydraulic Oil Return Filter (After First 250 Hours)**

**NOTE:** *Replace hydraulic oil return filter after first 250 hours of operation or rebuild, then every 1,000 hours thereafter (See page 4-67).*

## **Change Pilot Filter (After First 250 Hours)**

**NOTE:** *Change pilot filter after first 250 hours and every 1,000 hours thereafter (See page 4-68).*

## **Inspect Pins and Bushings of the Front End Attachments for Signs of Wear**

## **Check Fluid Levels in Batteries**

See "Inspection of Battery Electrolyte Level" on page 4-92 for further information.

## **Inspect for Any Loose or Missing Nuts and Bolts**

## **Inspect Fuel System Hose Clamps**

# 500 HOUR / 3 MONTH SERVICE

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

### Grease Swing Gear and Pinion

---



**AVOID DEATH OR SERIOUS INJURY**

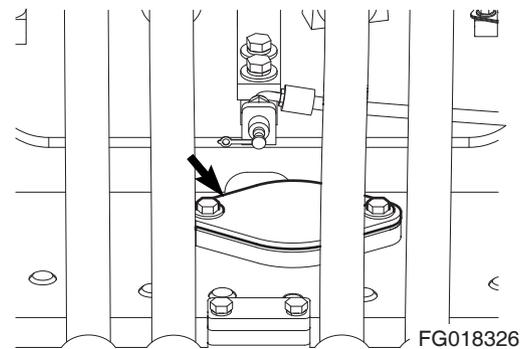
**Greasing swing gear and pinion must be done by only one person.**

---

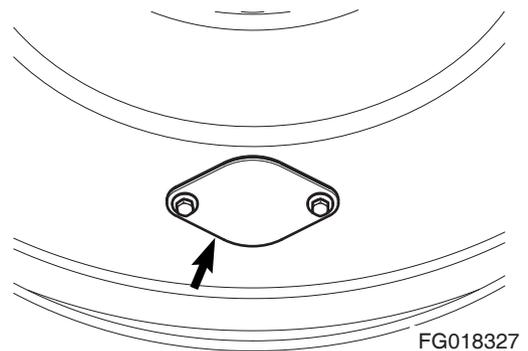
1. Remove inspection cover on the main frame and inspect the condition of the grease. Inspect for water or other contaminants on the gear teeth.

**NOTE:** *The upper structure must be rotated a little at a time so the entire face of the swing gear can be lubricated. Use extreme caution when performing this operation.*

2. If water or other contaminations are found, remove lower access cover bottom of the track frame so the gear teeth can be thoroughly cleaned and lubricated.
3. Install access covers after lubricating gear teeth.



**Figure 64**



**Figure 65**

# Change Engine Oil and Filter

---

## **WARNING**

---

### AVOID DEATH OR SERIOUS INJURY

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

---

1. Remove a cover under the engine. (Figure 66)

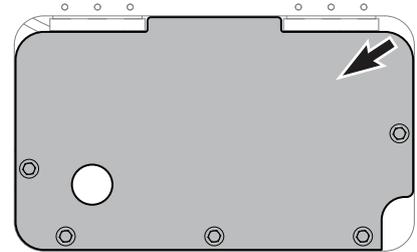


Figure 66

DS1902730

2. Position a larger container under the engine. Remove a plug (Figure 67) to drain the engine oil.
3. Drain the engine oil and then install the plug.

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

---

## **NOTICE**

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

---

4. Replace engine oil filter by using filter wrench. The engine oil filter is a spin-on type. See Figure 68. Remove and discard filter.
5. 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.

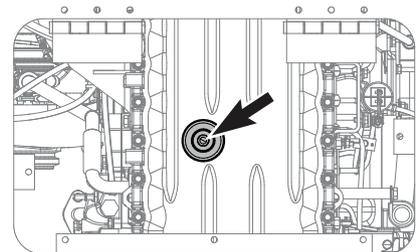


Figure 67

DS1902731

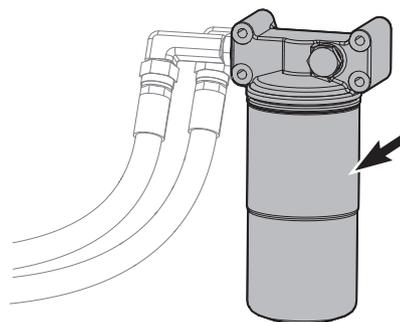


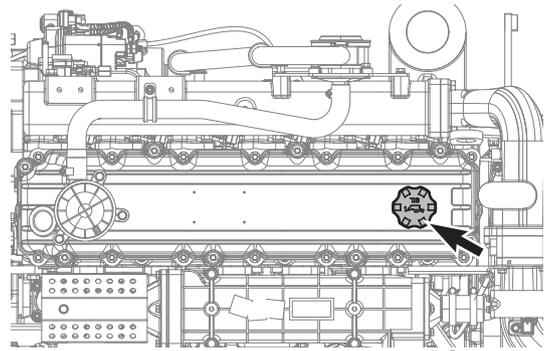
Figure 68

DS1603059

6. Refill the engine with the correct oil through the oil fill port (Figure 69). Refer to the Lubrication Table of this manual for the recommended oil for the operating conditions.

**NOTE:** See "Fluid Capacities" on page 4-20. for capacity.

7. Start engine. Run engine for five minutes at "LOW IDLE" and check engine oil pressure light.
8. Stop engine. Look for signs of leaks at filter. Recheck oil level after fifteen minutes.



DS1603060

Figure 69

## Check and Clean Air-conditioning Inner Filter



### WARNING

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AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

---



### WARNING

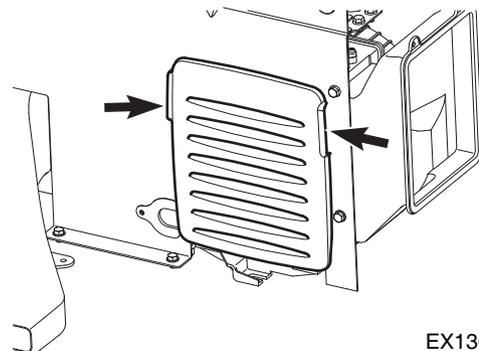
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AVOID DEATH OR SERIOUS INJURY

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

---

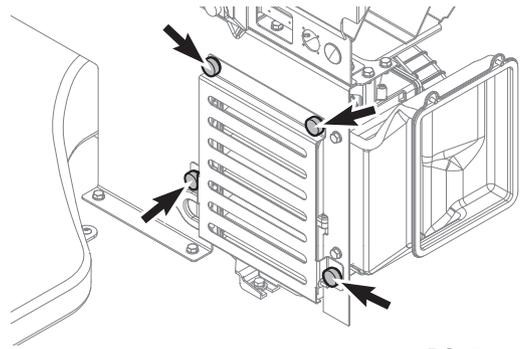
1. Remove cover by pulling knob (Figure 70) outward on top of the left and right of the filter which is inside the left rear part of the cabin-STD cabin.



EX1300822

Figure 70 STD Cabin

Loosen the bolts (Figure 71) and remove cover-Oregon Cabin.



**Figure 71** Oregon Cabin

DS1601478

2. Remove inner filter by pulling knob outward while pressing the upperpart and lower part of the filter handle.
3. Use compressed air to clean filter. If the filter is damaged, replace with a new one.

If the filter is very dirty, use a mild soap or detergent and water to clean it.

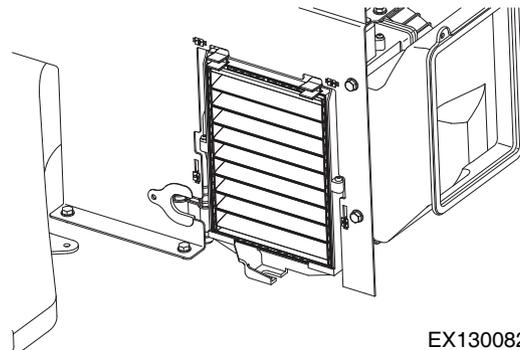
---

 **NOTICE**

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**If water was used to clean filter, be certain that filter is completely dry before installing.**

---



**Figure 72**

EX1300823

## Clean Air-conditioning Outer Filter

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

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



### WARNING

---

#### AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

---



### WARNING

---

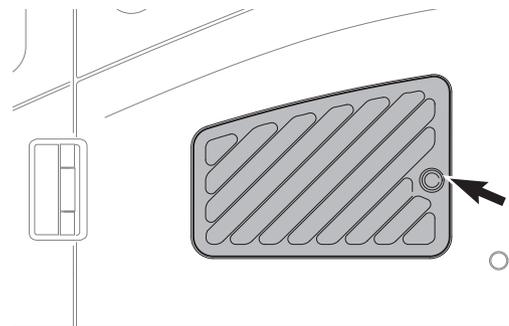
#### AVOID DEATH OR SERIOUS INJURY

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

---

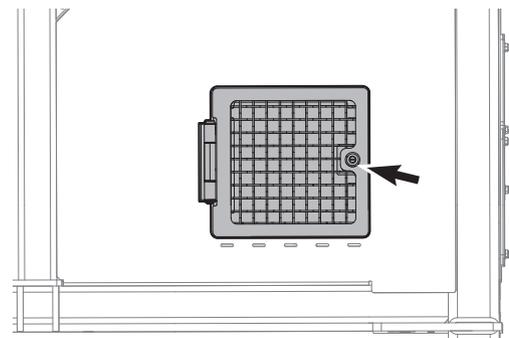
**NOTE:** *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

1. Open the cover by using the starter KEY in the left side of the cabin.



DS1900867

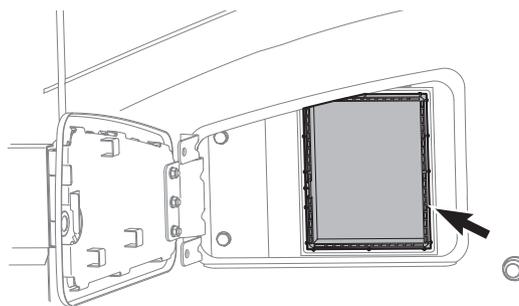
Figure 73 STD Cabin



DS1601476

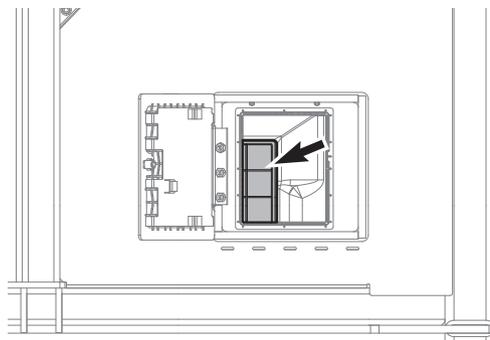
Figure 74 Oregon Cabin

2. Remove filter (Figure 75) and inspect for any damage.
3. Use compressed air to clean filter. If filter is still dirty, then replace filter.
4. Reassemble in reverse order.



**Figure 75** STD Cabin

DS1900868



**Figure 76** Oregon Cabin

DS1601477

# Clean Radiator, Oil Cooler, Intercooler, Fuel Cooler and Air Conditioner Condenser Cores



## WARNING

### AVOID DEATH OR SERIOUS INJURY

Using compressed air, steam or water to clean can cause serious injury. Always wear safety goggles, mask and safety shoes during the cleaning process. Keep personnel and bystanders clear of work area.

1. Open the left door(s) and engine cover and loosen the bolt(s) on the upper cover of oil cooler.
2. Remove the dust net using its handle.

3. Clean the outside of the radiator and oil cooler, intercooler and fuel cooler with compressed air, steam or water. Wash from the outside of the engine compartment towards the inside. Repeat the cleaning process from the inside of the engine compartment towards the outside to remove all dirt and debris.

**NOTE:** Clean dust net and install it after cleaning radiator, oil cooler, intercooler and fuel cooler.

4. Clean air conditioner condenser core with compressed air, steam or water.



## NOTICE

To prevent damage to the cores, apply compressed air from an appropriate distance. Damaged cores can cause leakage or overheating. In dusty conditions, check the cores daily.

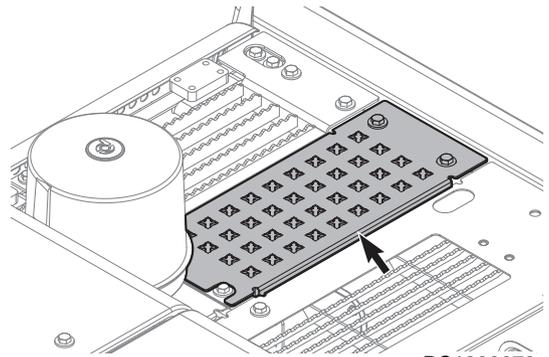


Figure 77

DS1900679

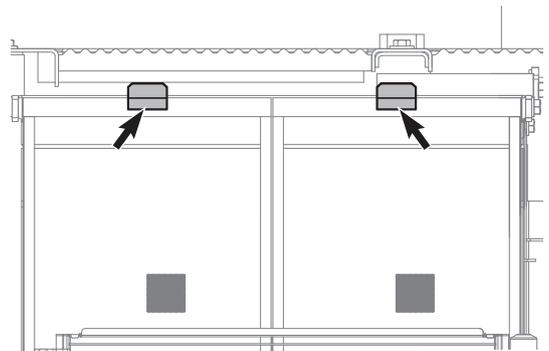


Figure 78

DS1900680

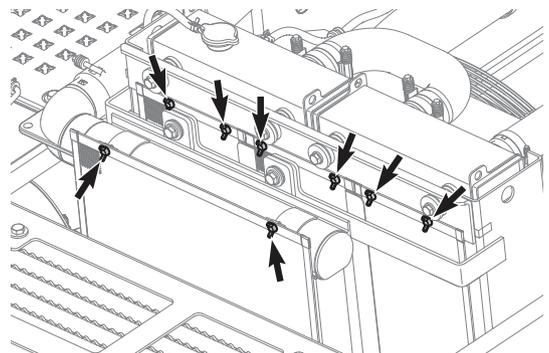


Figure 79

DS1603119

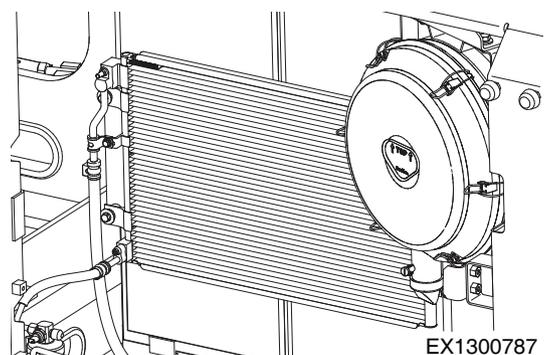


Figure 80

EX1300787

## Clean Outer Filter of Air Cleaner

**NOTE:** Clean outer filter every 500 hours/3 months of service.

**NOTE:** If air cleaner clogged warning symbol (Figure 81) on display monitor comes "ON", the air cleaner must be serviced.

**NOTE:** When working in very dusty conditions, the service interval must be shortened.



## WARNING

### AVOID DEATH OR SERIOUS INJURY

Never clean or attempt to remove air cleaner filter if the engine is running.

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

1. Locate the air cleaner assembly.

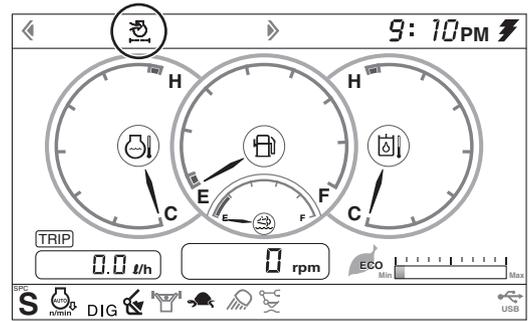
**NOTE:** When it reaches every 500 hours or If indicator symbol (Figure 81) on display monitor comes "ON" the air cleaner must be serviced.

**NOTE:** Replace outer filter after cleaning 5 times or every 2,000 hours/1 year of service.

2. Remove and clean rubber evacuator valve (1, Figure 82) from bottom of air cleaner housing cover (2). Inspect seal lips for wear or damage. Replace valve if necessary.

**NOTE:** Install evacuator valve with lips parallel to the cover.

3. Remove access cover (2, Figure 83) by loosening the latches (3).
4. Remove outer filter (4, Figure 83) from the housing. Do not remove inner filter (5).



EX1301105

Figure 81

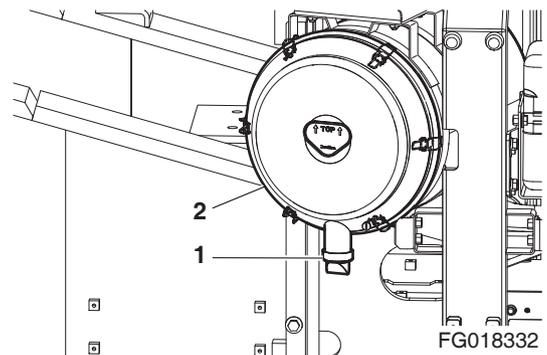


Figure 82

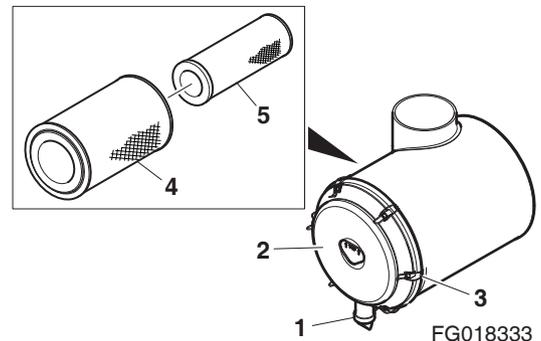


Figure 83

5. Clean the outer filter (4, Figure 83) by blowing compressed air from the inside of the filter towards the outside. Do not use more than 205 kPa (30 psi) air pressure.



Figure 84

HAOC570L

6. Check outer filter by shining a light through it. If small holes or thinner parts are found on the element after cleaning it, replace the filter.
7. Clean the inside of the air cleaner body and the inside of the air cleaner cover. Do not use compressed air.
8. Properly install the air filter and cover.



Figure 85

FG000412

9. Install cover (2, Figure 86) as follows.
  - A. Align cover with the element.
  - B. Hook the tip of latches (3, Figure 86) to the protruding part of the air cleaner body and lock it in position.
  - C. When locking latches (3, Figure 86) in position, attach them in turn on opposite sides (top, bottom, left, right) in the same way as when tightening bolts.
  - D. Always install cover (2, Figure 86) so evacuator (1) is facing the ground (A).

**NOTE:** Make sure that lips of evacuator are parallel to cover.

- E. When cover (2, Figure 86) is installed, check that cover (2) is properly seated in air cleaner body. If it is seated, install again.

**NOTE:** If after cleaning the outer filter, the air cleaner clogged indicator remains "ON", replace the outer and inner filters. Do not clean inner filter.

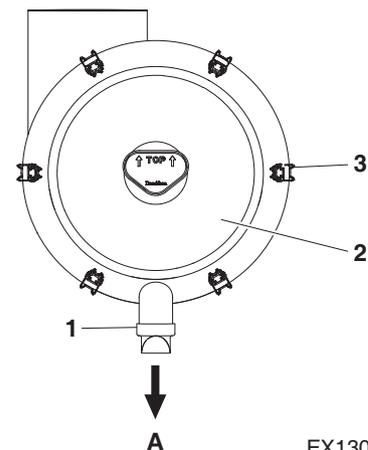


Figure 86

EX1300859

## Change of Water Separator and Pre Fuel Filter (Fuel Prefilter)

1. Open the pump compartment door to access fuel prefilter.
2. Turn cock valve to "CLOSE" position. (Figure 87)
3. Position a small container under prefilter. Drain fuel by opening drain valve on bottom of filter.

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

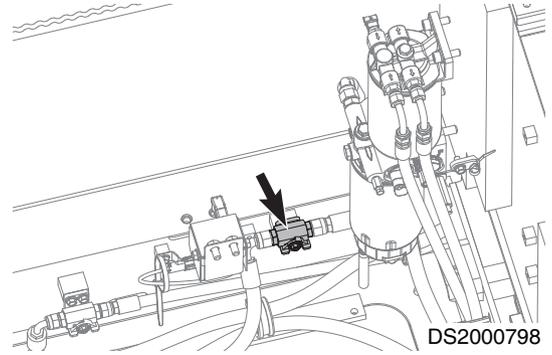


Figure 87

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

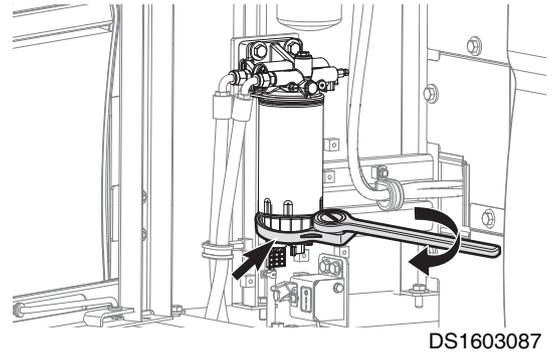


Figure 88

6. Coat surface of packing (2, Figure 89) with fuel on new cartridge (1).
7. Tighten cartridge by hand until packing comes into contact with surface of filter housing head.
8. When packing contacts surface, tighten the cartridge about 3/4 of a turn more.
9. Coat surface of seal (3, Figure 89) with fuel, and tighten the bowl with tool.

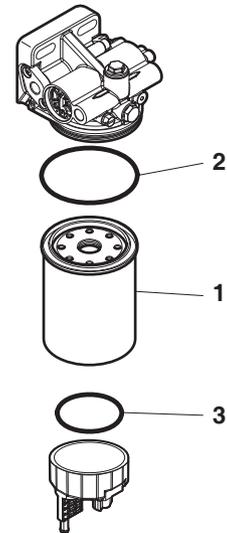


Figure 89

DS1603088

## Change Main Fuel Filter



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

1. Locate fuel filter inside pump compartment.
2. Turn cock valve to "CLOSE" position. (Figure 87)
3. Position a small container under fuel filter.
4. Unscrew fuel filter from head assembly. Discard fuel filter.

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

5. After cleaning filter head, install new fuel filter. Screw filter on head until gasket contacts head, and turn filter 1/2 turn more with a filter wrench.

**NOTE:** *Coat fuel filter gasket with fuel.*

**NOTE:** *Fill fuel filter with clean fuel. This will help reduce fuel system priming.*

### Bleeding Fuel System

If air remains in the fuel inlet line to the engine, it can cause the engine to run in an abnormal condition. Air may impact the starting capability of the engine, and may also result in surging engine speeds.

If the machine happens to have run out of fuel or the fuel filter has been replaced and engine doesn't start at a time after long-term storage, bleed the air out using the following procedure:

1. Stop Engine.
2. Check cock valve (Figure 87) is open.
3. Loosen plug (1, Figure 92) on the pre fuel filter head.
  - Tool: 10 mm (  )
4. Loosen plug (1, Figure 90) on the main fuel filter head.
  - Tool: 10 mm (  )
5. Turn electric transfer pump switch (3, Figure 92) to "I"(ON) position.
6. When pure fuel falls from tap (2, Figure 92) on the pre fuel filter head, turn electric transfer pump switch (3, Figure 92) to "O" (OFF) position.

