



Operation and Maintenance Manual

DX57W-5 Excavator

Serial Number **1001 and Up**

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Foreword

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

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

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

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

Attachments

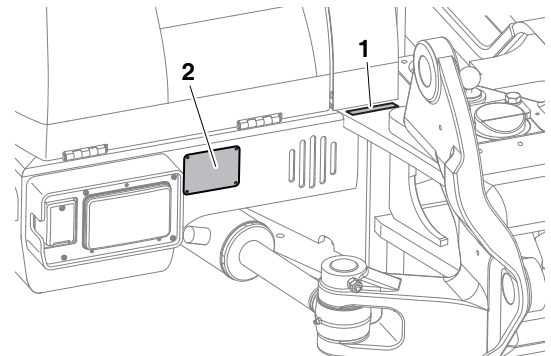
These and other attachments are approved for use on this machine. Do not use unapproved attachments. Attachments not manufactured by DOOSAN may not be approved. See your DOOSAN distributor for information about approved attachments and attachment manuals.

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

Product Identification Number (PIN)

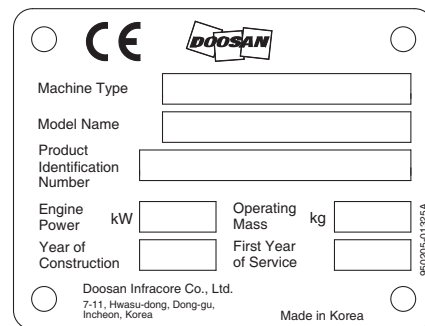
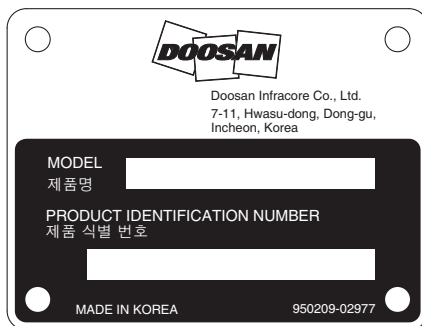
A PIN number is stamped on upper frame back side of boom foot (1, Figure 1). It is also stamped on a product identification plate (2, Figure 1) on the front right side of upper frame.

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



WE1500607

Figure 1



EX1301248

Figure 2

Component Serial Numbers

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

Engine Identification

Engine Data Plate

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

The data plate and engine serial number are located on the head cover. Have the following engine data available when communicating with a DOOSAN Authorized Repair Location. The following information on data plate is mandatory when sourcing service parts:

Reference Number	Description
1	DOOSAN Data Plate
2	Engine Serial Number

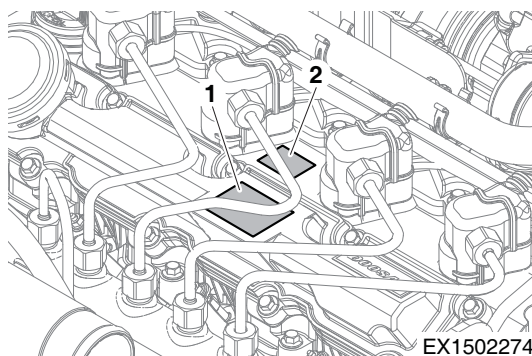


Figure 3

EX1502274

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.

IMPORTANT

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

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

EC DECLARATION OF CONFORMITY

Doosan Benelux SA, Drève Richelle 167, 1410 Waterloo, (Belgium),
as authorized representative in the European Community of Doosan Infracore Co., Ltd. (Korea),
certifies that the construction equipment machinery.

Type of Machine : HYDRAULIC WHEEL EXCAVATOR
Manufacturer : Doosan Infracore Co., Ltd., 489, Injung-ro, Dong-gu, Incheon, Korea
Technical file : Doosan Benelux SA, Drève Richelle 167, 1410 Waterloo, (Belgium)
Brand : Doosan
Model Name : DX57W-5
Serial Number :
Year of Manufacturing :
Engine Manufacturer : Doosan
Engine Model : D24NAP
Net Installed Power : 42.5 kW / 2,400 rpm (SAE J1995)
Net Power : 40.9 kW / 2,400 rpm (SAE J1349)

Pertinent EC noise emission requirement :
Has been manufactured in conformity with the provisions of the Directive 2000/14/EC,
as stated below;

Certificate No. : SNCH*2000/14*2005/88*2508*00
Certification Issued Date : November 12th, 2014
Conformity Assessment Procedure : Annex VIII Full Quality Assurance
Notified Body Involved : Société Nationale de Certification et d'Homologation (SNCH)
2a. Kalchesbruck, L-1852 Luxemburg (Luxembourg)
Notified Body 0499 for EC Directive 2000/14/EC
Measured Sound Power Level : 97 dB(A)
Guaranteed Sound Power Level : 98 dB(A)

Has been manufactured in conformity with the provisions of
2006/42/EC (Machinery), 97/68/EC (Exhaust Gas Emission),
2004/108/EC or 2014/30/EU (Electromagnetic Compatibility)

Designed and manufactured in accordance with the sound engineering practice as valid for Class I
or Article 3.3 items of 97/23/EC.

B1410 - Waterloo

Signature

Sales Director

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.

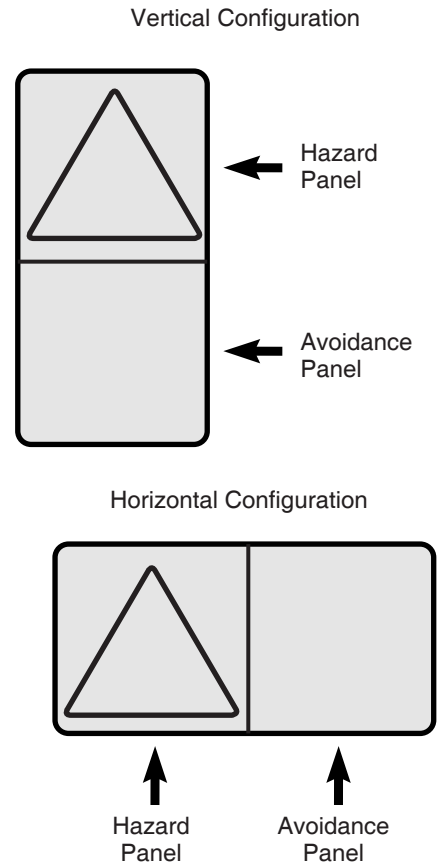
Safety Decals With Text

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.

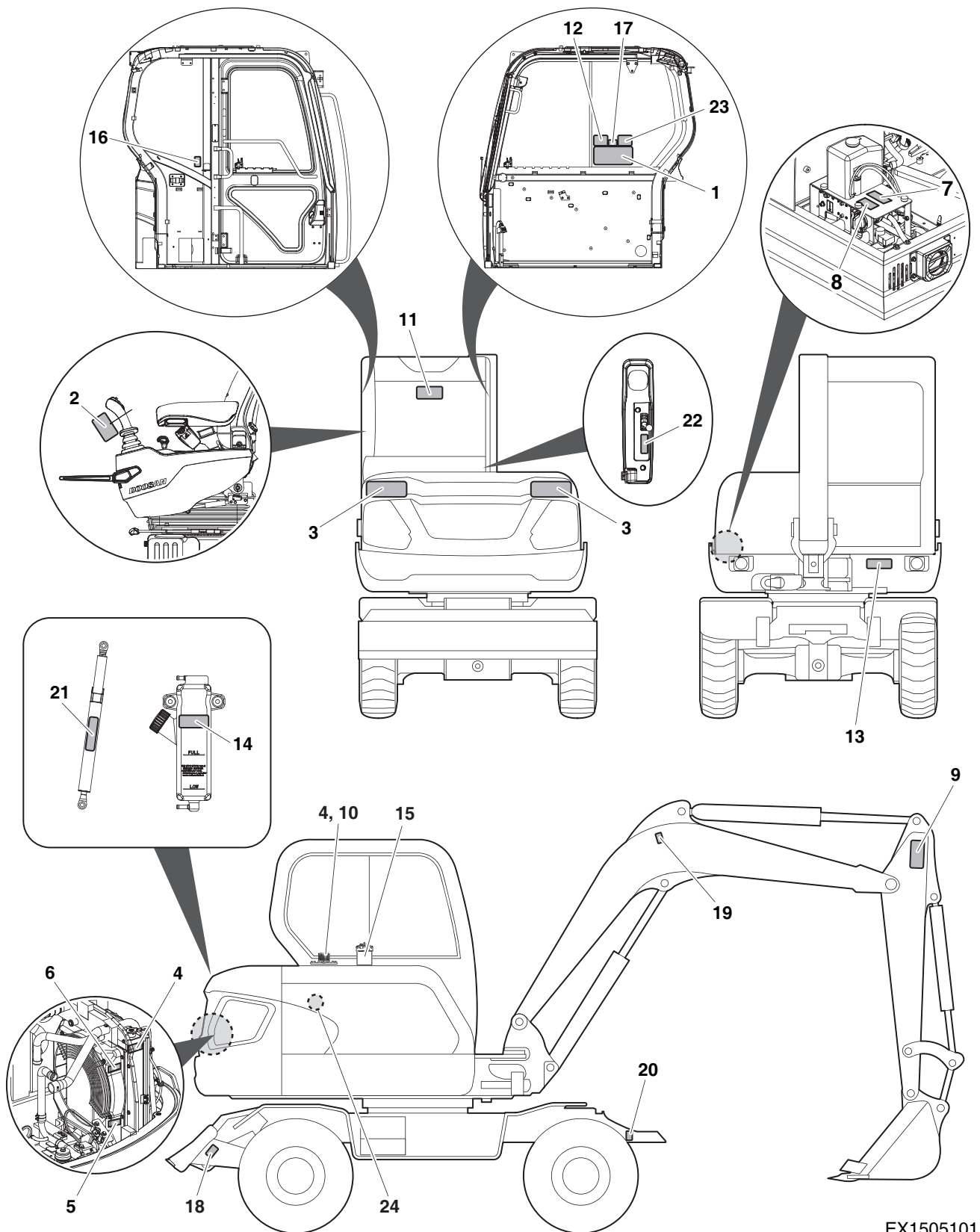
A safety decal may contain more than one hazard panel and more than one avoidance panel.



FG018723

Figure 1

Information and Location for Safety Decals



EX1505101

Figure 2

1. General Hazard (950205-04969)



EX1502344



WARNING

AVOID DEATH OR SERIOUS INJURY

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

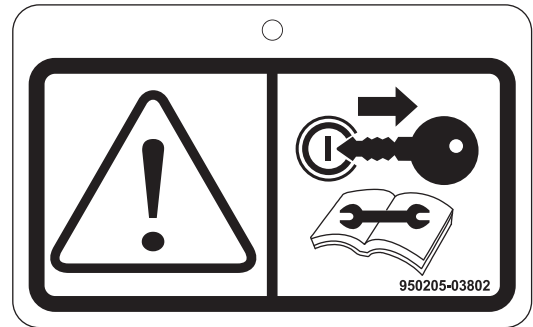
2. Warning Tag - "Do Not Operate" (950205-03802)



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

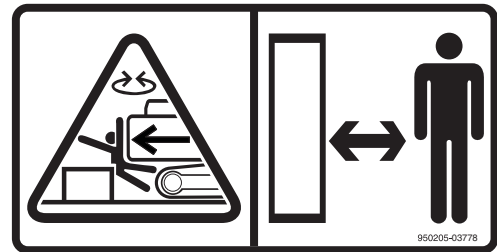
3. Keep Bystanders Away (950205-03778)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



EX1402206

4. Hot Pressurized Fluid (950205-03781)



WARNING

HOT PRESSURIZED FLUID CAN CAUSE
SERIOUS BURNS

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



EX1301180

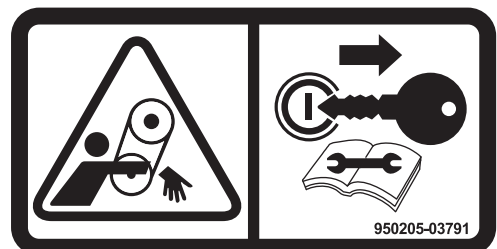
5. Entanglement in Rotating Parts (950205-03791)



WARNING

ROTATING PARTS CAN CAUSE DEATH OR
SERIOUS INJURY

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



EX1301181

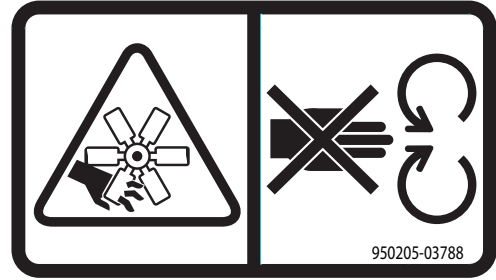
6. Rotating Fan (950205-03788)



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

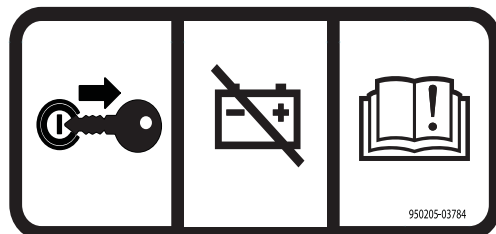
8. Battery Disconnection (950205-03784)

IMPORTANT

AVOID ELECTRICAL COMPONENT DAMAGE

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

Disconnect battery only when the engine is turned
OFF.



EX1301184

9. Crush Hazard (950205-03787)



WARNING

AVOID DEATH OR SERIOUS INJURY

Stay clear of the boom, arm, and attachment.



EX1402207

10. Hot Surface (950205-03777)



WARNING

HOT SURFACE CAN CAUSE SERIOUS BURNS

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

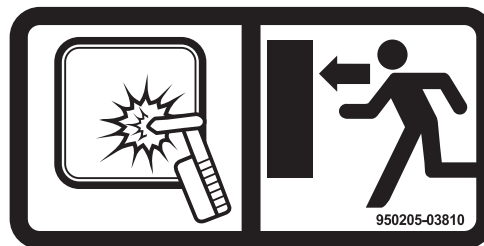


EX1301189

11. Emergency Exit (950205-03810)

IMPORTANT

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



EX1301190

12. ISO Control Pattern (950205-03860)

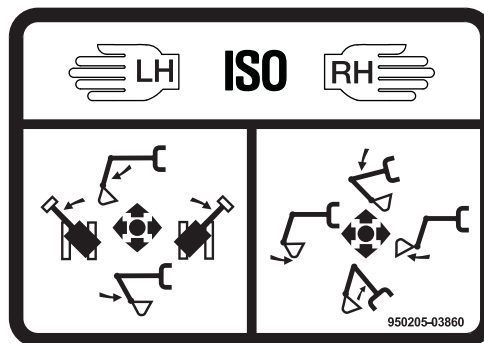


WARNING

AVOID INJURY OR DEATH

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

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



EX1301191

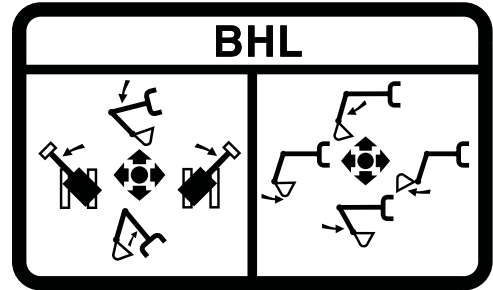


WARNING

AVOID INJURY OR DEATH

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

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



EX1301192

13. Lift/Transport (950205-03776)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



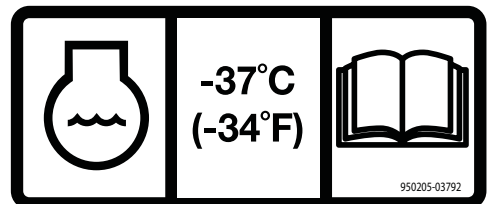
EX1402208

14. Coolant (950205-03792)

IMPORTANT

AVOID COOLING SYSTEM DAMAGE

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

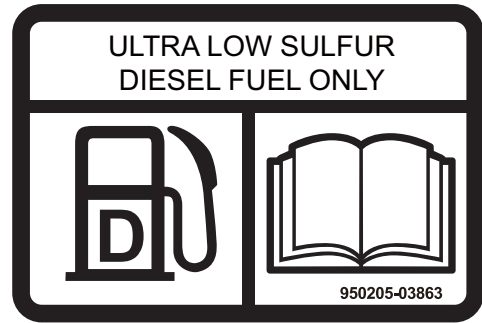


EX1402209

15. Ultra Low Sulfur Diesel Fuel (Optional)
(950205-03863, 950205-03864)

IMPORTANT

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



EX1301196



EX1301194

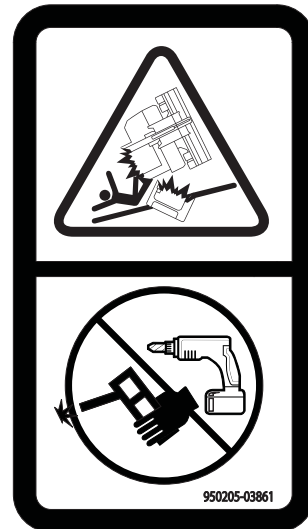
16. ROPS Warning (Optional) (950205-03861)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



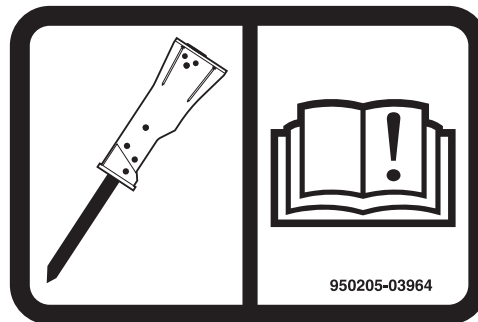
EX1301197

17. Hydraulic Breaker (950205-03964)

IMPORTANT

AVOID HYDRAULIC SYSTEM DAMAGE

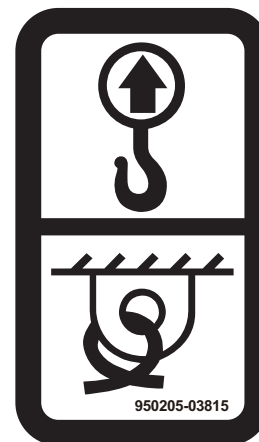
To adjust breaker impact, see Operation & Maintenance Manual for additional instructions.



EX1301200

18. Lift/Tie Down (950205-03815)

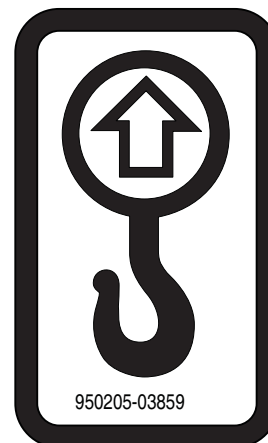
Identifies lift point and tie down point location.



EX1301201

19. Lift (950205-03859)

Identifies lift point and tie down point location.



EX1402212

20. Tie Down (950205-03816)

Identifies tie down point location.



EX1301203

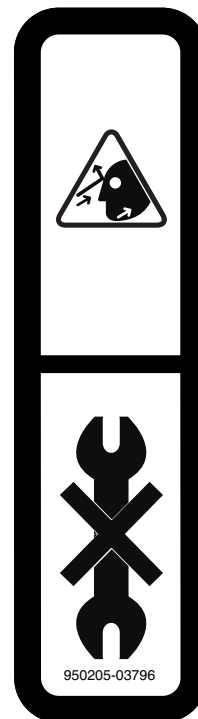
21. Thrown or Flying Objects (950205-03796)



WARNING

AVOID DEATH OR SERIOUS INJURY

- Safety sign is located on the gas spring in the engine compartment and in the cab.
- High-pressure gas can cause serious injury or death.
- Do not open. Opening cylinder can release rod.



EX1402213

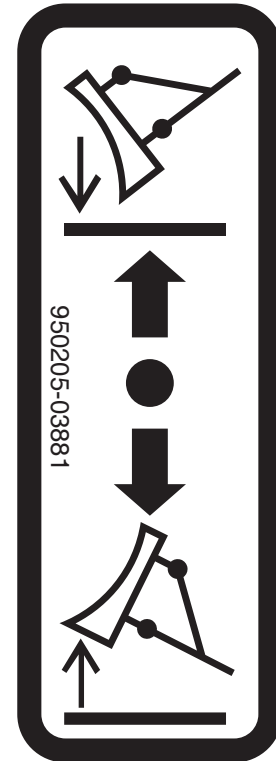
22. Dozer (950205-03881)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



EX1402247

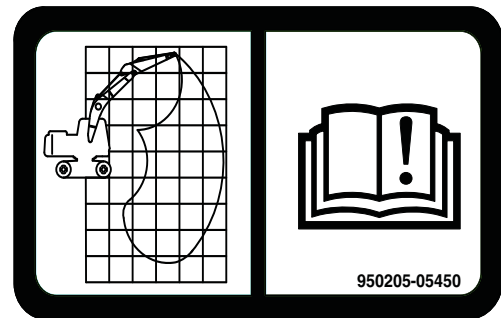
23. Lifting Capacity (950205-05450)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



WE1500865

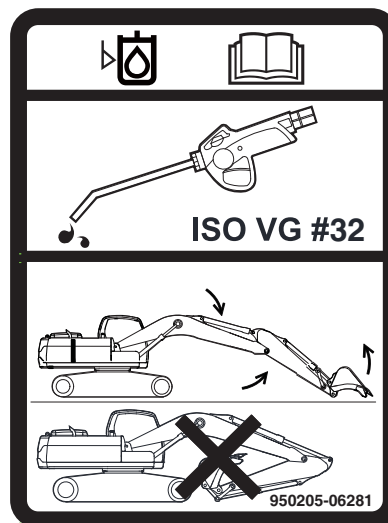
24. Hydraulic Oil Check (Optional)
(950205-06281, 950205-03965, 950205-06282)

IMPORTANT

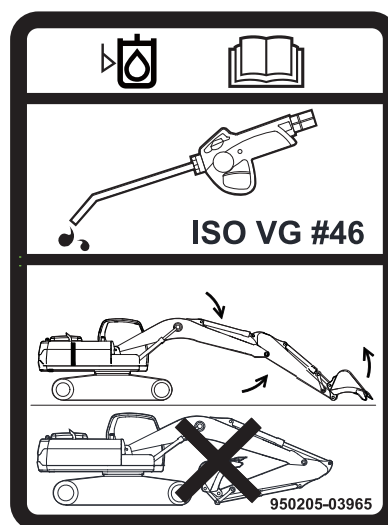
**INCORRECT OIL LEVEL OR INCORRECT FLUID CAN
CAUSE HYDRAULIC SYSTEM DAMAGE**

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

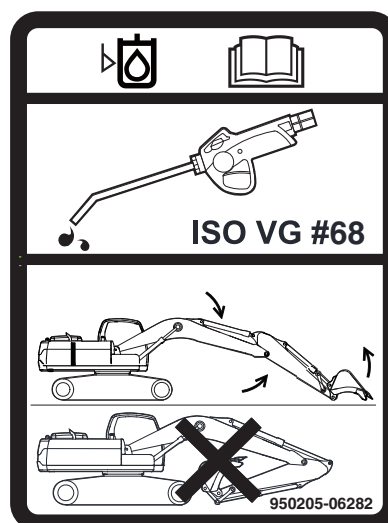
Use hydraulic oil which is suitable for machine.



EX1505097



EX1505098



EX1505099

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 lock 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 DOOSAN for use on DOOSAN machines. When installing and using optional attachments, read instruction manual for attachment, and general information related to attachments in this manual. Because DOOSAN cannot anticipate, identify or test all attachments that owners may want to install on their machines, contact DOOSAN 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 DOOSAN distributor about auxiliary hydraulic kits for attachments installation. If you are in doubt about compatibility of a particular attachment with a machine, consult your DOOSAN distributor.

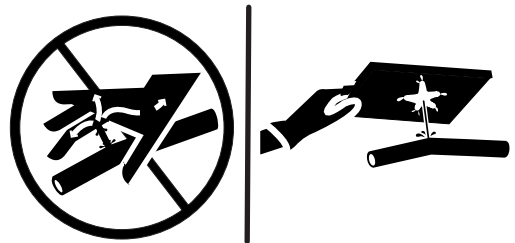
Pressurized Fluids

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.



FG018457

Figure 3

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

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

Obey all local laws and regulations for disposal of liquids.

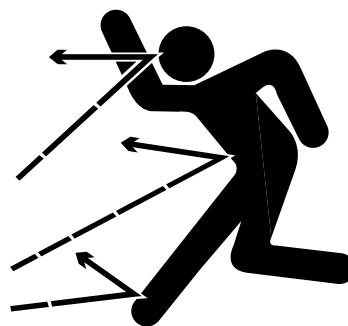
To prevent hot coolant from spraying out, stop engine and wait for coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

Flying or Falling Objects

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

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

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



HAOA110L

Figure 4



HAOA100L

Figure 5

Personal Protective Equipment (PPE)

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

Do not wear oily clothes. They are highly flammable.

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

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

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



Figure 6

Correction of Machine Problems

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

Crushing and Cutting

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

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

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

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

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

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

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



HDO1010L

Figure 7

Hot Coolant and Oils - Burn Prevention

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



FG019095

Figure 8

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



FG019096

Figure 9

Fire and Explosion Prevention

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

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

Always observe the following:

- 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.



HDO10151

Figure 10



FG018458

Figure 11

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 3-12, 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.

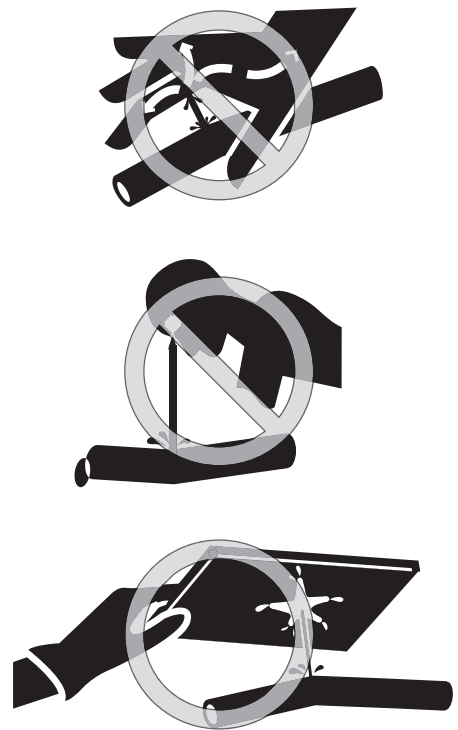


Figure 12

EX1400129

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.



ARO1050S

Figure 13

Never Use Ether Starting Aids

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

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



FG018458

Figure 14

Welding and Grinding

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

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

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

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

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

If a Fire Occurs

If a fire occurs:

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

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



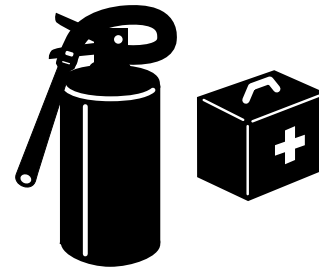
FG018459

Figure 15

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

To be prepared in the event of a fire:

- 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 inside the cabin (Figure 17) and keep another kit at work site. Check kit periodically and keep it properly supplied.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department readily available.



HDO1009L

Figure 16

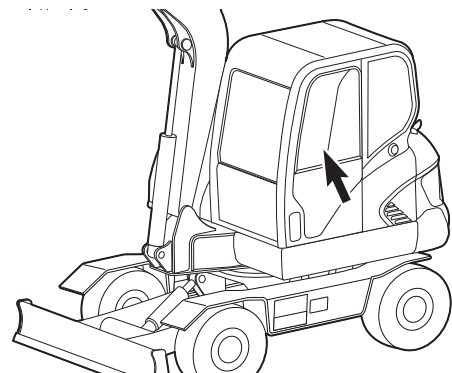


Figure 17

WE1500714

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 DOOSAN distributor.*

Roll-over Protective Structure (ROPS)

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

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

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

ROPS Certification

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

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

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

Never modify the ROPS cabin. Replace the cabin and hardware if damaged. See your DOOSAN distributor for parts.

ROPS – Roll-over Protective Structure complies with ISO 12117-2:2008, EN13531: 2001.

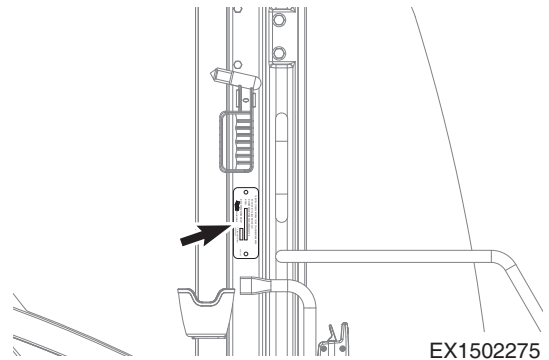


Figure 18



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Protecting Cabin from Flying or Falling Objects (Optional)

The roof guard (1, Figure 19) is available for applications where the risk of small falling objects exists.

The guard is applied to the upper side of the cabin to protect the operator and prevent damage to the glass roof from small falling objects (gravel, sand, etc.).

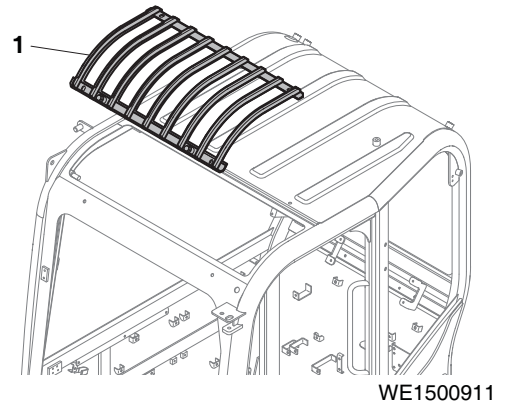


Figure 19

When working in mines, quarries or other work sites where there is a hazard of falling rocks, install Operator Protection Guard (OPG) (2, Figure 20) and apply a laminated coating sheet to front glass.

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

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

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

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

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

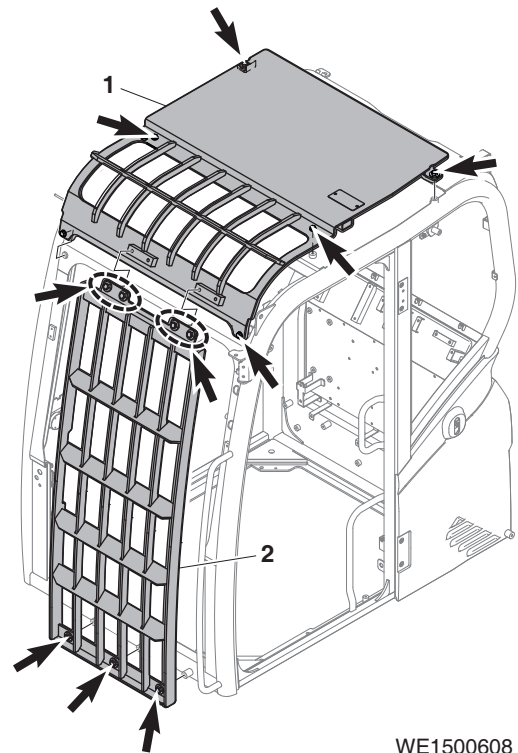


Figure 20

WE1500608

Emergency Exit from Operator's Station

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

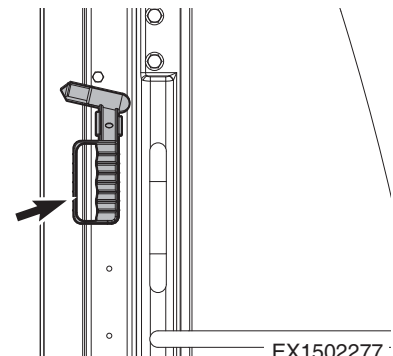


Figure 21

EX1502277

TRANSPORTATION

Obey State and Local Over-the-Road Regulations

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

The hauling vehicle, trailer and load must be in compliance with applicable regulations for the shipping route.

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

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

The machine can be disassembled into parts for transporting. Contact your DOOSAN 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 tires, dozer and lower structure. 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 tires to drop down to the ramps or trailer. This will occur at the joint between the ramps and trailer. Travel slowly over this point.
- Cover the exhaust pipe to prevent turbocharger damage. Lock the cabin door and lower the antenna.
- After loading, block each tire and secure the machine with tie-downs of adequate load rating, so the machine cannot move.
- For machines equipped with a cabin, always lock door after loading machine to prevent door from suddenly opening during transportation.

Transporting Machine

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

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

OPERATION

Always make sure that the machine is properly maintained.

Before Engine Starting

Machine Condition

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

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

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

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

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

Know maximum operating dimensions of your machine.

Work Site

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

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

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

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

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

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

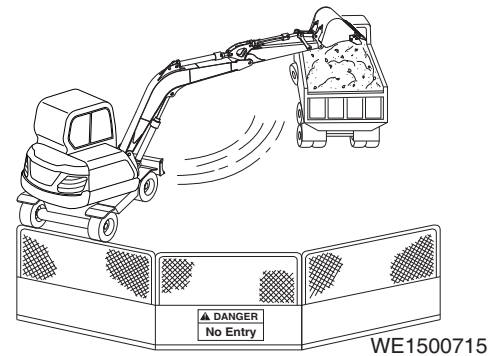


Figure 22

Mounting/Dismounting

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

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

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

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

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

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

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



Figure 23

Cleaning

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

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

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

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

Clean window glass and working lights for good visibility.

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

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

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

Operator Station

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

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

Keep all windows and doors closed on machine.

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

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

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

Seat Belt

Check seat belt daily for correct function.

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

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Always wear seat belt when operating machine.

Visibility Information

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Adjust visual aids for best visibility around machine.

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

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

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

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

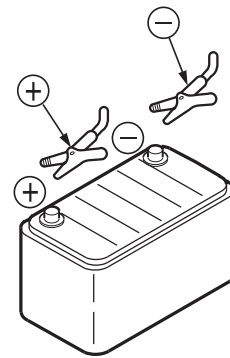
When operating or traveling during poor visibility conditions, follow the preceding work site rules.

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 Battery

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.
- Refer to "Starting Engine With a Booster Cable" on page 3-12, for proper procedure in this manual.
- Connect positive (+) cable first when installing cables and disconnect negative (-) cable first when removing them. The final cable connection, at the metal frame of the machine being charged or boost started, must be as far away from the battery as possible.



HAOA310L

Figure 24

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 (optional) 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.

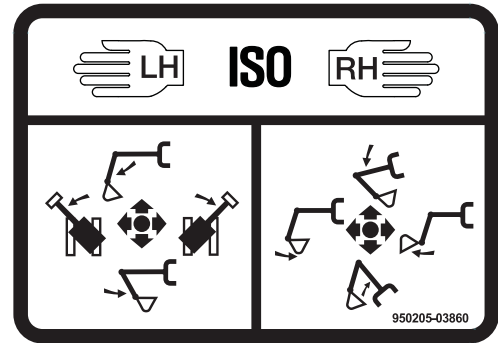
- Do not attempt to start engine by short-circuiting engine starting circuit. This can result in death or serious injury, or fire.
- When starting engine, sound horn as a warning to alert personnel in the work area.

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 25

Swinging or Traveling

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

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

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

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

NOTE: *Be sure to "LOCK" the outriggers when traveling.*

- Make sure that upper structure is facing forwards with dozer blade in front.
- Store the front attachment in the transport position and set the function lock in the "TRAVEL" position.
- Set the ram cylinder toggle switch in the "UNLOCK" position.
- Before moving the machine, make sure that swing lock pin has engaged. This will prevent the machine from accidentally rotating during traveling.
- When changing travel direction from forward to reverse or from reverse to forward, reduce speed and stop machine before changing travel direction.
- Sound horn to alert people in area.
- Check that there is no one in area around machine. There are restricted visibility areas behind machine so, if necessary, swing upper structure slowly to check that there is no one behind machine before traveling in reverse.
- Before moving the machine, make sure that swing lock pin is "ENGAGED". This will prevent the upper structure from accidentally rotating while traveling.
- 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.

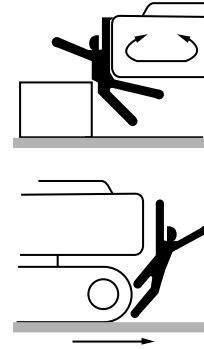


Figure 26

HAOA190

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

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

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

Do not operate attachments while traveling.

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

Never travel over obstacles or excessive slopes that will cause machine to tilt severely. Avoid any slope or obstacle that can cause machine to tilt 10° or more to right or left, or 30° or more from front to rear.

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

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

Always operate within permissible water depth. Permissible water depth is up to bottom of axle housing.

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

Never exceed maximum permitted load for bridges.

Always operate machine with dozer blade to front under cabin and outriggers to rear.

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

Keep height and length of attachment in mind.

Travel Position

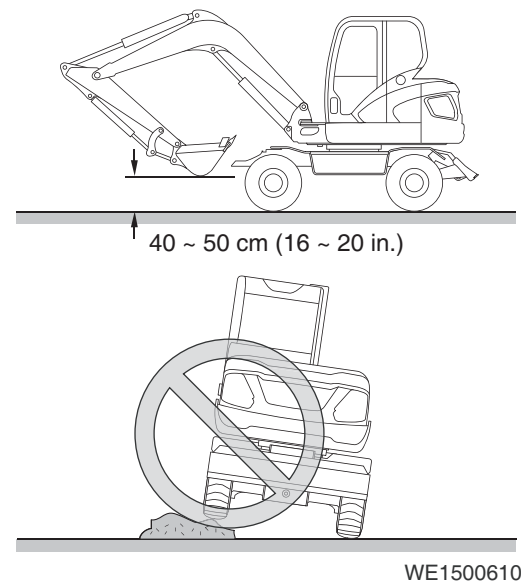


Figure 27

Lifting and Digging

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

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

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

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

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

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

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

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

Operation on Slopes

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

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

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

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

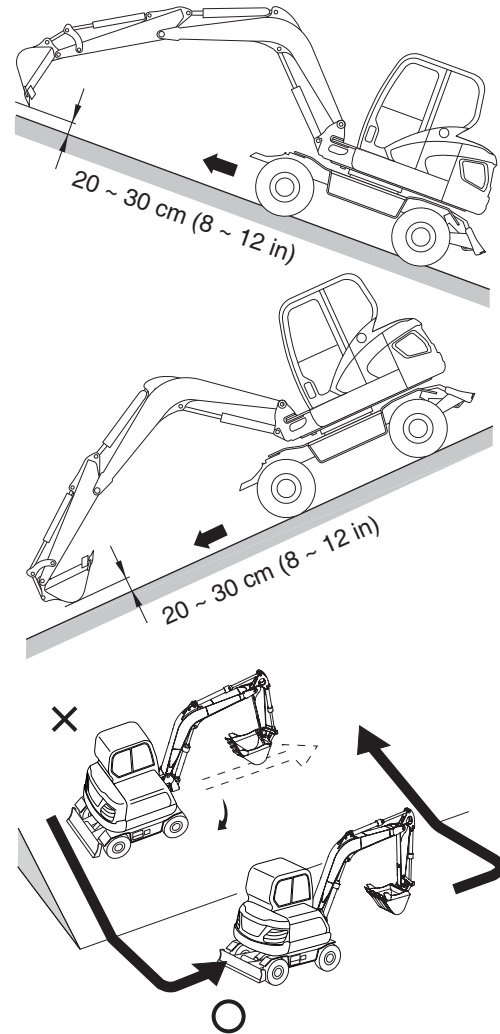
Do not travel on grass, fallen leaves, or wet steel plates. Even slight slopes can cause machine to slide down a slope. Travel at low speed and make sure that the machine is always traveling directly up or down slope.

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

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

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

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



WE1500611

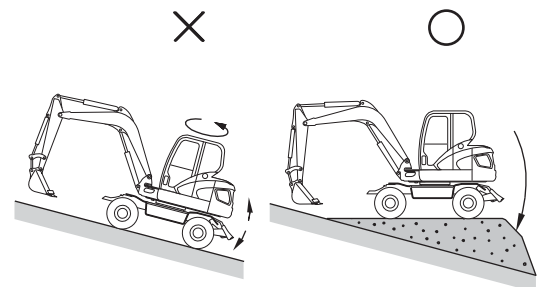
Figure 28

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.



WE1500612

Figure 29

Towing

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

- Follow the instruction given in this manual.
- Use a wire rope of sufficient strength for towing.
- In the event of slipping into swampy ground or towing heavy objects, use a wire rope to tow the machine as shown in the illustration.
- Put wood blocks between the wire rope and the machine to protect the machine and wire rope from damage.
- Only use the towing hole for light objects.
- Be sure to use shackles. Keep the cable horizontal, straight, and parallel to the tires.
- Select the "LOW" travel mode. Slowly drive the machine when towing.
- When performing preparation work for towing with two or more personnel, determine signals to use and correctly follow these signals.
- Always attach wire rope onto left and right hooks and secure in position.
- If engine on problem machine will not start or there is a failure in brake system, always contact your DOOSAN 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.

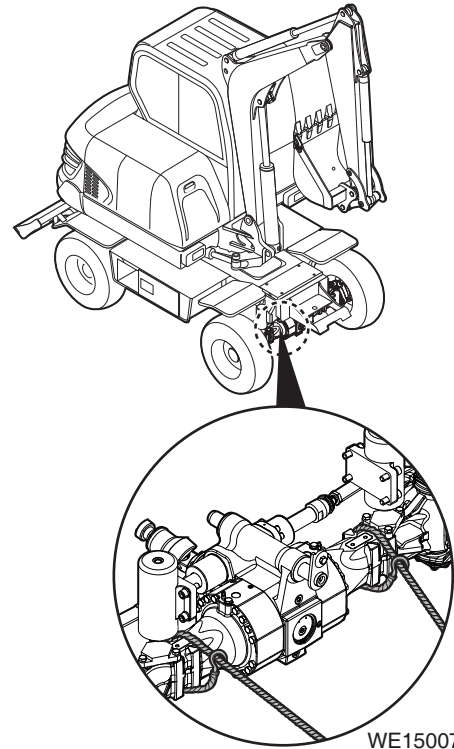


Figure 30

Attachment

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

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

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



EX1400133

Figure 31

Equipment Lowering with Engine Stopped

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

Engine Stop

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

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

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

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

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

Parking Machine

Avoid making sudden stops, or parking machine wherever it happens to be at end of workday. Park machine on firm and level ground away from traffic and away from high walls, drop-offs and any area of potential water accumulation or runoff. If parking on inclines is unavoidable, block tires 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.

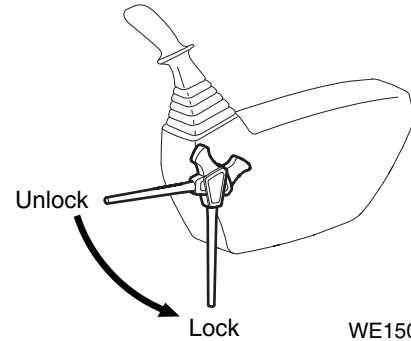
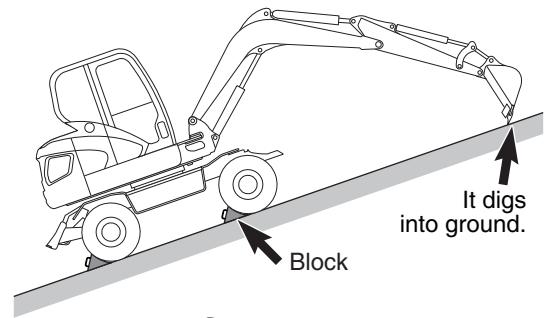
After front attachment has been lowered to an overnight storage position and all switches and operating controls are in "OFF" position, safety lever must be moved to "LOCK" position. This will disable all pilot control functions.

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.

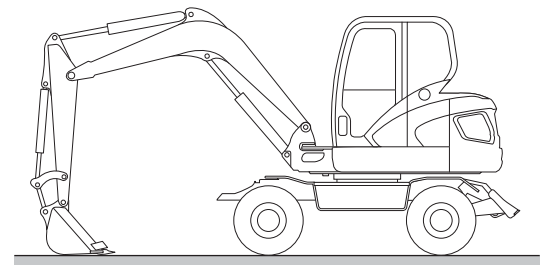
Machine movement will occur if any controls are moved. This can result in death or serious injury.

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



WE1500613

Figure 32



WE1500614

Figure 33

Service Brake



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Preservation/Storing Machine

Perform the following if storing excavator for more than one month.

Conditions	Maintenance Required
Cleaning	Pressure wash lower structure and axle 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 4-102, 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 3-13, 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 3-73, 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 label (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.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

- Never service DOOSAN equipment without instructions.
- Always lower bucket and blade to ground before doing any maintenance.
- Use correct procedure to lift and support excavator.
- Cleaning and maintenance are required daily.
- Welding or grinding painted parts must be done in well ventilated areas.
- Wear a dust mask when grinding painted parts. Toxic dust and gas can be produced.
- Vent exhaust to outside when engine must be running for service.
- Exhaust system must be tightly sealed. Exhaust fumes are hazardous and can cause death or serious injury.
- Stop and allow engine to cool and clean engine of flammable materials before checking fluids.
- Never service or adjust machine with engine running unless instructed to do so in this manual.
- Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate skin or eyes.
- Never fill fuel tank while engine running, while smoking, or when near open flame.
- Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
- Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for welding.

- Lead-acid batteries produce flammable and explosive gases.
- Keep arcs, sparks, flames and lighted tobacco away from batteries.
- Batteries contain acid which burns eyes or skin on contact.
- Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention from a physician familiar with this injury.
- The maintenance procedures which are given in this manual can be performed by the owner or operator without any specific technical training. Maintenance procedures which are not in this manual must be performed **ONLY BY QUALIFIED SERVICE PERSONNEL**. Always use genuine DOOSAN 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 tires 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 lock lever in the fully lowered "LOCK" position, complies with OSHA's lockout requirements.

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

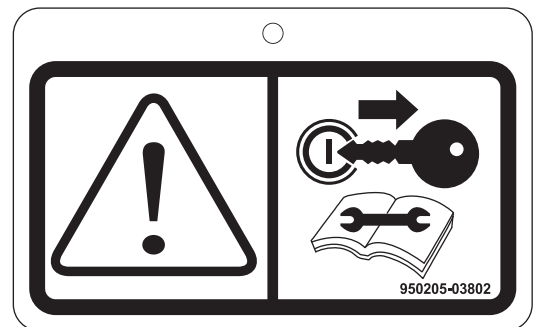
- Always attach "DO NOT OPERATE" warning tag to work equipment control lever in the operator's cabin to alert others that you are performing service or maintenance on the machine. Attach additional warning tags on the machine, if necessary.

Keep warning tags in tool box while it is not used. If there is not a tool box, then keep them 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 DOOSAN distributor.



EX1301177

Figure 34

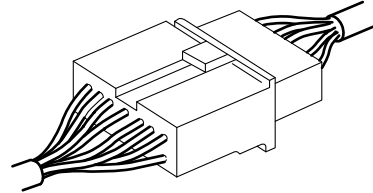
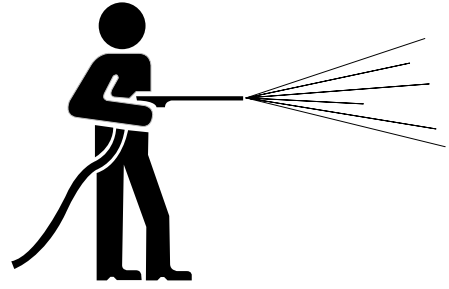
Cleaning

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.



ARO1330L

Figure 35

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.

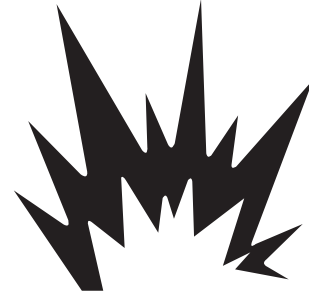
Clean all electrical connections and tighten all electrical connections. Check electrical wires daily for wires that are loose or frayed. Tighten all loose, and repair or replace all frayed, electrical wires before operating machine.

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



HDO10151

Figure 36



FG018458

Figure 37

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.

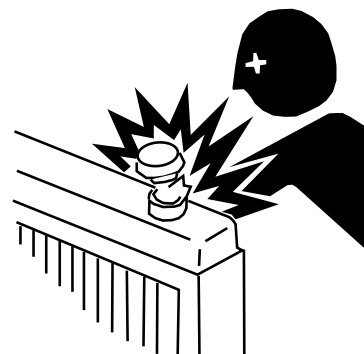
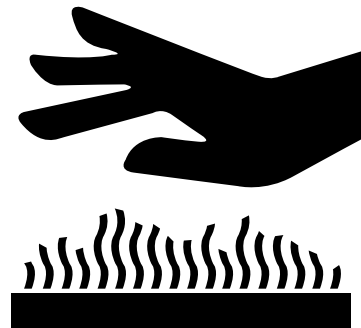


Figure 38

HAAE1980

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.

Rubber That Contains Fluorides

Use 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 plastic 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. Symptoms may not appear until several hours afterwards.

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

IMPORTANT

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

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

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

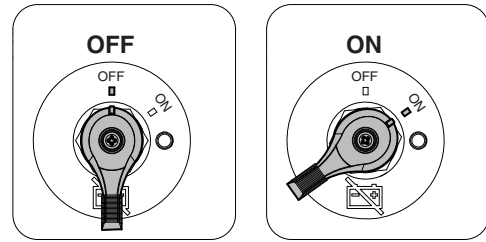
A qualified welder must do the following:

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

Preparation for Electrical Welding On Body Structure

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

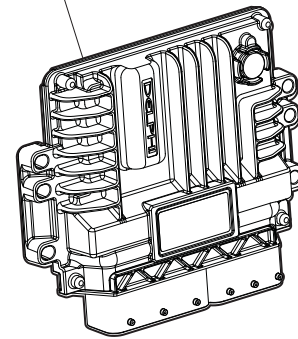
1. Turn battery disconnect switch to "OFF" position.
2. Disconnect the connector between ECU and machine, and the connector between ECU and engine.
3. Disconnect the negative (-) cable of battery.
4. Proceed with welding.
5. After welding, connect the connector between ECU and machine, and the connector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



EX1500481

Figure 39

Electric Control Unit (ECU)



EX1502278

Figure 40

Warning for Counterweight and Front Attachment Removal



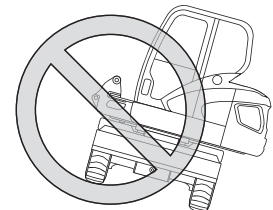
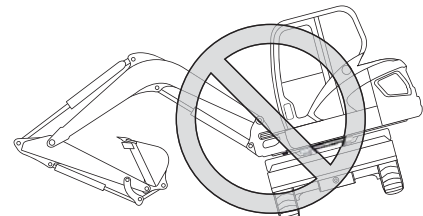
WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

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



WE1500615

Figure 41

Lock Inspection Covers

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

Working on Machine

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

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



ARO1380L

Figure 42

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 4-105.

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 DOOSAN 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.

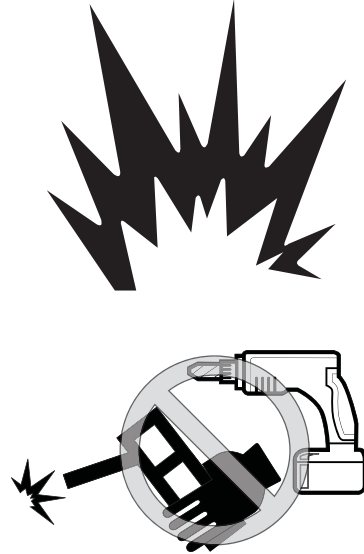


Figure 43

EX1400135

Compressed Air

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

Supports and Blocking for Work Equipment

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

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

Do not use hollow, cracked or unsteady wobbling supports.

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



Figure 44

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 4-105.

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 4-79, 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 DOOSAN distributor for replacement parts.