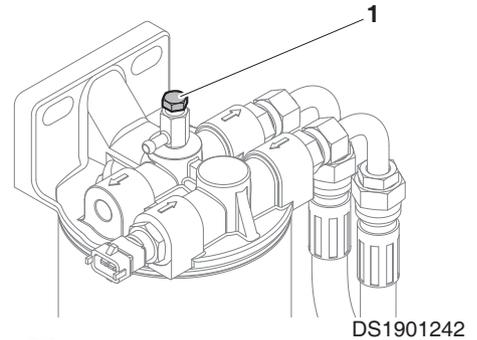


Figure 90

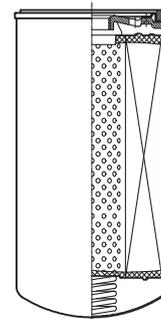


Figure 91

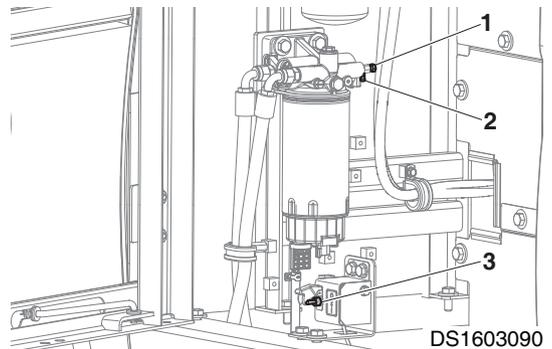


Figure 92

7. Tighten plug (1, Figure 92) on the pre fuel filter head.
  - Plug tightening torque:  $8 \pm 2$  N.m ( $0.8 \pm 0.2$  kg.m,  $5.9 \pm 1.5$  ft lb)
8. Turn electric transfer pump switch (3, Figure 92) to "I" (ON) position.
9. When pure fuel flows out from plug hole on the main fuel filter head, turn electric transfer pump switch (3, Figure 92) to "O" (OFF) position.
10. Tighten plug (1, Figure 90) on the main fuel filter head.
  - Plug tightening torque:  $8 \pm 2$  N.m ( $0.8 \pm 0.2$  kg.m,  $5.9 \pm 1.5$  ft lb)
11. Start engine and look for signs of leaks.
12. Repeat procedure if necessary.

## Check Oil Level in Travel Reduction Gear (One on Each Side of Unit)

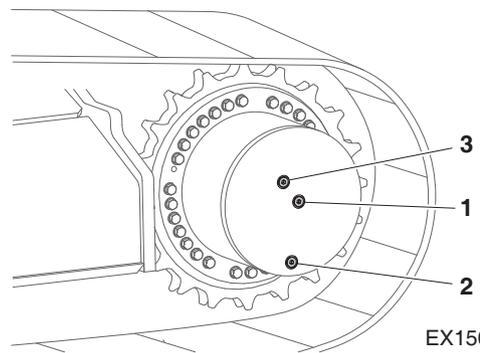


### WARNING

#### 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.



EX1500945

Figure 93

| Reference Number | Description    |
|------------------|----------------|
| 1                | Oil Level Plug |
| 2                | Drain Plug     |
| 3                | Fill Plug      |

1. Make sure that the machine is on firm and level ground.
2. Rotate the track until ports (1 thru 3, Figure 93) are in their proper positions as shown.
3. Loosen fill plug (3, Figure 93) slightly to allow pressurized air to escape.
4. Remove oil level plug (1, Figure 93).
5. Check oil level. The oil must be near the bottom of the level plug opening.
6. Add oil through the fill plug (3, Figure 93) opening, if necessary.
7. Clean and install oil level and fill plugs (1 and 3, Figure 93).
8. Repeat this procedure on the other travel reduction gear.

## **Change Oil in Travel Reduction Gear (One on Each Side of Unit) (After First 500 Hours)**

**NOTE:** *Drain and refill oil after first 500 hours of operation or rebuild, and every 1,000 hours thereafter (See page 4-81).*

## **Change Oil in Swing Reduction Gear (Drain and Refill After First 500 Hours)**

**NOTE:** *Change swing reduction gear oil after first 500 hours on a new machine and every 1,000 hours thereafter (See page 4-69).*

# 1,000 HOUR / 6 MONTH SERVICE

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

### Grease Swing Reduction Gear

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Remove air vent plug (1, Figure 94) from swing reduction gear.
3. Press grease fitting and inject grease with the grease gun on the marked point (2, Figure 95).
4. Install air vent plug (1, Figure 94) in swing reduction gear.

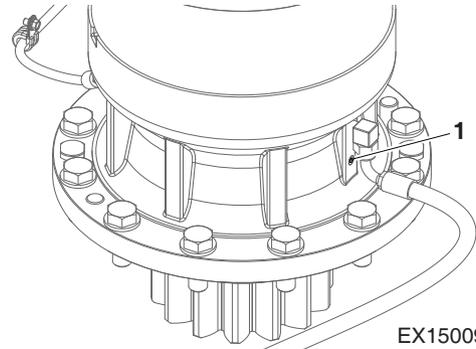


Figure 94

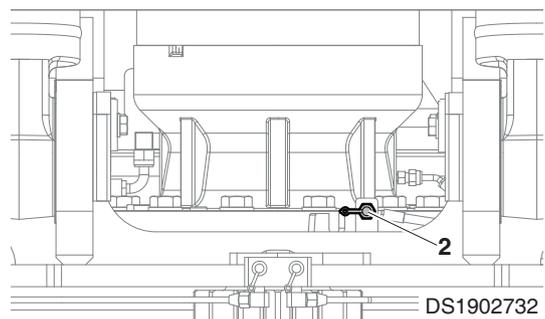


Figure 95

### Change Hydraulic Oil Tank Breather Filter

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip breather cap up (2, Figure 96) slightly to release the internal pressure.
3. Unscrew the bolt (1, Figure 96) and take off the breather cap (2).
4. Change a filter cartridge (3, Figure 96) and assemble the breather cap by tightening the bolt.

**NOTE:** The used filter should always be disposed of according to local regulations.

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

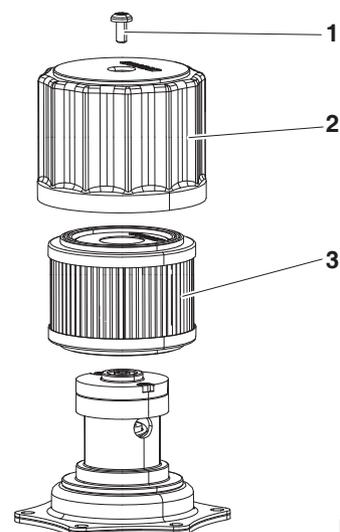


Figure 96

## Replace Hydraulic Oil Return Filter

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

**NOTE:** If return filter clogged warning symbol (Figure 97) on display monitor comes "ON" the return filter must be serviced.



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow the system to cool before attempting to service any of the hydraulic components.

The hydraulic tank is pressurized. Tip the hydraulic breather cap up slightly to allow the pressurized air to vent. After the pressure has been released, remove service covers or drain water from tank.



### NOTICE

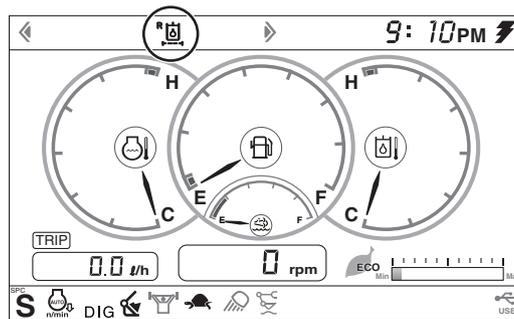
Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the fill port and filter ports.

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip breather cap up (1, Figure 98) slightly to release the internal pressure.
3. Remove bolts (2, Figure 98) and service cover (3). Remove O-ring (4), spring (5), valve (6) and bypass strainer (7), and then filter (8).

4. Remove filter and discard.

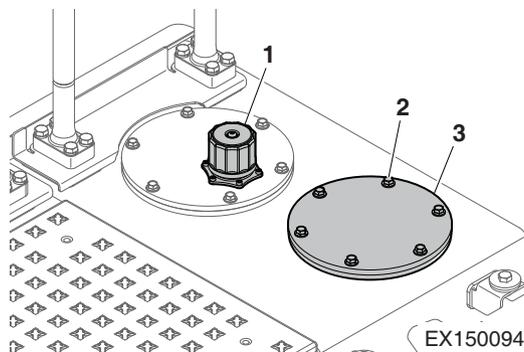
**NOTE:** Used filter should always be disposed of according to local laws and regulations.

5. Install new filter and a new O-ring. Install bypass strainer, valve and spring. Install service cover plate.
6. Run engine for ten minutes at "LOW IDLE" to purge air from circuit.
7. Check level in hydraulic oil tank (See page 4-30). Add oil if necessary.



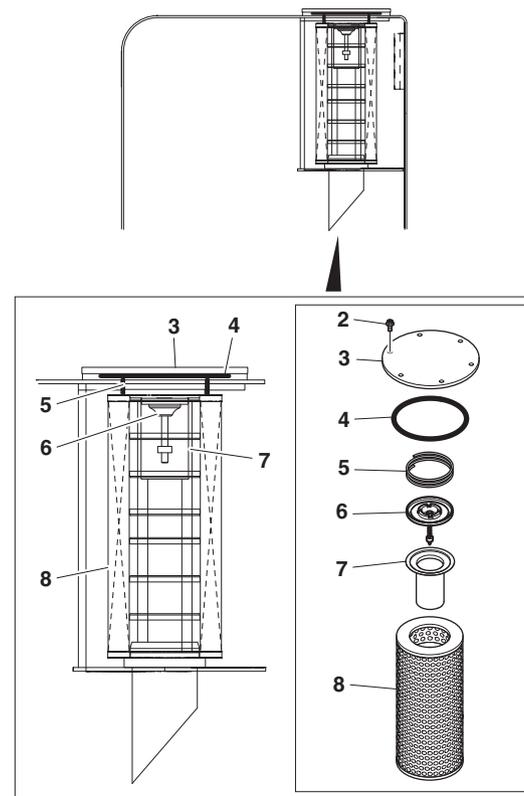
EX1301106

Figure 97



EX1500948

Figure 98

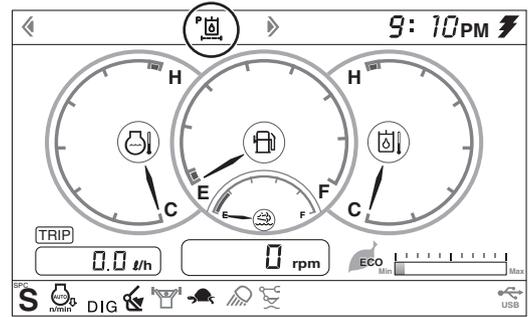


EX1400648

Figure 99

## Change Pilot Filter

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



EX1301107

Figure 100



## WARNING

**AVOID DEATH OR SERIOUS INJURY**

**The hydraulic oil will be hot after machine operation.**

**Allow the system to cool down before changing pilot filter.**

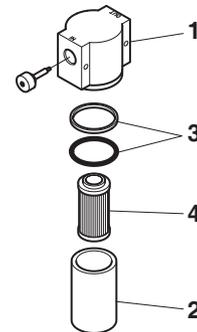
1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip breather cap up (1, Figure 98) slightly to release the internal pressure.
3. Locate pilot system filter assembly.
4. Unscrew canister (2, Figure 101) and remove O-ring (3) and filter cartridge (4).

**NOTE:** The canister will be filled with oil. Use caution when removing this assembly.

5. Insert a new filter cartridge and O-ring. Apply a small amount of oil around the entire O-ring and install the canister assembly onto the filter head (1, Figure 101).

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

6. After changing pilot filter, vent air from pump and check level of hydraulic oil tank.



DS1703795

Figure 101

## Change Oil in Swing Reduction Gear

**NOTE:** Change swing reduction gear oil after first 500 hours of operation or rebuild, and every 1,000 hours thereafter.



### WARNING

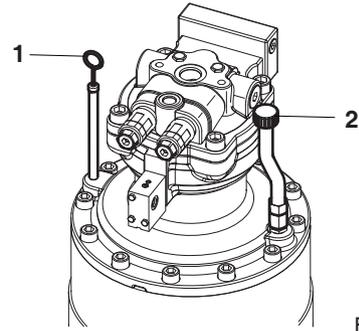
#### AVOID DEATH OR SERIOUS INJURY

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

1. Park machine on firm and level ground. Lower attachment to the ground and stop engine.
2. Release the drain plug (3, Figure 103) and drain the swing reduction gear oil into a container.

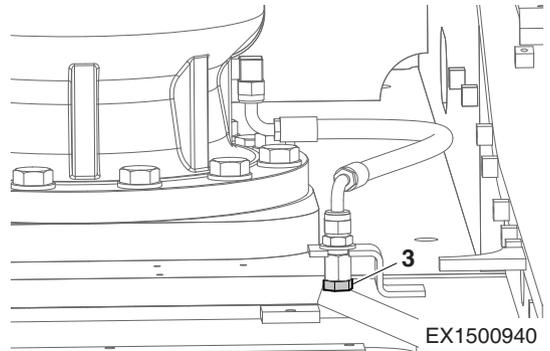
**NOTE:** Dispose of drained fluids in compliance with all applicable environmental regulations.

3. After draining oil, tighten the drain plug.
4. Remove breather/fill cap (2, Figure 102) and add oil to "H" mark on dipstick (1).



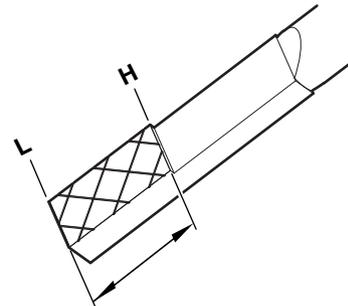
FG018305

Figure 102



EX1500940

Figure 103



FG000419

Figure 104

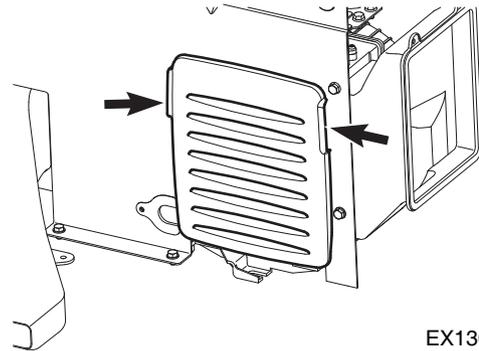
# Change Air-conditioning Inner Filter

## **WARNING**

### **AVOID DEATH OR SERIOUS INJURY**

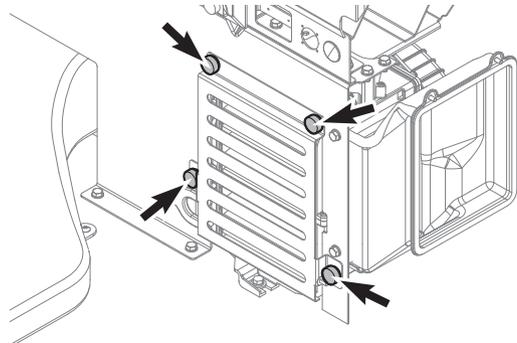
All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

1. Remove cover by pulling knob (Figure 105) outward on top of the left and right of the filter which is inside the left rear part of the cabin-STD Cabin.



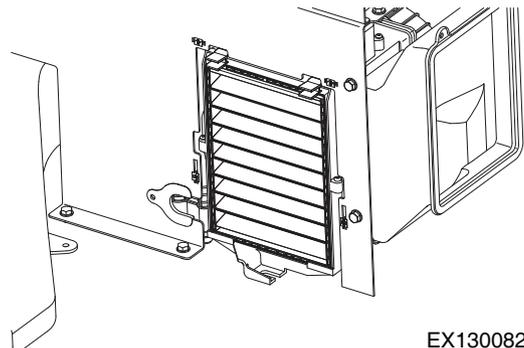
**Figure 105** STD Cabin

Loosen the bolts (Figure 106) and remove cover-Oregon Cabin.



**Figure 106** Oregon Cabin

2. Remove inner filter by pulling knob outward while pressing the upperpart and lower part of the filter handle.
3. Replace with new one.
4. Reassemble filter in reverse order.



**Figure 107**

## Change Air-conditioning Outer Filter

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

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



### WARNING

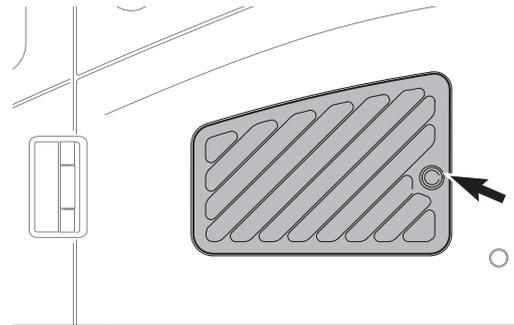
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#### AVOID DEATH OR SERIOUS INJURY

**All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.**

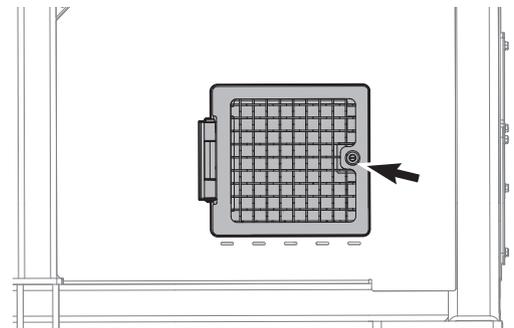
**NOTE:** *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

1. Open the cover by using the starter KEY in the left side of the cabin.



DS1900867

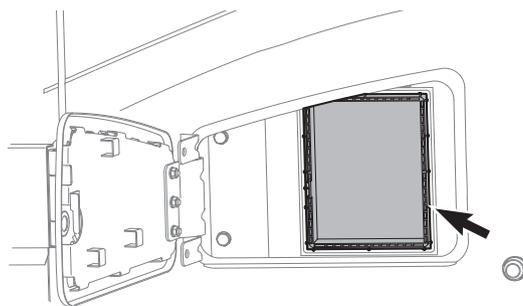
**Figure 108** STD Cabin



DS1601476

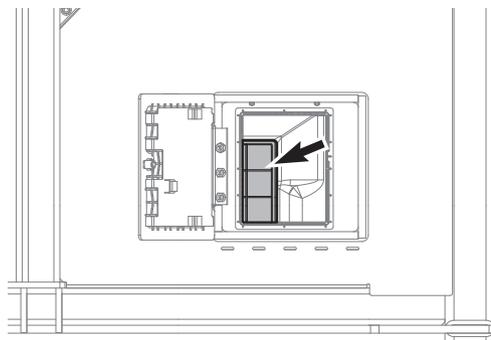
**Figure 109** Oregon Cabin

2. Remove filter (Figure 110) and replace with new one.
3. Reassemble in reverse order.



**Figure 110** STD Cabin

DS1900868



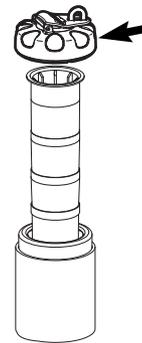
**Figure 111** Oregon Cabin

DS1601477

## Change Fuel Cap Filter



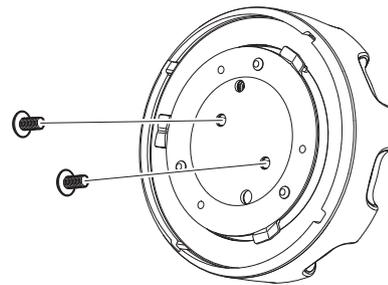
External shock or damage to fuel cap can cause permanent damage to filter.



FG020189

**Figure 112**

1. Remove screws and filter assembly from fuel cap (Figure 113).



FG015684

**Figure 113**

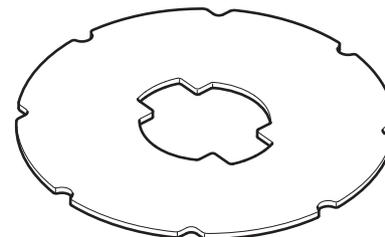
2. After disassembly, carefully lay it as shown in Figure 114.



FG015685

**Figure 114**

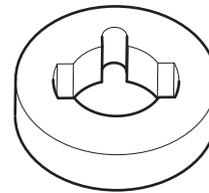
3. After disassembly (Figure 114), remove rubber piece as shown on (Figure 115).



FG015686

**Figure 115**

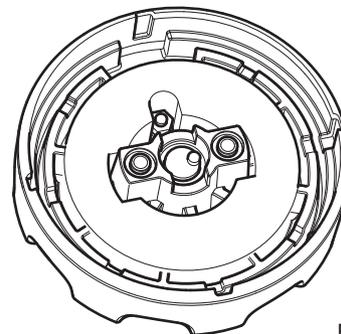
4. After disassembly as shown in (Figure 115), replace filter (Figure 116) with a new one.



FG015687

**Figure 116**

5. After installing new filter, assemble fill cap in reverse order.



FG015688

**Figure 117**

# 2,000 HOUR / YEARLY SERVICE

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

### Replace Outer and Inner Air Cleaner Filters



## WARNING

**AVOID DEATH OR SERIOUS INJURY**

**Never clean or attempt to remove air cleaner filter if the engine is running.**

**NOTE:** *Replace outer element after cleaning 5 times or every 2,000 hours of service.*

**NOTE:** *Replace inner element whenever a new outer element is installed.*

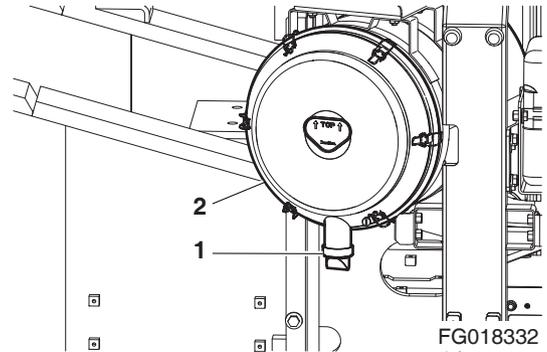
1. Open the side door of the machine, remove 6 latches (3, Figure 119), then remove cover.
2. Remove evacuator valve (1, Figure 119) from the air cleaner cover (2).

**NOTE:** *Inspect evacuator valve seal lips for wear or damage. Replace valve if necessary. Install evacuator valve with lips parallel to the cover.*

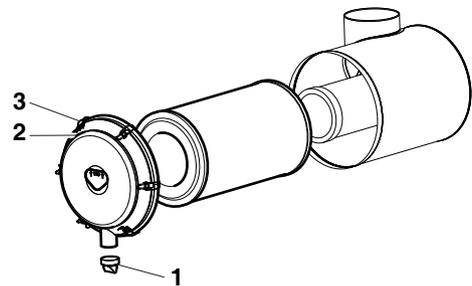
3. Hold the outer element (4, Figure 120), rock it lightly up and downward, and swing the element to pull it out. Remove inner element (5) after doing this.
4. Wipe off the dirt stuck to the air cleaner cover and the inside of the air cleaner housing.