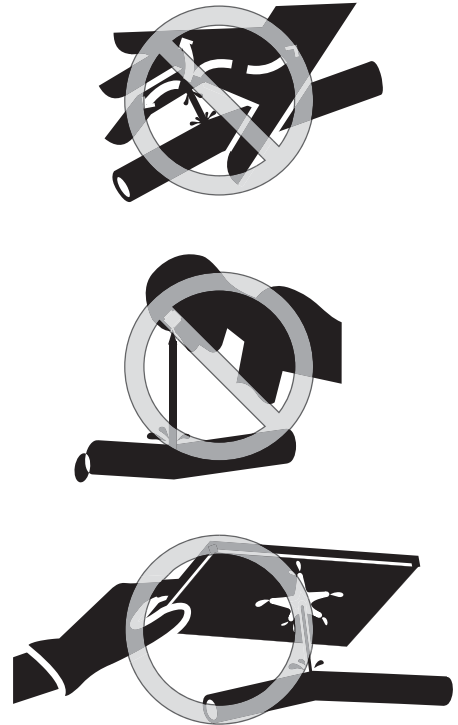


Figure 45

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 46

EX1400136

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

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

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

ENVIRONMENT AND CIRCUMSTANCES

Work Site Areas Requiring Extra Caution

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

Digging Under an Overhang

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

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

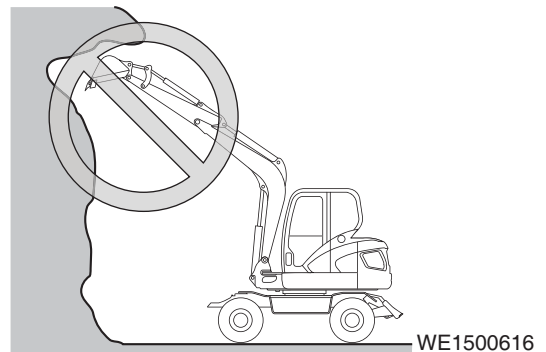


Figure 47

Deep Digging

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

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

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

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

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

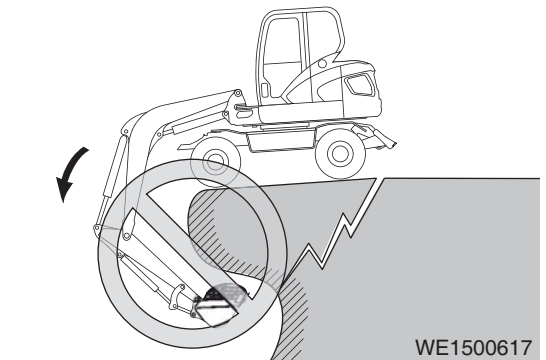


Figure 48

Drop-off or Edge

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

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

Poor Visibility

For good visibility, always do the following:

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

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

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

Loose or Soft Ground

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

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

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

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

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

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

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

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

High-voltage Cables

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

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

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

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

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

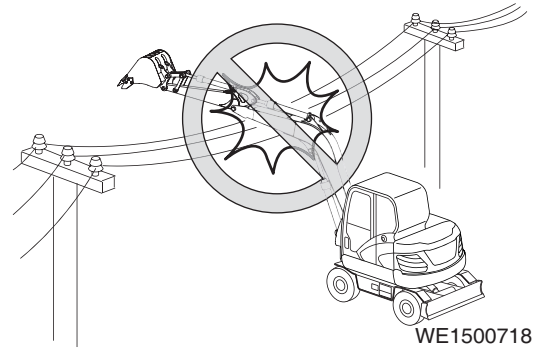


Figure 49

Underground Operation

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

Special equipment and engines may be required in some countries. Contact your DOOSAN distributor for more information.

Check that there is sufficient room for machine and load.

Move slowly.

Make sure that authorities or companies responsible for underground cables, utilities, and electrical lines have been contacted and that their instructions are followed. Also check which rules apply to ground personnel regarding exposing cables, utilities and electrical lines.

Consider all electrical cables as live.

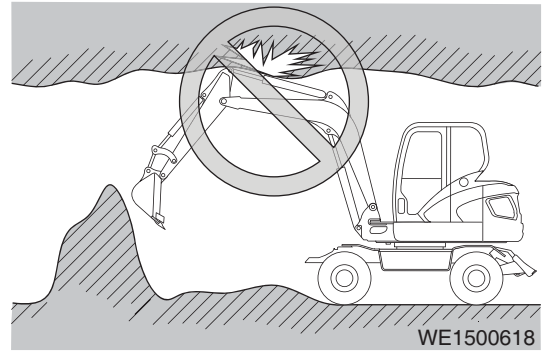


Figure 50

Working in Water

IMPORTANT

Do not exceed maximum permissible water depth. The water level must not reach higher than centerline of the axle housing (1, Figure 51).

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.

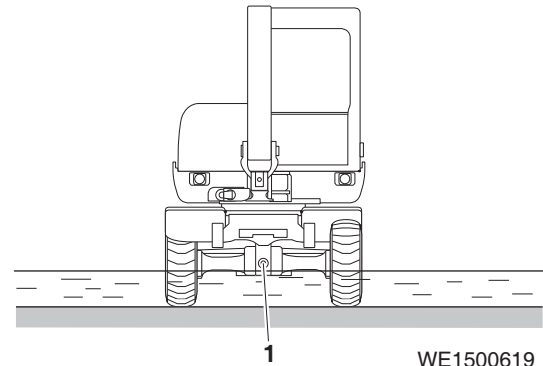


Figure 51

Working in Contaminated Environment

When working within area which is contaminated or where there is a health risk, check local regulations and contact your DOOSAN 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 start-up.
 - Preheat the engine before start-up. Wait 3 to 4 seconds after preheating until voltage of the battery return, and then actuate the starter 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, efficacy of the battery is reduced accordingly. Insulation of the battery prevents reduction of efficacy, and supports improvement of starting power of the starter.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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 4-20, in this manual or Shop Manual for details.
5. Always keep the fuel tank fully filled after completion of the operation. Always drain water from the fuel tank before and after the operation. In addition, check the water separator, and drain it if required. The fuel filter, if frozen, may interrupt the flow of fuel. Periodically remove water from the fuel tank, drain water from the filter, and replace the

filter upon regular basis. To prevent fuel from being clogged because of formation of wax in fuel, make sure that wax formation point of fuel is lower than atmospheric temperature.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

6. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-16, in this manual or lubrication chart on machine.
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.

IMPORTANT

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 4-29 and "Check for Leaks in Fuel System" on page 4-29, of this manual. Check for water content before filling fuel tank. High temperatures and cooling off cause condensation in storage drums.
4. Lubricate as specified in "Lubrication and Service Chart" on page 4-16, in this manual or Lubrication Decal on machine.
5. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from sun, dirt and dust.
 - A. Cover machine if no suitable shelter is available. Protect engine compartment and hydraulics from dirt and debris.
 - B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season. Rust and paint blisters will appear on metal surfaces and fungus growth on other surfaces.
 - C. Protect all unfinished, exposed surfaces with a film of preservative lubricating oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation In Dusty and Sandy Areas

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

2. Use care when servicing fuel system to prevent dust and sand from entering tank.
3. Service air cleaner at frequent intervals, check air restriction indicator daily and keep dust cup and dust valve clean. Prevent dust and sand from entering engine parts and compartments as much as possible.
4. Lubricate and perform services outlined on current lubrication chart on machine and "Lubrication and Service Chart" on page 4-16. Clean all lubrication fittings before applying lubricant. Sand mixed with lubricant becomes very abrasive and accelerates wear on parts.
5. Protect machine from dust and sand as much as possible. Park machine under cover to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

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

1. Keep all exposed surfaces coated with preservative lubricating 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 lubricating oil. Pay attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or "Lubrication and Service Chart" on page 4-16, in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

Operation at High Altitudes

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

1. Check engine operating temperature for evidence of overheating. The radiator cap must make a perfect seal to maintain coolant pressure in cooling system.

- Perform warming-up operation thoroughly. If machine is not thoroughly warmed up before control levers or control pedals are operated, reaction of machine will be slow.
- If battery electrolyte is frozen, do not charge battery or start engine with a different power source. There is a potential hazard that could cause a battery explosion or fire.
- Before charging or starting engine with a different power source, thaw battery electrolyte and check for any leakage of electrolyte before starting.

Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

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

Exhaust Ventilation

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

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

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

Ventilation for Enclosed Area

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

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

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



ARO1770L

Figure 52

Asbestos Information



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

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

Silica Dust Information



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Disposal of Hazardous Materials

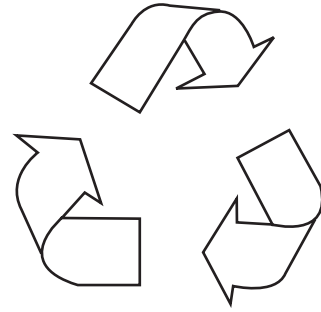
Physical contact with used motor oil or gear oil could create a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

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

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

Improperly disposing of waste can threaten environment. Potentially harmful fluids must be disposed of according to local regulations.

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



FG009156

Figure 53

Sound

Sound Level Information: Hearing protection may be needed 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)	75 dB(A)
Sound power level (LwA) around the machine (Measurement according to 2000/14/EC with applicable appendices and measuring method according to ISO 6395)	98 dB(A)

Vibration Information

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

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

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

Hand/Arm Vibration Level

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

Whole Body Vibration Level

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

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

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

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

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

Operating Controls

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

1. "Component Locations" on page 2-2
2. "Operator's Area" on page 2-8
3. "Operational Controls and Panels" on page 2-10
4. "Display Monitor" on page 2-30
5. "User Menu" on page 2-51
6. "Heater and Air Conditioner Control Panel" on page 2-81
7. "Stereo" on page 2-87
8. "Miscellaneous Electrical Devices" on page 2-88
9. "Seat Adjustment" on page 2-91
10. "Engine Emergency Stop Switch" on page 2-95
11. "Emergency Exit Glass Breaking Tool" on page 2-95
12. "Miscellaneous Convenience Devices" on page 2-96
13. "Miscellaneous Access Covers and Doors" on page 2-100
14. "Air Gun and Compressor" on page 2-102

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

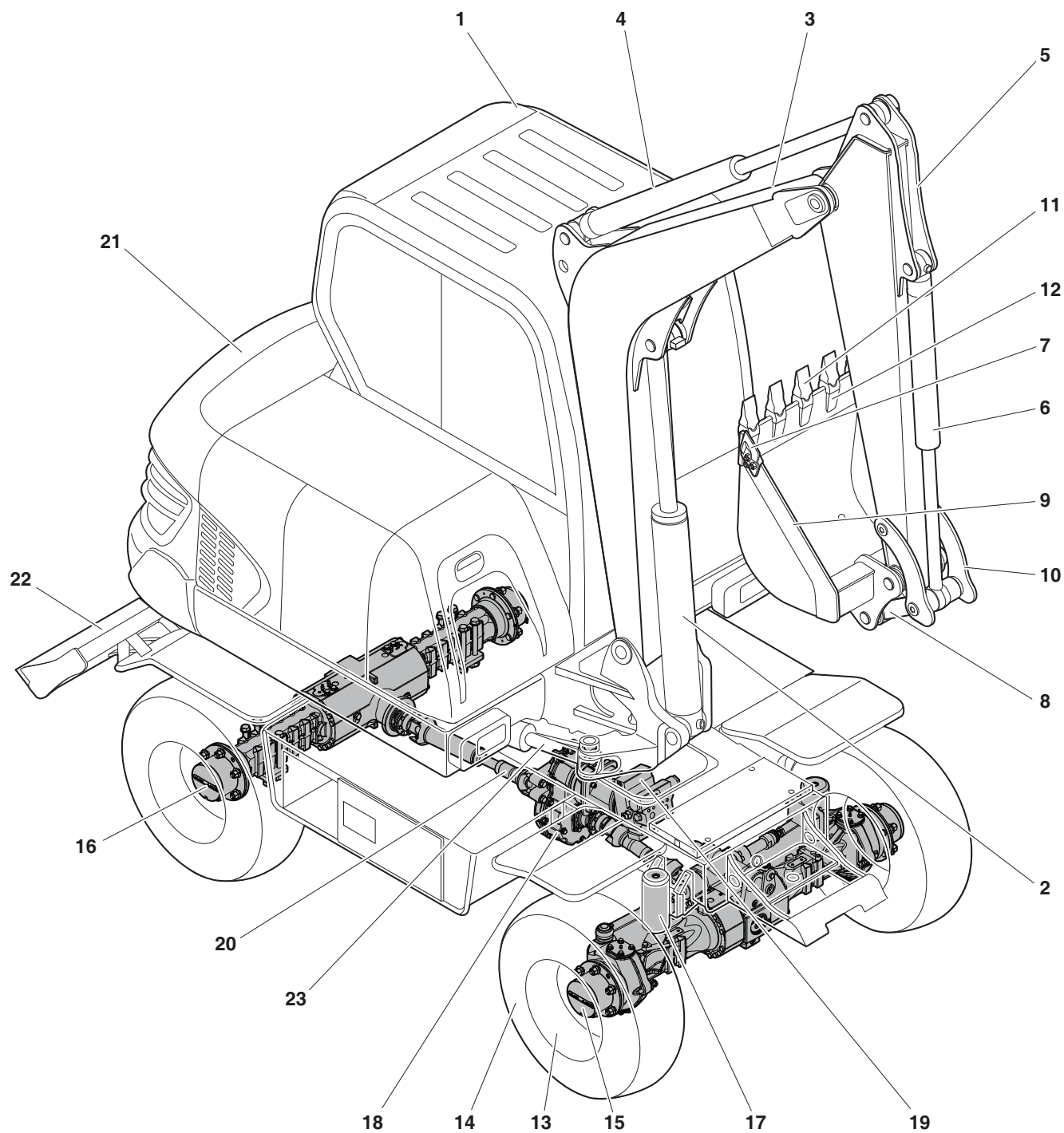
Warning symbols will appear above the gauges on the display monitor when a problem with the machine is detected.

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

IMPORTANT

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

COMPONENT LOCATIONS



WE1500723

Figure 1

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

Reference Number	Description
13	Rim
14	Wheel (Tire)
15	Front Axle
16	Rear Axle
17	Chocking Cylinder
18	Transmission
19	Travel Motor
20	Driveshaft
21	Bonnet
22	Dozer Blade
23	Boom Swing Cylinder

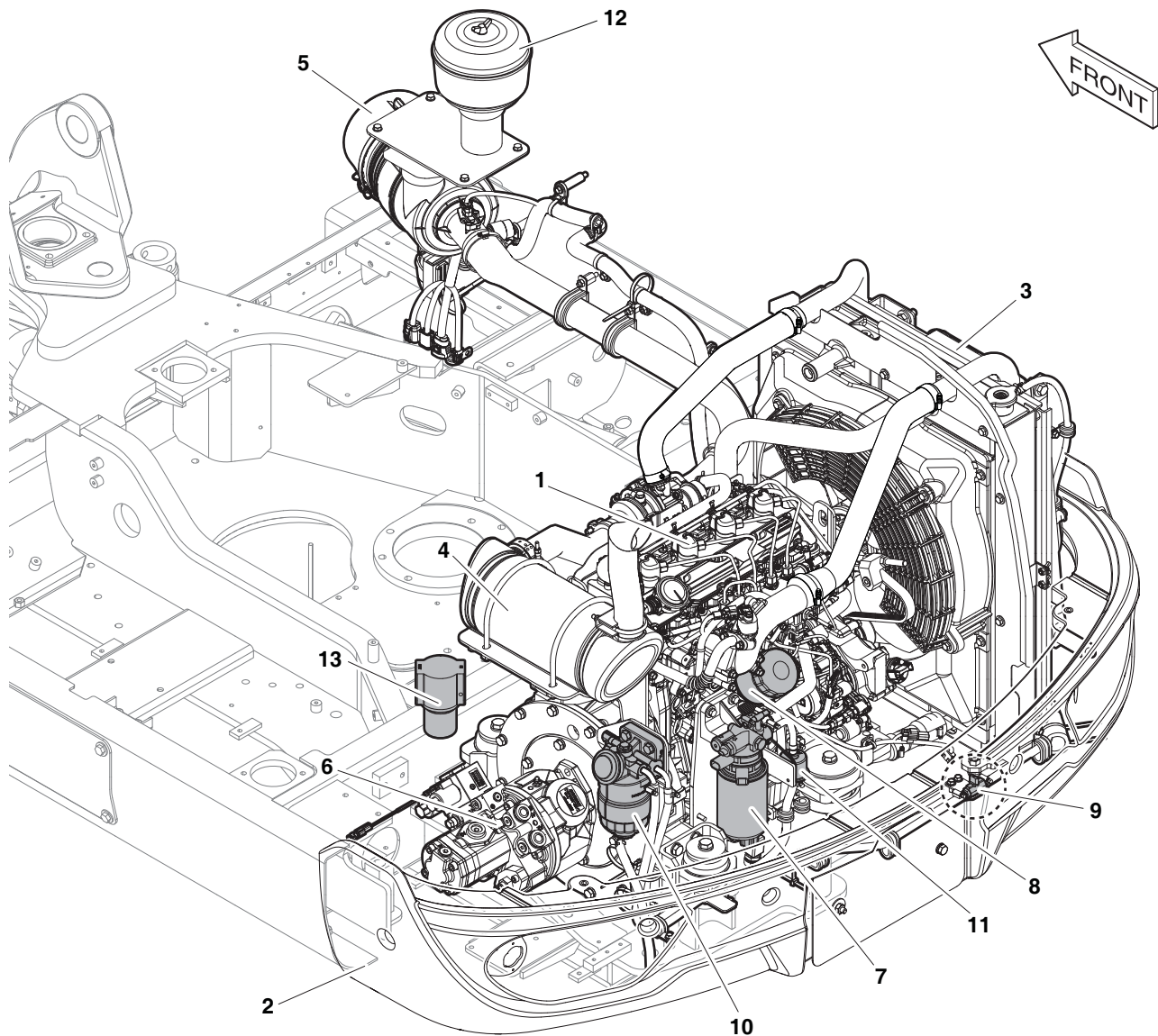
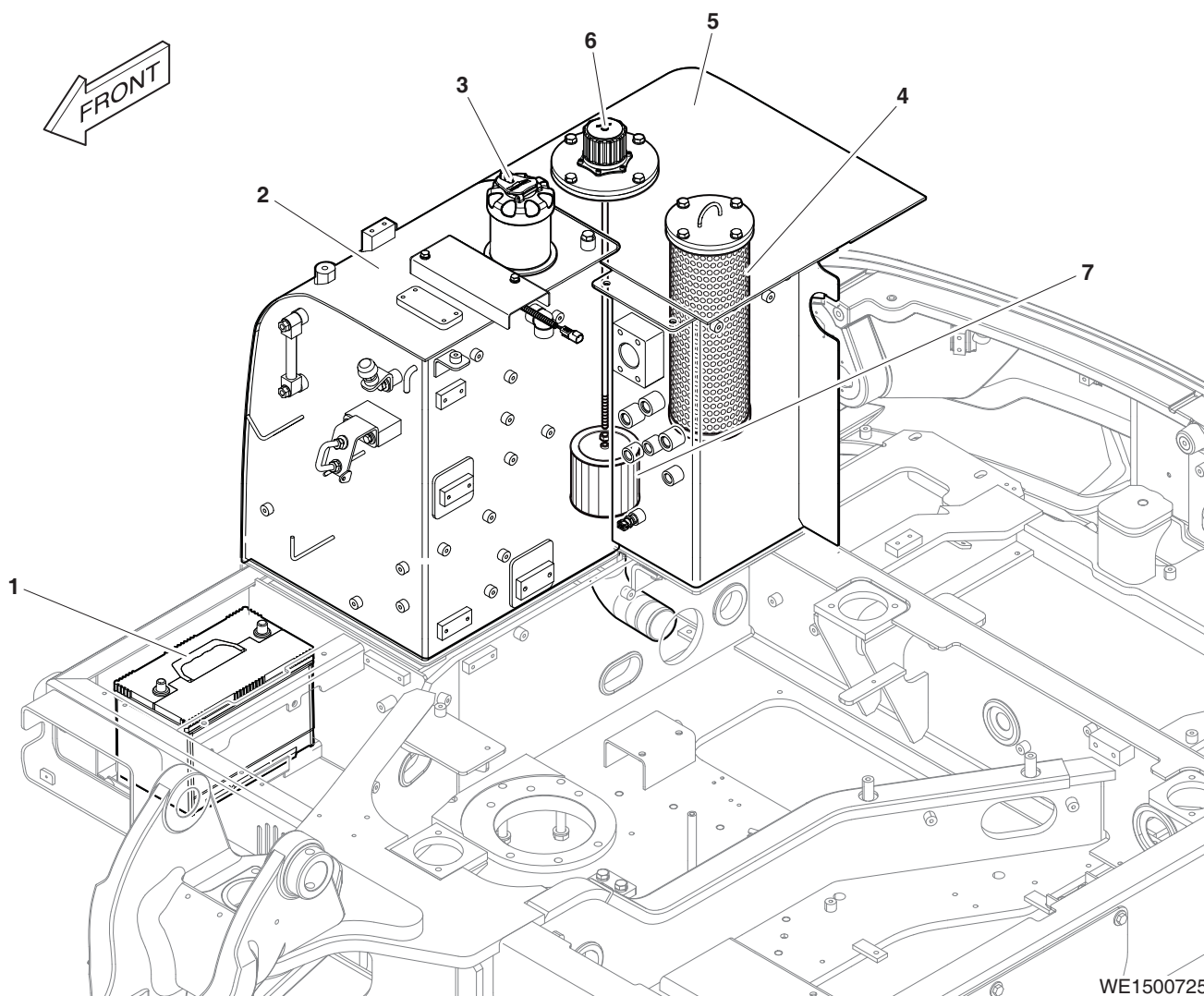


Figure 2

WE1500724

Reference Number	Description
1	Engine
2	Counter Weight
3	Radiator
4	DOC Muffler
5	Air Cleaner
6	Main Pump
7	Main Fuel Filter
8	Oil Filter

Reference Number	Description
9	Cock Valve
10	Water Separator & Pre Fuel Filter
11	Fuel Pump (Electric Transfer Pump)
12	Pre Cleaner
13	Pilot Filter

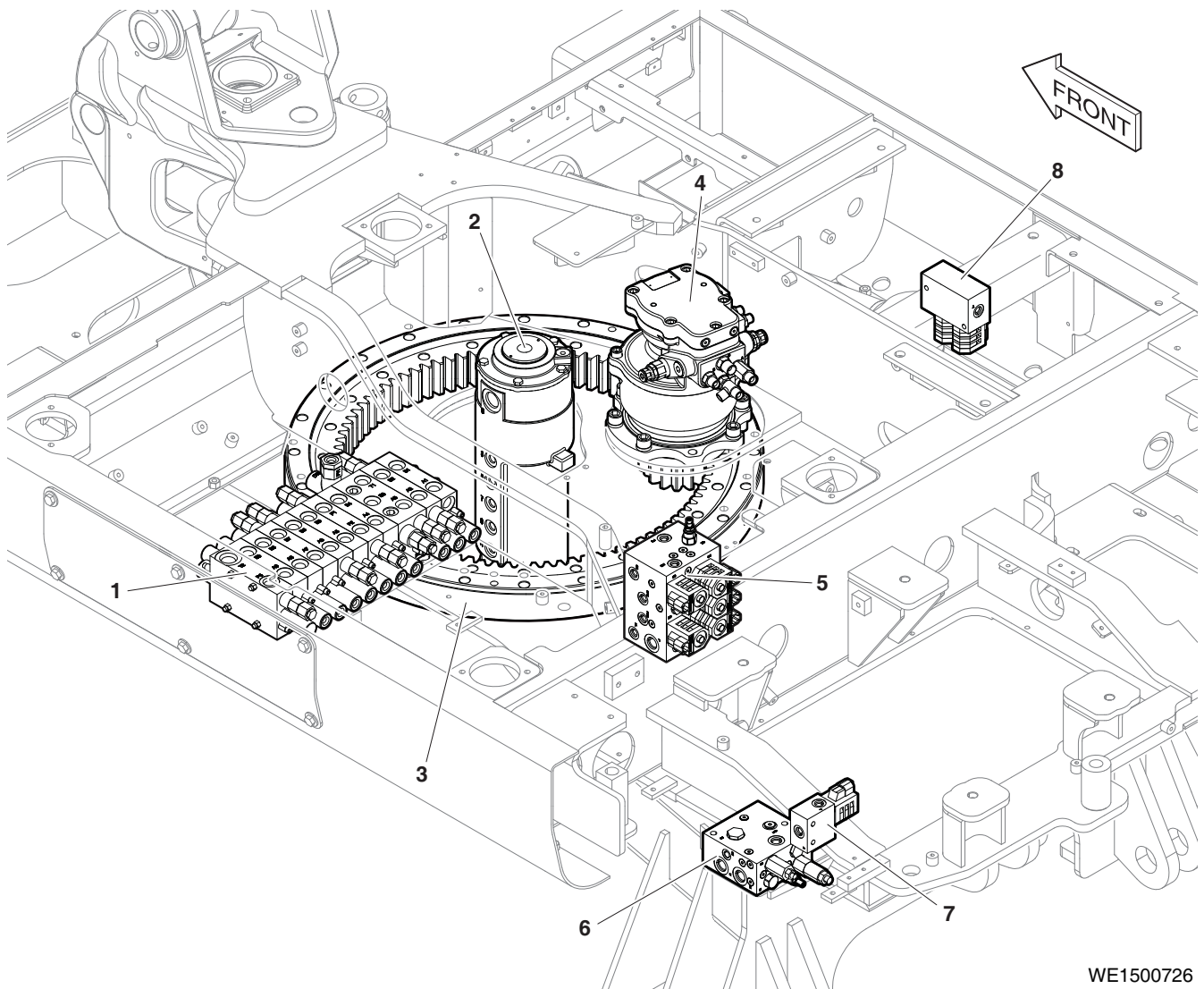


WE1500725

Figure 3

Reference Number	Description
1	Battery
2	Fuel Tank
3	Fuel Cap
4	Return Filter

Reference Number	Description
5	Hydraulic Oil Tank
6	Air Breather
7	Suction Filter



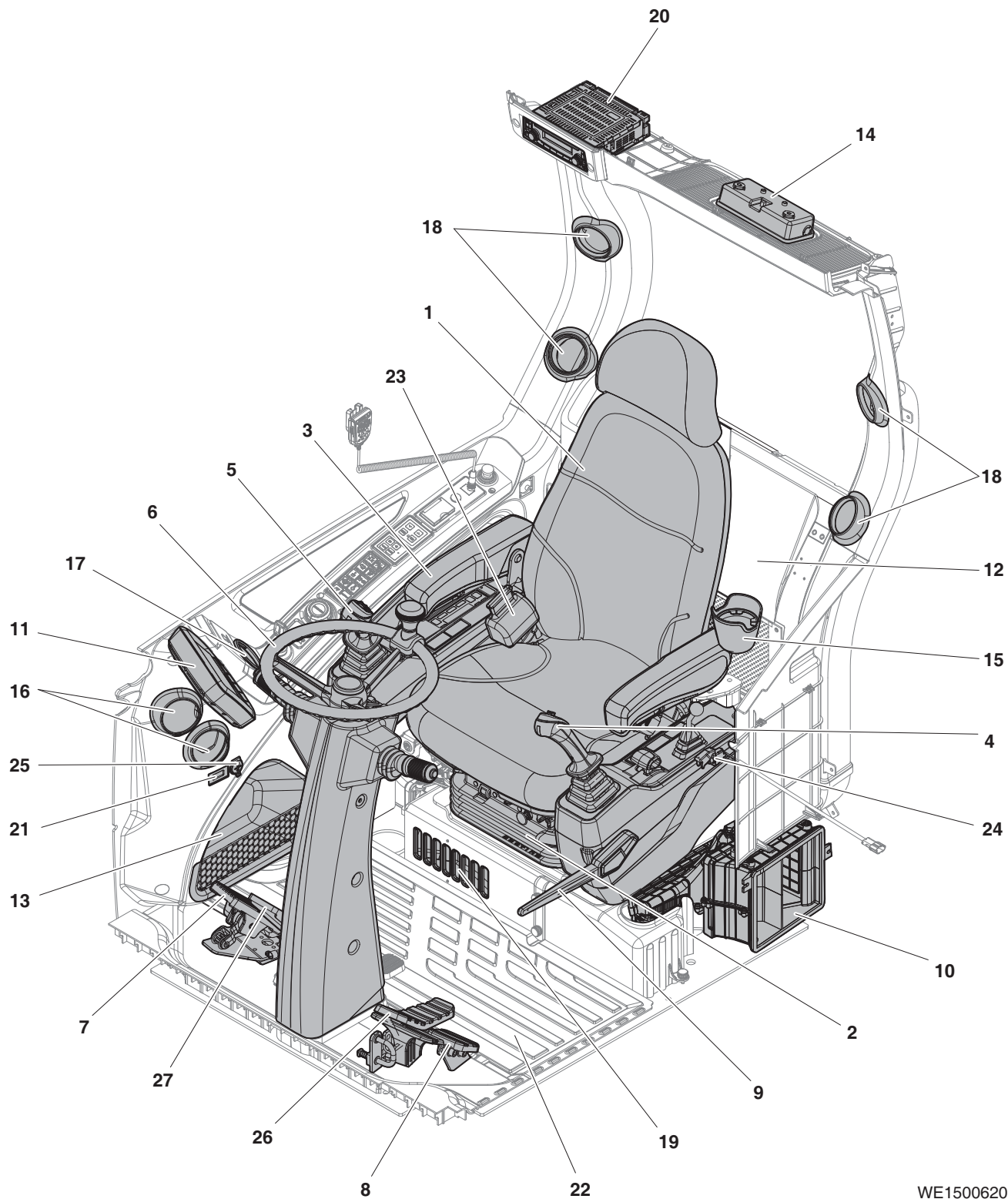
WE1500726

Figure 4

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

Reference Number	Description
5	Pilot Supply Valve
6	Brake Supply Valve
7	Solenoid Valve (Power Shift)
8	Solenoid Valve (Lo-hi)

OPERATOR'S AREA



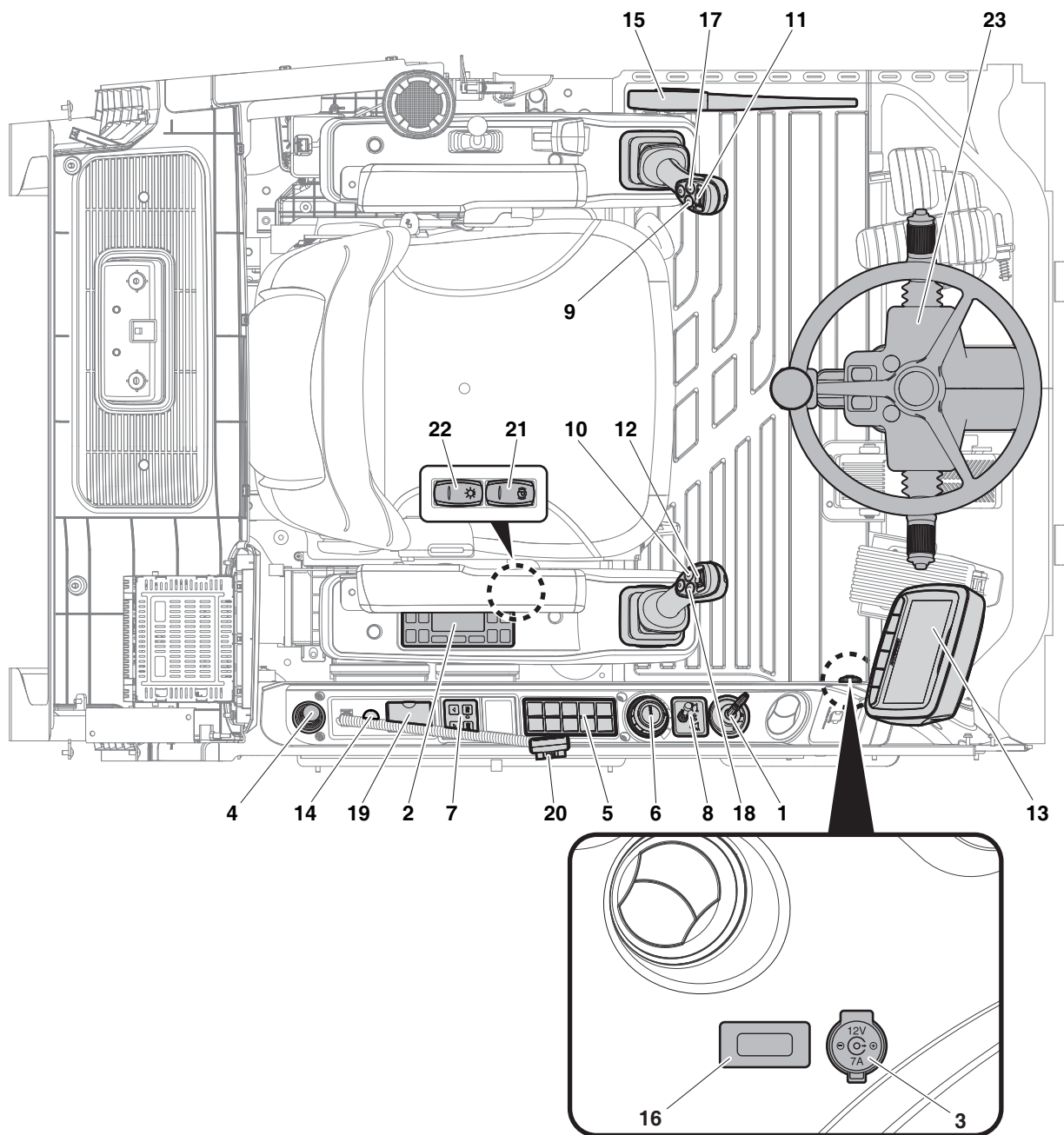
WE1500620

Figure 5

Reference Number	Description
1	Seat
2	Suspension
3	Arm Rest
4	Left-hand Work Lever (Joystick)
5	Right-hand Work Lever (Joystick)
6	Steering Wheel
7	Accelerator Pedal
8	Footrest
9	Safety Lever
10	Air Conditioner Unit
11	Display Monitor
12	Storage Space
13	Storage Space
14	Sunglass Case

Reference Number	Description
15	Cup Holder (PET)
16	Defroster Vent
17	Face Vent
18	Rear Vent
19	Foot Vent
20	Stereo
21	Hour Meter
22	Mat
23	Seat Belt
24	Engine Emergency Stop Switch
25	Power Socket for 12V
26	Two-way Pedal (Optional)
27	Brake Pedal

OPERATIONAL CONTROLS AND PANELS



WE1500621

Figure 6

Reference Number	Description
1	Starter Switch
2	Heater and Air Conditioner Control Panel
3	Power Socket for 12 V
4	Cigarette Lighter
5	Keypad
6	Engine Speed Control Dial
7	Audio Control Panel
8	Quick Coupler Switch (Optional)
9	Horn Button (Left-hand Work Lever)
10	Breaker Button (Right-hand Work Lever)
11	Rotating Switch

Reference Number	Description
12	Shear Switch
13	Display Monitor
14	Photo Sensor
15	Safety Lever
16	Hour Meter
17	One Touch Deceleration Button
18	Option Pedal Switching Button
19	Jack Assembly
20	Micro Phone (Optional)
21	Parking Brake Switch
22	Light Switch
23	Steering Console

1. Starter Switch

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

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

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

- 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", battery warning symbol and engine oil pressure warning symbols will turn "ON".

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

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

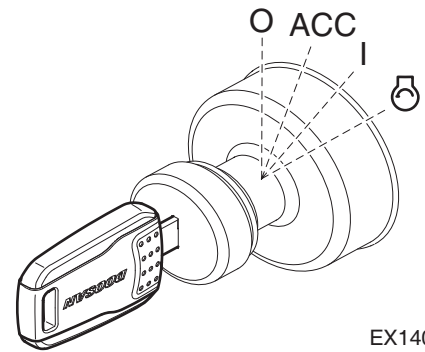


Figure 7

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 2-81, for more information.

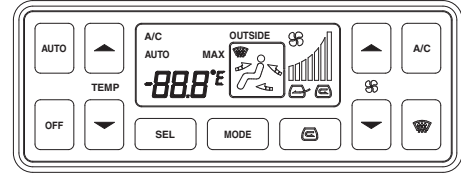


Figure 8

FG000029

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.*

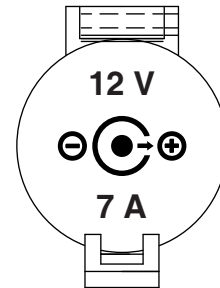


Figure 9

FG017015

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 12V only. Never connect a 24V electrical device to the lighter.*

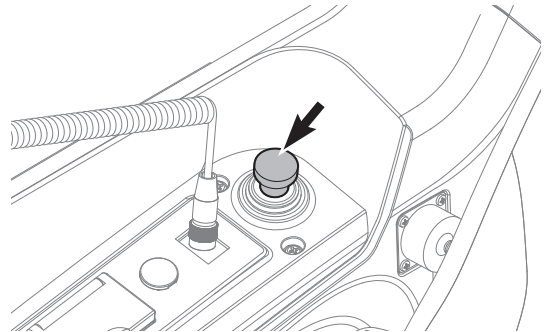


Figure 10

EX1502354

5. Keypad

Reference Number	Description
1	Power Mode Selector Switch
2	Work Light Switch
3	Overload Warning Switch
4	Work Mode Selector Switch
5	Ram Lock Switch
6	Boom Swing Switch
7	Travel Alarm Switch
8	Air Compressor Switch (Optional)
9	Buzzer Stop Switch
10	Warning Light Switch

NOTE: The keypad has a memory function. When the starter switch is turned "OFF" the settings for the keypad will be stored.

1. Power Mode Selector Switch

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

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

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

NOTE: Power mode setting is available only digging mode.

2. Work Light Switch



CAUTION

AVOID INJURY

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

Operates the work lights mounted on the boom.

- Center LED lamp "OFF": Work lights are turned "OFF".
- Center LED lamp "ON": Work lights will be turned "ON".

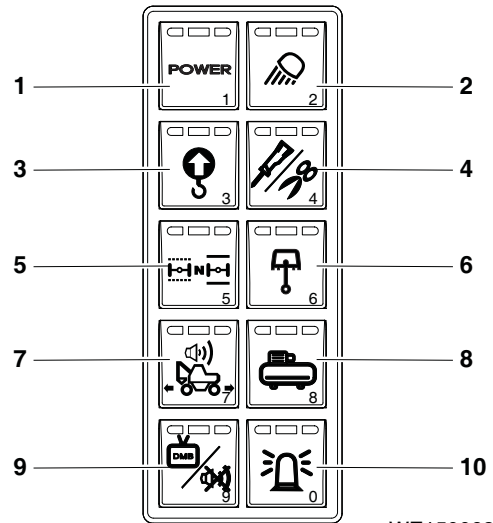


Figure 11

WE1500622

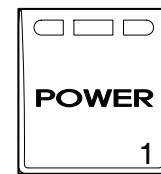


Figure 12

EX1502392

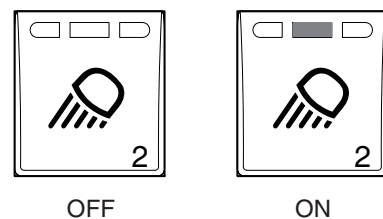


Figure 13

WE1500623

3. Overload Warning Switch

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

- Center LED lamp "OFF"; The overload warning device is turned "OFF".
- Center LED lamp "ON"; The overload warning device is turned "ON". When a load is lifted that reaches the machine's lifting limit, the warning symbol on the display monitor will turn "ON" and a warning buzzer will sound.

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



WARNING

AVOID DEATH OR SERIOUS INJURY

To prevent injury, do not exceed the rated load capacity of the machine. If the machine is not on level ground, load capacities will vary. Check for and follow all applicable laws and regulations when lifting objects.

4. Work Mode Selector Switch

Used to select the digging, breaker or shear mode.

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

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

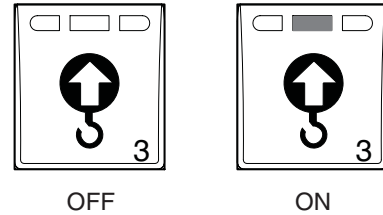


Figure 14

WE1500624

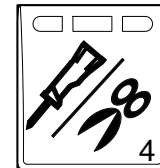


Figure 15

EX1502396

5. Ram Lock Switch

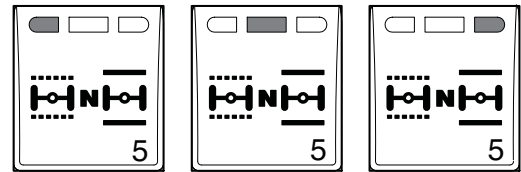
The ram lock switch controls the ram cylinder on the front axle.

- Left LED lamp "ON"; The ram lock valve is "UNLOCKED".
When traveling or working, set the ram cylinder in released state.

NOTE: *When the brake pedal is fully depressed to the bottom level or the brake is latched, the ram cylinder is "LOCKED" to hold the equipment.*

- Center LED lamp "ON"; the ram cylinder is "UNLOCKED".
- Right LED lamp "ON"; the ram cylinder is "LOCKED".

NOTE: *Regardless of the Ram Lock Switch position, applying the parking brake switch deactivates the ram lock valve cylinder*



1st Step

2nd Step

3rd Step

WE1500625

Figure 16



WARNING

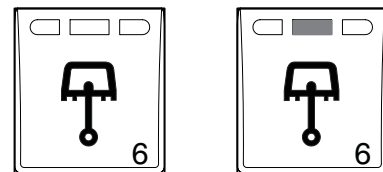
AVOID DEATH OR SERIOUS INJURY

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

6. Boom Swing Switch

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

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



OFF

ON

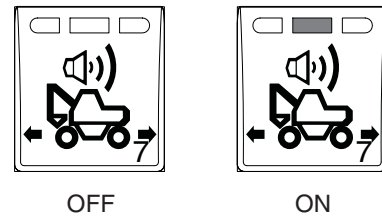
WE1500626

Figure 17

7. Travel Alarm Switch

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

- Center LED lamp "OFF": The travel alarm system is turned "OFF".
- Center LED lamp "ON": The travel alarm will sound when the machine is traveling (moving).



WE1500627

Figure 18

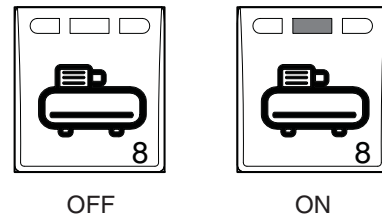
8. Air Compressor Switch (Optional)

This switch is used to activate the air compressor system.

- Center LED lamp "OFF": The air compressor system is turned "OFF".
- Center LED lamp "ON": The air compressor system is turned "ON".

NOTE: *The keypad has a memory function. When the starter switch is turned "OFF", the settings for the keypad will be stored.*

Therefore, even though the air compressor switch is set "OFF" with the engine stopped, the switch is automatically set "ON" next time the engine is started.



EX1502400

Figure 19

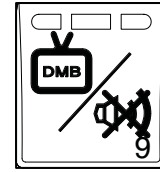
IMPORTANT

To prevent air compressor motor from overheating, do not run it or attempt to run it for more than 30 continuous minutes.

If the air compressor motor runs for more than 30 continuous minutes, the system will automatically shut off.

9. Buzzer Stop Switch

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



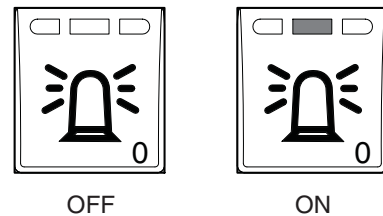
EX1502401

Figure 20

10. Warning Light Switch

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

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



EX1502402

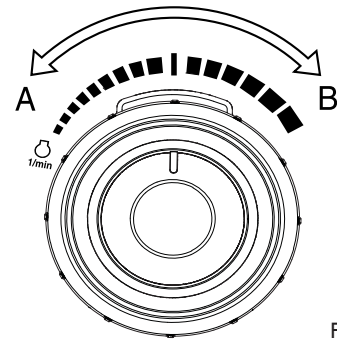
Figure 21

6. 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.

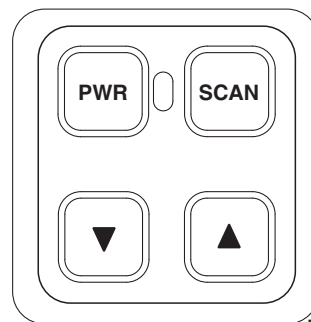


FG018094

Figure 22

7. Audio Control Panel

The audio system can be remotely controlled using this panel.



EX1502356

Figure 23

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".



EX1502357

Figure 24

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.

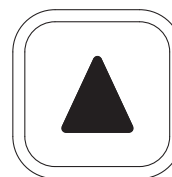


FG000022

Figure 25

Increase Volume

Press the up button, to "INCREASE" volume.

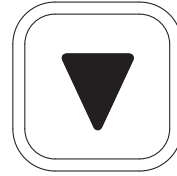


FG000020

Figure 26

Decrease Volume

Press the down button, to "DECREASE" volume.



FG000021

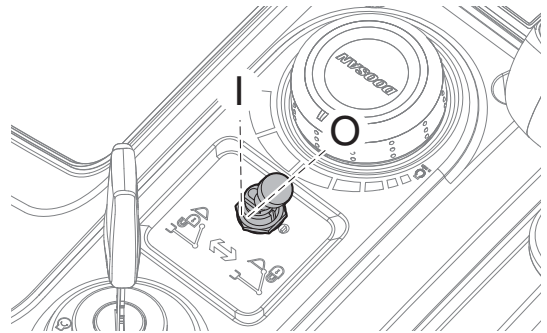
Figure 27

8. Quick Coupler Switch (Optional)

This switch is used for engaging or releasing the attachment.

- O. In this position the quick coupler release system is "LOCKED". The attachment is secured to the quick coupler.
- I. In this position the quick coupler release system is "UNLOCKED". The attachment can be released from the quick coupler.

NOTE: To move the quick coupler switch, *PULL UP* on the quick coupler switch and then move it into "I" (UNLOCKED) position.



EX1502358

Figure 28



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.

9. 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".

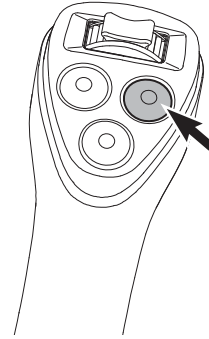


Figure 29

EX1403213

10. Breaker Button (Right-hand Work Lever)

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

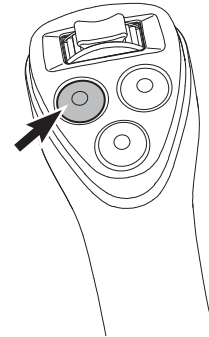


Figure 30

EX1403214

11. 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".

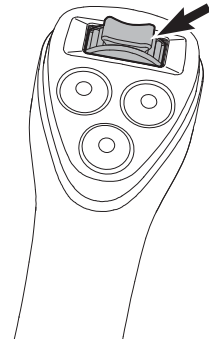


Figure 31

EX1403215



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.

12. 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)".

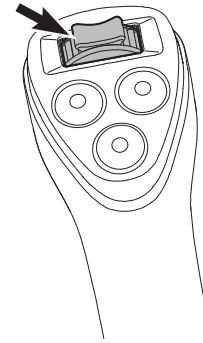


CAUTION

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.

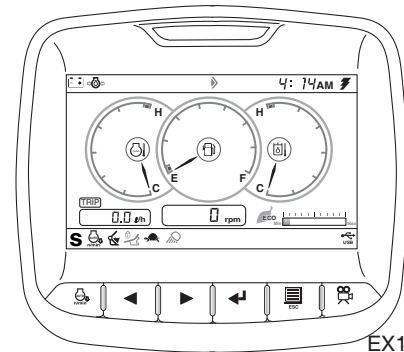


EX1403216

Figure 32

13. Display Monitor

See "Display Monitor" on page 2-30



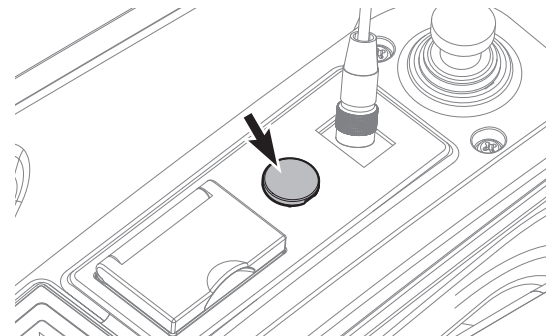
EX1502359

Figure 33

14. 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.



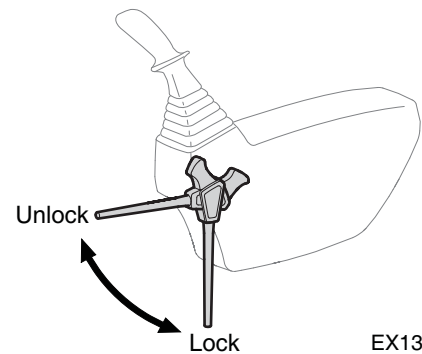
EX1502360

Figure 34

15. Safety Lever

See "Safety Lever" on page 3-18

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



EX1300566

Figure 35

16. 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.

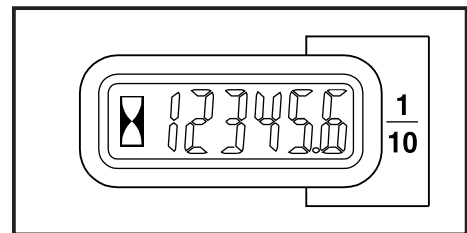


Figure 36

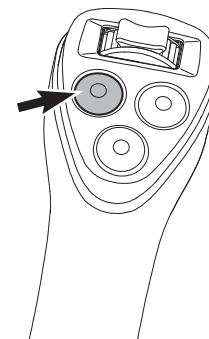
HAOA601L

17. 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.



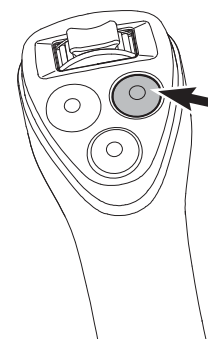
EX1403217

Figure 37

18. Option Pedal Switching Button

For machines equipped with option pedal, this button is used to select the control method between thumb wheel or pedal.

This button is applied breaker, shear and rotating function, equally.



EX1403848

Figure 38

19. 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.

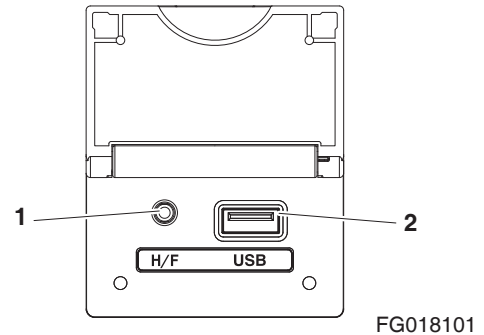


Figure 39

20. Micro Phone (Optional)

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

How to use the microphone:

A. Siren

Turn switch (1, Figure 40) on the bottom to "ON" and set switch (2) on the top to the far left position (▷), the siren will be triggered.

B. Microphone

Turn switch (1, Figure 40) on the bottom to "ON", set switch (2) on the top to the center position (⊙), and then press switch (3).

Turn switch (4, Figure 40) clockwise or counterclockwise to increase or decrease the volume.

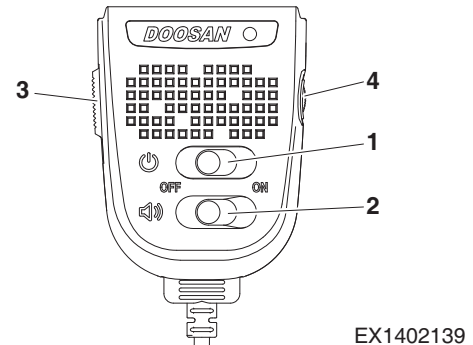


Figure 40

21. Parking Brake Switch

This switch is used to park the machine.

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

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

NOTE: If parking brake is released, the engine cannot be started. To start the engine, engage parking brake first.

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

To release parking brake, turn parking brake switch "ON" then "OFF" once more although parking brake may look not to be engaged.

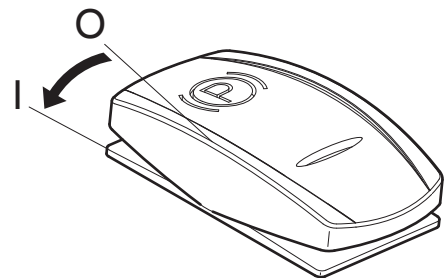
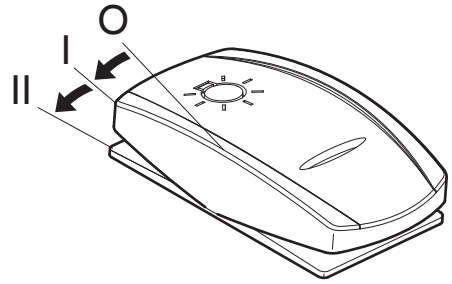


Figure 41

22. 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

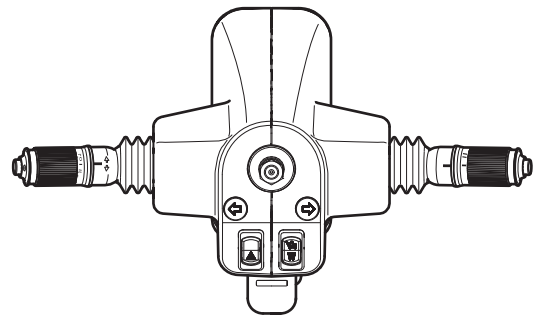
Figure 42

IMPORTANT

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.