**NOTE:** *When replacing the outer element, replace the inner element simultaneously. Do not reuse the inner element.*

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



**Figure 118**



**Figure 119**

5. Remove inner element (5, Figure 120), then install a new inner element. Insert the inner element properly so it does not move.
6. Push the new outer element (5, Figure 120) in straight to the air cleaner body.

---

**! NOTICE**

---

**Be sure to install the air cleaner filters facing in the correct direction. If the direction of installation is incorrect, this will damage the air cleaner filters or the engine.**

---

7. Replace O-ring (6) of cover (2) with a new part.

**NOTE:** *When inserting the element, if the rubber at the end is wedged or the outer element is not pushed in straight, and cover is assembled by force of hook afterward, the hook and air cleaner body can be damaged.*

8. Install cover (2, Figure 123) as described bellow.
  - A. Align cover with the element.
  - B. Hook the tip of latches (3, Figure 123) to the protruding part of the air cleaner body and lock it in position.
  - C. When locking latches (3, Figure 123) in position, apply the hooks in turn on opposite sides (top, bottom, left, right) in the same way as when tightening bolts.
  - D. Always install cover (2, Figure 123) so evacuator (1) is facing the ground (A).
  - E. When cover (2, Figure 123) is installed, check that clearance between the air cleaner body and cover (2) is not too large. If it is too large, remove cover and install again.

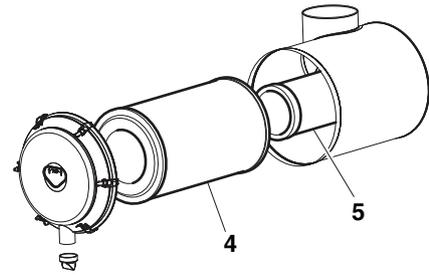


Figure 120

EX1300863

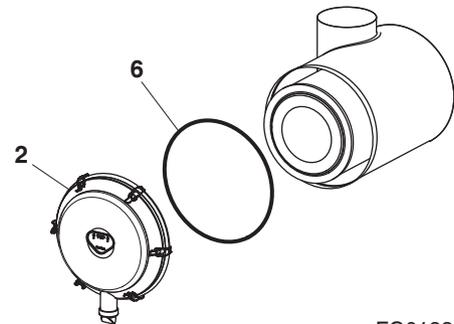


Figure 121

FG018342

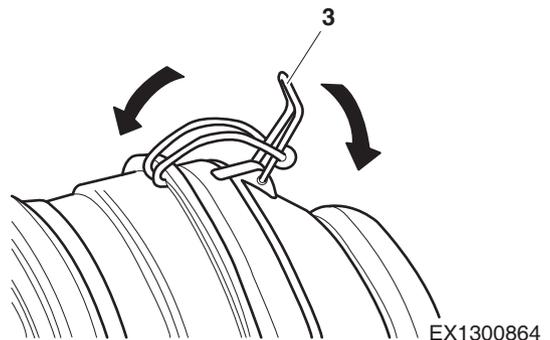


Figure 122

EX1300864

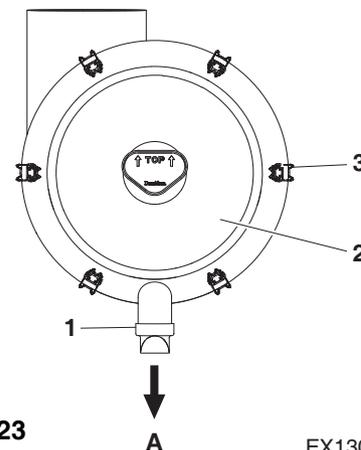


Figure 123

EX1300859

## Change Radiator Coolant

**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

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#### AVOID DEATH OR SERIOUS INJURY

Allow the engine to cool before releasing the radiator cap. Make sure to loosen the cap slowly to release any remaining pressure.

Radiator cleaning is performed while the engine is running. Take extreme caution when working on or near a running engine. Make sure to lock out and tag the controls notifying personnel that service work is being performed.

Do not remove radiator cap unless it is required. Check the coolant level in the coolant recovery tank.

---

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### NOTICE

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Do not mix up the antifreeze from different makers. Mixing the two compounds can cause generation of foreign material which can damage the system. Therefore, it is recommended to use authorized HYUNDAI genuine antifreeze solution.

To achieve the best cooling performance, keep the mixing ratio of the antifreeze and water by 50 : 50. Using water only can corrode the coolant circuit.

In bitterly cold working conditions, the customer should frequently check the performance of the coolant for appropriateness for the weather and then determine change cycle of the coolant.

---

1. Slowly open the radiator cap and the surge tank cap (Figure 124) to allow any pressure to escape.

**NOTE:** See "Fluid Capacities" on page 4-20. for capacity.

**NOTE:** Some models may have no surge tank or radiator cap. This instruction is only applicable to those with the cap.

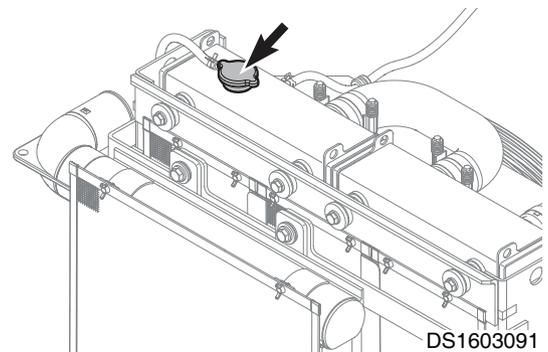
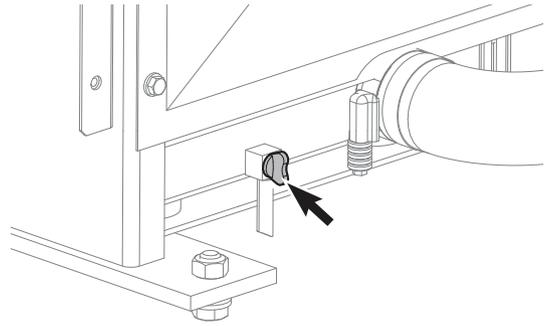


Figure 124

2. Place a container under the radiator and open the drain plug (Figure 125).

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

3. Fill cooling system with a flushing solution.
4. Run engine at low idle until coolant temperature gauge reaches the "WHITE ZONE". Run engine for another ten minutes.
5. Allow engine to cool.
6. Drain flushing fluid and fill system with water.
7. Run engine again to allow water to completely circulate.
8. After allowing engine to cool, drain water and fill system with proper antifreeze mixture for ambient temperature. Refer to coolant concentration table. See "Antifreeze Concentration Tables" on page 4-98.
9. Run engine without radiator cap and surge tank cap installed, so all air will be purged from system. Fill radiator to fill neck.
10. Drain and fill radiator coolant recovery tank.



**Figure 125**

DS1603092

## Hydraulic Oil Exchange and Suction Strainer Cleaning



### WARNING

---

#### AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow the system to cool before attempting to service any of the hydraulic components.

The hydraulic tank is pressurized. Tip breather cap up to allow the pressurized air to vent. After the pressure has been released, remove service covers.

---



### NOTICE

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Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the fill port and filter ports.

Hydraulic oil change interval is 2,000 hours only when HYUNDAI Genuine Oil is used. If another brand of oil is used, a change interval of 1,000 hours is necessary.

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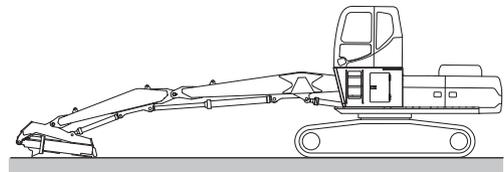
**NOTE:** *Based on the type of excavating being completed, the working conditions (extremely hot or dusty) and the extra front end attachments being used (hydraulic breaker, etc.), the hydraulic fluid will need to be changed more frequently.*

1. Park machine on firm and level ground. Swing upper structure parallel to tracks. Lower boom and position bucket or work tool on ground as shown in Figure 127.
2. Move safety lever to "LOCK" position.
3. Stop engine.
4. Release pressurized air from hydraulic tank by tip breather cap up (1, Figure 130).



Figure 126

ARO1760L



EX1300554

Figure 127

5. Drain hydraulic oil from tank into a container capable of holding 280 L (74 U.S. gal.). After draining tank, install drain plug.



## WARNING

**AVOID DEATH OR SERIOUS INJURY**

**Be careful of squirting oil when removing drain plug.**

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

6. Carefully remove bolts and cover (2, Figure 130) from top of hydraulic oil tank. There is a spring (3, Figure 130) under the cover that will force the cover up.
7. Remove spring (3, Figure 130) and strainer (5, Figure 130), by pulling on rod (4, Figure 130).
8. Clean inside and outside of strainer. Replace strainer if it is broken.
9. Position strainer (5, Figure 130) on boss portion of suction pipe (6, Figure 130).

**NOTE:** *Measurement "A" is 612.5 mm (24.11 in).*

10. Fill the hydraulic oil tank. Check level using sight gauge on side of tank.
11. Place spring (3, Figure 130) on rod (4, Figure 130) and assemble cover (2, Figure 130).
12. After replacing and cleaning the hydraulic oil, filter, and strainer, vent the system. See "Venting and Priming Hydraulic System" on page 4-107.



## NOTICE

**When the hydraulic breaker is being used, because of the higher heat generated by this unit.**

13. Check level of hydraulic oil tank. (See page 4-30)

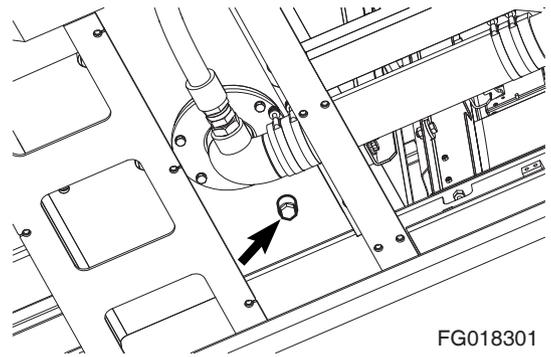


Figure 128

FG018301

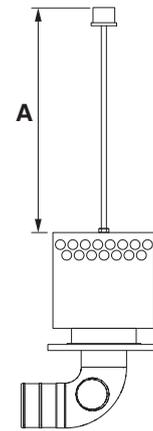


Figure 129

EX1400644

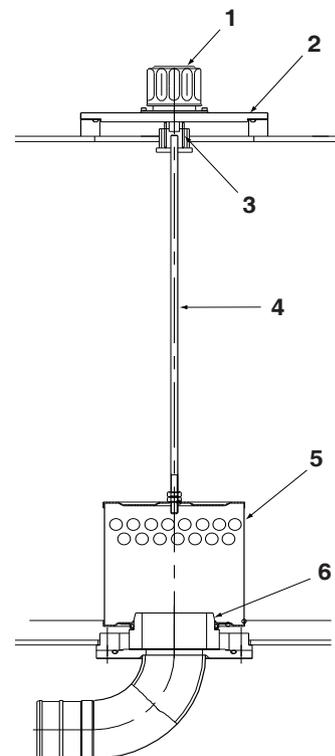


Figure 130

ARO1720L

## Change Oil in Travel Reduction Gear (One on Each Side of Unit)



### 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.

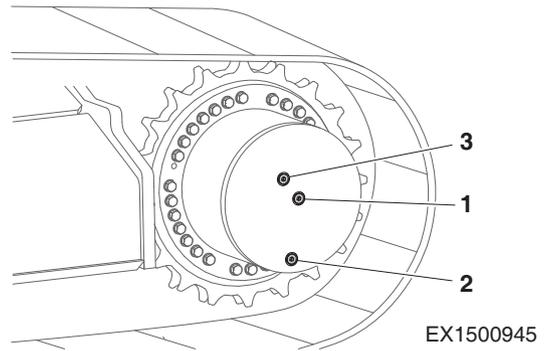


Figure 131

| Reference Number | Description    |
|------------------|----------------|
| 1                | Oil Level Plug |
| 2                | Drain Plug     |
| 3                | Fill Plug      |

**NOTE:** Change oil after first 500 hours of operation or rebuild, and every 1,000 hours thereafter.

1. Make sure that the machine is on firm and level ground.
2. Rotate the track until ports (1 thru 3, Figure 131) are in their proper positions as shown.
3. Place a container under drain plug (2, Figure 131) and remove plugs (1 thru 3) to drain the travel reduction gear oil.

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

4. Install drain plug (2, Figure 131). Refill the travel reduction gear case with fluid through fill port (3) until fluid level is at port (1). Install level plug (1) and fill plug (3).

**NOTE:** See "Fluid Capacities" on page 4-20. for capacity.

5. Repeat this procedure on the other travel reduction gear.

**Check Alternator and Starter\*\***

**Check All Rubber Antivibration Shock  
Mounts**

**Perform and Record Results of Cycle Time  
Tests**

**Inspect Machine to Check for Cracked or  
Broken Welds or other Structural Damage**

**Check, Adjust Valve Clearance\*\***

**Check Head Bolt Torques**

\*\*These checks need to be completed by an authorized  
HYUNDAI distributor.

# 4,000 HOUR / BIENNIAL SERVICE

## Major Parts - Periodic Replacement

For proper operation and work, perform periodic inspections. These parts are those most often subjected to abrasion, heat and fatigue. Replace these parts with new ones at the designated time intervals, even if the old parts look satisfactory.

Replace all related parts such as gaskets and O-rings with original equipment manufacturer's parts.

| Major Component  |             | Parts Name to be Replaced Periodically     | Time to Replace        |
|------------------|-------------|--|------------------------|
| Engine           |             | Fuel Hose (Tank to Fuel Filter)            | 2 years or 4,000 hours |
|                  |             | Fuel Hose (Fuel Filter to CP Pump)         |                        |
|                  |             | Fuel Hose (CP Pump to Fuel Cooler)         |                        |
|                  |             | Fuel Hose (Fuel Cooler to Fuel Filter)     |                        |
|                  |             | Fuel Hose (Fuel Filter to HP Pump)         |                        |
|                  |             | Fuel Hose (HP Pump to Fuel Filter)         |                        |
|                  |             | Fuel Hose (Fuel Filter to Water Separator) |                        |
|                  |             | Fuel Hose (Water Separator to Tank)        |                        |
|                  |             | Fuel Hose (Tank to Drain Valve)            |                        |
|                  |             | Heater Hose (Heater to Engine)             |                        |
|                  |             | Heater Hose (Heater to Radiator)           |                        |
|                  |             | Air Conditioner Hose                       |                        |
| Hydraulic System | Body        | Pump Suction Hose                          |                        |
|                  |             | Pump Discharge Hoses                       |                        |
|                  |             | Pump Side Branch Hoses                     |                        |
|                  |             | Swing Motor Hoses                          |                        |
|                  |             | Travel Motor Hoses                         |                        |
|                  | Work Device | Boom Cylinder Line Hoses                   |                        |
|                  |             | Arm Cylinder Line Hoses                    |                        |
|                  |             | Heel Cylinder Line Hoses                   |                        |

# 4,500 HOUR / BIENNIAL SERVICE

## Change DEF (AdBlue) Filter

---

### NOTICE

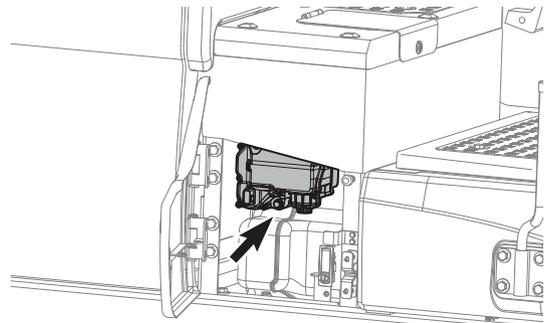
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The replacement interval of the DEF (urea solution) filter is different by the amount of foreign materials in DEF.

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

---

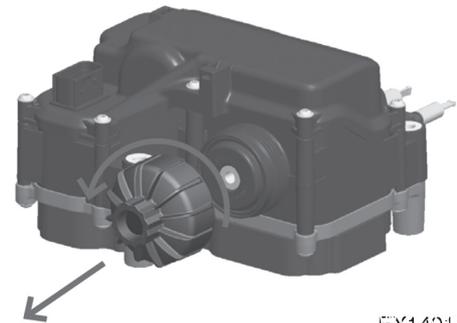
1. Remove filter cover.



DS1603093

Figure 132

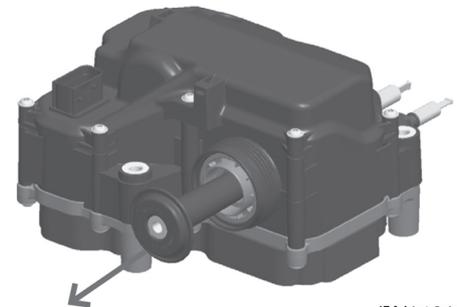
2. Remove equalizing element.



EX1401870

Figure 133

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



EX1401871

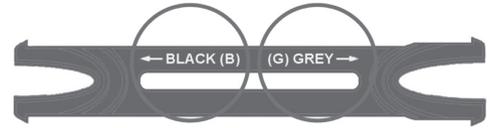
Figure 134



EX1401872

Figure 135

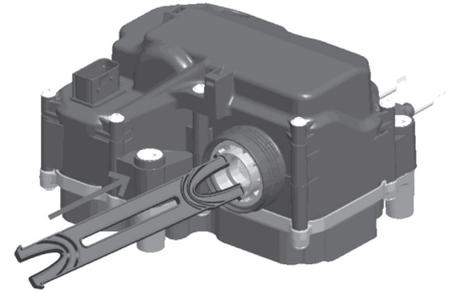
4. Set the color of the mark on the end of the filter removing tool in the same direction with the filter color section.



EX1401873

**Figure 136**

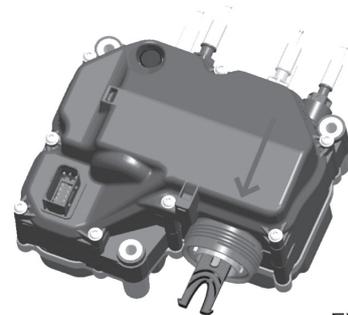
5. Insert the end of the filter removing tool until a clicking sound is heard or engagement with the filter is felt.



EX1401874

**Figure 137**

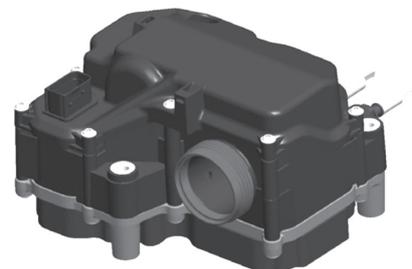
6. Pull the filter removing tool to remove filter.



EX1401875

**Figure 138**

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



EX1401881

**Figure 139**

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

---

 **CAUTION**

**AVOID INJURY**

**Use Mobil Velocite No. 6 oil from Bosch.**

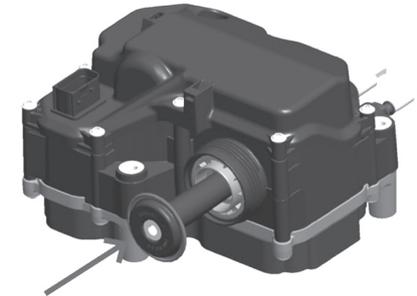
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EX1401882

**Figure 140**

9. Install a new equalizing element.



EX1401883

**Figure 141**

10. Tighten the filter cover to 20 N.m + 5 N.m.

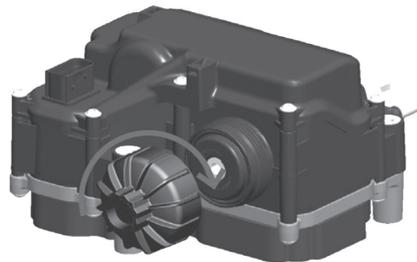
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 **CAUTION**

**AVOID INJURY**

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

---



EX1401884

**Figure 142**

# 12,000 HOUR / 6 YEAR SERVICE

## Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN))

European regulations state that in-service life of any hydraulic hose may not exceed six years. HYUNDAI recommends the following:

- Hoses at the customer premises cannot be stored more than 2 years before being discarded or installed on a machine.
- In-service lifetime of hoses fitted on a machine can never exceed 6 years, but replace hoses described in "Major Parts - Periodic Replacement" on page 4-83, every 2 years. Always replace hoses having exceeded the allowed in-service lifetime irrespective of the external appearance/wear.
- Always store hoses in a dark place at a maximum of 65% relative humidity, between 0°C (32°F) and 35°C (95°F) but as close as possible to 15°C (59°F) and away from copper, manganese or tube generating Ozone.

# AIR-CONDITIONING SYSTEM

**NOTE:** See *"Clean Air-conditioning Outer Filter"* on page 4-57.

## Check Control Panel

When a function switch is pushed, the last setting has to be displayed on the LCD display.

When the light switch is turned to "I" position, the LED for illumination in the control panel has to turn "ON".

## Check Air Conditioner Hoses

Check the hose for cracking and damage. Replace if necessary.

## Check Condenser

Inspect the condenser for dust and debris. Clean if necessary.

**NOTE:** See *"Clean Radiator, Oil Cooler, Intercooler, Fuel Cooler and Air Conditioner Condenser Cores"* on page 4-59.

## Check Magnetic Clutch

Check the magnetic clutch for dirt and interference.

Push the "A/C" switch to energize and check magnetic clutch.

# BUCKET

## Bucket Tooth Replacement

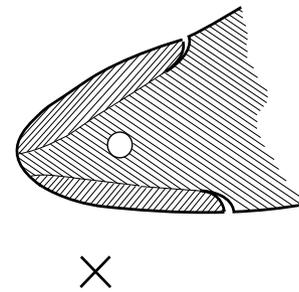
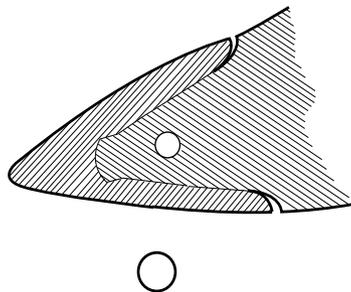


### AVOID DEATH OR SERIOUS INJURY

Due to the possibility of flying metal objects and to avoid death or serious injury, always wear safety helmet, protective gloves and eye protection when changing bucket teeth.

Curl the bucket upwards and place the round rear surface of the bucket firmly on the ground. Stop engine and lock out the hydraulic controls before working on the bucket.