23. Steering Console

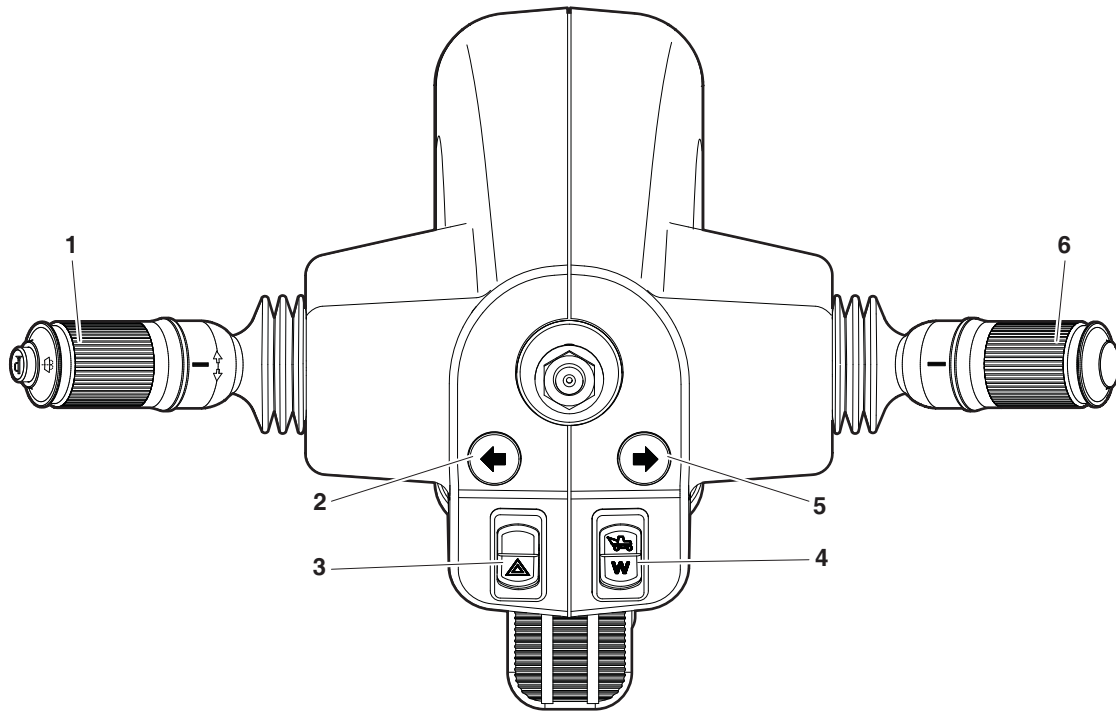
See "Steering Console" on page 2-26.



FG018109

Figure 43

Steering Console



WE1500628

Figure 44

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

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

1. Combination Switch (LH)

A. Wiper Switch

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

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

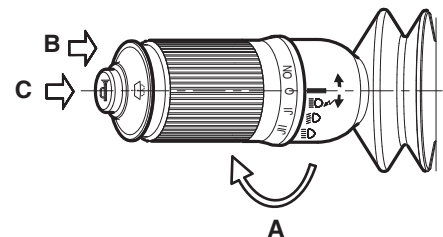
O : In this position, windshield wiper is turned "OFF"

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

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

B. Window Washer Switch

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



FG007018

Figure 45

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

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

C. Horn Button

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

D. Turn Signal Lever

Operates the left and right direction lights.

- a. Right Side Direction Switch - Pushing lever forward, activates right outside directional lights and directional indicator light on instrument panel.
- b. Left Side Directional Switch - Pulling lever back, activates left outside directional lights and directional indicator light on instrument panel.

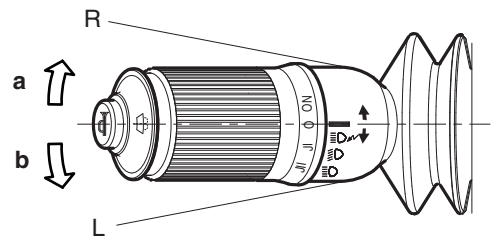
NOTE: When the turn is completed the lever automatically returns to "NEUTRAL" position. Should it not, it can be manually returned by hand.

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

E. Headlight Switch

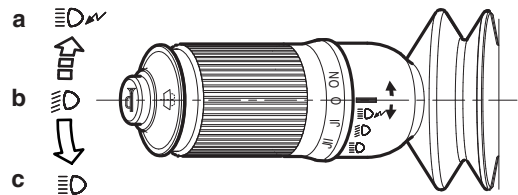
- a. Pull up - Momentarily turns "ON" both the low beams and high beams. (It returns to "NEUTRAL" position when released.)
- b. Neutral position - Normal low beams.
- c. Push down - Locks into position and turns "ON" high beams.

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



FG002183

Figure 46



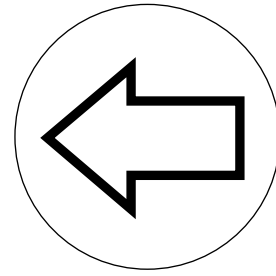
FG006179

Figure 47

2. Left Turn Signal Light and Hazard Warning Light

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

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



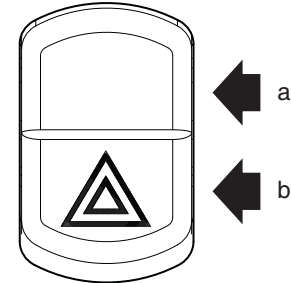
ACO0242L

Figure 48

3. Hazard Warning Light Switch

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

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



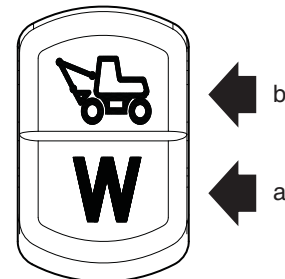
WE1500206

Figure 49

4. Work/travel Selector Switch

This switch is used to select work or travel modes.

- In work mode position, "Work Mode" is selected for normal operation.
- In travel mode position, "Travel Mode" is selected for street travel.



WE1401071

Figure 50



CAUTION

AVOID INJURY

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

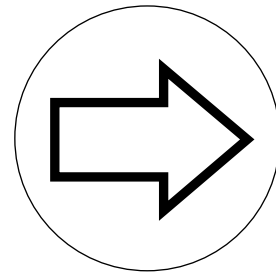
Although it is possible to travel with the switch in the work mode position, extreme caution must be exercised since the front attachment can be moved by accidentally touching the work levers (joysticks).

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

5. Right Turn Signal Light and Hazard Warning Light

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

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



ACO0243L

Figure 51

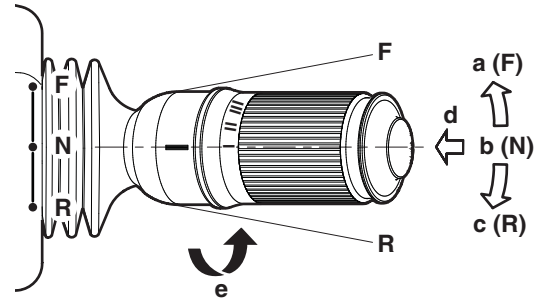
6. Travel Selector Switch

A. Forward/Reverse selector lever.

- Forward (F) - When the lever is pushed forward, transmission is in "FORWARD".
- Neutral (N) - When the lever is returned to the center position, between forward and reverse, the transmission is in "NEUTRAL".
- Reverse (R) - When the lever is pulled back, transmission is in "REVERSE".
- Ram lock shift button - When machine is under ram lock duel mode the button shifts ram lock mode to opposite mode.

NOTE: *Ram lock can be controlled with the button when ram lock switch is in "2nd Step" and not applying brake pedal.*

- Travel speed selector mode - Rotating the switch shifts forward/reverse travel speed between 1st, 2nd or 3rd.
 - "I" position - Creep speed
 - "II" position - Low speed
 - "III" position - High speed



WE1500678

Figure 52



CAUTION

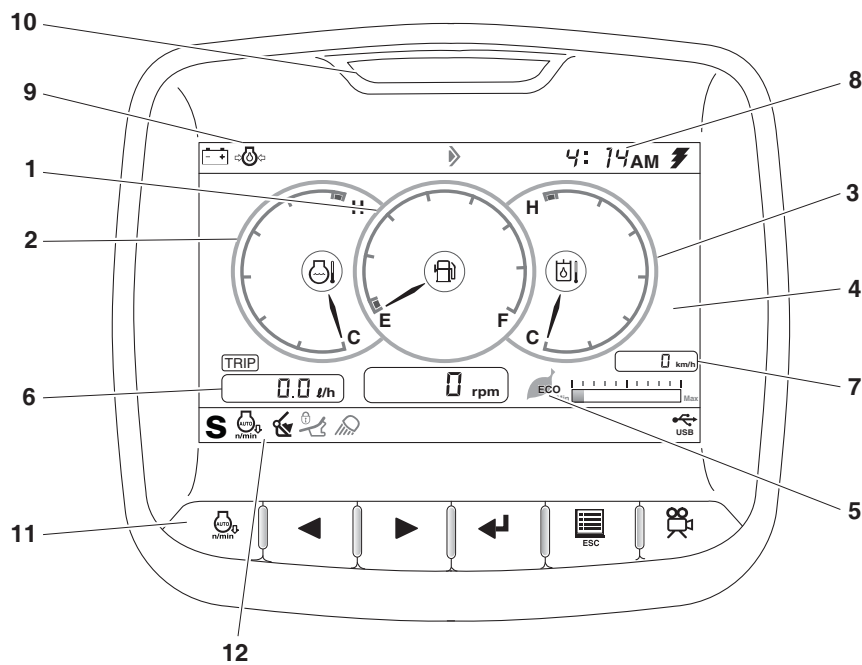
AVOID INJURY

When the machine is traveling, do not change the travel speed problem complete stop condition.

Change the travel speed under if do not like this, it can make a serious.

Change the travel speed under complete stop condition and applying brake pedal.

DISPLAY MONITOR



WE1501688

Figure 53

Reference Number	Description
1	Fuel Gauge
2	Engine Coolant Temperature Gauge
3	Hydraulic Oil Temperature Gauge
4	Multifunction Gauge and Graphic Information Area
5	ECO Gauge

Reference Number	Description
6	Trip Meter
7	Speed Meter
8	Digital Clock
9	Display Warning Symbols
10	Warning Light
11	Function Buttons
12	Selector Function Display

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 53).

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 2-65, for further details.

IMPORTANT

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.

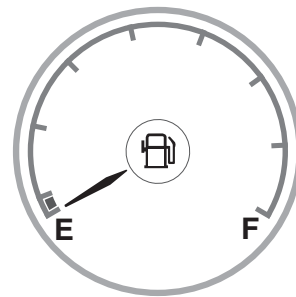
RED ZONE (■) - Indicates that fuel level is low.

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 2-35, for location of this warning symbol and others.

Check the fuel level on firm and level ground.

NOTE: Only use Ultra Low Sulfur Diesel fuel and API CJ-4/ACEA E9 grade engine oil.



EX1401618

Figure 54

2. Engine Coolant Temperature Gauge

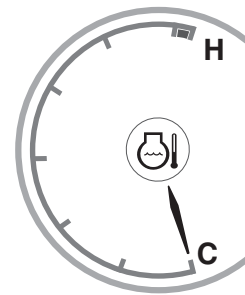
The colored bands indicate the temperature of the engine coolant.

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



EX1301000

Figure 55

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.

3. Hydraulic Oil Temperature Gauge

The colored bands indicate the temperature of the hydraulic oil.

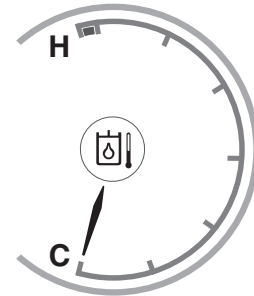
WHITE ZONE (□) - Indicates temperature is within the normal operating range.

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 2-35, for location of this warning symbol and others.



EX1301001

Figure 56

4. 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.

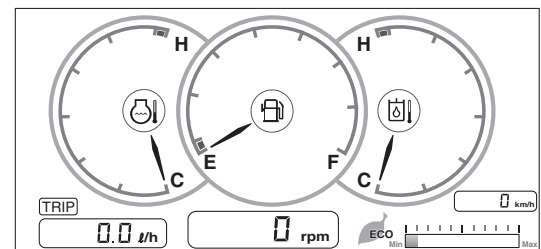
When the LOGO disappears, the multifunction gauge and graphic information screen will appear.

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 2-51 for the language selection and information display sequences.



WE1501689

Figure 57

Communication Indicator

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

1. Normal Condition:

The symbol will sequentially move like lightening.

NOTE: See Figure 58.

2. Abnormal Condition:

If the symbol is not displayed, it means there is a communication error.

NOTE: See Figure 59.

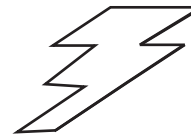


Figure 58

FG000047

Communication Error Warning

If a communication error is generated between VCU controller and display monitor, this symbol will be displayed.

When this symbol is displayed, contact a DOOSAN distributor.

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

Power mode: Standard mode

Working mode: Digging mode

Auto idle: "ON" (Selection state)

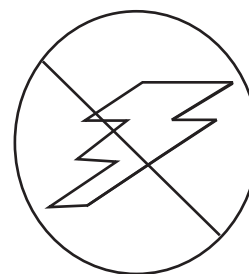


Figure 59

FG000048

Engine Speed

The engine speed is numerically displayed.



Figure 60

EX1301378

5. 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.

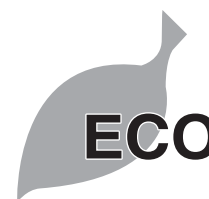


Figure 61

EX1301004

- 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.



Figure 62

FG018120

6. 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.

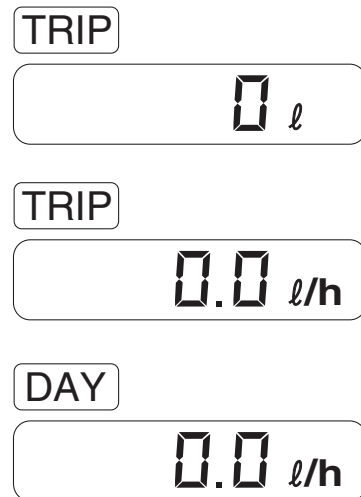


Figure 63

EX1301003

7. Speed Meter

Speed meter displays the current speed of machine. Depending on the setting it is displayed in km/h or mph.



Figure 64

WE1501690

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 2-51 for time setting.

HH:mm

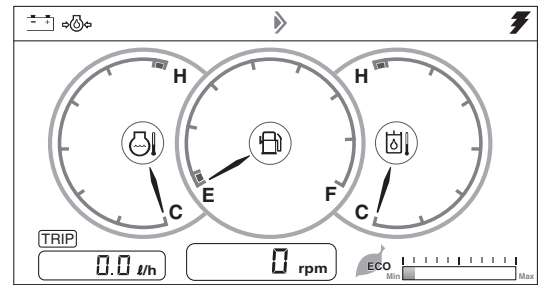
Figure 65

FG018262

9. Display Warning Symbols

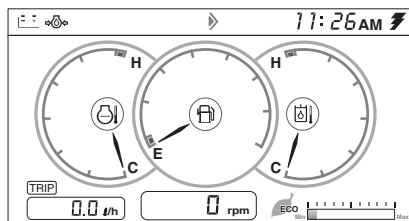
Reference Number	Description
1	Charge Warning Symbol
2	Engine Oil Pressure Warning Symbol
3	Engine Coolant Temperature Warning Symbol
4	Preheating Indicator Symbol
5	Engine Check Warning Symbol
6	Hydraulic Oil Overheat Warning Symbol
7	Fuel Shortage Warning Symbol
8	Air Cleaner Clogged Warning Symbol
9	Water in Fuel Warning Symbol
10	Quick Coupler Release System Activated Warning Symbol (Optional)
11	Overload Warning Symbol
12	Engine Stop Warning Symbol
13	Machine Check Symbol
14	Machine Stop Symbol
15	Brake Oil Pressure Warning Symbol

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



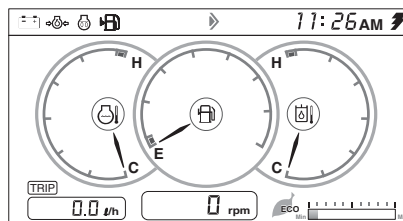
EX1502370

Figure 66



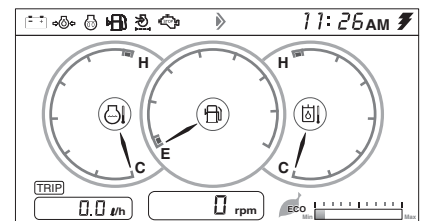
EX1502371

<2 kinds of warning symbols>



EX1502372

<4 kinds of warning symbols>



EX1502373

<6 kinds of warning symbols>

Figure 67

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.

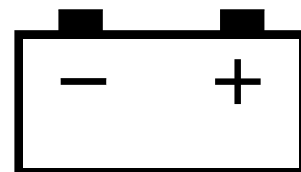


Figure 68

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.

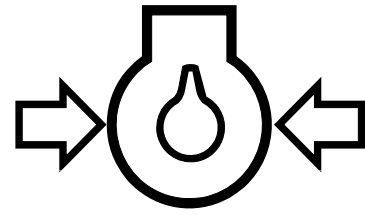


Figure 69

HAOA620L

IMPORTANT

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.

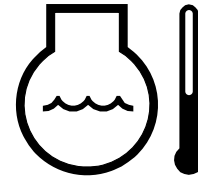


Figure 70

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.

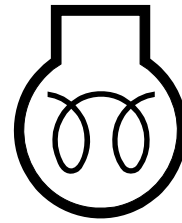


Figure 71

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.*

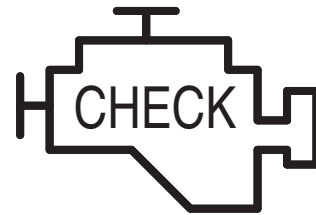


Figure 72

FG000045

6. Hydraulic Oil Overheat Warning Symbol

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

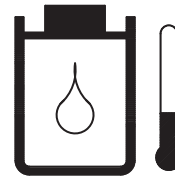


Figure 73

FG000056

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.

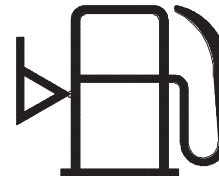


Figure 74

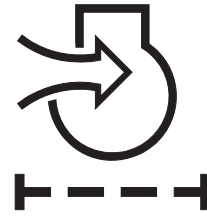
FG000057

8. 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.



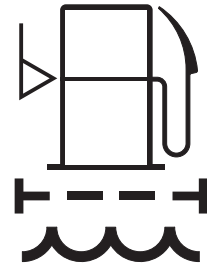
FG000053

Figure 75

9. 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.



FG013744

Figure 76

10. Quick Coupler Release System Activated Warning Symbol (Optional)

This symbol indicates when the quick coupler release system is activated. A buzzer will also sound 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 77

11. Overload Warning Symbol (Optional)

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.



WARNING

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.

12. 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.



Figure 78

FG000253

12. 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.

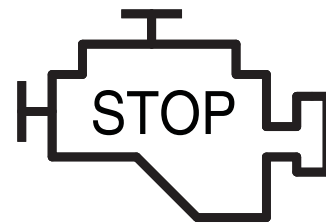


Figure 79

FG019003

13. 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.*



Figure 80

EX1301379

14. 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.*



Figure 81

EX1301380

15. Brake Oil Pressure Warning Symbol

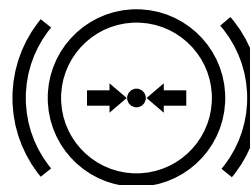
This symbol indicates when the pressure in hydraulic brake line is lower than the regulatory level.



WARNING

AVOID DEATH OR SERIOUS INJURY

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



BCS0800L

Figure 82

10. Warning Light

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

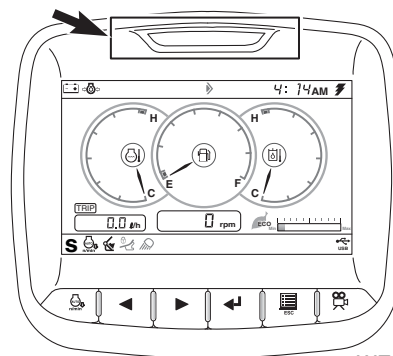
IMPORTANT

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

IMPORTANT

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

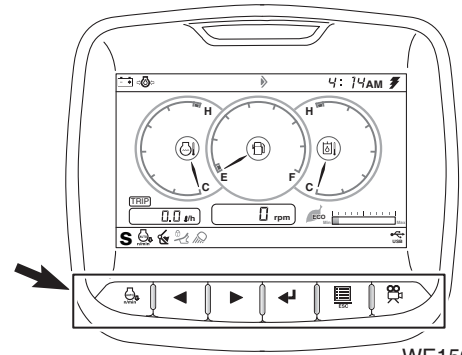
NOTE: For explanation of warnings see "Warning Pop-up Window" on page 2-48.



WE1500630

Figure 83

11. Function Buttons



WE1500631

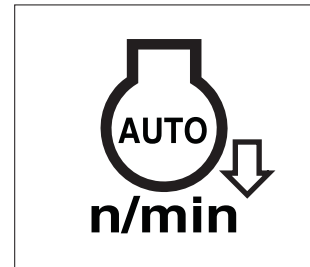
Figure 84

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

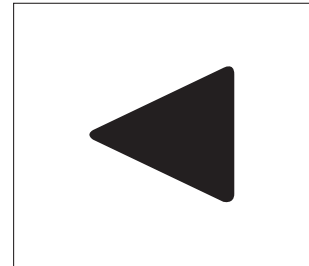


EX1301010

Figure 85

2. Up Arrow Button

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



EX1301011

Figure 86

3. Down Arrow Button

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

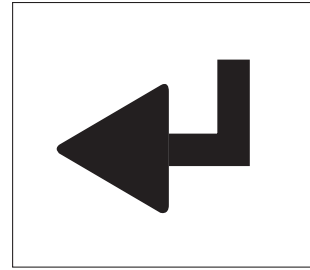


EX1301012

Figure 87

4. Selector Button

Selection button (←), is used to enter the selected menu or clear the operating hour of filter/oil.



EX1301013

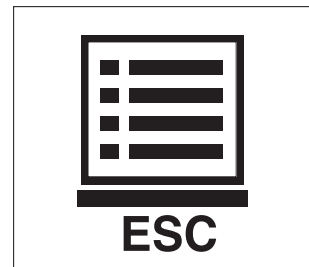
Figure 88

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.

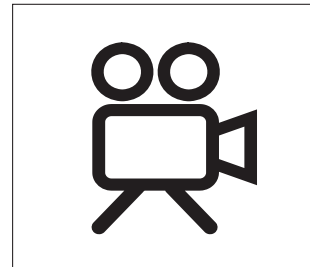


EX1301014

Figure 89

6. Camera Mode Selector

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



EX1301015

Figure 90

12. Selector Function Display

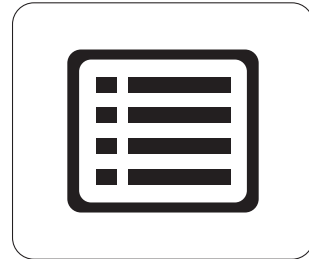
See "Switch Operation Indication" on page 2-77.

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.



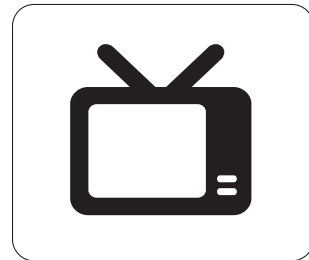
EX1301394

Figure 91

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 92

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 93

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 94

5. 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.*



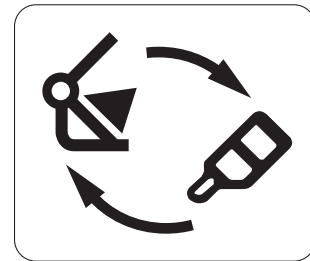
EX1301399

Figure 95

6. Work Mode

When optional equipment is installed on the equipment, digging 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 96

7. Trip Meter

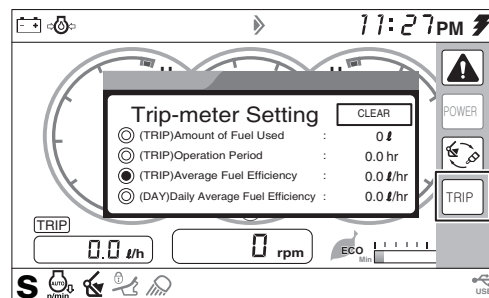
Use this to see fuel usage according to operation time, operation period, average mileage and daily average mileage.

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



EX1301401

Figure 97



WE1500637

Figure 98

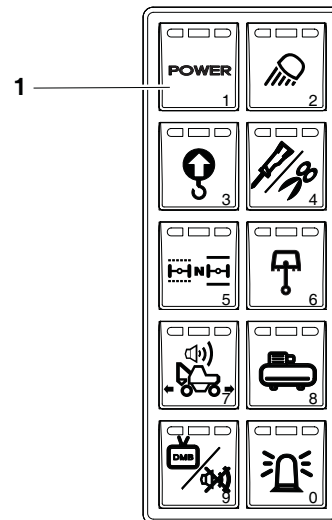
13. Mode Selector Buttons

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

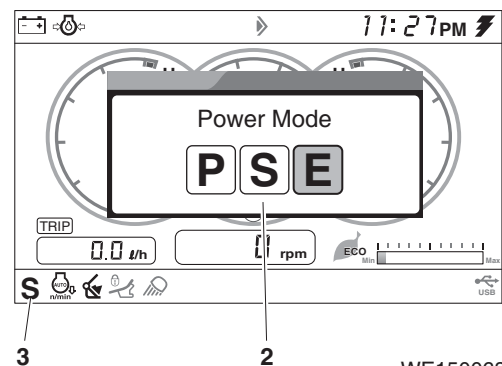
- A. When the starter switch is turned "ON" the power mode is automatically defaulted to the standard setting.
- B. Select a proper power mode using button (1, Figure 99) before starting work.
- C. When the power mode button (1, Figure 99) is pressed, instrument panel displays a power mode selection pop up menu (2, Figure 100).