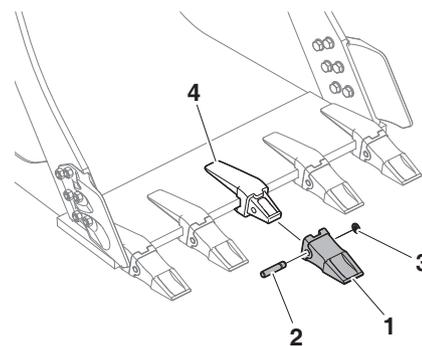
**NOTE:** *These instructions are only for HYUNDAI OEM, buckets. If you are using other manufacturers buckets, refer to their specific instructions.*



HAOC680L

**Figure 143**

1. On a routine basis, inspect bucket teeth to make sure that tooth wear or breakage has not developed. Do not allow replaceable bucket teeth to wear down to a point that bucket adapter is exposed. See Figure 143.
2. To replace a tooth (1, Figure 144), use a hammer and punch to drive locking pin (2) and lock washer (3) out of tooth adapter (4).
3. Once worn tooth has been removed, use a putty knife to scrape adapter as clean as possible.
4. Slide new tooth into position and insert lock washer.
5. Insert locking pin into tooth and use a hammer, to drive pin in until lock washer seats in locking groove.



**Figure 144**

DS1901244

# Bucket O-ring Replacement



## WARNING

### AVOID DEATH OR SERIOUS INJURY

Due to possibility of flying metal objects and to avoid death or serious injury, always wear safety helmet, protective gloves and eye protection when changing pins.

1. Inspect bucket O-rings on a routine basis. If worn or damaged, replacement is necessary.
2. Roll old O-ring (1, Figure 145) onto boss (2, Figure 145) around bucket pin (3, Figure 145). Remove bucket pin and move arm or bucket link (4, Figure 145) out of way.

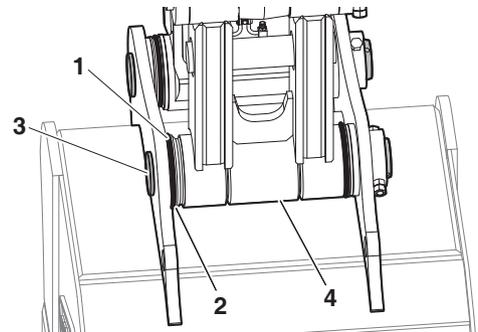


Figure 145

DS1900905

3. Remove old O-ring and temporarily install new O-ring (1, Figure 146) onto bucket boss (2, Figure 146). Make sure that O-ring groove on both bucket link (4, Figure 146) and boss have been cleaned.
4. Realign arm or link with bucket pinhole and insert bucket pin (3, Figure 145).

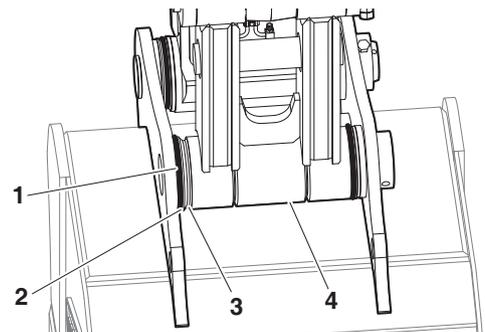


Figure 146

DS1900906

5. Roll new O-ring (1, Figure 147) into O-ring groove.

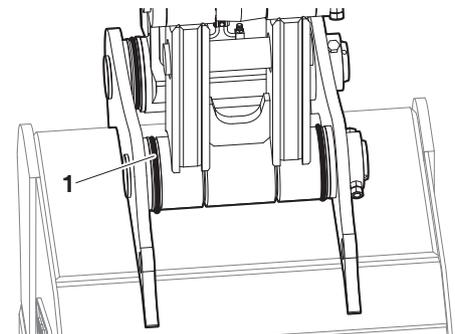


Figure 147

DS1900907

# ELECTRICAL SYSTEM

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

## Battery

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### WARNING

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#### 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

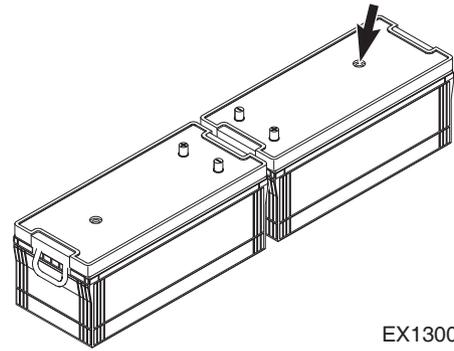
In colder weather, a greater drain is placed on the batteries when they are used for the preheat cycle and when starting a cold engine. Battery performance decreases as the temperature gets lower.

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 transparent, this indicates a low electrolyte state because of a leakage or charging system error. Determine the cause of problem and replace the batteries immediately.



EX1300841

Figure 148

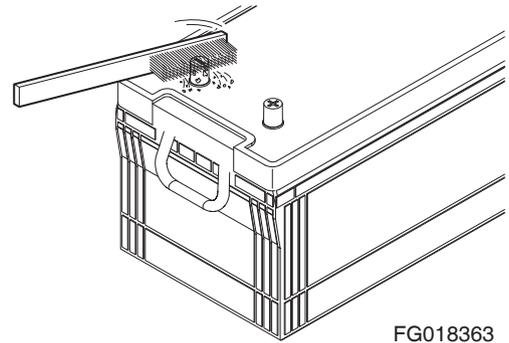
### Check Charging State

Check charging state through the charging indicator.

- GREEN: Sufficiently charged.
- BLACK: Insufficient charged.
- WHITE: Replace battery.

### Check Battery Terminals

Be certain that battery is held securely in its compartment. Clean the battery terminals and the battery cable connectors. A solution of baking soda and water will neutralize acid on the battery surface, terminals, and cable connectors. Petroleum jelly or grease can be applied to the connectors to help prevent corrosion.



FG018363

Figure 149

### Battery Replacement

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

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

## Fuses

1. The fuses in the fuse box are used to protect the various electrical circuits and their components from being damaged. See Figure 150. The fuses used are standard automotive type fuses.
2. The section on "Fuse Identification" on page 4-94 lists the circuits and the fuse amperage required for each circuit. If a fuse blows, determine the cause and repair any electrical faults or failures.
3. Do not insert a higher amperage fuse into a lower amperage slot. Serious damage to the electrical components or fire can result.

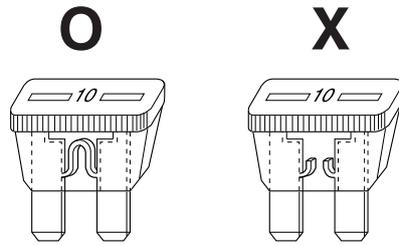


Figure 150

HAOC670L



## NOTICE

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

### Fuse Boxes

There are two fuse boxes (Figure 151) on the left side of the heater box. The fuses prevent electrical devices from overloading or shorting.

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

Spare fuses are mounted on the inside of fuse box's cover. (One each of a 10A, 15A, 20A and 30A.)

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

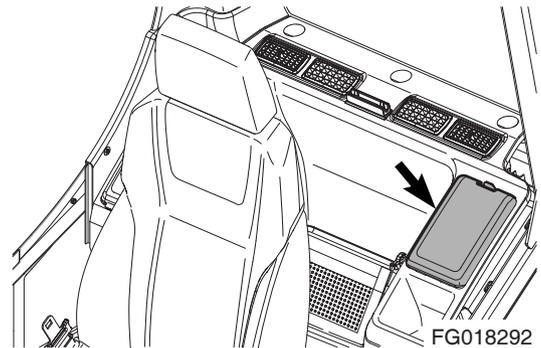


Figure 151

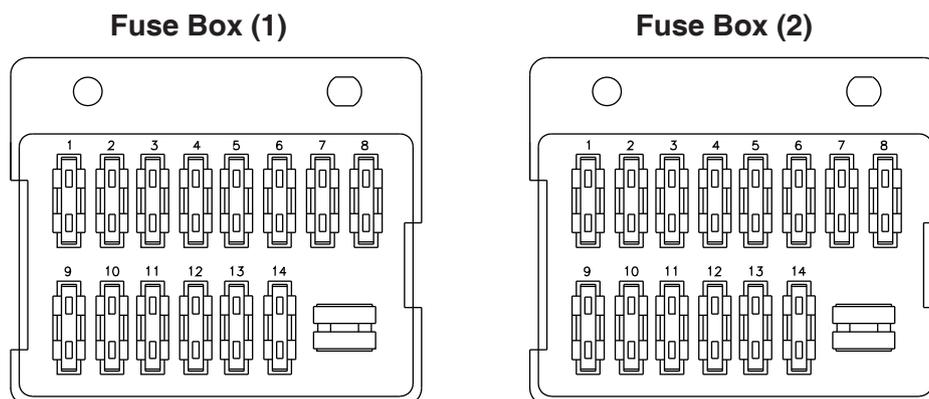


## WARNING

**AVOID DEATH OR SERIOUS INJURY**

**Always replace fuses with the same type and capacity fuse that was removed. Otherwise, electrical damage or fire could result.**

## Fuse Identification



FG000542

Figure 152

### STD Cabin

| No. | Fuse Box One                |          |
|-----|-----------------------------|----------|
|     | Name                        | Capacity |
| 1   | Cigarette Lighter           | 10A      |
| 2   | Spare                       | 10A      |
| 3   | EGR                         | 20A      |
| 4   | Washer Pump                 | 10A      |
| 5   | 12V Power (If Equipped)     | 10A      |
| 6   | Car Stereo, 12V Power, ACC  | 15A      |
| 7   | Diesel Heater (If Equipped) | 10A      |
| 8   | Starter Switch, Hour Meter  | 30A      |
| 9   | Air Conditioner, Heater     | 30A      |
| 10  | Micro Phone (If Equipped)   | 20A      |
| 11  | DEF Tank, Nox Sensor        | 30A      |
| 12  | Seat Heater, Suspension     | 15A      |
| 13  | EPOS, TMS                   | 15A      |
| 14  | ECU                         | 30A      |

| No. | Fuse Box Two                                      |          |
|-----|---|----------|
|     | Name  | Capacity |
| 1   | Alarm Buzzer (If Equipped)                        | 10A      |
| 2   | Horn  | 10A      |
| 3   | DEF Heater  | 30A      |
| 4   | Pedal Safety (If Equipped)                        | 10A      |
| 5   | Pilot Cut Off, Head Lamp, Rear Working Lamp       | 15A      |
| 6   | Auxiliary Mode, Diesel Heater Timer (If Equipped) | 10A      |
| 7   | Memory Back up                                    | 10A      |
| 8   | Room Lamp   | 10A      |
| 9   | Cabin Lamp  | 15A      |
| 10  | Working Lamp                                      | 15A      |
| 11  | Fuel Heater                                       | 30A      |
| 12  | Spare   | 20A      |
| 13  | Gauge Panel, Pilot Buzzer                         | 10A      |
| 14  | Fuel Pump (If Equipped)                           | 15A      |

Oregon Cabin

| No. | Fuse Box One                        |          |
|-----|-------------------------------------|----------|
|     | Name                                | Capacity |
| 1   | Cigarette Lighter                   | 10A      |
| 2   | FAN                                 | 10A      |
| 3   | EGR                                 | 20A      |
| 4   | Washer Pump                         | 20A      |
| 5   | 12V Power (If Equipped)             | 10A      |
| 6   | 12V Power, ACC                      | 15A      |
| 7   | Diesel Heater (If Equipped),<br>SCR | 10A      |
| 8   | Starter Switch, Hour Meter          | 30A      |
| 9   | Air Conditioner, Heater             | 30A      |
| 10  | Micro Phone (If Equipped)           | 20A      |
| 11  | Rear Cabin Light<br>(If Equipped)   | 30A      |
| 12  | Seat Warmer,<br>Air Suspension      | 15A      |
| 13  | EPOS, TMS                           | 15A      |
| 14  | ECU                                 | 30A      |

| No. | Fuse Box Two   |          |
|-----|--|----------|
|     | Name   | Capacity |
| 1   | Alarm Buzzer (If Equipped)                           | 10A      |
| 2   | Horn   | 10A      |
| 3   | DEF Heater   | 30A      |
| 4   | Pedal Safety (If Equipped)                           | 10A      |
| 5   | Pilot Cut Off, Head Lamp,<br>Rear Working Lamp       | 15A      |
| 6   | Auxiliary Mode, Diesel Heater<br>Timer (If Equipped) | 10A      |
| 7   | Memory Back up                                       | 10A      |
| 8   | Room Lamp  | 15A      |
| 9   | Cabin Lamp   | 15A      |
| 10  | Working Lamp   | 15A      |
| 11  | Fuel Heater  | 30A      |
| 12  | Spare  | 20A      |
| 13  | Gauge Panel, Pilot Buzzer                            | 10A      |
| 14  | Fuel Pump (If Equipped)                              | 15A      |

# 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 4-98. 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

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### AVOID DEATH OR SERIOUS INJURY

**Pressure at air nozzle must not exceed 2 kg/cm<sup>2</sup> (28 psi). Always wear goggles when using compressed air.**

**Do not pour cold water into radiator when engine is hot and water level is below the top of the tubes. Such action could result in damage to engine cylinder heads.**

---

Heavy-duty diesel engines require a balanced mixture of water and antifreeze. Drain and replace the mixture 1 year or 2,000 hours of operation, whichever comes first. This will eliminate buildup of harmful chemicals.

Antifreeze is essential in any climate. It broadens the operating temperature range by lowering the coolant's freezing point and by raising its boiling point. Do not use more than 50% antifreeze in the mixture unless additional antifreeze protection is required. Never use more than 60% antifreeze under any condition.

## Types of Antifreeze

Ethylene Glycol - HYUNDAI 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 HYUNDAI.**

**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 <mi bXUJ's genuine coolant is the top priority. If <mi bXUJ'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<br>(Do not use Propylene Glycol)   | Ethylene Glycol Base<br>or Propylene Glycol<br>(Both available)             |
| Additive         | Only Phosphate type<br>available  | Only Phosphate type<br>available<br>(Do not use Silicates<br>type additive) |
| Remark           | Below should not be contained for Scania Engine <ul style="list-style-type: none"><li>• 2-EHA (mono carboxylate acid)</li><li>• Benzoat (aromatic carboxylate acid)</li></ul> |   |

## Antifreeze Concentration Tables

| Ethylene Glycol - HYUNDAI 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 HYUNDAI 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



**CAUTION**

**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.

---

# FUEL TRANSFER PUMP (IF EQUIPPED)

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## NOTICE

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Please open fuel cap before operate fuel transfer pump to avoid any safety issue/damages due to the pressure building up.

Dry operating fuel pump for more than fifteen seconds can cause wear and/or damage to pump.

- Cooling and lubrication of pump is achieved by fuel passing through pump. If pump is dry operated, heat generated by moving parts will cause damage to pump rotors, vanes and seals.

Do not operate pump for more than fifteen minutes at a time.

- Continuous usage of pump over recommended time interval will cause overheating of motor and will result in motor damage.

Do not use fueling pump for other types of fuel or fluids. (Use only for diesel fuel)

- Do not use fueling pump for other types of fuel which have a low flash point.
- Do not use fueling pump for fuel contaminated with water or high humidity. Moisture in pump mechanism can cause rust and can create pump failure.

Always operate pump using strainer installed on inlet hose. This will prevent any foreign materials from being introduced into pump. Always maintain pump and all of its components in a clean condition.

- If dirt or other foreign materials enter pump, they can become lodged between the rotor and/or vanes and generate heat which can cause pump damage.
- Do not remove strainer or use a strainer with larger mesh to increase flow of fuel.

Be careful not to overfill or spill fuel.

Make sure direction of check valve is in line with flow direction of fuel.

Any pump parts or components that become lost, damaged or inoperable must be immediately replaced.

---



## WARNING

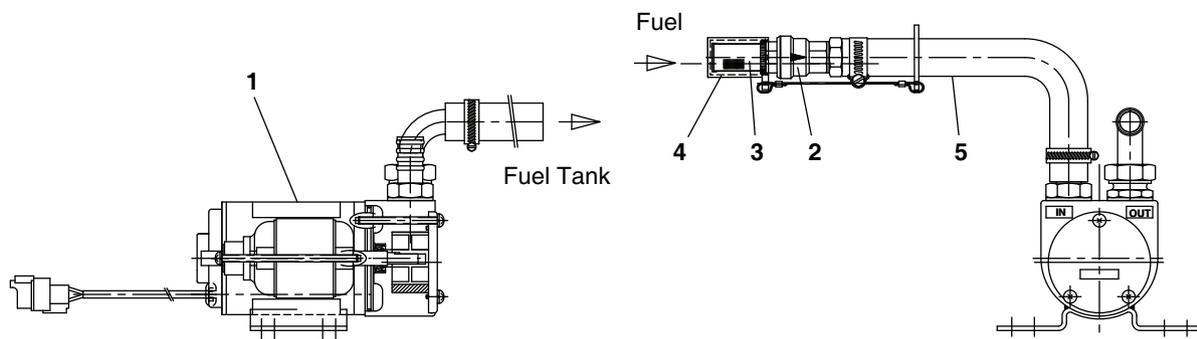
### AVOID DEATH OR SERIOUS INJURY

If there is any sign of leakage while operating transfer pump, inspect the following components to prevent fire or hazardous fuel spill:

- Check all hoses leading to and from the transfer pump.
- Check all hose clamps.
- Check transfer pump inlet port.

The transfer pump is used to transfer fuel from a refueling source to the fuel tank. A check valve is installed in the inlet hose to prevent fuel from flowing back from fuel tank to source. A strainer is installed in inlet hose to prevent any foreign material from being introduced into transfer pump or fuel tank.

A thermal limiter, built into the motor, will automatically shut off power if motor is overheating to protect it from being damaged.



FG000161

Figure 153

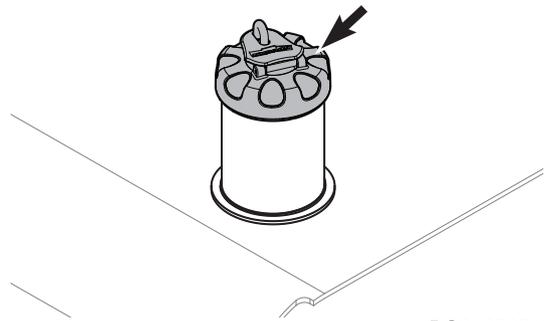
| Reference Number | Description |
|------------------|-------------|
| 1                | Body        |
| 2                | Check Valve |
| 3                | Strainer    |

| Reference Number | Description  |
|------------------|--------------|
| 4                | Strainer Cap |
| 5                | Inlet Hose   |

1. Open the fuel cap on the fuel tank.
2. Remove strainer cap (4, Figure 153) from strainer (3, Figure 153) on end of inlet hose (5, Figure 153).

**NOTE:** *Keep strainer cap (4, Figure 153) in a safe location to reseal strainer (3, Figure 153) after refueling is complete.*

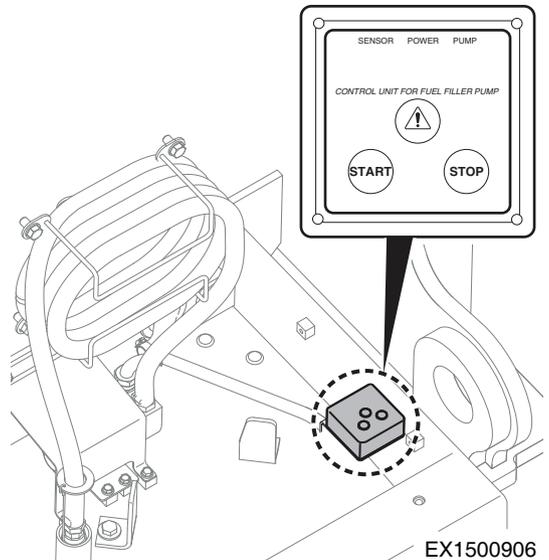
3. Insert inlet hose (5, Figure 153) into refueling tank.



DS2100094

**Figure 154**

4. Push fuel pump "START" switch (Figure 155) inside of battery box on front side.
5. Once fuel transfer is completed, the pump will automatically turn "OFF".
6. Lift inlet hose (5, Figure 153) from fueling source and push "START" switch and push "STOP" switch after two - three seconds to drain remaining fuel from hose to fuel tank.
7. Install strainer cap (4, Figure 153) on inlet strainer (3, Figure 153) and return hose (5, Figure 153) to storage position.



EX1500906

**Figure 155**

# HANDLING OF ACCUMULATOR

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## WARNING

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### AVOID DEATH OR SERIOUS INJURY

Even though the engine is stopped, the hydraulic accumulators for the pilot system are still charged. Do not disconnect any pilot system hoses until accumulator pressure has been released from the circuit. To release pressure, turn the starter switch to "I" (ON) position and operate all hydraulic control levers and forward/reverse travel levers. Even though the engine is stopped, hydraulic actuated components may move while releasing pilot pressure. Keep all personnel and bystanders away from forestry machine while performing this operation.

- Move safety lever to "LOCK" position after stopping engine.
  - DO NOT mishandle accumulator(s), because they contain high-pressure nitrogen gas.
  - DO NOT puncture or apply heat or fire to an accumulator.
  - DO NOT weld on accumulator, or try attaching anything to it.
  - When replacing an accumulator, contact a HYUNDAI distributor or sales agency so the gas can be properly released.
  - Wear safety goggles and protective gloves when working on an accumulator. Hydraulic oil under pressure can penetrate the skin and cause death or serious injury.
- 

Release pilot accumulator pressure using the following procedure:

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Move safety lever to "UNLOCK" position.
3. Turn starter switch to "I" (ON) position.
4. Fully stroke work and travel levers in all directions.
5. Move safety lever to "LOCK" position.
6. Turn key to "O" (OFF) position and remove from starter switch.
7. Remove accumulator by unscrewing it slowly.

# TRACK TENSION (IF EQUIPPED TYPE 1)



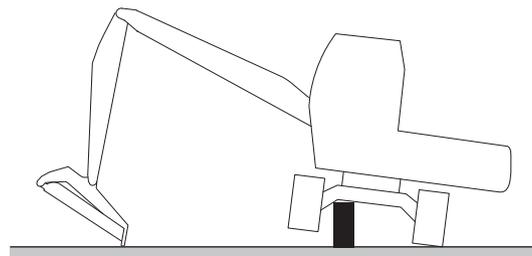
## AVOID DEATH OR SERIOUS INJURY

Measuring track tension requires two people. One person must be in the operator's seat, operating the controls while the other person makes dimensional checks. Block frame to make sure the machine won't move or shift position during service. Warm up the engine to prevent stalls, park the excavator in an area that provides level, uniform ground support and/or use support blocks when necessary.

**NOTE:** *The track tension must be adjusted in accordance with the operating conditions. If a lot of dust stick to the track assembly in the working place, keep the track as loose as possible.*

Track shoe link pins and bushings wear with normal usage, reducing track tension. Periodic adjustment is necessary to compensate for wear and it may also be required by working conditions.

1. Track tension is checked by jacking up one side of the forestry machine. See Figure 156. Place blocking under frame while taking measurement. Turn the track backward 1 ~ 2 turns.



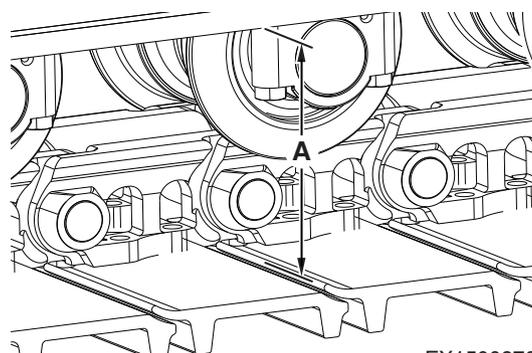
EX1300535

Figure 156

2. Measuring the distance (A, Figure 157) between the bottom of the side frame and the top of the lowest crawler shoe. Recommended tension for operation over most types of terrain is as below table.

**NOTE:** *Clean off the tracks before checking clearance for accurate measurements.*

3. Too little sag in the crawler track (less than clearance distance "A" on below table) can cause excessive component wear. The recommended adjustment can also be too tight causing accelerated stress and wear if ground conditions are wet, marshy or muddy.



EX1500970

Figure 157

4. A track that is properly adjusted may have a different sag according to the track options. Contact your dealer for information.

| Terrain Type | Distance "A"                     |
|--------------|----------------------------------|
| Normal       | 365 ~ 395 mm<br>(14.4 ~ 15.6 in) |



## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

5. Track tension adjustments are made through the grease fitting (1, Figure 158) in the middle of each side frame. Adding grease increases the length of an adjustment cylinder (2). Extending the adjustment cylinder, increases the pressure on the tension spring pushing the track idler wheel outward.
6. If there is not enough slack or clearance in the tracks and the adjustment is too tight, the idler wheel and adjusting cylinder can be retracted by bleeding off grease through hole in adjustment cylinder (2, Figure 158).

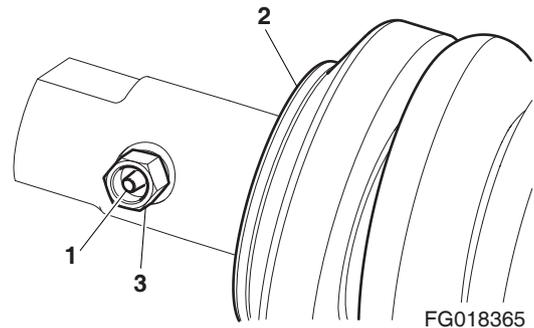


Figure 158

# TRACK TENSION (IF EQUIPPED TYPE 2)



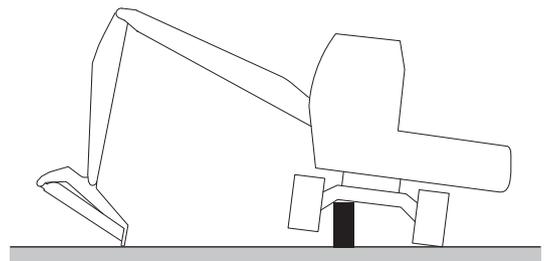
## AVOID DEATH OR SERIOUS INJURY

Measuring track tension requires two people. One person must be in the operator's seat, operating the controls while the other person makes dimensional checks. Block frame to make sure the machine won't move or shift position during service. Warm up the engine to prevent stalls, park the excavator in an area that provides level, uniform ground support and/or use support blocks when necessary.

**NOTE:** *The track tension must be adjusted in accordance with the operating conditions. If a lot of dust stick to the track assembly in the working place, keep the track as loose as possible.*

Track shoe link pins and bushings wear with normal usage, reducing track tension. Periodic adjustment is necessary to compensate for wear and it may also be required by working conditions.

1. Track tension is checked by jacking up one side of the forestry machine. See Figure 159. Place blocking under frame while taking measurement. Turn the track backward 1 ~ 2 turns.



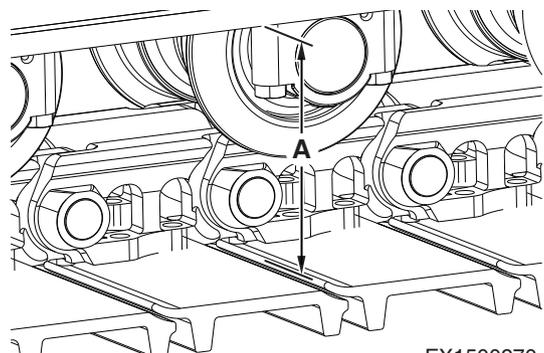
EX1300535

**Figure 159**

2. Measuring the distance (A, Figure 160) between the bottom of the side frame and the top of the lowest crawler shoe. Recommended tension for operation over most types of terrain is as below table.

**NOTE:** *Clean off the tracks before checking clearance for accurate measurements.*

3. Too little sag in the crawler track (less than clearance distance "A" on below table) can cause excessive component wear. The recommended adjustment can also be too tight causing accelerated stress and wear if ground conditions are wet, marshy or muddy.



EX1500970

**Figure 160**

4. A track that is properly adjusted may have a different sag according to the track options. Contact your dealer for information.

| Terrain Type | Distance "A"                     |
|--------------|----------------------------------|
| Normal       | 365 ~ 395 mm<br>(14.4 ~ 15.6 in) |



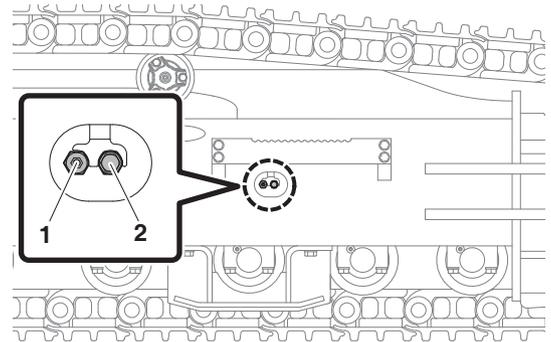
## WARNING

### AVOID DEATH OR SERIOUS INJURY

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

5. The track tension can be adjusted with the grease fitting valve (1, Figure 161) and handle screws (2, Figure 161) 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:  $68.6 \pm 9.8$  N.m (7 kg  $\pm$  1 kg.m, 5.2  $\pm$  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.*



DS1901245

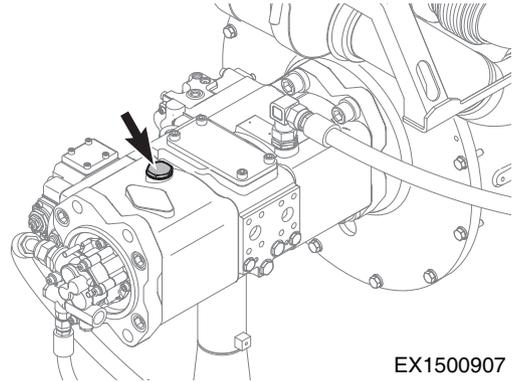
Figure 161

# VENTING AND PRIMING HYDRAULIC SYSTEM

## Main System Pump

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

1. With the engine stopped, remove vent plug (Figure 162) to see if any oil is present.
2. If oil is not present, fill oil tank with oil.
3. Install vent plug (Figure 162) first.
4. Slowly loosen vent plug (Figure 162) several turns, until hydraulic oil flows out of plug. This shows that air has been released.
5. Tighten the plug (Figure 162).



**Figure 162**

EX1500907

## Hydraulic Cylinders



### **NOTICE**

---

**If cylinders are operated in "HIGH IDLE" after the hydraulic system has been drained or the cylinder has been rebuilt, damage to piston packing and seals can occur. Always vent air from cylinders at "LOW IDLE" and at a slow speed.**

---

1. Run engine at "LOW IDLE". Extend and retract each cylinder to within 100 mm (4 in) of fully stroking it 4 - 5 times.
2. Operate fully extend and retract each cylinder 3- 4 times.
3. Repeat procedure until cylinders extend and retract smoothly.

## Swing Motor

---

### NOTICE

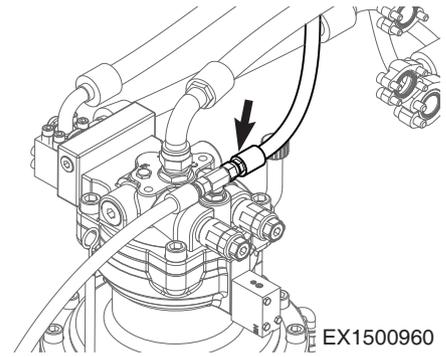
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**If the air is not vented from the system, it will cause damage to the swing motor and bearings.**

---

**NOTE:** *Perform this only when oil has been drained from swing motor.*

1. Stop engine.
2. Disconnect drain hose and fill swing motor case with hydraulic oil.
3. Connect the drain hose.
4. Start engine and set throttle at "LOW IDLE" and swing upper structure slowly two full revolutions to the left and right.

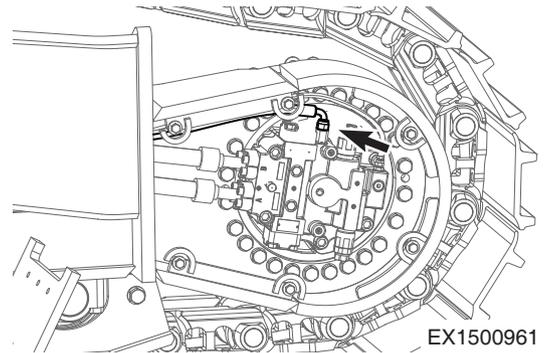


**Figure 163**

## Travel Motor

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

1. Stop engine.
2. Disconnect drain hose (Figure 164) and fill motor case with hydraulic oil.
3. Connect drain hose.
4. Start engine and set engine speed control dial to "LOW IDLE". Run the engine for one minute and slowly drive forestry machine forwards and backwards.



**Figure 164**

## 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 Under Abnormal Conditions" on page 3-54 for other recommendations.

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



# Transportation

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

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

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

If the actual height exceed the limitation on the trailer, the operator must submit special permission to the government. Consult to the national or regional Road authorities.

Or, to avoid height limit, one may disassemble front linkage or guardrail during transportation.



## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

Whenever removal or reassemble guardrail, always use external ladder to access. And NEVER climbing up machine without guardrail and external ladder.

Consult to the HYUNDAI dealer.

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## NOTICE

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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.

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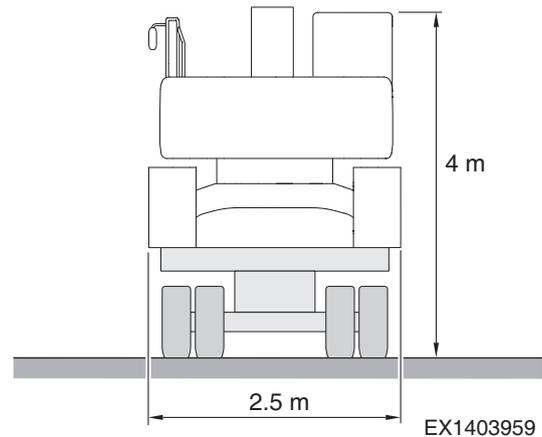


Figure 1

# LOADING AND UNLOADING

## Warning for Counterweight and Front Attachment Removal



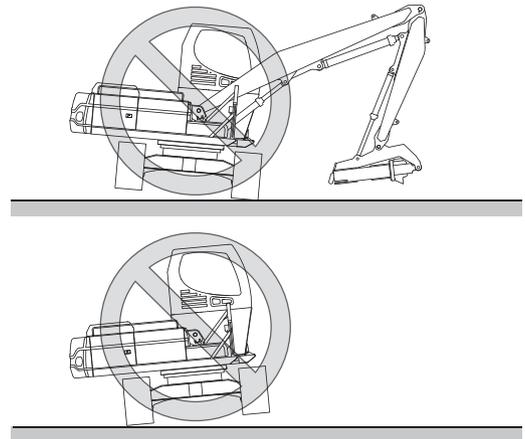
**AVOID DEATH OR SERIOUS INJURY**

**DO NOT** remove machine counterweight, front attachment or any other part. This could cause tipping or roll-over resulting in death or serious injury.

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

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

---



EX1500889

Figure 2

## Counterweight

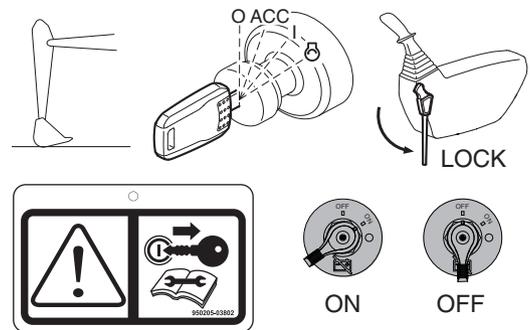


**AVOID DEATH OR SERIOUS INJURY**

Death or serious injury can occur from a counterweight falling during removal or installation. Do not allow personnel under or around the counterweight during removal or installation.

Use certified cables and shackles of adequate load rating. Improper lifting can allow the load to shift and cause death or serious injury.

---



EX1500510

Figure 3

## Removal

1. Park on firm and level ground.
2. Lower front attachment (bucket or work tool) to ground.
3. Stop engine.
4. Move safety lever to "UNLOCK" position.
5. Turn starter switch to "I" (ON) position.



## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

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

---

6. Fully stroke work levers (joysticks) in all directions to relieve any pressure from accumulators.
  7. Move safety lever to "LOCK" position.
  8. Turn key to "O" (OFF) position and remove from starter switch.
  9. Attach maintenance warning tag on controls.
  10. Turn battery disconnect switch to "OFF" position.
  11. Make sure all electrical lines and other items are disconnected.
  12. Using a suitable lifting device capable of handling a heavy load, partially support counterweight from lifting holes (6, Figure 4), counterweight (1) before loosening four bolts (2). Stop lifting with assist crane as soon as lifting slings are taut.
  13. Remove four bolts (2, Figure 4), washers (3) and shims (5) from counterweight (1, Figure 4).
    - Tool: 60 mm (  )
    - Weight: 6,300 kg (13,900 lb)
- NOTE:** *Heat bolts, if necessary, to free them.*
14. When bolts (2, Figure 4), washers (3) and shims (5) have been removed, lift counterweight (1) a very short distance above support frame (4) and stop. Check slings and make sure counterweight is being supported evenly.

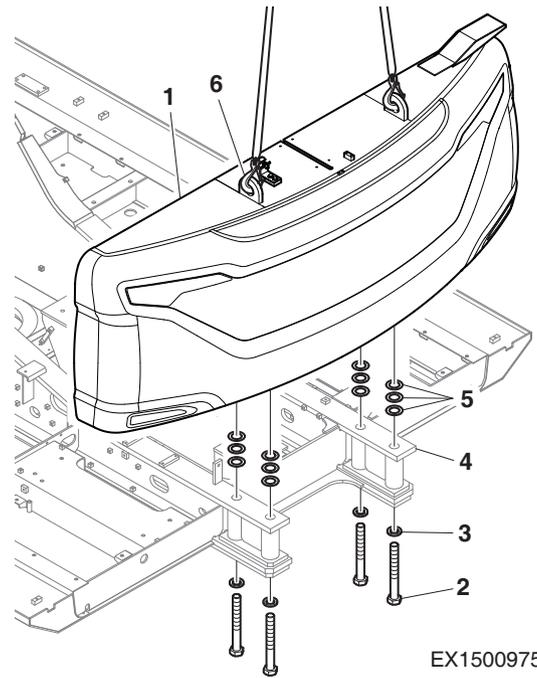


Figure 4

## Installation

1. Using suitable lifting device capable of handling the weight of the counterweight, support counterweight from lifting holes (6, Figure 5). Raise counterweight (1) into position just above support frame (4) leaving counterweight suspended. Verify that counterweight is level and even.

**NOTE:** Leave counterweight (1, Figure 5) suspended 3 mm (0.125") above support frame (4) until all four mounting bolts (2) are started in counterweight mounting holes.

2. Slide washers (3, Figure 5) onto bolts (2). Apply Loctite #242 to mounting bolt threads.
3. Install four bolts (2, Figure 5) with washers (3) into counterweight until washers contact support frame. Fully lower counterweight onto support frame and finish tightening bolts.

- Tool: 60 mm (  )
- Torque: 2,451 N.m (250 kg.m, 1,808 ft lb)

**NOTE:** As assembling counterweight into main frame, adjust the gap of height between counterweight and side door assembly using shim (5, Figure 5) suitably.

4. Remove lifting device from counterweight lifting holes. (6, Figure 5)
5. Make sure all electrical lines and other items are connected.
6. Turn battery disconnect switch to "ON" position.

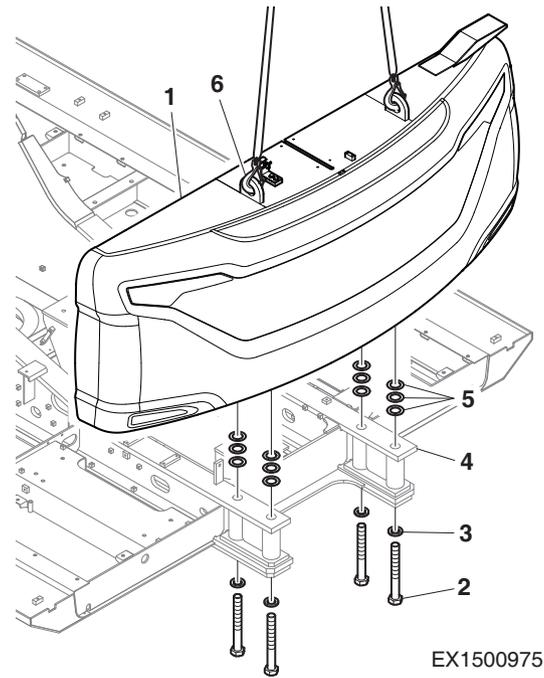


Figure 5

EX1500975



## 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 forestry machine.

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

Make sure to secure the forestry machine onto the trailer as required by local transportation laws and regulations.

---

1. Make sure that trailer is parked on firm and level ground. See Figure 6.
2. Make sure that ramps that are being used are designed to handle the weight of the forestry machine. 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.

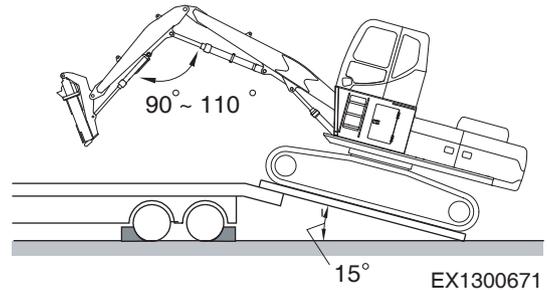


Figure 6

4. Set the travel speed selector switch to "O" (OFF) position. See Figure 7.

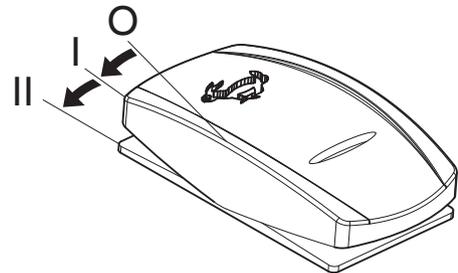
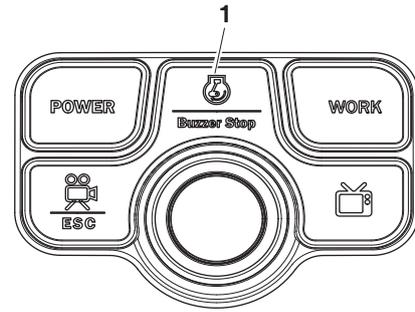


Figure 7

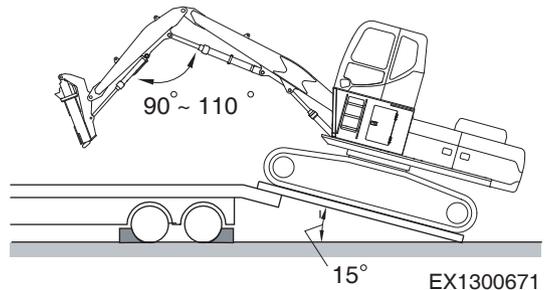
5. Turn "OFF" auto idle selector button (1, Figure 8). The indicator symbol will disappear.
6. Move engine speed to "LOW IDLE".



FG018616

**Figure 8**

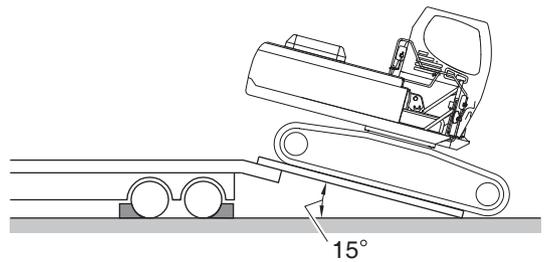
7. If the machine is equipped with work equipment, position the work equipment toward the front of the forestry machine, and travel forward to load it.



EX1300671

**Figure 9**

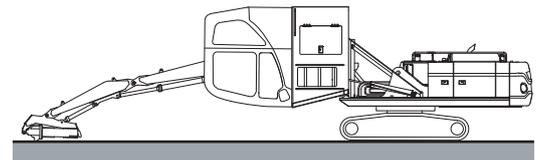
8. The unit does not require disassembly for normal over-the-road transportation. If the boom and arm need to be removed, the counterweight will place more weight on the rear of the machine. Make sure to back the forestry machine onto the trailer so the counterweight end (heavy end) of the forestry machine is positioned on the ramp first. See Figure 10.



EX1500903

**Figure 10**

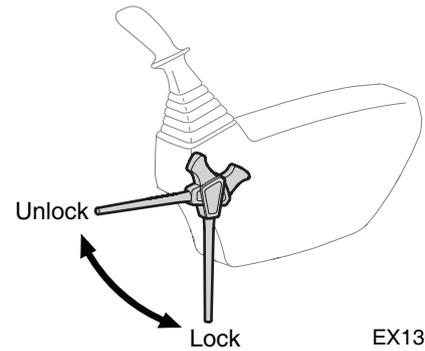
9. Extend heel and arm cylinders to maximum length and then lower the boom slowly.



EX1300672

**Figure 11**

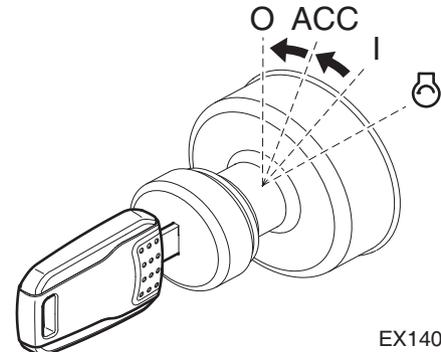
10. Move safety lever to "LOCK" position.



EX1300566

Figure 12

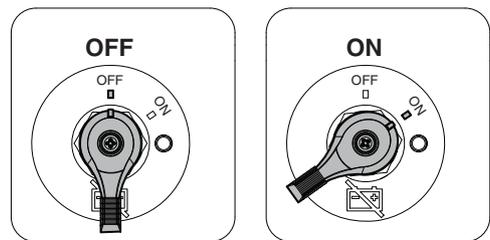
11. Stop engine by turning key to "O" (OFF) position (Figure 13).
12. Remove key from starter switch.