When power mode is selected, symbol (3, Figure 100) shows on screen.



WE1500632

Figure 99



WE1500633

Figure 100

Mode	Selection Point
Power Mode	<ul style="list-style-type: none"> Fast work. Work in a short period of time.
Standard Mode	<ul style="list-style-type: none"> General work. Optimize speed and fuel consumption.
Economy Mode	<ul style="list-style-type: none"> Light work. Minimize fuel consumption. Reduce noise.

Work Mode

- A. When the starter switch is turned "ON" the work mode is automatically defaulted to digging mode.
- B. Select a proper work mode using button (2, Figure 101) before starting working.
(Digging/Breaker/Shear Mode)

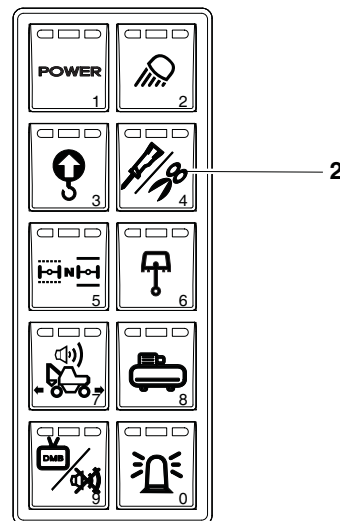


Figure 101

WE1500634

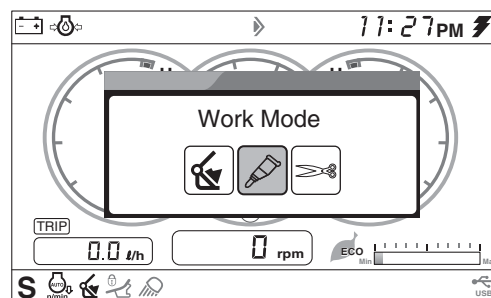


Figure 102

WE1500635

Auto Idle Mode

- A. 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.
- B. When the starter switch is turned "ON", the work mode is automatically defaulted to "AUTO IDLE".
- C. When the symbol (4, Figure 103) is turned "ON", the auto idle function is activated. Deactivate the auto idle function by again pressing the auto idle selector button (3, Figure 103). Now the symbol will be turned "OFF".

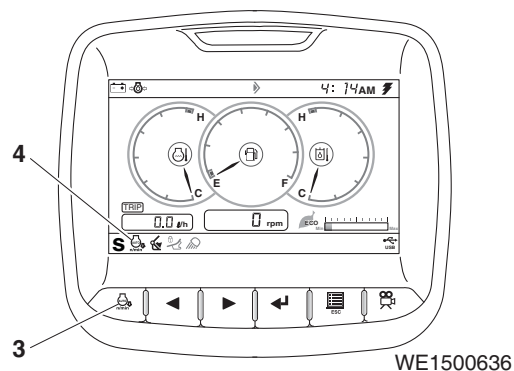


Figure 103

WE1500636



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.

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 is pressed.

For multiple warnings and/or alarms, press the ◀ and ▶ buttons to select the warning/alarm and read the relevant message.



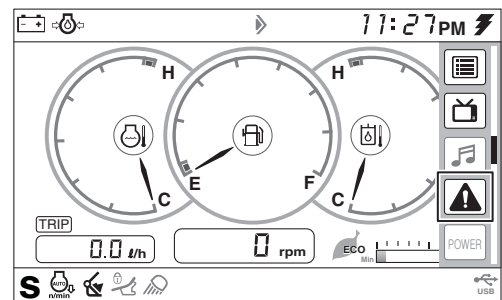
WARNING

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

Press the ◀ and ▶ buttons on the dashboard to activate the launch menu.

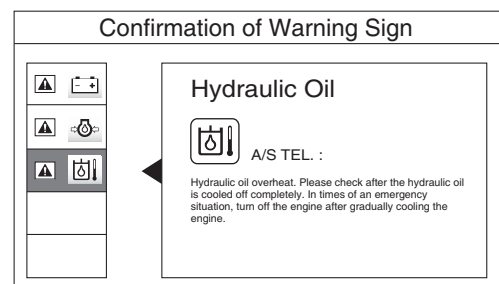


WE1500638

Figure 104

2. Enter Checking Mode

Move the cursor over the Confirmation of Warning Sign using the ◀ and ▶ buttons and press the ◀ button to see details of the malfunction.

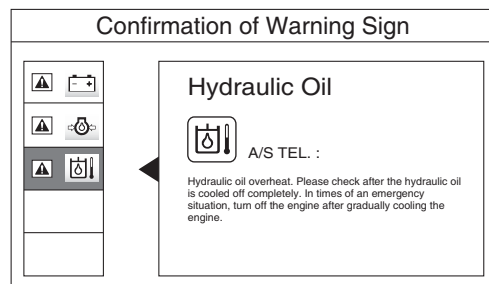


EX1301405

Figure 105

3. Read Warning Message

Check the warning message by pressing the  button.

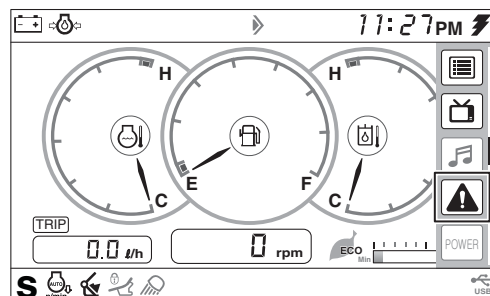


EX1301405

Figure 106

4. Delete Warning Pop-up

Press escape button to delete the warning pop-up window.



WE1500638

Figure 107

Warning Pop-up Windows List

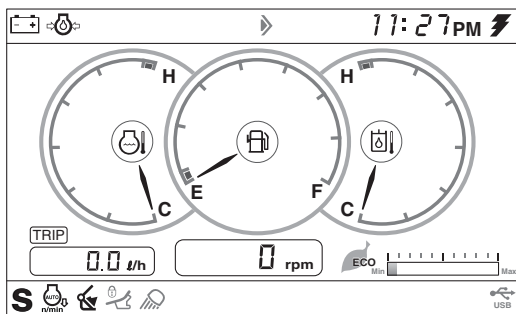
	Warning	Description
1	Charge	Check the battery charging system.
2	Low E/G Oil Pressure	Check the engine oil system.
3	Coolant Overheat	Coolant is overheated. Service/repair the cooling system after fully cooled down.
4	Preheat	Being preheated.
5	E/G Warning	Check the engine system.
6	Water in Fuel	Drain the water in the fuel filter.
7	Hydraulic Oil	Hydraulic oil is overheated. 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	Brake Oil Pressure Low	Brake oil pressure is too low. Check the brake system.
11	Quick Coupler	Quick coupler release system is activated. Check locking system to prevent attachment from falling off.
12	Machine Warning	Check the machine system.

USER MENU

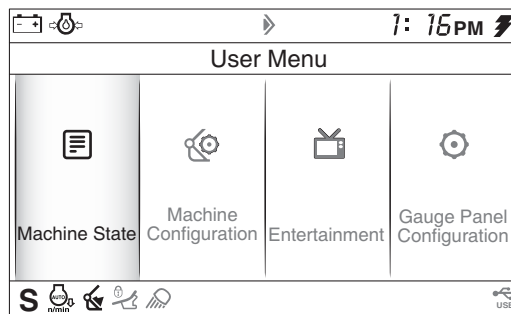
User Menu - Access and Escape Methods

Access Method

1. Proceed to the user menu using the menu/esc button on the front of the dashboard.
2. Select the user menu from the launch menu.



<Normal Indication Monitor>



<Main Menu Monitor>

WE1500639

Figure 108

Escape Method

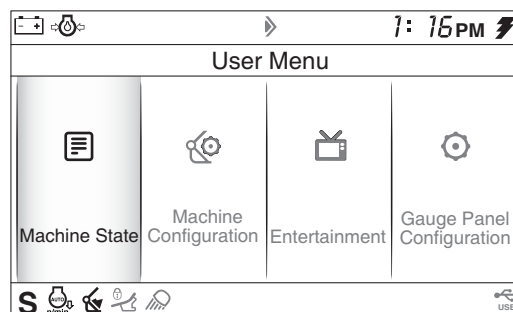
1. Press the ESC button to move to the normal display screen.
2. If 20 seconds have passed without the operation of the button, the normal display screen will be displayed.
3. Turning "OFF" the starter switch to cut off power, you will move to the normal display screen.

User Menu

Use the ◀ and ▶ buttons and move the cursor to see a reversed display on the desired menu. Then, press the ◀ button to select the menu.

Machine State ↔ Machine Configuration ↔ Entertainment ↔ Gauge Panel Configuration

Press the ESC button to return to the previous screen.



WE1500640

Figure 109



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.

Use the ◀ and ▶ buttons and move the cursor to see a reversed display on the desired menu. Then, press the ↵ button 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 pressure, voltage, fuel level, etc.

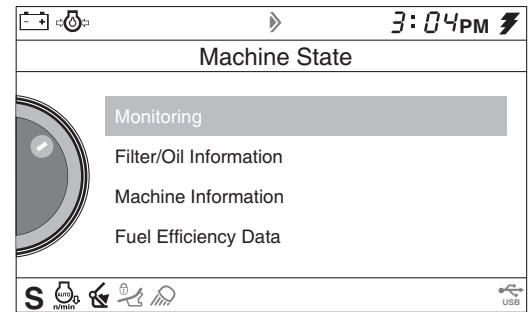
At the machine state, if the cursor is placed on Monitoring, press the ↵ button to display the Monitoring screen.

Press the ESC button to return to the previous screen.

B. Filter/Oil Information

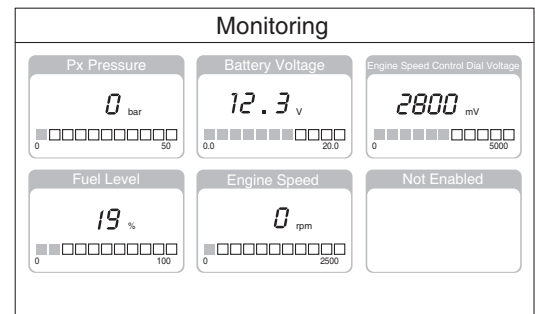
The screen displays the information on filter/oil use time, replacement period, and remaining time.

At the machine state, if the cursor is placed on the filter/oil information, press the ↵ button to display the filter/oil information.



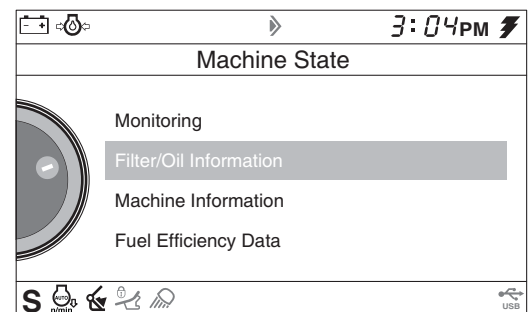
WE1500641

Figure 110



EX1502378

Figure 111



WE1500642

Figure 112

Reset Method/Replacement Period Change Method

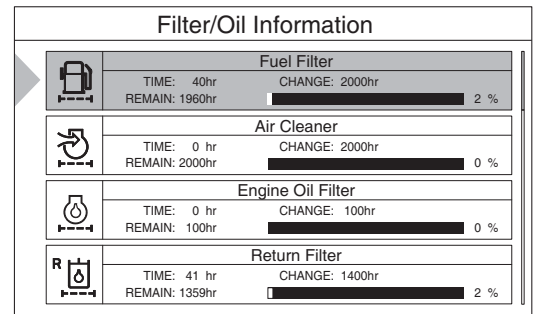
Move the cursor over the filter/oil item you wish to change using the ◀ and ▶ buttons on the front of the dashboard and press the ↵ button on the front of the dashboard. A window for resetting/changing the filter/oil time will pop-up.

To reset the use time, move the cursor over 'clear' and press the ↵ button on the front of the dashboard.

Use the ◀ and ▶ buttons to locate it at YES. Then, press the ↵ button to reset the operation hour.

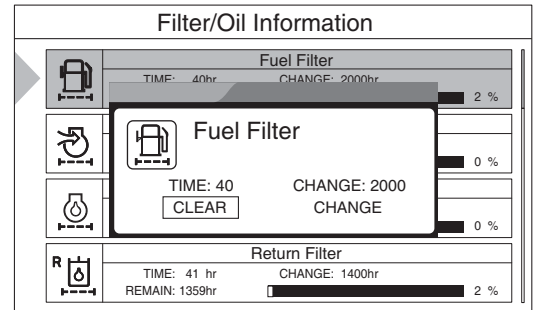
Use the ◀ and ▶ buttons to locate it at NO. Then, press the ↵ button to allow the pop-up window to disappear without resetting the operation hour.

- 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.



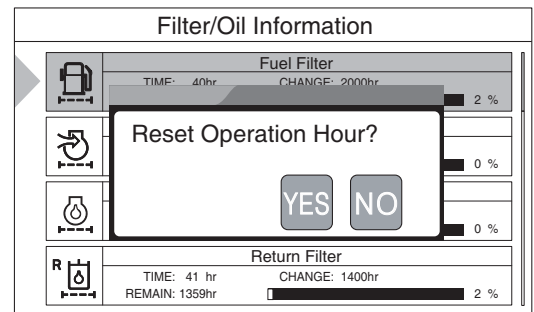
EX1301406

Figure 113



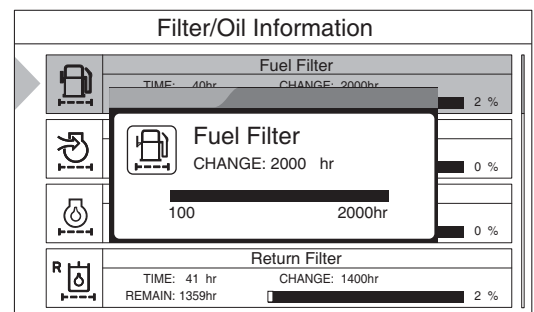
EX1301407

Figure 114




EX1301408


Figure 115






EX1301409




Figure 116




In order to change the filter/oil exchange period, move the cursor over 'change' in the window for resetting/changing the filter/oil time and press the  button on the front of the dashboard.

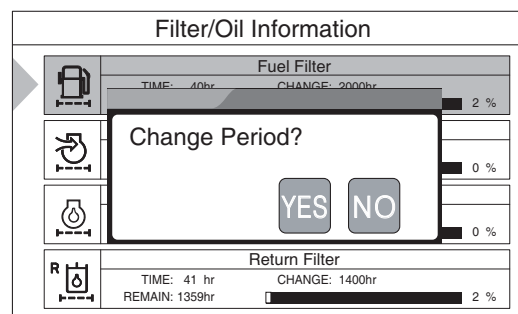
After the exchange period change screen pops up, press the  button on the front of the dashboard and the exchange time will start flashing.

Next, change the exchange period using the  and  buttons on the front of the dashboard.

With the replacement period change being completed, press the  button to create a pop-up window to select the period change.

Use the  and  buttons to locate it at YES. Then, press the  button to change the replacement period.

Use the  and  buttons to locate it at NO. Then, press the  button to allow the pop-up window to disappear without the replacement period not being changed.



EX1301410









Figure 117

Filter/Oil Period Setup Table

Unit: time (hr)


Kind	Replacement Period		
	Basic Setup Value	Minimum Available Setup Value	Change Value By Step
Fuel Filter	500	100	50
Air Cleaner	500	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 Water	2,000	1,000	50

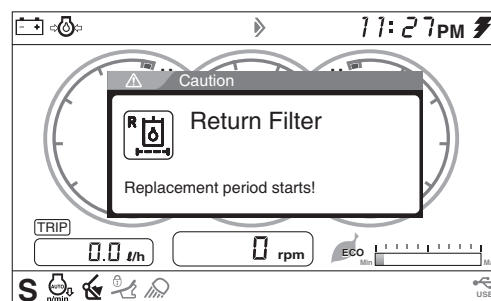
Symbol Description

Filter/ Oil Name	Fuel Filter	Air Cleaner	ENG Oil Filter	Return Filter	Pilot Filter	ENG Oil	HYD. Oil	Coolant Water
Icon								

EX1300858


Figure 118

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  button to allow the pop-up window to disappear.



WE1500643

Figure 119

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




WARNING

AVOID DEATH OR SERIOUS INJURY

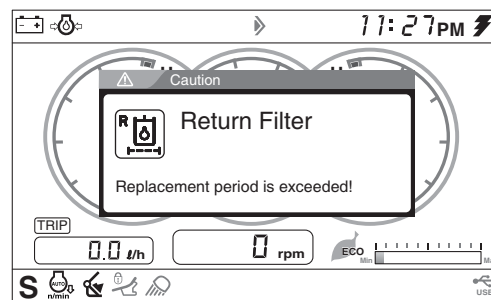
Do not use machine state menu when traveling or operating.

C. Machine Information

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

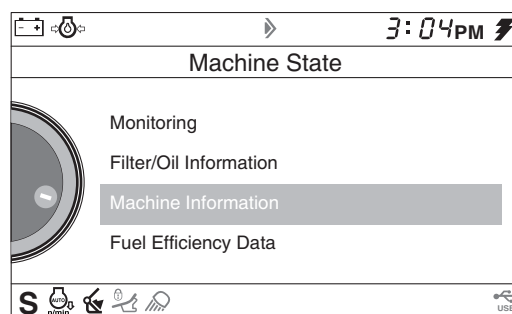
At the machine state, if the cursor is placed on the machine information, press the  button to access the machine information screen.

Click the ESC button to return to the previous screen.



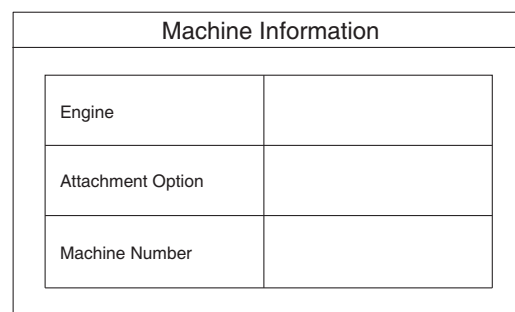
WE1500644

Figure 120



WE1500645

Figure 121



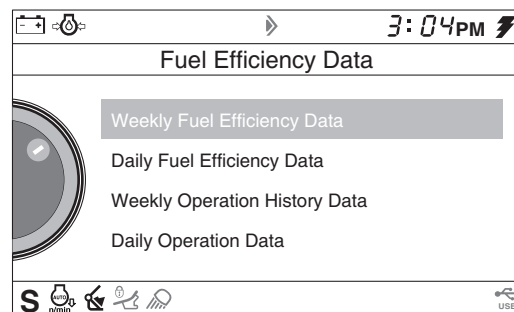
WE1500736

Figure 122

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.

NOTE: *Fuel related information displayed on the instrument cluster is supportive information for the current operating environment and condition. This indication may differ from the actual value (fuel consumption) based on the actual machine specification, operating pattern and operating environment.*

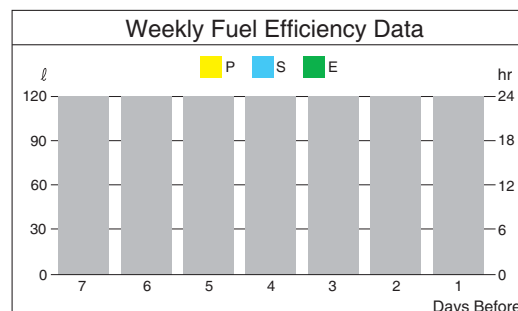


WE1500646

Figure 123

1) Weekly Fuel Efficiency Data

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

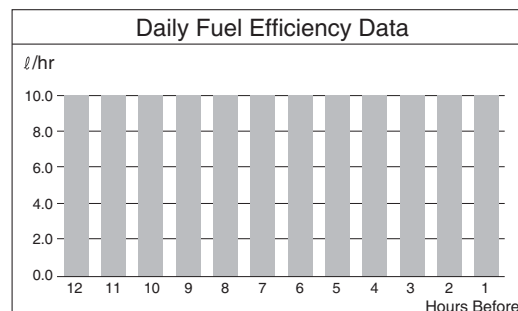


EX1502385

Figure 124

2) Daily Fuel Efficiency Data

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



EX1402171

Figure 125

3) Weekly Operation History Data

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

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 126

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

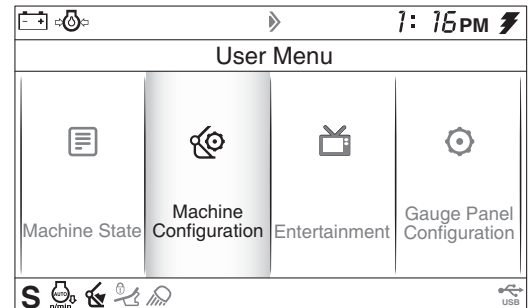
EX1402173

Figure 127

2. Machine Configuration

This is used when selecting the functions such as attachment setting.

Use the ◀ and ▶ buttons and move the cursor to see an reversed display on the desired menu. Then, press the ↵ button to select the menu.

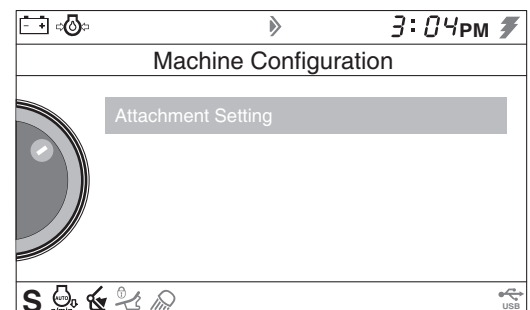


WE1500647

Figure 128

Attachment Setting

Press the ESC button to return to the previous screen.



WE1500648

Figure 129

A. Attachment Setting

Attachment setting screen is used to set 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.

Attachment Setting	
Attachment Use	Button Type <input type="checkbox"/> Toggle
Max E/G Limit	Max Press(ATT)
Max Flow(Pump)	Max Flow(ATT)
2 Pump Option	Min Flow(ATT)

EX1502388

Figure 130

3. Entertainment

This menu is used to replay Video and MP3.

Use the ◀ and ▶ buttons and move the cursor to see a reversed display on the desired menu. Then, press ◀ button to select the menu.

Video ↔ MP3

Press the ESC button to return to the previous screen.

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 to remove pop-up window.

For details, See "Gauge Panel Configuration" on page 2-65

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.

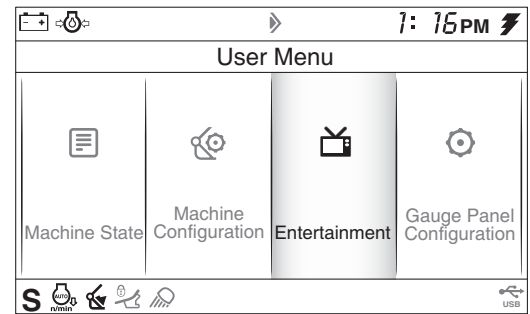
Press the ESC button to remove pop-up window.



WARNING

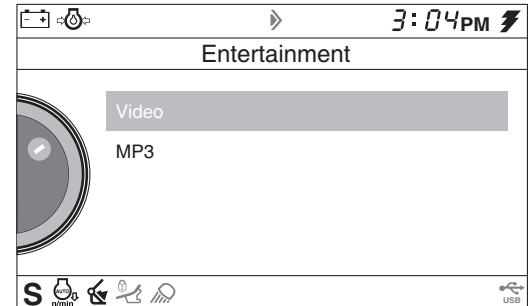
AVOID DEATH OR SERIOUS INJURY

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.



WE1500650

Figure 131



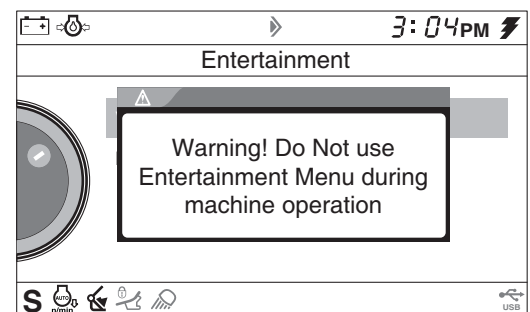
WE1500651

Figure 132



WE1500652

Figure 133

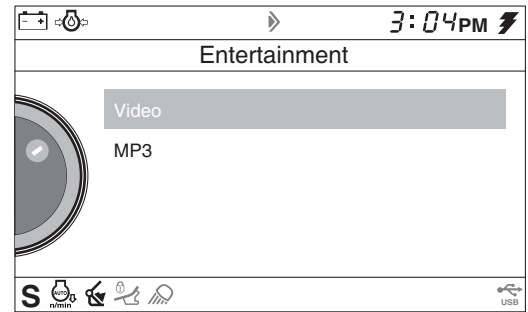


WE1500653

Figure 134

A. Video

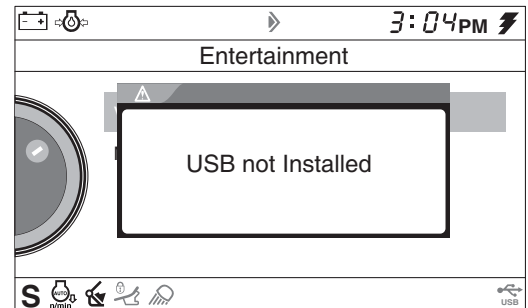
From the entertainment screen, select video to access it.



WE1500655

Figure 135

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

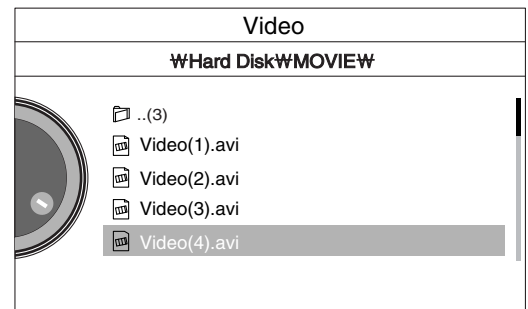


WE1500656

Figure 136

When initially accessing the video player, the USB storage system file tree is displayed on the screen, use the ◀ and ▶ buttons to select and play a video.