EX1402155

Figure 13

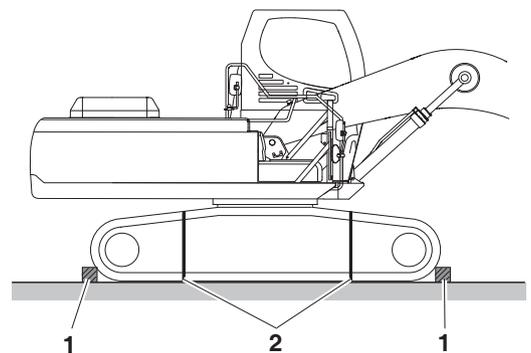
13. Turn battery disconnect switch to "OFF" position (Figure 14).
14. Lock all doors and covers.
15. Adjust direction of rotating beacon and TMS antenna.



EX1500481

Figure 14

16. Make sure to secure the forestry machine onto the trailer before transporting. Place blocking (1, Figure 15) in front of and behind each track. Tie front and rear (2, Figure 16) and tie down point (3, Figure 16) on the lower frame with wire cable as required by local transportation regulations.
17. Refer to "Specification" section of this manual for overall machine height and width dimensions. Make sure to position the forestry machine as shown. If not transported in this position, the height measurements may be different.



EX1300845

Figure 15

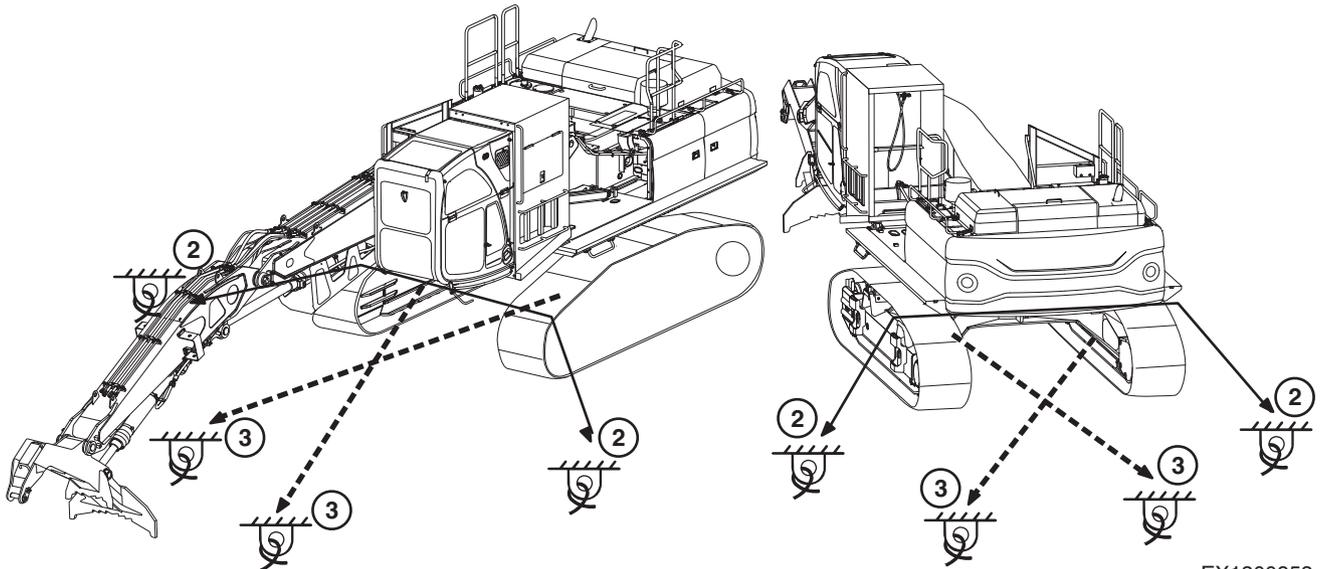


Figure 16

EX1300853

## LIFTING MACHINE



### WARNING

#### AVOID DEATH OR SERIOUS INJURY

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

Never enter the area under or around a raised machine.

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

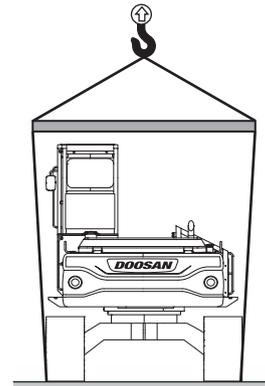
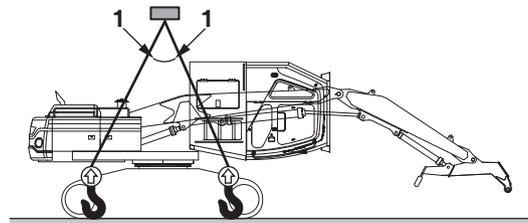
When lifting, move the safety lever to "LOCK" position to prevent the machine from moving unexpectedly.

Use only properly rated cables and slings.

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

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

1. Refer to "Specification" section of this manual for weight and dimensional information.
2. Lower the work equipment to the ground as shown in the diagram on the right.
3. Lower the dozer blade to the ground. (if equipped)
4. Move safety lever to "LOCK" position. Stop engine.



EX1300662

Figure 17

5. Ensure there is nothing around the operator's compartment, close the cabin door and front glass securely.
6. Bind wire ropes between the 1st and 2nd track rollers from the front and between the 1st and 2nd track rollers from the rear.
7. Use spreader bars between the wire rope and the machine to prevent damage to the rope or machine. Set the lifting angle (1, Figure 17) of the wire rope to 30 ~ 40°.
8. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.



# Specification

## STANDARD SPECIFICATION

| Component          |                            | Specification   |                             |                |
|--------------------|----------------------------|---|-----------------------------|----------------|
|                    |                            | Metric  | English                     |                |
| Operating Weight   | STD Cabin                  | 37.5/*37.2 metric tons  | 41.3/*41.0 tons             |                |
|                    | Oregon Cabin               | 38.3/*37.6 metric tons  | 42.2/*41.4 tons             |                |
| Engine             | Model                      | DL08P   |                             |                |
|                    | Type                       | 4-cycle Water Cooled, Turbo Charge, Direct Injection, Exhaust Gas Recirculation |                             |                |
|                    | Rated Output               | 202 kW @ 1,800 rpm  | 271 HP (275 PS) @ 1,800 rpm |                |
|                    | Maximum Torque             | 1,275 N.m @ 1,300 rpm   | 940 ft lb @ 1,300 rpm       |                |
|                    | Fuel Tank Capacity         | 500 L   | 132 U.S. gal.               |                |
| Hydraulic Pump     | Type                       | Axial piston  |                             |                |
|                    | Discharging Pressure       | 350 kg/cm <sup>2</sup>  | 343 bar (4,975 psi)         |                |
|                    | Maximum Discharge Quantity | 2 x 248 L/min   | 2 x 65.5 U.S. gpm           |                |
|                    | Hydraulic Oil Capacity     | Tank Level  | 165 L                       | 43.6 U.S. gal. |
| System             |                            | 310 L   | 81.9 U.S. gal.              |                |
| Performance        | Swing Speed                | 9.7 rpm   |                             |                |
|                    | Travel Speed               | High-speed  | 4.2 km/h                    | 2.61 MPH       |
|                    |                            | Low Speed   | 2.7 km/h                    | 1.68 MPH       |
|                    | Traction Force             | High-speed  | 23.2 metric tons            | 25.6 tons      |
|                    |                            | Low Speed   | 35.7 metric tons            | 39.3 tons      |
|                    | Gradeability               | 35° (70% slope)   |                             |                |
| Ground Pressure    | STD Cabin                  | 0.62 kg/cm <sup>2</sup>   | 8.82 psi                    |                |
|                    | Oregon Cabin               | 0.63 kg/cm <sup>2</sup>   | 8.96 psi                    |                |
| Ground Clearance   |                            | 760 mm  | 29.9 in                     |                |
| Track Shoe Width   |                            | 700 mm  | 27.6 in                     |                |
| Upper Roller Qty.  |                            | 2 per side  |                             |                |
| Bottom Roller Qty. |                            | 9 per side  |                             |                |

\* Road Builder

# OVERALL DIMENSIONS

## Log Loader

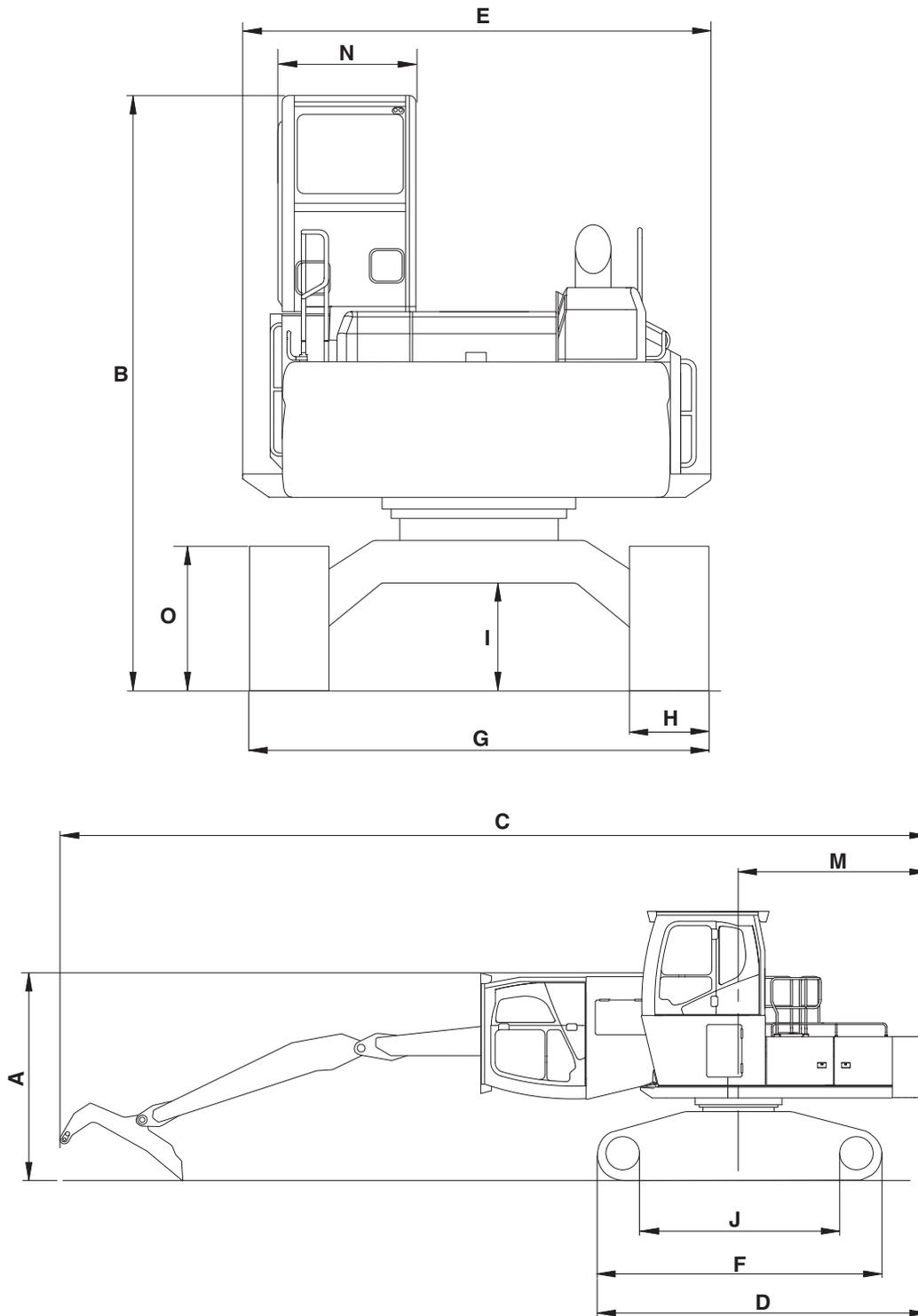


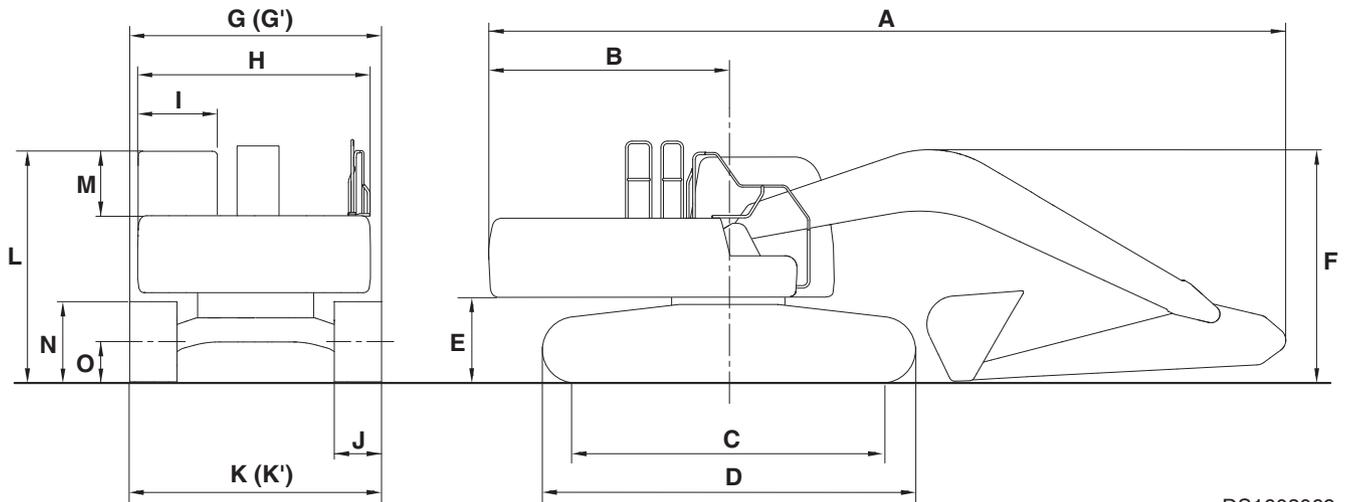
Figure 1

EX1500908

| Dimension |                                  | 6.3 m (20' 8") Boom                   |
|-----------|----------------------------------|---------------------------------------|
|           |                                  | 3.912 m (12' 10") Arm                 |
| A         | Shipping Height                  | 3,604 mm (11' 10")                    |
| B         | Overall Height                   | 4,696 mm (15' 5")/**4,907 mm (16' 1") |
| C         | Shipping Length                  | 14,770 mm (48' 5")                    |
| D         | Shipping Length (W/O Attachment) | 6,045 mm (19' 10")                    |
| E         | Upper Structure Width            | 3,576 mm (11' 8")                     |
| F         | Track Length                     | 4,920 mm (16' 2")                     |
| G         | Shipping Width                   | 3,600 mm (11' 10")                    |
| H         | Undercarriage Width              | 700 mm (2' 4")                        |
| I         | Car Body Clearance (W/O Grouser) | 760 mm (2' 6")                        |
| J         | Tumbler Distance                 | 4,010 mm (13' 2")                     |
| M         | Tail Swing Radius                | 3,560 mm (11' 9")                     |
| N         | Cab Guard Width                  | 1,105 mm (3' 8")/**1,140 mm (3' 9")   |
| O         | Track Height (W/O Grouser)       | 1,189 mm (3' 11")                     |

\*\* : Oregon Cabin

# Road Builder



DS1603069

Figure 2

| Dimension |                                       | 6.245 m (20' 6") Boom                 |
|-----------|---------------------------------------|---------------------------------------|
|           |                                       | 3.1 m (10' 2") Arm                    |
| A         | Shipping Length                       | 10,958 mm (35' 11")                   |
| B         | Tail Swing Radius                     | 3,235 mm (11' 7")                     |
| C         | Tumbler Distance                      | 4,010 mm (13' 2")                     |
| D         | Track Length                          | 4,920 mm (16' 2")                     |
| E         | Counterweight Clearance (W/O Grouser) | 1,473 mm (4' 10")                     |
| F (Boom)  | Shipping Height                       | 3,571 mm (11' 9")                     |
| F (Hose)  | Shipping Height                       | 3,689 mm (12' 1")                     |
| G         | Shipping Width (STD)                  | 3,600 mm (11' 10")                    |
| G'        | Shipping Width (Narrow)               | -                                     |
| H         | House Width                           | 3,576 mm (12' 0")                     |
| I         | Cab Width                             | 1,010 mm (3' 4")/**1,140 mm (3' 9")   |
| J         | Shoe Width                            | 700 mm (2' 4")                        |
| K         | Undercarriage Width                   | 3,600 mm (11' 10")                    |
| L         | Height Over Cab                       | 3,381 mm (11' 1")/**3,695 mm (12' 1") |
| M         | Cabin Height Above House              | 853 mm (2' 2")/**1,170 mm (3' 10")    |
| N         | Track Height (W/O Grouser)            | 1,189 mm (3' 11")                     |
| O         | Car Body Clearance (W/O Grouser)      | 760 mm (2' 6")                        |

\*\* : Oregon Cabin

# DISASSEMBLED PARTS, DIMENSION AND WEIGHT

## Components

### Log Loader Boom

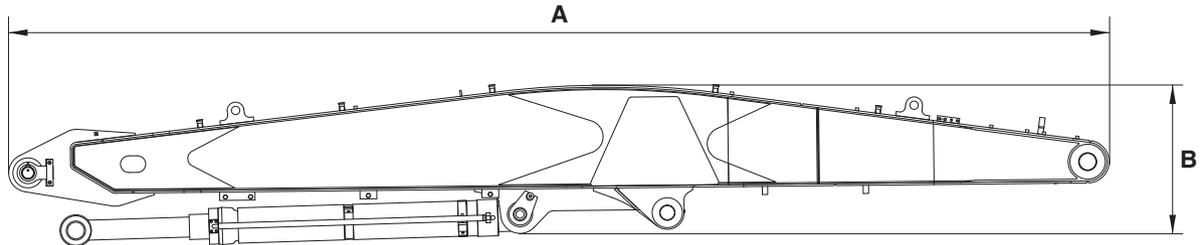


Figure 3

EX1500962

### Road Builder Boom

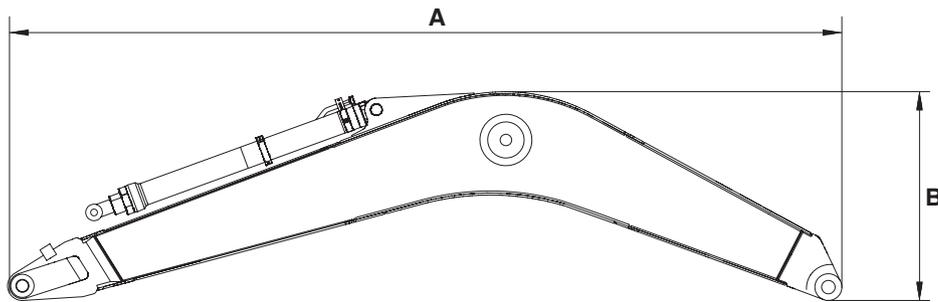


Figure 4

FG018627

| Description |            | 6.3 m (20' 8") LL Boom | 6.245 m (20' 6") RB Boom |
|-------------|------------|------------------------|--------------------------|
| Length (A)  | mm (ft in) | 6,540 (21' 5")         | 6,465 (21' 3")           |
| Length (B)  |            | 895 (2' 11")           | 1,690 (5' 7")            |
| Width       |            | 945 (3' 1")            | 760 (2' 6")              |
| Weight      | kg         | 2,200                  | 2,400                    |
|             | lb         | 4,850                  | 5,291                    |

## Log Loader Arm

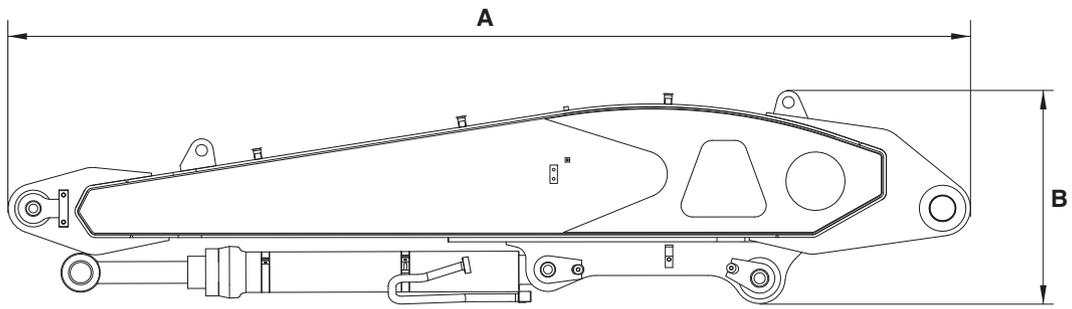


Figure 5

EX1500963

## Road Builder Arm

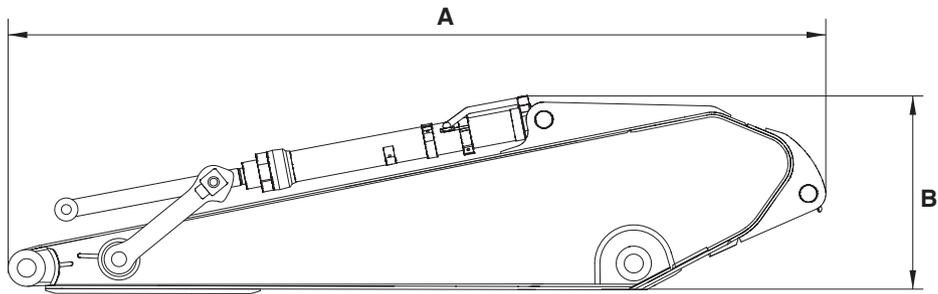
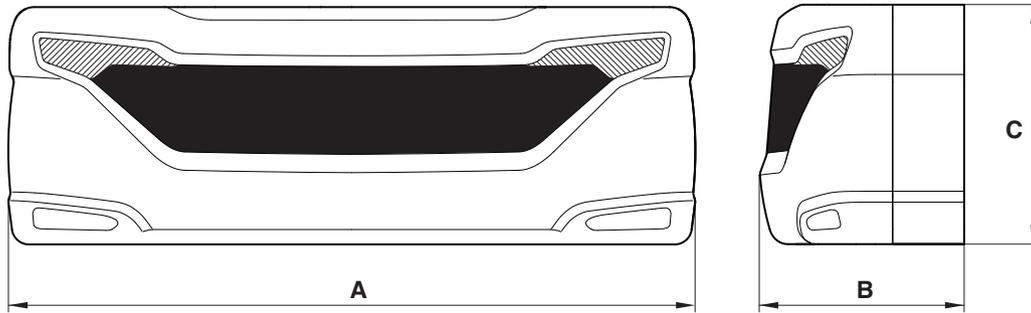


Figure 6

FG018628

| Description |            | 3.912 m (12' 10") LL Arm | 3.1 m (10' 2") RB Arm |
|-------------|------------|--------------------------|-----------------------|
| Length (A)  | mm (ft in) | 925 (3' 0")              | 4,095 (13' 5")        |
| Length (B)  |            | 4,140 (13' 7")           | 985 (3' 3")           |
| Width       |            | 515 (1' 8")              | 410 (1' 4")           |
| Weight      | kg         | 1,140                    | 1,050                 |
|             | lb         | 2,513                    | 2,315                 |

## Counterweight



EX1401711

Figure 7

| Description |               | Counterweight |
|-------------|---------------|---------------|
| Length (A)  | mm<br>(ft in) | 2,960 (9' 9") |
| Length (B)  |               | 610 (2')      |
| Length (C)  |               | 1,050 (3' 5") |
| Weight      | kg            | 6,300         |
|             | lb            | 13,900        |

## GROUND PRESSURE

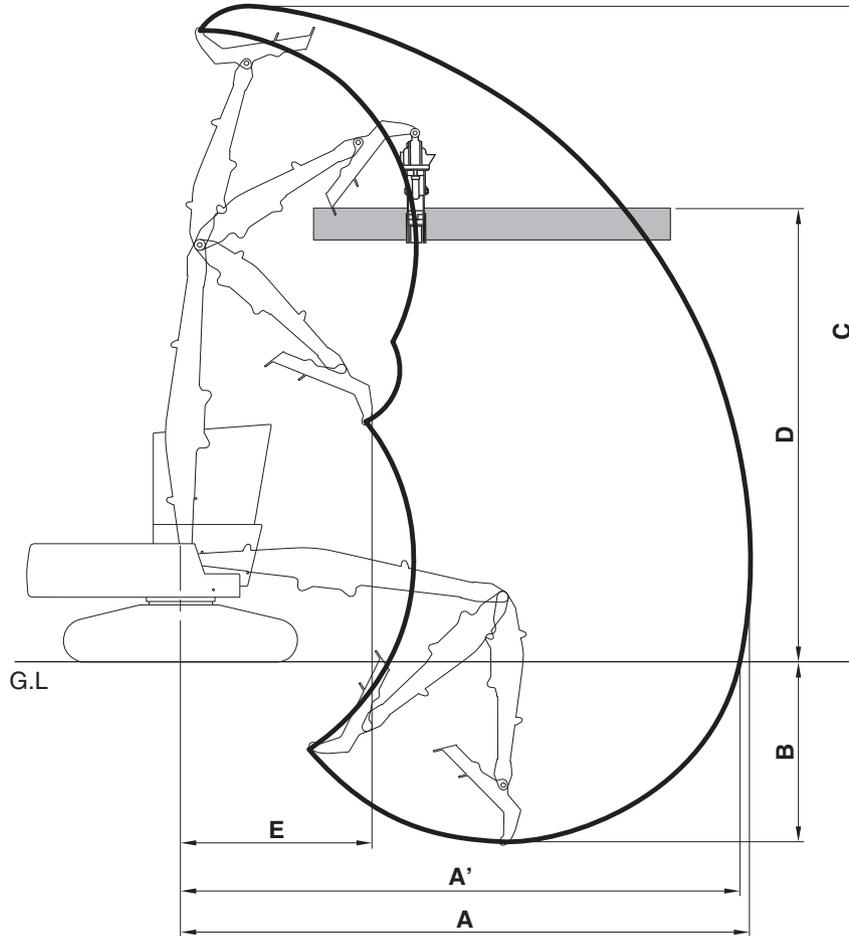
| Description       | Shoe Width<br>mm | Boom Length<br>mm (ft in) | Arm Length<br>mm (ft in) | Counter-<br>weight<br>kg (lb) | Operating<br>Weight<br>kg (lb) | Ground<br>Pressure<br>kg/cm <sup>2</sup> (psi) |
|-------------------|------------------|---------------------------|--------------------------|-------------------------------|--------------------------------|--|
| Double<br>Grouser | 700              | 6,300 (20' 8")            | 3,912 (12' 10")          | 6,300 (13,900)                | 37,900 (83,555)                | 0.62 (8.82)                                    |
|                   | 800              |                           |                          |                               | 38,400 (84,657)                | 0.63 (8.96)                                    |

# DIGGING FORCE

| Description             |                   | Unit | 6.245 m (20' 5") Boom |  |
|-------------------------|-------------------|------|-----------------------|--|
|                         |                   |      | 3.1 m (10' 2") Arm    |  |
| Breakout Force          | Normal (SAE)      | kN   | 157.9                 |  |
|                         |                   | kg   | 16,100                |  |
|                         |                   | lb   | 35,494                |  |
|                         | Power Boost (SAE) | kN   | 167.7                 |  |
|                         |                   | kg   | 17,100                |  |
|                         |                   | lb   | 37,699                |  |
|                         | Normal (ISO)      | kN   | 176.5                 |  |
|                         |                   | kg   | 18,000                |  |
|                         |                   | lb   | 39,683                |  |
|                         | Power Boost (ISO) | kN   | 187.3                 |  |
|                         |                   | kg   | 19,100                |  |
|                         |                   | lb   | 42,108                |  |
| Tearout Force           | Normal (SAE)      | kN   | 129.4                 |  |
|                         |                   | kg   | 13,200                |  |
|                         |                   | lb   | 29,101                |  |
|                         | Power Boost (SAE) | kN   | 137.3                 |  |
|                         |                   | kg   | 14,000                |  |
|                         |                   | lb   | 30,865                |  |
|                         | Normal (ISO)      | kN   | 130.4                 |  |
|                         |                   | kg   | 13,300                |  |
|                         |                   | lb   | 29,321                |  |
|                         | Power Boost (ISO) | kN   | 138.3                 |  |
|                         |                   | kg   | 14,100                |  |
|                         |                   | lb   | 31,085                |  |
| Rotation Angle - Bucket |                   | deg  | 175                   |  |

# WORKING RANGE

## Log Loader

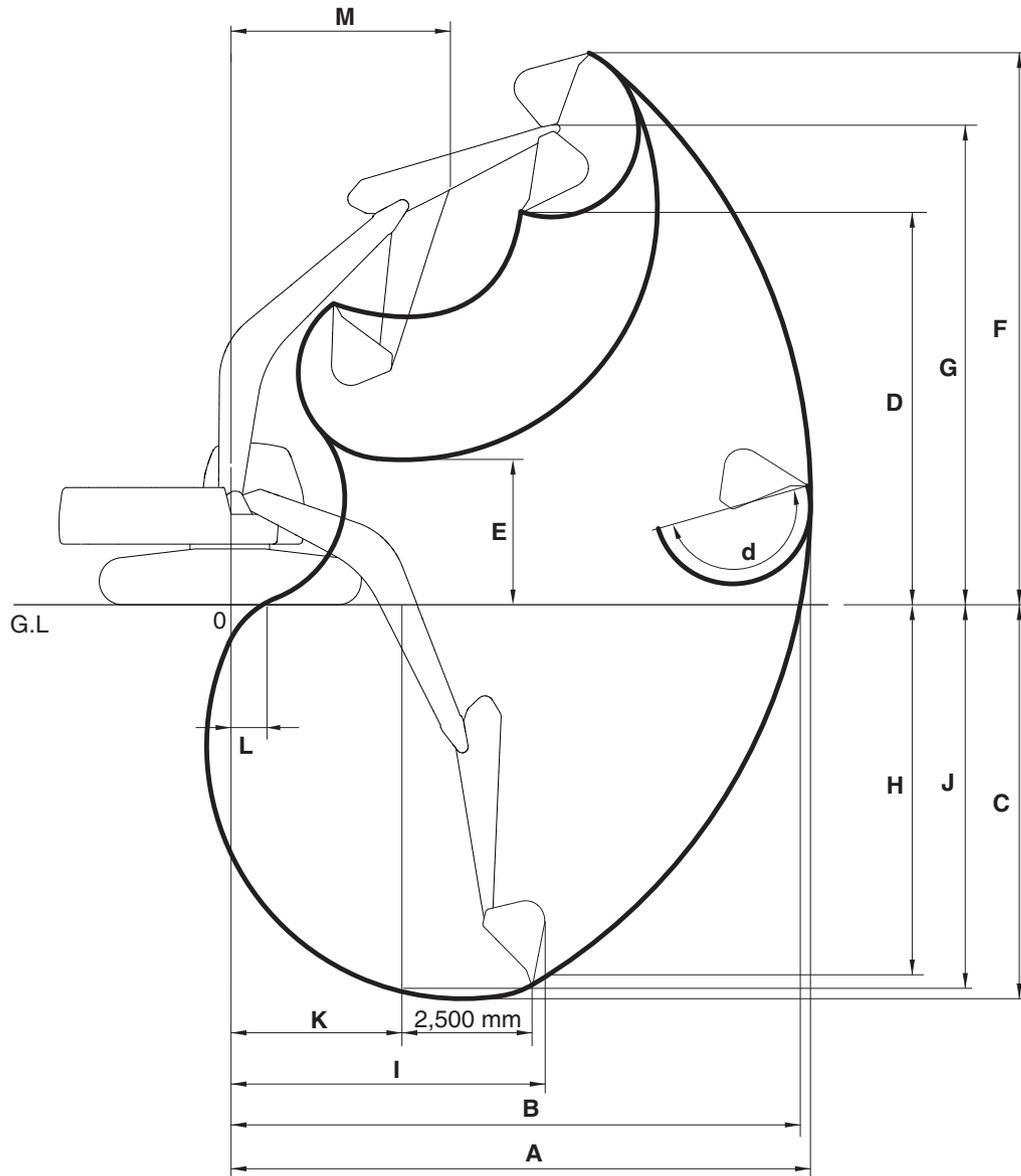


DS1902733

Figure 8

| DIM. | Boom Type                   | 6.300 m (20' 8")   |
|------|-----------------------------|--------------------|
|      | Arm Type                    | 3.912 m (12' 10")  |
| A    | Max Working Reach           | 11,570 mm (38' 0") |
| A'   | Max Working Reach At Ground | 11,330 mm (37' 2") |
| B    | Max Working Depth           | 3,738 mm (12' 3")  |
| C    | Max Working Height          | 13,135 mm (43' 1") |
| D    | Max Log Level Height        | 9,325 mm (30' 7")  |
| E    | Min Swing Radius            | 4,450 mm (14' 7")  |

# Road Builder



EX1401493

Figure 9

|             |                              |   |
|-------------|------------------------------|---|
| <b>DIM.</b> | <b>Boom Type (One Piece)</b> | <b>6,245 mm (20' 6")</b>                        |
|             | <b>Arm Type</b>              | <b>3,100 mm (10' 2")</b>                        |
|             | <b>Bucket Type (SAE)</b>     | <b>1.60 m<sup>3</sup> (2.09 yd<sup>3</sup>)</b> |
| A           | Max. Digging Reach           | 10,670/*10,670 mm (35' 0"/*35' 0")              |
| B           | Max. Digging Reach (Ground)  | 10,430/*10,420 mm (34' 3"/*34' 2")              |
| C           | Max. Digging Depth           | 7,015/*5,950 mm (23' 0"/*19' 6")                |
| D           | Max. Loading Height          | 7,400/*8,620 mm (24' 3"/*28' 3")                |
| E           | Min. Loading Height          | 2,990/*3,665 mm (9' 10"/*12' 0")                |
| F           | Max. Digging Height          | 10,340/*11,700 mm (33' 11"/*38' 5")             |
| G           | Max. Bucket Pin Height       | 8,970/*10,190 mm (29' 5"/*33' 5")               |
| H           | Max. Vertical Wall Depth     | 5,015/*5,020 mm (16' 5"/*16' 6")                |
| I           | Max. Radius Vertical         | 7,625/*7,620 mm (25' 0"/*25' 0")                |
| J           | Max. Depth to 2,500 mm Line  | 6,810/*5,780 mm (22' 4"/*19' 0")                |
| K           | Min. Radius 2,500 mm Line    | 2,890/*3,960 mm (9' 6"/*13' 0")                 |
| L           | Min. Digging Reach           | 515/*900 mm (1' 8"/*2' 11")                     |
| M           | Min. Swing Radius            | 4,230/*3,005 mm (13' 11"/*9' 10")               |
| d           | Bucket Angle                 | 175°/*175°                                      |

\*High Lift

# FORESTRY MACHINE RATED LIFT CAPACITY TABLES

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## NOTICE

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Always keep operators manual in operator station:

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

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## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

Keep bystanders away from the boom cylinder. While operating, boom, arm, bucket or work tool hydraulic hoses could burst causing high-pressure oil to spray or sudden lowering of the load or front structure. This could cause death or serious injury.

When changing the hydraulic hoses, record the part numbers of the hoses to factory log book.

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## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

All rated lift capacities are based on the machine and the load both remaining level at all times. **DO NOT EXCEED THE RATED LIFT CAPACITY.** Lifting loads greater than those shown in the rated capacity tables can cause tipping, equipment failure and/or structural failure of the machine.

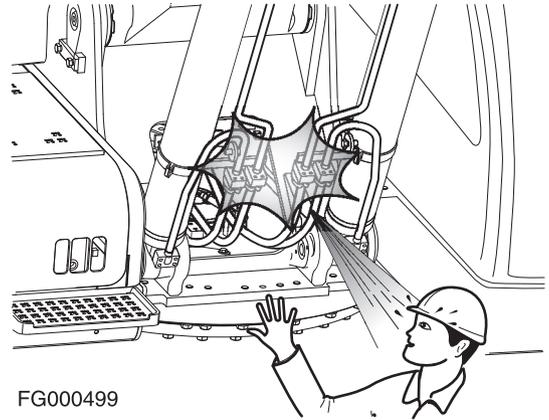
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Operate the forestry machine on firm and level ground and surfaces that can support the weight of the forestry machine and the loads that will be lifted. Avoid operating the forestry machine, if these conditions exist:

- Soft or uneven ground.
- Unlevel terrain.
- Side loads.
- Modifications or poor maintenance of the forestry machine.
- Failure to lift squarely over the end or over the side of the machine.

When a load is in the air, the operator must:

- Avoid use of uneven slings that can cause side loads when traveling with a load or swinging the load.



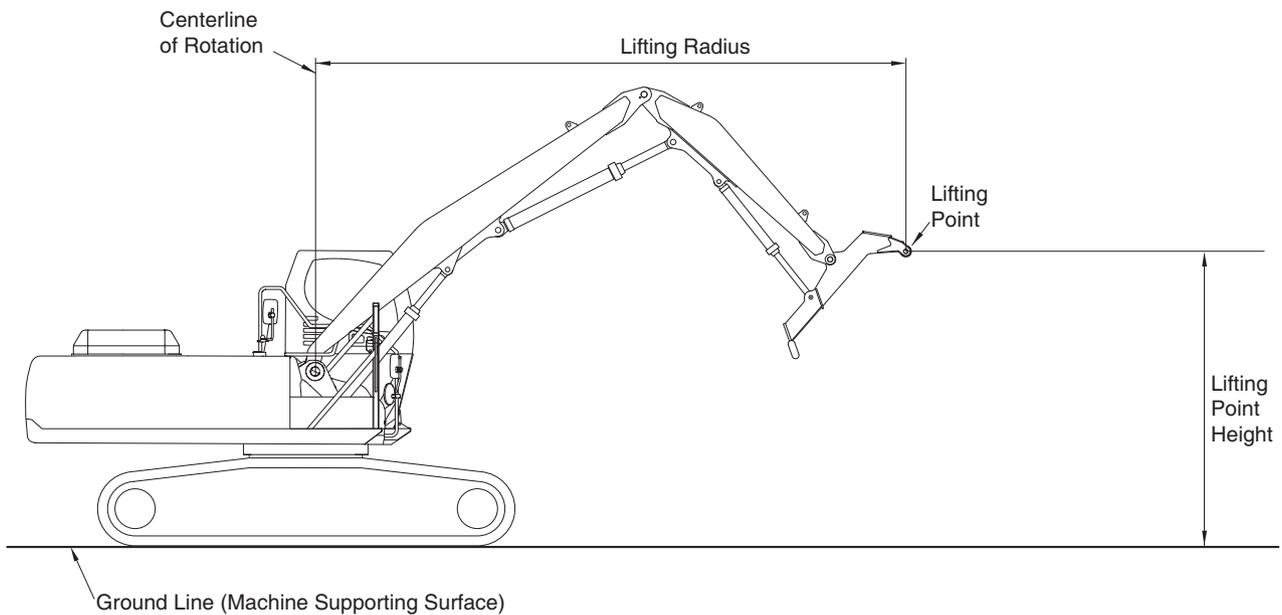
FG000499

Figure 10

- Avoid lifting loads that can become unbalanced if the hook line is twisted and starts to rotate. If the surface area of the load is large enough, wind gusts can create side loads.
- Keep the arm end point directly over the load. Use tag lines on opposite sides of the load to help stabilize the load and prevent side loads caused by wind gusts.

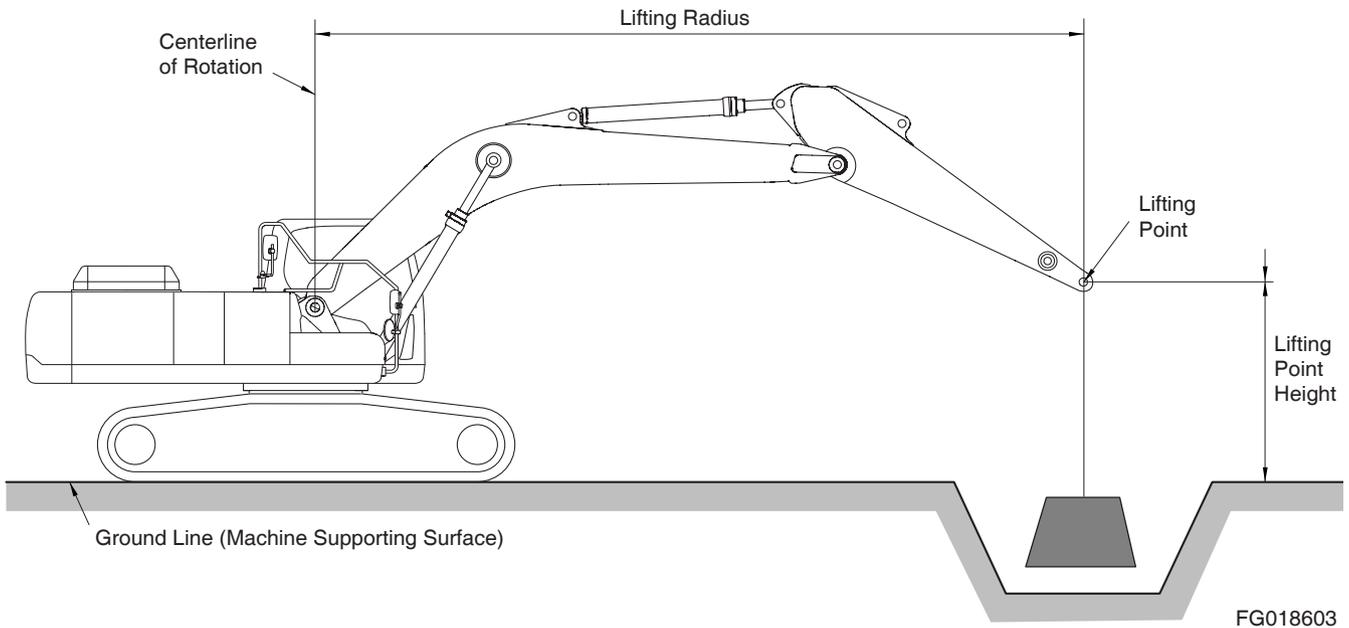
The following rated loads are in compliance with ISO 10567 and applicable ISO standards for hydraulic forestry machines or excavators performing lifting operations on firm supporting surfaces. An asterisk (\*) next to the load rating indicates rated load does not exceed 87% of hydraulic capacity. All other ratings do not exceed 75% of tipping capacity.

Do not attempt to lift or hold any load that exceeds rated load capacity at the specified distances (from the machine's rotation centerline and height - see "Lifting Radius" and "Lifting Point Height" in the reference drawing, Figure 11 or Figure 12).



**Figure 11**

EX1300674



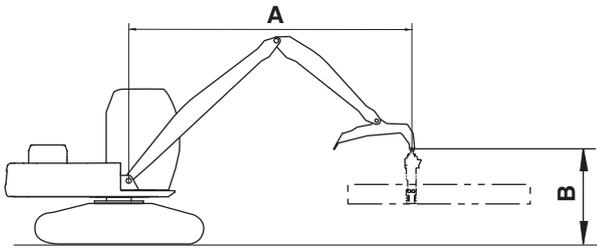
**Figure 12**

The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine net lifting load. The lift point must be on the end of the arm, as shown in Figure 11 or Figure 12.



**NOTICE**

Select the Digging Mode switch on the Instrument Panel before using the forestry machine for lifting work. Engine and hydraulic oil should both be fully warmed up to operating temperature before operating.