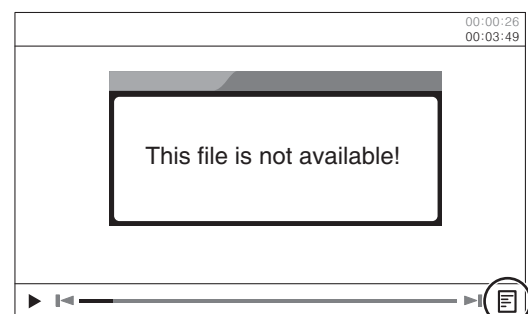
If there is a video file that played last, it will automatically be replayed.



FG018511

Figure 137

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 138

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.

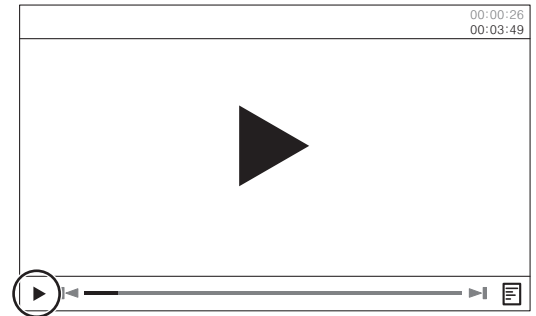
The bottom displays the video player function operation symbol and cursor.

The video player function operation symbol and ◀ and ▶ buttons are operated in the following order.

Play/Pause ↔ **Replay the Previous File** ↔ **Video Progress Bar** ↔ **Replay the Next File** ↔ **Video Files List**

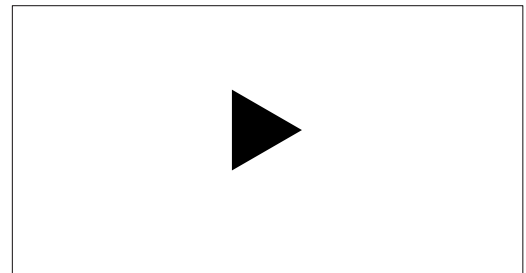
If no operation continues for more than 5 seconds, the video will automatically be converted into the whole screen.

On the whole screen, press the ◀ button or the ESC button to remove whole screen.



EX1301452

Figure 139



FG018214

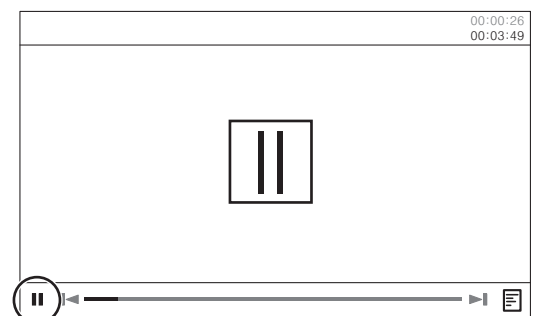
Figure 140

Play/Pause

Locate the cursor on the play/pause symbol and press the ◀ button to execute the video's play/pause functions.

With the play being on, press the ◀ button to display the pause symbol at the center of the screen, thus allowing the video to pause.

With the pause being on, press the ◀ button to cause the pause symbol at the center of the screen to disappear, resuming the video playing.

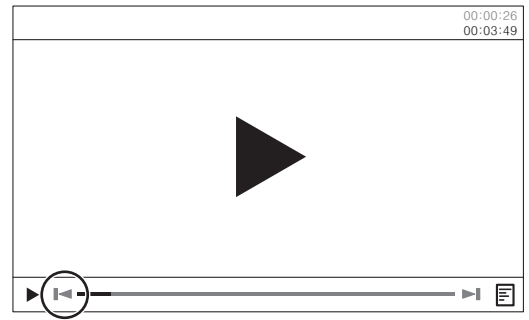


EX1301453

Figure 141

Replay the Previous File

Locate the cursor at the replay the previous file symbol and press the ◀ button to replay the previous file.



EX1301454

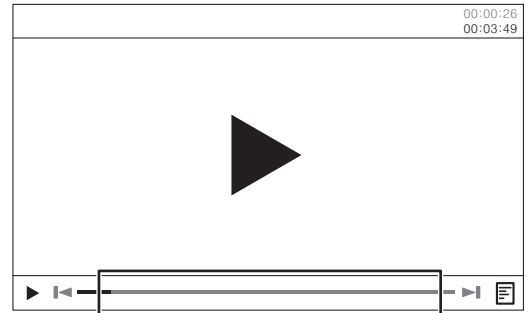
Figure 142

Locate the cursor at the video progress bar and press the ◀ button to convert into the fast forward/rewinding mode.

On the fast forward/rewinding mode, use the ◀ and ▶ buttons to conduct fast forward/rewinding.

Fast forward/rewinding can be conducted at an interval of 30 seconds per click during which the ◀ and ▶ buttons are pressed.

On the fast forward/rewinding mode, press the ESC button to disable the fast forward/rewinding mode.

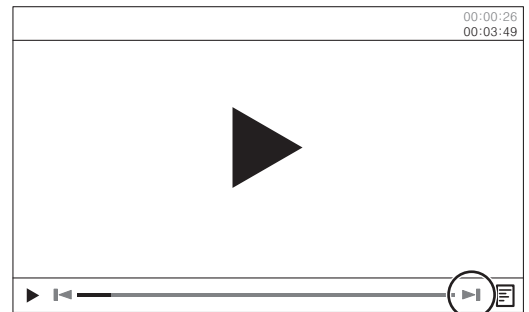


EX1301455

Figure 143

Replay the Next File

Locate the cursor at the replay the next file symbol and press the ▶ button to replay the next file.

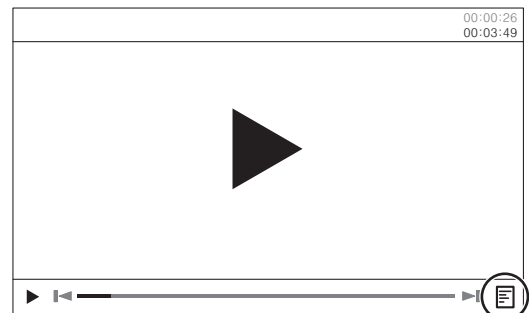


EX1301456

Figure 144

Video Files List

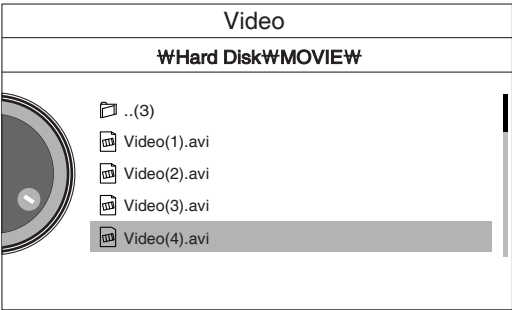
Locate the cursor at the video files list symbol and press the ◀ button to move to the video file list screen.



EX1301457

Figure 145

Select and replay a video.

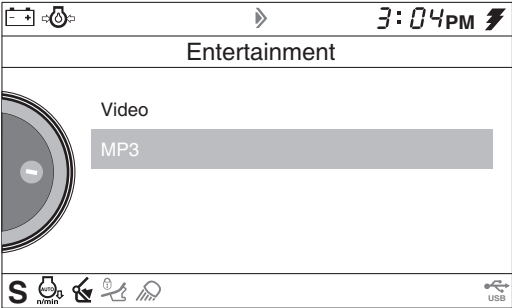


FG018557

Figure 146

B. MP3

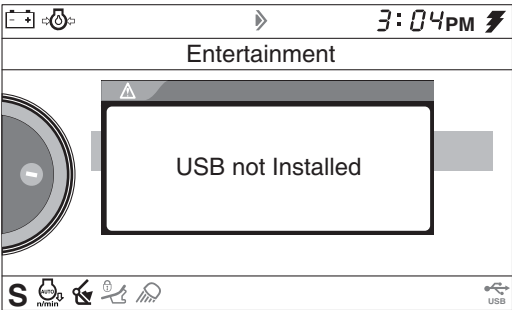
From the entertainment screen, select MP3 to access it.



WE1500657

Figure 147

If there is no USB storage system, a pop-up window is displayed for 3 seconds, saying "USB not Installed" and the MP3 player is not run.

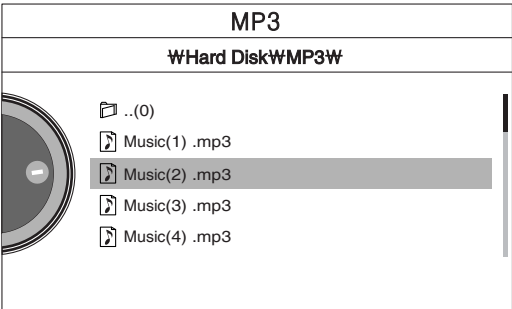


WE1500658

Figure 148

When initially accessing the MP3 player, the file tree screen of USB storage system is displayed. Use the ◀ and ▶ buttons to select and play an MP3 file.

If there is an MP3 file played last, the file will automatically be played.



FG018560

Figure 149

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 ◀ and ▶ buttons 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

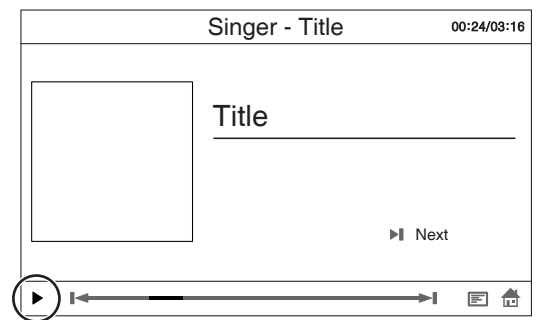
Locate the cursor at the play/pause symbol and press the ◀ button to execute the MP3 play/pause functions.

With play being on, press the ◀ button to display the pause symbol at the center of the screen, causing the MP3 to pause.

With pause being on, press the ◀ button to cause the pause symbol at the center of the screen to disappear, resuming the MP3 playing.

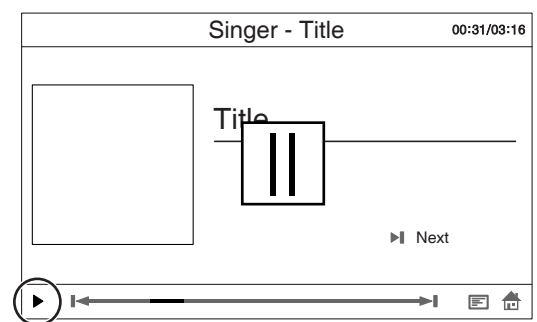
Replay the Previous File

Locate the cursor at the replay the previous file symbol, and press the ◀ button to replay the previous file.



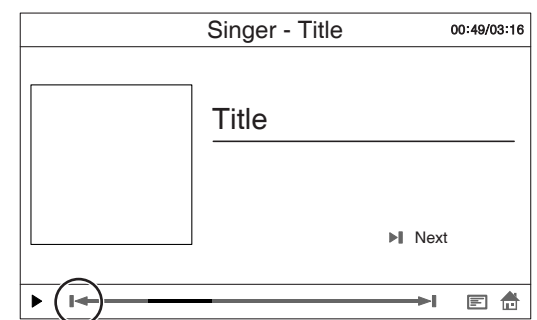
FG020124

Figure 150



FG020125


Figure 151







FG020126

Figure 152

Fast Forward/Rewinding


Locate the cursor at the video progress bar and press the  button to convert into the fast forward/rewinding mode.

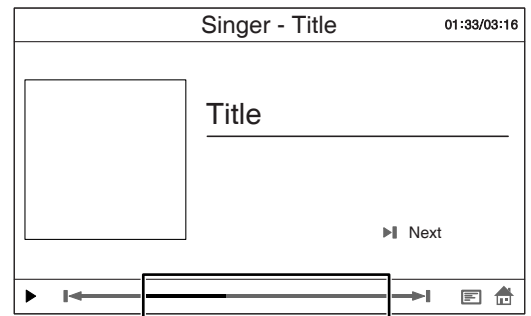
On the fast forward/rewinding mode, use the  and  buttons to conduct fast forward/rewinding.

Fast forward/rewinding can be conducted at an interval of 30 seconds per click during which the  and  buttons are pressed.

On the fast forward/rewinding mode, press the ESC button to disable the fast forward/rewinding mode.

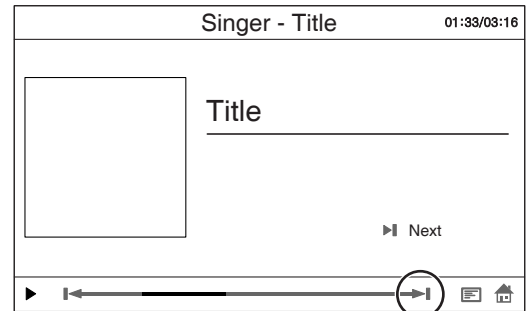
Replay the Next File

Locate the cursor at the replay the previous file symbol and press the  button to replay the next file.



FG020127


Figure 153

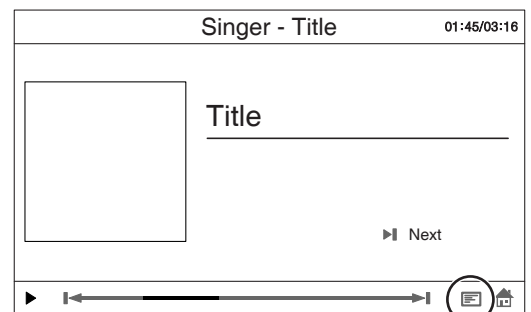


FG020128

Figure 154

MP3 Files List

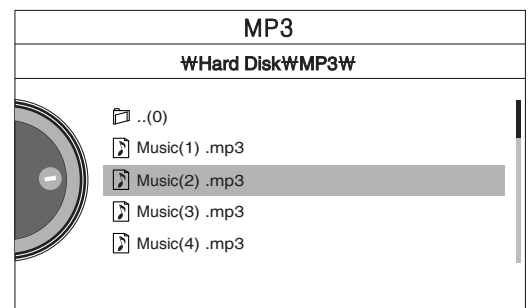
Locate the cursor at the MP3 files list symbol and press the  button to move to the file list screen.



FG020129

Figure 155


Select a file and replay the MP3.

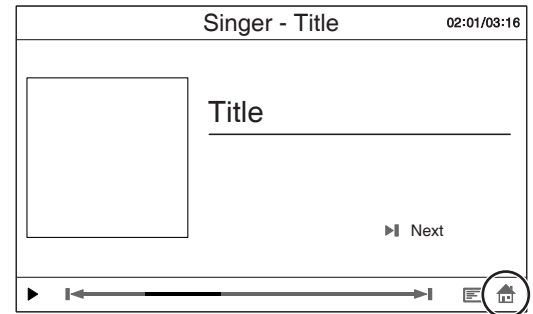


FG018560

Figure 156

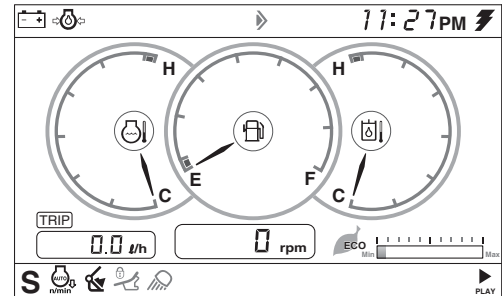
Background MP3 Play

Position the cursor on the "HOME" button and press the  button, MP3 is played by the initial screen.



FG020130


Figure 157



WE1500659

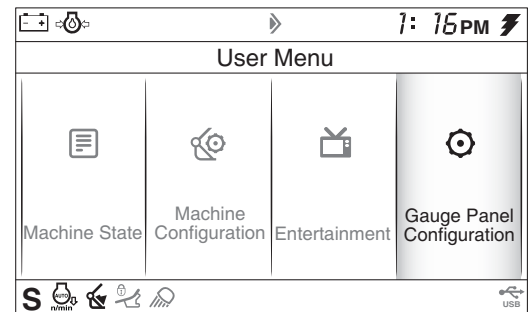
Figure 158

4. Gauge Panel Configuration

This menu is used to set up password, brightness, default screen and time, and to input service phone number. Move the cursor to see a reversed display on the desired menu. Then, press the  button to select the menu.

Password Setting ↔ Brightness 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.



WE1500661

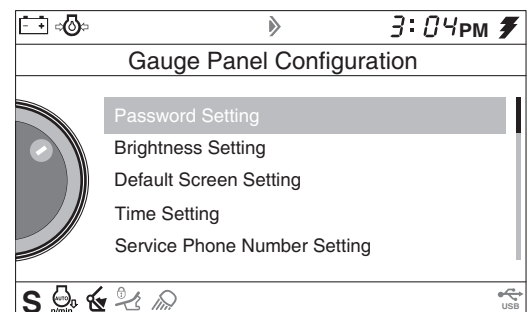
Figure 159

A. Password Setting

Password Setting

An owner passwords and user 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.



WE1500662

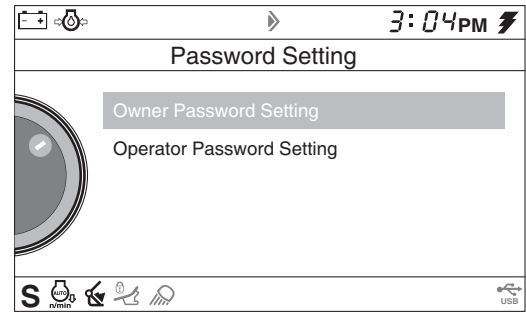
Figure 160

Owner Password Setting

1) Selection

An owner password can be set for managing functions of equipment and use privileges of the equipment for different users.

To set an owner password, place the cursor over Owner Password Setting in the settings screen and press the **◀** button.



WE1500663

Figure 161

2) Password entry

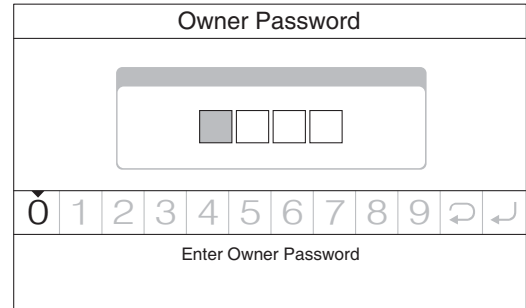
When the password entry screen appears, use the keypad or **◀**, **▶** buttons to enter the password and move to the settings screen.

The default password is "1111".

How to enter the password

Use the **◀** and **▶** buttons or keypad to select digits from 0 to 9 below, and press the **◀** button to input the password.

If the password is input incorrectly, use the **↶** button on the lower right to delete the input password.

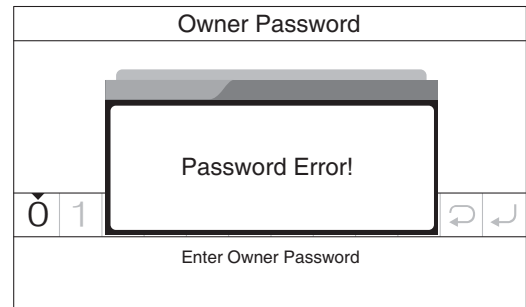


EX1301416

Figure 162

IMPORTANT

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.

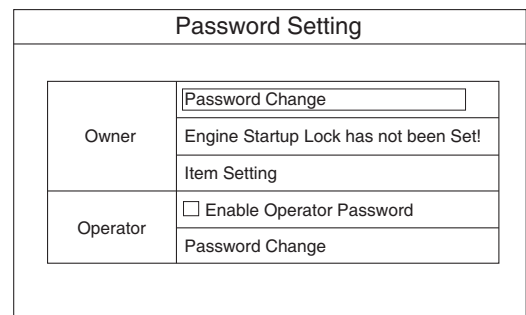


EX1301433

Figure 163

3) Structure

Owner password settings include password change, start-up restriction settings, function item settings, operator password use settings, and operator password change.



EX1502423

Figure 164

Password change

To change the owner password, select password change with the keypad or ◀, ▶ buttons.

Owner Password Change

Enter Password

EX1301435

Figure 165

When the owner password has been changed, "Password Set!" will pop-up.

Password Setting

Password Set!

EX1502424

Figure 166

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.*

- Engine startup
Setting of password input upon operation of equipment.
- Attachment setting
Setting of password input for attachment setting.
- Entertainment use setting
Setting of password input for entertainment (Video/MP3) use setting.

Item 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"/>

EX1502425

Figure 167

3) Structure

Operator password settings include password change, start-up restriction settings, and function item settings.

Password Setting	
Operator	<div> <div>Password Change</div> <div> <input checked="" type="radio"/> Always <input type="radio"/> 1min <input type="radio"/> 5min </div> </div>
	Item Setting

EX1502429

Figure 171

Password change

To change the operator password, select password change, and change the operator password using the keypad or ◀, ▶ buttons.

Operator Password Change	
<div> <div> <div></div><div></div><div></div><div></div> </div> </div>	
<div> <div>0</div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div><div>9</div><div>↶</div><div>↵</div> </div>	
Enter Password	

EX1502430

Figure 172

When the operator password is changed, "Password Set!" will pop-up.

Password Setting	
Operator	<div> <div> <div> <div></div><div></div><div></div><div></div> </div> </div> </div>
	Item Setting

EX1502431

Figure 173

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.*

- Engine startup
Setting of password input upon operation of equipment.
- Attachment setting
Setting of password input for attachment setting.
- Entertainment use setting
Setting of password input for entertainment (Video/MP3) use setting.

Item Setting	
Item	Enable Operator Password
Engine Startup	<input checked="" type="checkbox"/>
Attachment Setting	<input type="checkbox"/>
Entertainment Use Setting	<input type="checkbox"/>

EX1502432

Figure 174


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.

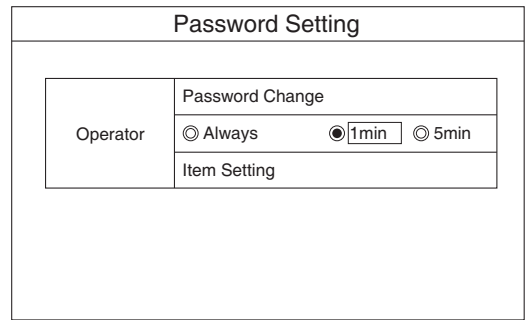
- a) Always
Password is entered with each start-up.
- b) 1 min
If the system is started again within 1 minute from key-off after the password is input, the password is not requested again.
- c) 5 min
If the system is started again within 5 minutes from key-off after the password is input, the password 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

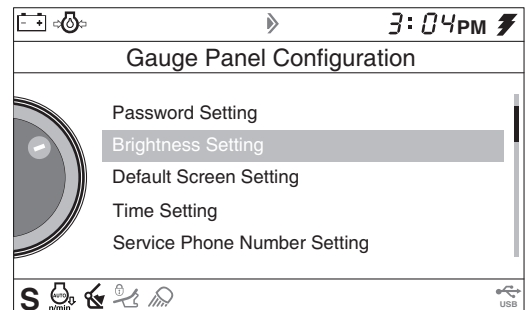
On the Gauge Panel configuration screen, when cursor is placed on brightness setting, press the  button to display the screen brightness setting and camera brightness setting screen.

If you want to change the screen brightness, select the screen brightness setting to display the brightness adjustment screen.



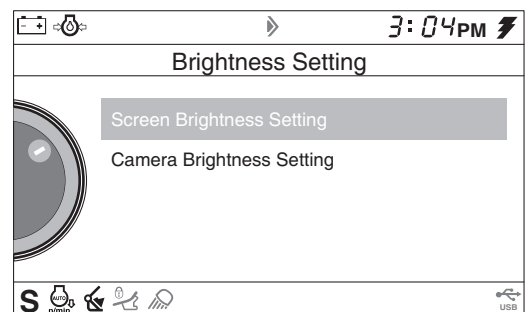
EX1502433

Figure 175



WE1500665

Figure 176



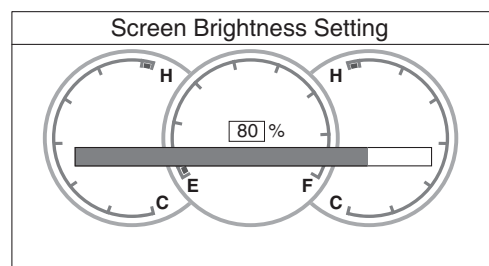
WE1500666

Figure 177

Use the ◀ and ▶ buttons and adjust the brightness of 0 ~ 100% at an interval of 10%.

The screen brightness when manufactured is set as 80%.

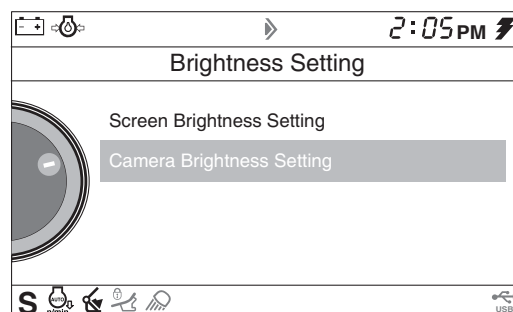
Press the ESC button to return to the previous screen.



EX1502436

Figure 178

If you want to change the camera screen brightness, select the camera brightness setting to display the camera screen brightness adjustment screen.



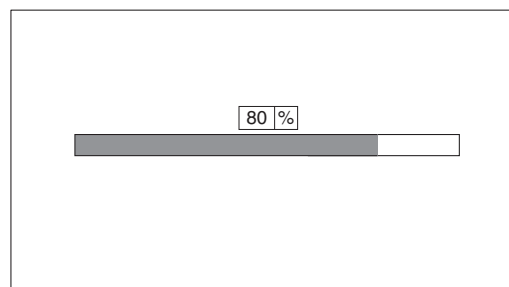
WE1500667

Figure 179

Use the ◀ and ▶ buttons 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.

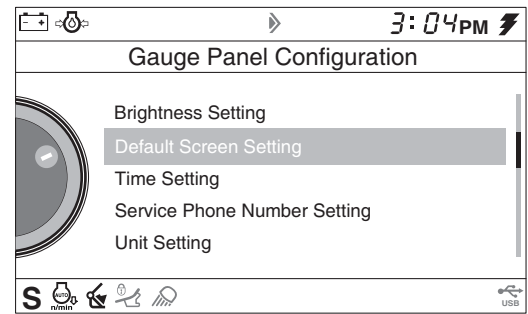


EX1404851

Figure 180

C. Default Screen Setting

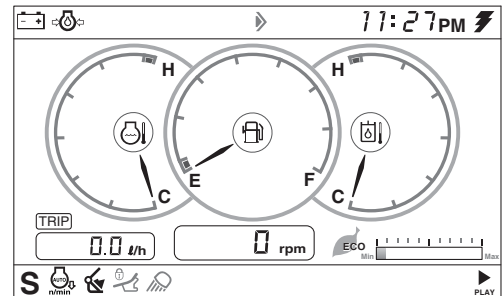
Sets the main screen display on the instrument panel.