Track Width : 3.6 m (11' 10")  
 Boom : 6.3 m (20' 8")  
 Arm : 3.912 m (12' 10")  
 Heel Weight : 635 kg (1,400 lb)  
 Counterweight : 6,300kg (13,900 lb)  
 Shoe : 700 mm (28")  
 Cabin : Non Rops  
 : Rating Over Front  
 : Rating Over Side or 360 degree  
 Unit : 1,000 kg (1,000 lb)

DS1902734

Figure 13

**METRIC**

1,000 kg

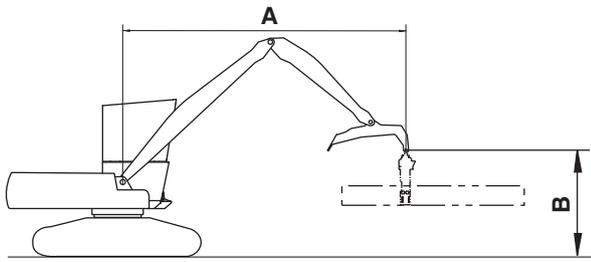
| A (m) \ B (m) | 4.5   |   | 6   |   | 7.5   |   | 9   |   | MAX. REACH  |   | A (m) |
|---------------|---|---|---|---|---|---|---|---|---|---|-------|
|               |  |  |  |  |  |  |  |  |  |  |       |
| 10.5          |   |   | * 11.99   | * 11.99   |   |   |   |   | * 11.97   | 11.95   | 6.06  |
| 9             |   |   | * 11.00   | * 11.00   | * 10.13   | 8.68  |   |   | * 10.09   | 8.29  | 7.69  |
| 7.5           |   |   | * 11.03   | * 11.03   | * 9.86  | 8.80  |   |   | 9.08  | 6.77  | 8.79  |
| 6             |   |   | * 11.62   | * 11.62   | * 10.07   | 8.73  | 8.79  | 6.57  | 8.01  | 5.98  | 9.52  |
| 4.5           | * 16.00   | * 16.00   | * 12.56   | 11.97   | * 10.47   | 8.56  | 8.73  | 6.51  | 7.44  | 5.55  | 9.97  |
| 3             |   |   | * 13.50   | 11.55   | * 10.87   | 8.36  | 8.63  | 6.42  | 7.18  | 5.35  | 10.18 |
| 1.5           |   |   | * 13.96   | 11.18   | * 10.99   | 8.16  | 8.54  | 6.33  | * 6.98  | 5.34  | 10.17 |
| 0             | * 12.01   | * 12.01   | * 13.56   | 10.95   | * 10.58   | 8.03  | * 8.23  | 6.27  | * 6.29  | 5.52  | 9.93  |
| -1.5          | * 15.40   | * 15.40   | * 12.10   | 10.87   | * 9.37  | 7.99  |   |   | * 7.06  | 6.45  | 8.82  |

**FEET**

1,000 lb

| A (ft) \ B (ft) | 15  |   | 20  |   | 25  |   | 30  |   | MAX. REACH  |   | A (ft) |
|-----------------|---|---|---|---|---|---|---|---|---|---|--------|
|                 |  |  |  |  |  |  |  |  |  |  |        |
| 35              |   |   | * 26.44   | * 26.44   |   |   |   |   | * 26.40   | 26.33   | 19.87  |
| 30              |   |   | * 24.25   | * 24.25   | * 22.34   | 19.14   |   |   | * 22.24   | 18.29   | 25.24  |
| 25              |   |   | * 24.32   | * 24.32   | * 21.74   | 19.40   |   |   | 20.01   | 14.93   | 28.82  |
| 20              |   |   | * 25.61   | * 25.61   | * 22.19   | 19.24   | 19.37   | 14.48   | 17.66   | 13.18   | 31.23  |
| 15              | * 35.27   | * 35.27   | * 27.68   | 26.39   | * 23.09   | 18.88   | 19.25   | 14.36   | 16.40   | 12.23   | 32.71  |
| 10              |   |   | * 29.75   | 25.46   | * 23.96   | 18.42   | 19.03   | 14.16   | 15.84   | 11.79   | 33.41  |
| 5               |   |   | * 30.77   | 24.64   | * 24.23   | 18.00   | 18.82   | 13.95   | * 15.39   | 11.77   | 33.37  |
| 0               | * 26.47   | * 26.47   | * 29.90   | 24.13   | * 23.33   | 17.71   | * 18.15   | 13.83   | * 13.87   | 12.17   | 32.57  |
| -5              | * 33.96   | * 33.96   | * 26.68   | 23.96   | * 20.66   | 17.61   |   |   | * 15.56   | 14.22   | 28.93  |

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (\*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.



Track Width : 3.6 m (11' 10")  
 Boom : 6.3 m (20' 8")  
 Arm : 3.912 m (12' 10")  
 Heel Weight : 635 kg (1,400 lb)  
 Counterweight : 6,300kg (13,900 lb)  
 Shoe : 700 mm (28")  
 Cabin : Oregon  
 : Rating Over Front  
 : Rating Over Side or 360 degree  
 Unit : 1,000 kg (1,000 lb)

DS1902735

Figure 14

**METRIC**

1,000 kg

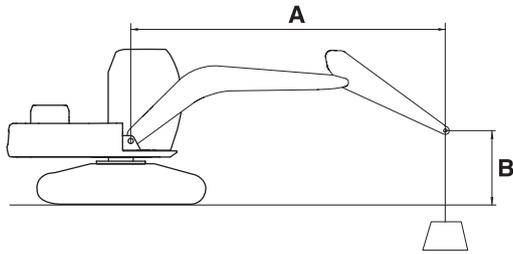
| A (m) \ B (m) | 4.5   |   | 6   |   | 7.5   |   | 9  |   | MAX. REACH  |   | A (m) |
|---------------|---|---|---|---|---|---|--|---|---|---|-------|
|               |  |  |  |  |  |  |  |  |  |  |       |
| 10.5          |   |   |   |   |   |   |  |   | * 11.32   | * 11.32   | 5.97  |
| 9             |   |   | * 10.31   | * 10.31   | * 9.49  | 8.20  |  |   | * 9.46  | 7.91  | 7.65  |
| 7.5           |   |   | * 10.32   | * 10.32   | * 9.21  | 8.33  |  |   | * 8.53  | 6.42  | 8.76  |
| 6             |   |   | * 10.84   | * 10.84   | * 9.39  | 8.26  | 8.28   | 6.19  | 7.56  | 5.64  | 9.50  |
| 4.5           | * 14.90   | * 14.90   | * 11.71   | 11.35   | * 9.76  | 8.10  | 8.23   | 6.14  | 7.01  | 5.22  | 9.96  |
| 3             |   |   | * 12.58   | 10.93   | * 10.13   | 7.89  | 8.13   | 6.05  | 6.75  | 5.03  | 10.18 |
| 1.5           |   |   | * 13.02   | 10.56   | * 10.25   | 7.70  | 8.03   | 5.96  | * 6.50  | 5.01  | 10.17 |
| 0             | * 11.28   | * 11.28   | * 12.67   | 10.32   | * 9.88  | 7.56  | * 7.68   | 5.90  | * 5.86  | 5.17  | 9.94  |
| -1.5          | * 14.39   | * 14.39   | * 11.33   | 10.24   | * 8.77  | 7.52  |  |   | * 6.48  | 6.00  | 8.89  |

**FEET**

1,000 lb

| A (ft) \ B (ft) | 15  |   | 20  |   | 25  |   | 30   |   | MAX. REACH  |   | A (ft) |
|-----------------|---|---|---|---|---|---|--|---|---|---|--------|
|                 |  |  |  |  |  |  |  |  |  |  |        |
| 35              |   |   |   |   |   |   |  |   | * 24.95   | * 24.95   | 19.58  |
| 30              |   |   | * 22.73   | * 22.73   | * 20.92   | 18.07   |  |   | * 20.85   | 17.45   | 25.08  |
| 25              |   |   | * 22.74   | * 22.74   | * 20.30   | 18.36   |  |   | * 18.81   | 14.15   | 28.73  |
| 20              |   |   | * 23.91   | * 23.91   | * 20.70   | 18.21   | 18.25  | 13.65   | 16.67   | 12.44   | 31.16  |
| 15              | * 32.85   | * 32.85   | * 25.80   | 25.03   | * 21.52   | 17.85   | 18.13  | 13.54   | 15.45   | 11.52   | 32.67  |
| 10              |   |   | * 27.73   | 24.10   | * 22.32   | 17.40   | 17.92  | 13.33   | 14.89   | 11.09   | 33.40  |
| 5               |   |   | * 28.71   | 23.28   | * 22.59   | 16.97   | 17.70  | 13.13   | * 14.32   | 11.05   | 33.38  |
| 0               | * 24.88   | * 24.88   | * 27.94   | 22.75   | * 21.78   | 16.67   | * 16.94  | 13.00   | * 12.92   | 11.40   | 32.62  |
| -5              | * 31.73   | * 31.73   | * 24.98   | 22.57   | * 19.34   | 16.57   |  |   | * 14.29   | 13.22   | 29.17  |

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (\*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.



Track Width : 3.6 m (11' 10")  
 Boom : 6.245 m (20' 6")  
 Arm : 3.1 m (10' 2")  
 Bucket : Without Bucket  
 Counterweight : 6,300kg (13,900 lb)  
 Shoe : 700 mm (28")  
 Cabin : Rops  
 ⤴ : Rating Over Front  
 ⤵ : Rating Over Side or 360 degree  
 Unit : 1,000 kg (1,000 lb)

DS1902736

Figure 15

**METRIC**

1,000 kg

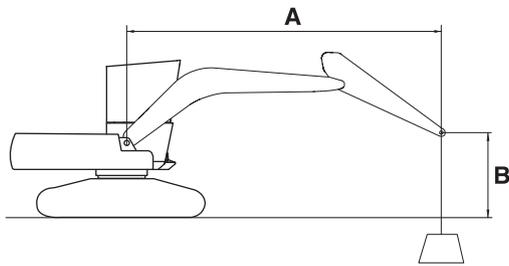
| A (m) \ B (m) | 1.5     |         | 3       |         | 4.5     |         | 6       |         | 7.5    |        | 9      |        | MAX. REACH |        | A (m) |
|---------------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|------------|--------|-------|
|               | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴      | ⤵      | ⤴      | ⤵      | ⤴          | ⤵      |       |
| 7.5           |         |         |         |         |         |         |         |         |        |        |        |        | * 4.99     | * 4.99 | 7.46  |
| 6             |         |         |         |         |         |         |         |         | * 6.33 | * 6.33 |        |        | * 4.83     | * 4.83 | 8.32  |
| 4.5           |         |         | * 14.12 | * 14.12 | * 9.37  | * 9.37  | * 7.65  | * 7.65  | * 6.85 | * 6.85 |        |        | * 4.87     | * 4.87 | 8.84  |
| 3             |         |         |         |         | * 12.27 | * 12.27 | * 9.05  | * 9.05  | * 7.57 | * 7.57 | * 5.80 | * 5.80 | * 5.08     | * 5.08 | 9.09  |
| 1.5           |         |         |         |         | * 14.47 | * 14.47 | * 10.32 | * 10.32 | * 8.29 | 7.71   | * 6.28 | 5.95   | * 5.48     | * 5.48 | 9.09  |
| 0             |         |         | * 7.31  | * 7.31  | * 15.43 | * 15.43 | * 11.15 | 10.32   | * 8.81 | 7.55   |        |        | * 6.17     | 6.05   | 8.83  |
| -1.5          | * 9.11  | * 9.11  | * 12.66 | * 12.66 | * 15.42 | * 15.42 | * 11.39 | 10.22   | * 8.93 | 7.50   |        |        | * 7.37     | 6.58   | 8.28  |
| -3            | * 14.26 | * 14.26 | * 19.34 | * 19.34 | * 14.54 | * 14.54 | * 10.89 | 10.28   |        |        |        |        | * 8.39     | 7.73   | 7.40  |
| -4.5          |         |         | * 17.17 | * 17.17 | * 12.38 | * 12.38 | * 8.91  | * 8.91  |        |        |        |        | * 8.82     | * 8.82 | 6.03  |

**FEET**

1,000 lb

| A (ft) \ B (ft) | 5       |         | 10      |         | 15      |         | 20      |         | 25      |         | 30      |         | MAX. REACH |         | A (ft) |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------------|---------|--------|
|                 | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴          | ⤵       |        |
| 25              |         |         |         |         |         |         |         |         |         |         |         |         | * 11.00    | * 11.00 | 24.46  |
| 20              |         |         |         |         |         |         |         |         | * 13.96 | * 13.96 |         |         | * 10.65    | * 10.65 | 27.29  |
| 15              |         |         | * 31.13 | * 31.13 | * 20.67 | * 20.67 | * 16.87 | * 16.87 | * 15.10 | * 15.10 |         |         | * 10.74    | * 10.74 | 29.02  |
| 10              |         |         |         |         | * 27.05 | * 27.05 | * 19.95 | * 19.95 | * 16.70 | * 16.70 | * 12.78 | * 12.78 | * 11.20    | * 11.20 | 29.83  |
| 5               |         |         |         |         | * 31.89 | * 31.89 | * 22.75 | * 22.75 | * 18.28 | 16.99   | * 13.85 | 13.11   | * 12.09    | * 12.09 | 29.81  |
| 0               |         |         | * 16.11 | * 16.11 | * 34.01 | * 34.01 | * 24.57 | 22.74   | * 19.42 | 16.65   |         |         | * 13.60    | 13.33   | 28.95  |
| -5              | * 20.08 | * 20.08 | * 27.90 | * 27.90 | * 34.00 | * 34.00 | * 25.11 | 22.54   | * 19.69 | 16.54   |         |         | * 16.25    | 14.51   | 27.18  |
| -10             | * 31.44 | * 31.44 | * 42.64 | * 42.64 | * 32.06 | * 32.06 | * 24.02 | 22.67   |         |         |         |         | * 18.49    | 17.03   | 24.29  |
| -15             |         |         | * 37.85 | * 37.85 | * 27.30 | * 27.30 | * 19.65 | * 19.65 |         |         |         |         | * 19.45    | * 19.45 | 19.79  |

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (\*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.



Track Width : 3.6 m (11' 10")  
 Boom : 6.245 m (20' 6")  
 Arm : 3.1 m (10' 2")  
 Bucket : Without Bucket  
 Counterweight : 6,300kg (13,900 lb)  
 Shoe : 700 mm (28")  
 Cabin : Oregon  
 ⤴ : Rating Over Front  
 ⤵ : Rating Over Side or 360 degree  
 Unit : 1,000 kg (1,000 lb)

DS1902737

Figure 16

**METRIC**

1,000 kg

| A (m) \ B (m) | 1.5     |         | 3       |         | 4.5     |         | 6       |         | 7.5    |        | 9      |        | MAX. REACH |   | A (m)  |        |      |
|---------------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|------------|---|--------|--------|------|
|               | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴      | ⤵      | ⤴      | ⤵      | ⤴          | ⤵ |        |        |      |
| 7.5           |         |         |         |         |         |         |         |         |        |        |        |        |            |   | * 4.66 | * 4.66 | 7.46 |
| 6             |         |         |         |         |         |         |         |         |        | * 5.87 | * 5.87 |        |            |   | * 4.52 | * 4.52 | 8.32 |
| 4.5           |         |         | * 13.16 | * 13.16 | * 8.72  | * 8.72  | * 7.11  | * 7.11  | * 6.35 | * 6.35 |        |        |            |   | * 4.55 | * 4.55 | 8.84 |
| 3             |         |         |         |         | * 11.41 | * 11.41 | * 8.40  | * 8.40  | * 7.02 | * 7.02 | * 5.42 | * 5.42 |            |   | * 4.75 | * 4.75 | 9.09 |
| 1.5           |         |         |         |         | * 13.45 | * 13.45 | * 9.58  | * 9.58  | * 7.69 | * 7.69 | * 5.88 | * 5.88 |            |   | * 5.13 | * 5.13 | 9.09 |
| 0             |         |         | * 6.93  | * 6.93  | * 14.34 | * 14.34 | * 10.35 | * 10.35 | * 8.17 | 7.59   |        |        |            |   | * 5.77 | * 5.77 | 8.83 |
| -1.5          | * 8.63  | * 8.63  | * 11.97 | * 11.97 | * 14.33 | * 14.33 | * 10.57 | 10.27   | * 8.28 | 7.53   |        |        |            |   | * 6.90 | 6.61   | 8.28 |
| -3            | * 13.48 | * 13.48 | * 18.27 | * 18.27 | * 13.51 | * 13.51 | * 10.11 | * 10.11 |        |        |        |        |            |   | * 7.77 | 7.76   | 7.40 |
| -4.5          |         |         | * 15.93 | * 15.93 | * 11.49 | * 11.49 | * 8.25  | * 8.25  |        |        |        |        |            |   | * 8.17 | * 8.17 | 6.03 |

**FEET**

1,000 lb

| A (ft) \ B (ft) | 5       |         | 10      |         | 15      |         | 20      |         | 25      |         | 30      |         | MAX. REACH |   | A (ft)  |         |       |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------------|---|---------|---------|-------|
|                 | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴       | ⤵       | ⤴          | ⤵ |         |         |       |
| 25              |         |         |         |         |         |         |         |         |         |         |         |         |            |   | * 10.28 | * 10.28 | 24.46 |
| 20              |         |         |         |         |         |         |         |         |         | * 12.95 | * 12.95 |         |            |   | * 9.96  | * 9.96  | 27.29 |
| 15              |         |         | * 29.02 | * 29.02 | * 19.23 | * 19.23 | * 15.67 | * 15.67 | * 14.00 | * 14.00 |         |         |            |   | * 10.04 | * 10.04 | 29.02 |
| 10              |         |         |         |         | * 25.15 | * 25.15 | * 18.52 | * 18.52 | * 15.48 | * 15.48 | * 11.96 | * 11.96 |            |   | * 10.47 | * 10.47 | 29.83 |
| 5               |         |         |         |         | * 29.64 | * 29.64 | * 21.12 | * 21.12 | * 16.95 | * 16.95 | * 12.96 | * 12.96 |            |   | * 11.30 | * 11.30 | 29.81 |
| 0               |         |         | * 15.27 | * 15.27 | * 31.62 | * 31.62 | * 22.81 | * 22.81 | * 18.01 | 16.73   |         |         |            |   | * 12.73 | * 12.73 | 28.95 |
| -5              | * 19.02 | * 19.02 | * 26.39 | * 26.39 | * 31.60 | * 31.60 | * 23.31 | 22.63   | * 18.26 | 16.61   |         |         |            |   | * 15.22 | 14.57   | 27.18 |
| -10             | * 29.72 | * 29.72 | * 40.28 | * 40.28 | * 29.78 | * 29.78 | * 22.29 | * 22.29 |         |         |         |         |            |   | * 17.14 | 17.10   | 24.29 |
| -15             |         |         | * 35.13 | * 35.13 | * 25.32 | * 25.32 | * 18.20 | * 18.20 |         |         |         |         |            |   | * 18.02 | * 18.02 | 19.79 |

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (\*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.

# APPROXIMATE WEIGHT OF WORKLOAD MATERIALS



## NOTICE

Weights are approximations of estimated average volume and mass. Exposure to rain, snow or groundwater; settling or compaction because of overhead weight and chemical or industrial processing or changes because of thermal or chemical transformations could all increase value of weights listed in table.

| Material                           | Density<br>1,200 kg/m <sup>3</sup><br>(2,000 lb/yd <sup>3</sup> ),<br>or less | Density<br>1,500 kg/m <sup>3</sup><br>(2,500 lb/yd <sup>3</sup> ),<br>or less | Density<br>1,800 kg/m <sup>3</sup><br>(3,000 lb/yd <sup>3</sup> ),<br>or less | Density<br>2,100 kg/m <sup>3</sup><br>(3,500 lb/yd <sup>3</sup> ),<br>or less |
|------------------------------------|---|---|---|---|
| Charcoal                           | 401 kg/m <sup>3</sup><br>(695 lb/yd <sup>3</sup> )                            | -   | -   | -   |
| Coke, blast furnace size           | 433 kg/m <sup>3</sup><br>(729 lb/yd <sup>3</sup> )                            | -   | -   | -   |
| Coke, foundry size                 | 449 kg/m <sup>3</sup><br>(756 lb/yd <sup>3</sup> )                            | -   | -   | -   |
| Coal, bituminous slack, piled      | 801 kg/m <sup>3</sup><br>(1,350 lb/yd <sup>3</sup> )                          | -   | -   | -   |
| Coal, bituminous r. of m., piled   | 881 kg/m <sup>3</sup><br>(1,485 lb/yd <sup>3</sup> )                          | -   | -   | -   |
| Coal, anthracite                   | 897 kg/m <sup>3</sup><br>(1,512 lb/yd <sup>3</sup> )                          | -   | -   | -   |
| Clay, DRY, in broken lumps         | 1,009 kg/m <sup>3</sup><br>(1,701 lb/yd <sup>3</sup> )                        | -   | -   | -   |
| Clay, DAMP, natural bed            | -   | -   | 1,746 kg/m <sup>3</sup><br>(2,943 lb/yd <sup>3</sup> )                        | -   |
| Cement, portland, DRY granular     | -   | -   | 1,506 kg/m <sup>3</sup><br>(2,583 lb/yd <sup>3</sup> )                        | -   |
| Cement, portland, DRY clinkers     | -   | 1,362 kg/m <sup>3</sup><br>(2,295 lb/yd <sup>3</sup> )                        | -   | -   |
| Dolomite, crushed                  | -   | -   | 1,522 kg/m <sup>3</sup><br>(2,565 lb/yd <sup>3</sup> )                        | -   |
| Earth, loamy, DRY, loose           | -   | 1,202 kg/m <sup>3</sup><br>(2,025 lb/yd <sup>3</sup> )                        | -   | -   |
| Earth, DRY, packed                 | -   | -   | 1,522 kg/m <sup>3</sup><br>(2,565 lb/yd <sup>3</sup> )                        | -   |
| Earth, WET, muddy                  | -   | -   | 1,762 kg/m <sup>3</sup><br>(2,970 lb/yd <sup>3</sup> )                        | -   |
| Gypsum, calcined, (heated, powder) | 961 kg/m <sup>3</sup><br>(1,620 lb/yd <sup>3</sup> )                          | -   | -   | -   |

| <b>Material</b>                | <b>Density<br/>1,200 kg/m<sup>3</sup><br/>(2,000 lb/yd<sup>3</sup>),<br/>or less</b> | <b>Density<br/>1,500 kg/m<sup>3</sup><br/>(2,500 lb/yd<sup>3</sup>),<br/>or less</b> | <b>Density<br/>1,800 kg/m<sup>3</sup><br/>(3,000 lb/yd<sup>3</sup>),<br/>or less</b> | <b>Density<br/>2,100 kg/m<sup>3</sup><br/>(3,500 lb/yd<sup>3</sup>),<br/>or less</b> |
|--------------------------------|--|--|--|--|
| Gypsum, crushed to 3 inch size | -  | -  | 1,522 kg/m <sup>3</sup><br>(2,565 lb/yd <sup>3</sup> )                               | -  |
| Gravel, DRY, packed fragments  | -  | -  | -  | 1,810 kg/m <sup>3</sup><br>(3,051 lb/yd <sup>3</sup> )                               |
| Gravel, WET, packed fragments  | -  | -  | -  | 1,922 kg/m <sup>3</sup><br>(3,240 lb/yd <sup>3</sup> )                               |
| Limestone, graded above 2      | -  | 1,282 kg/m <sup>3</sup><br>(2,160 lb/yd <sup>3</sup> )                               | -  | -  |
| Limestone, graded 1-1/2 or 2   | -  | 1,362 kg/m <sup>3</sup><br>(2,295 lb/yd <sup>3</sup> )                               | -  | -  |
| Limestone, crushed             | -  | -  | 1,522 kg/m <sup>3</sup><br>(2,565 lb/yd <sup>3</sup> )                               | -  |
| Limestone, fine                | -  | -  | 1,602 kg/m <sup>3</sup><br>(2,705 lb/yd <sup>3</sup> )                               | -  |
| Phosphate, rock                | -  | 1,282 kg/m <sup>3</sup><br>(2,160 lb/yd <sup>3</sup> )                               | -  | -  |
| Salt                           | 929 kg/m <sup>3</sup><br>(1,566 lb/yd <sup>3</sup> )                                 | -  | -  | -  |
| Snow, light density            | 529 kg/m <sup>3</sup><br>(891 lb/yd <sup>3</sup> )                                   | -  | -  | -  |
| Sand, DRY, loose               | -  | -  | 1,522 kg/m <sup>3</sup><br>(2,565 lb/yd <sup>3</sup> )                               | -  |
| Sand, WET, packed              | -  | -  | -  | 1,922 kg/m <sup>3</sup><br>(3,240 lb/yd <sup>3</sup> )                               |
| Shale, broken                  | -  | 1,362 kg/m <sup>3</sup><br>(2,295 lb/yd <sup>3</sup> )                               | -  | -  |
| Sulfur, broken                 | 529 kg/m <sup>3</sup><br>(891 lb/yd <sup>3</sup> )                                   | -  | -  | -  |

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