WE1500668

Figure 181

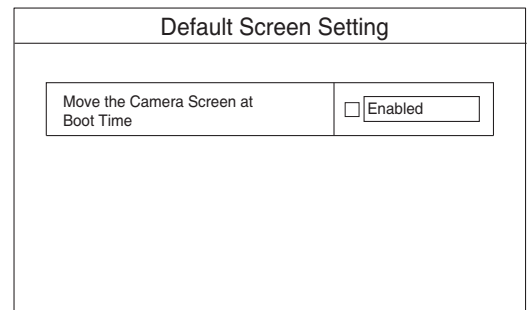
The initial screen shows basic information, including the fuel level, coolant temperature and hydraulic oil temperature.



WE1500659

Figure 182

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 183






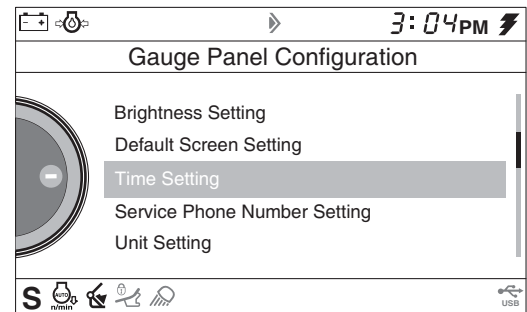
EX1502440

Figure 184

D. Time Setting



On the Gauge Panel configuration screen, when cursor is placed on time setting, press the  button to access the time setting.


Use the  and  buttons and locate the cursor at a target of change. Then, press the  button to change the target.




WE1500669

Figure 185

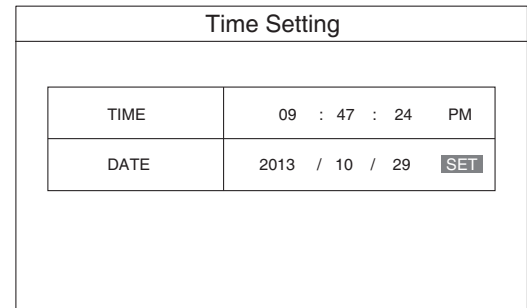
Use the  and  buttons to change numbers of each item.

If the setup is completed, press the  button to store the setup details.

When the time setting is completed, locate cursor to 'SET' and press the  button.

If the SET button is not pressed, time setting would not be completed.


Press the ESC button to return to the previous screen.

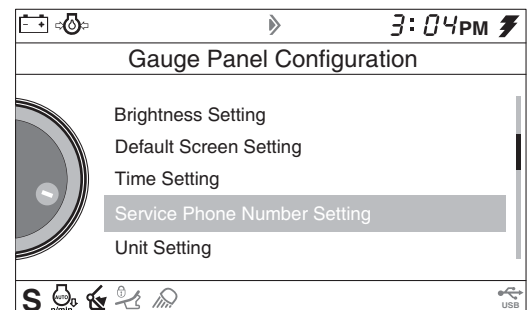


EX1301447

Figure 186





E. Service Phone Number Setting


On the Gauge Panel configuration screen, when cursor is placed on service phone number setting, press the  button to access the service phone number setting.

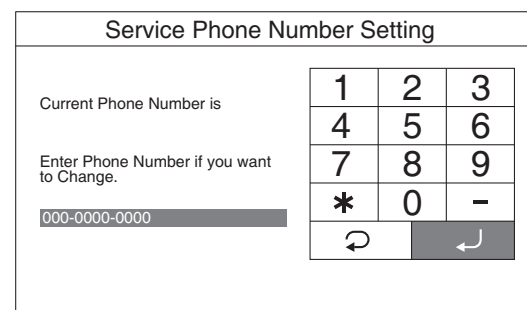


WE1500670

Figure 187

Use the  and  buttons and locate the cursor at a desired number. Then, press the  button to input the number. If number input is completed, press the  key to enter the input phone numbers.

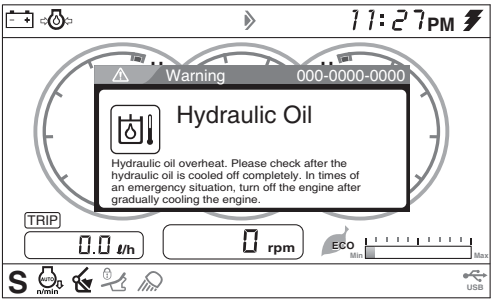
Use the  key and delete erroneously input numbers.



EX1301448

Figure 188


When you input service phone numbers, if warning/ alarm is issued, check the input phone numbers in the pop-up window.

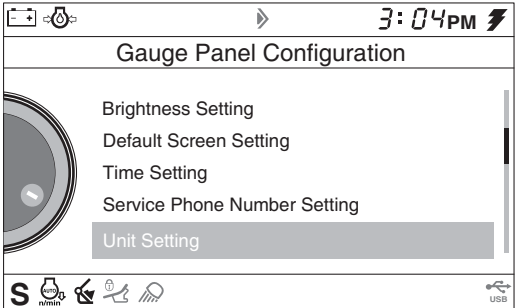


WE1500671

Figure 189

F. Unit Setting

On the Gauge Panel configuration screen, when cursor is placed on unit setting, press the  button to access the unit setting.

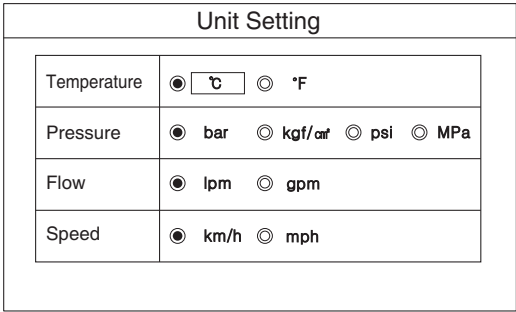


WE1500672

Figure 190

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: km/h

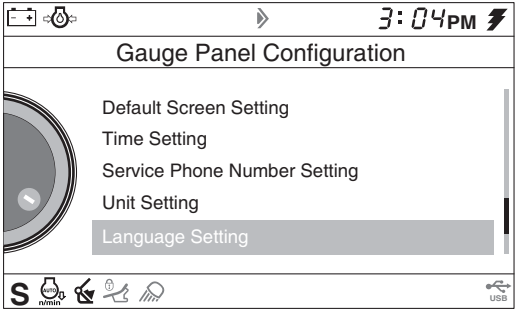


EX1502445

Figure 191

G. Language Setting

On the Gauge Panel configuration screen, when cursor is placed on language setting, press the  button to access the language setting.



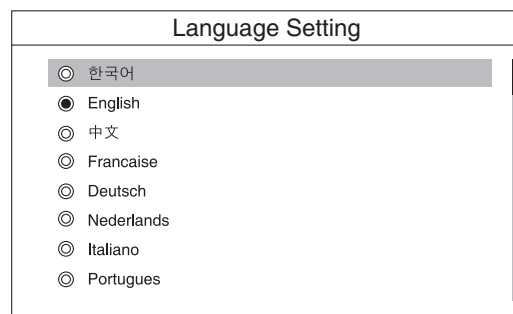
WE1500673

Figure 192

On the language selection screen, use the ◀ and ▶ buttons and move the cursor to select a language. Then, press the ↵ button 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

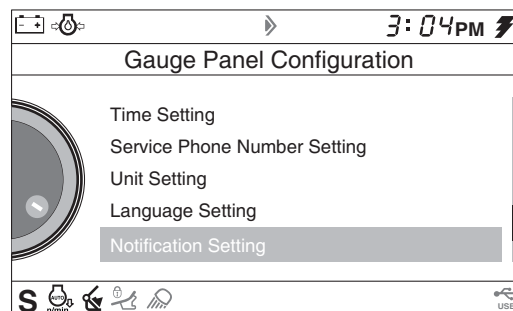


EX1301062

Figure 193

H. Notification Setting

On the Gauge Panel configuration screen, when cursor is placed on notification setting, press the ↵ button to access the notification setting.



WE1500674

Figure 194

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, use the ◀ and ▶ buttons and move the cursor to a desired location. Then, press the ↵ button to select enable or disable.

All notice items at the machine release time are set as Enable.


NOTE: The "Warning Alarm Pop Up" is always displayed as "Enable".

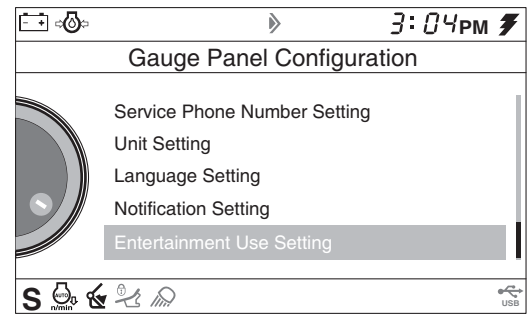
Notification Setting	
Warning Alarm Pop up	<input checked="" type="checkbox"/> Enable
Maintenance Notification Pop up	<input checked="" type="checkbox"/> Enable

EX1502448

Figure 195

I. Entertainment Use Setting

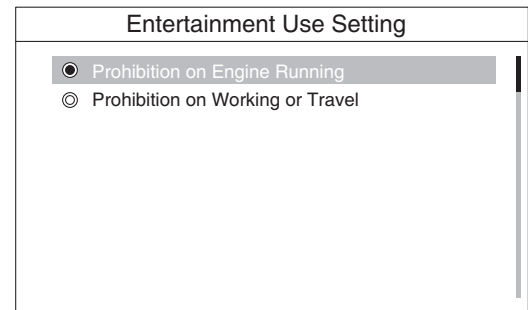
On the Gauge Panel configuration screen, when cursor is placed on entertainment use setting, press the  button to access the entertainment use setting.



WE1500675

Figure 196

Depending on the entertainment use setting details, the use of Video and MP3 is limited.



EX1301063

Figure 197

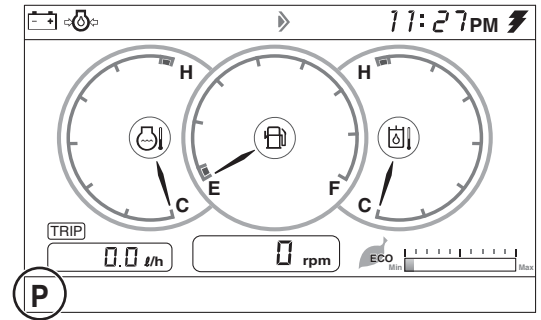
Switch Operation Indication

Enable

During the operation of switches for breaker, shear, travel, working light 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

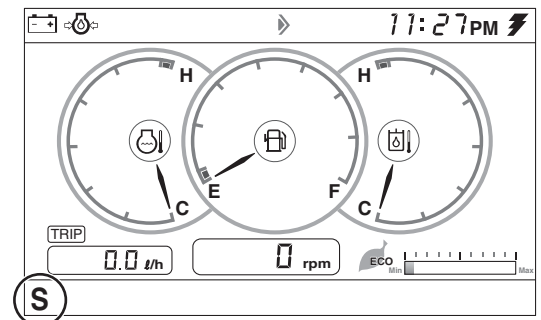
1. Power Mode Selection



EX1502450

Figure 198

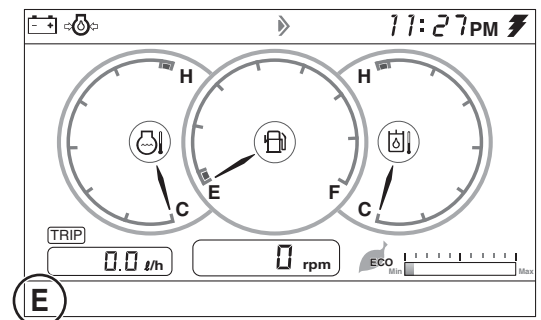
2. Standard Mode Selection



EX1502451

Figure 199

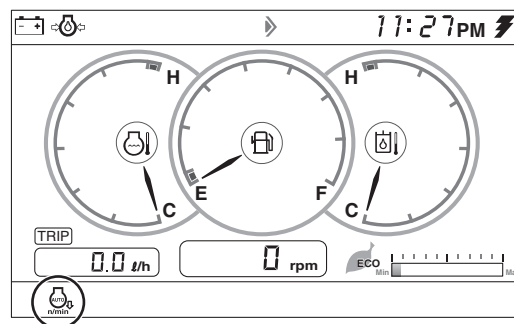
3. Economy Mode Selection



EX1502452

Figure 200

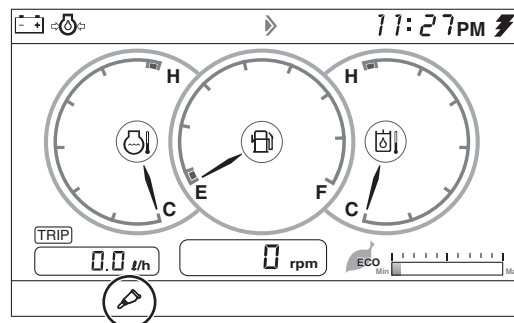
4. Auto Idle Selection



EX1502453

Figure 201

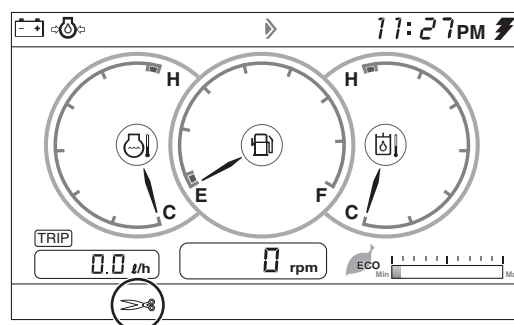
5. Breaker Selection



EX1502455

Figure 202

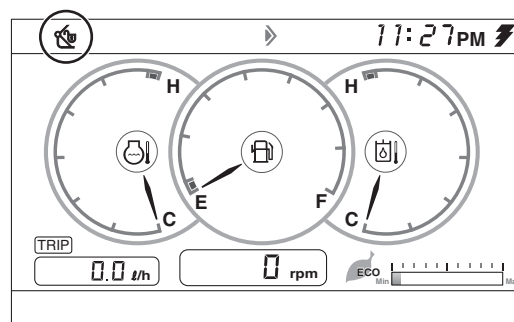
6. Shear Selection (Optional)



EX1502456

Figure 203

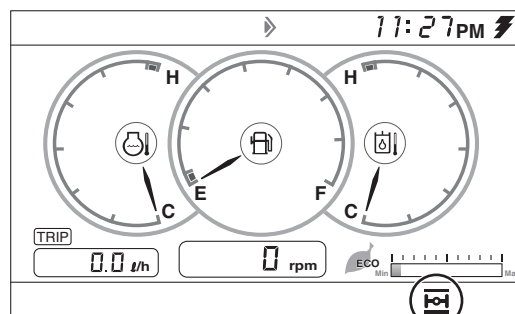
7. Quick Coupler Release System Activated (Optional)



EX1502457

Figure 204

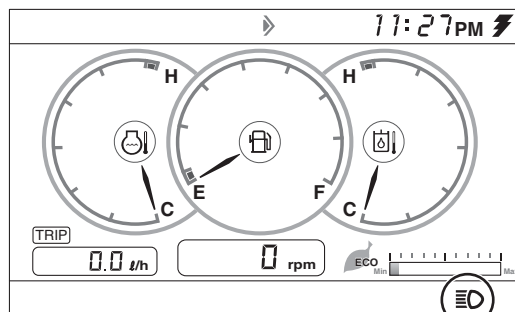
8. Ram Rock Operation Selection (Wheel Machine Only)



EX1502458

Figure 205

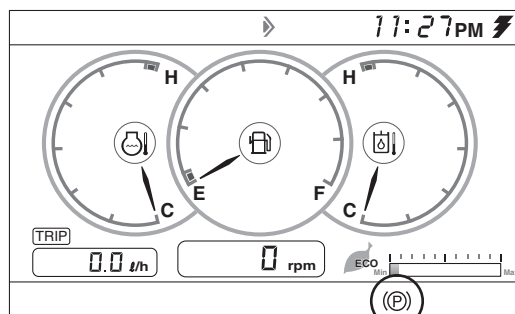
9. High Beam Light Selection (Wheel Machine Only)



EX1502459

Figure 206

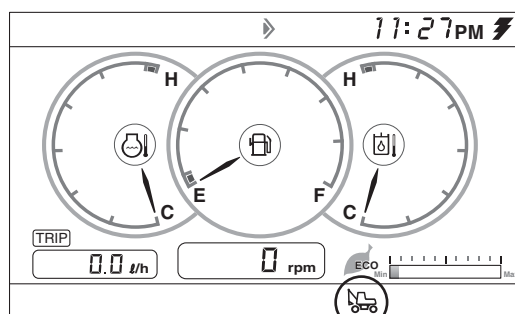
10. Parking Brake Operation Selection (Wheel Machine Only)



WE1500912

Figure 207

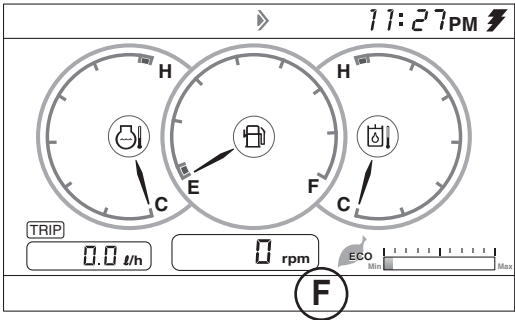
11. Travel Mode Selection (Wheel Machine Only)



WE1500913

Figure 208

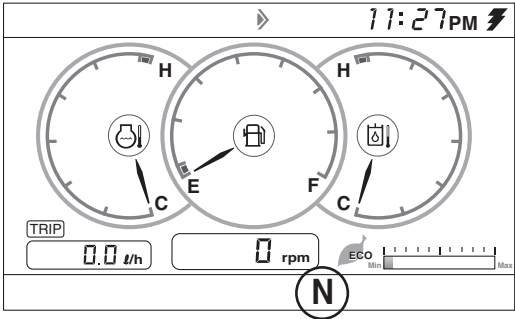
12. Forward Travel Selection (Wheel Machine Only)



WE1500914

Figure 209

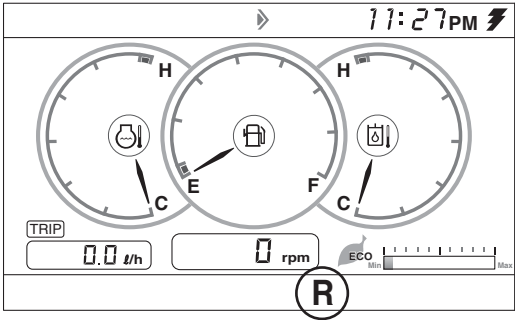
13. Neutral Selection (Wheel Machine Only)



WE1500915

Figure 210

14. Reverse Travel Selection (Wheel Machine Only)



WE1500916

Figure 211

HEATER AND AIR CONDITIONER CONTROL PANEL

Location of Controls and Vents

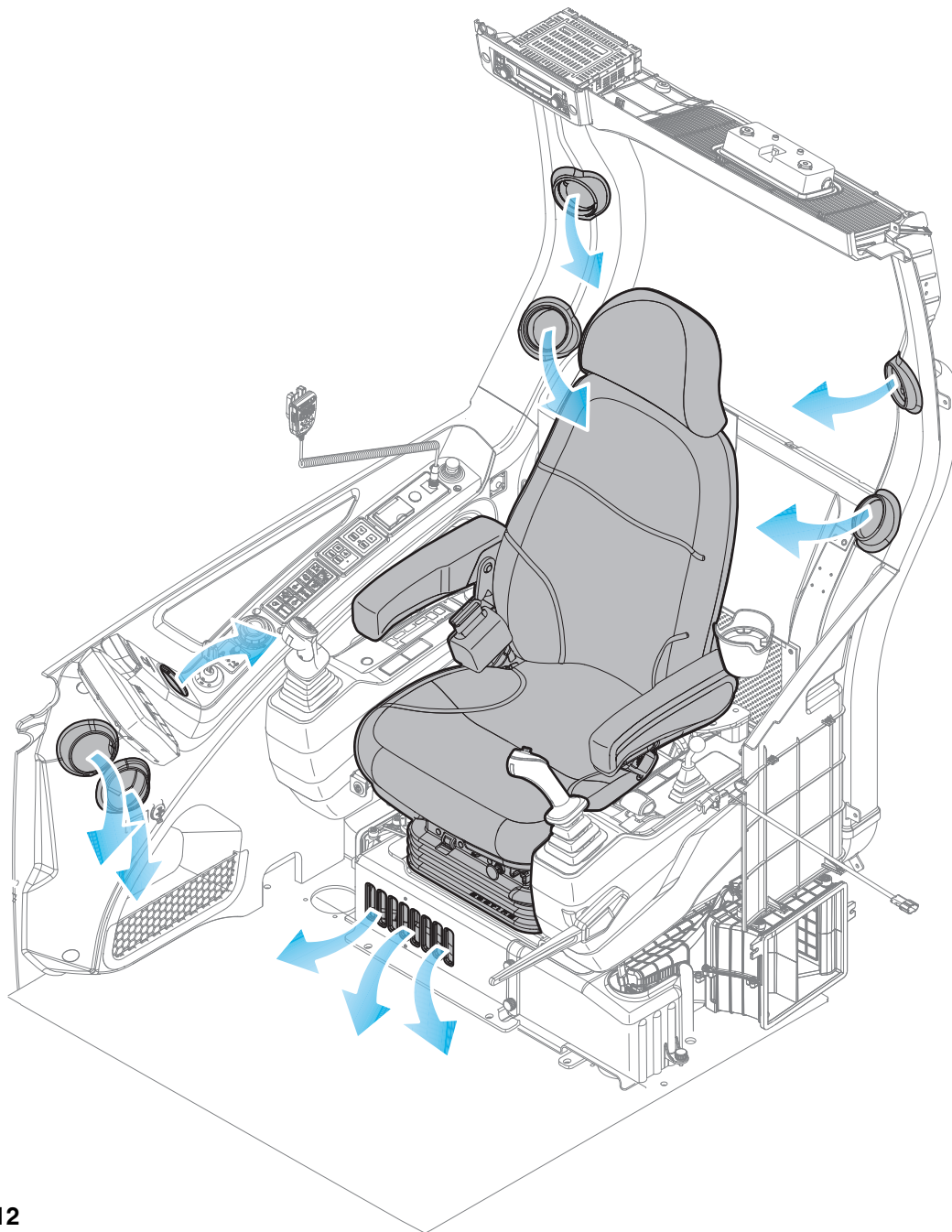


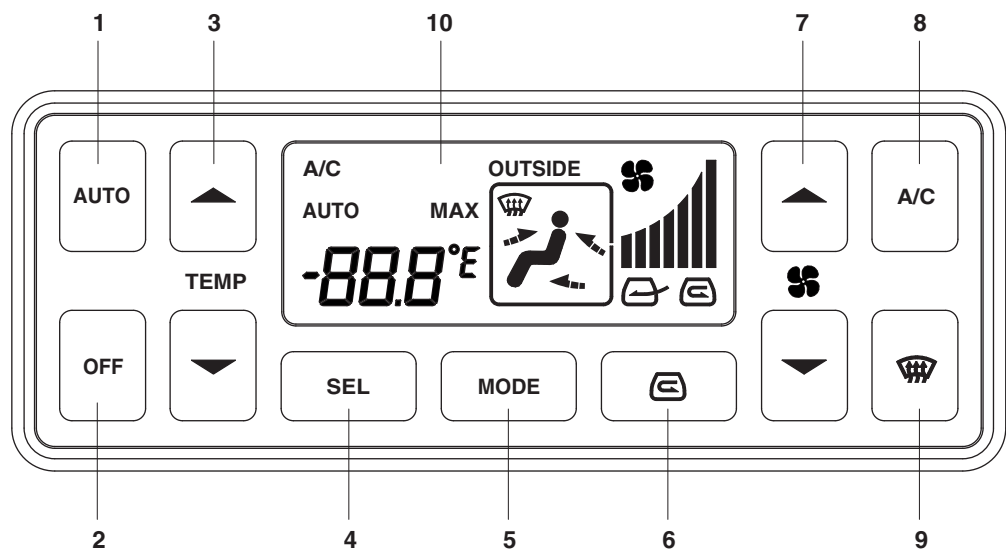
Figure 212

WE1500857

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

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

Control Panel



FG000086

Figure 213

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

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

NOTE: When the light switch is turned on, 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 automatic temperature control function is activated, the word "AUTO" will be displayed in the upper left of LCD display.

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.

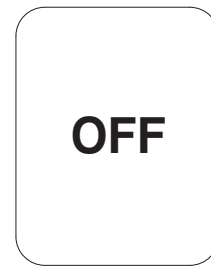


FG000088

Figure 214

2. Off Button

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



FG000089

Figure 215

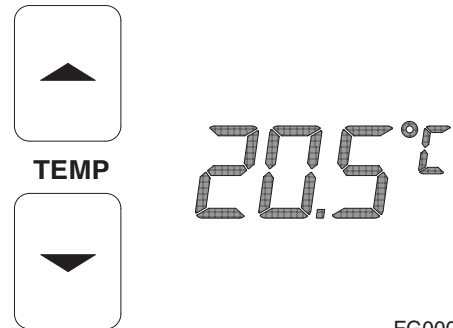
3. Temperature Control Button

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.



FG000090

Figure 216

4. Temperature Unit Selector Button

This button gives the choice to select either °C or °F.



FG000094

Figure 217

5. Mode Selector Button

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



FG000096

Figure 218

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

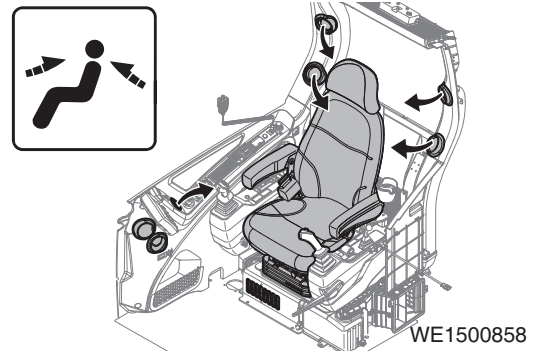


Figure 219

- 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.

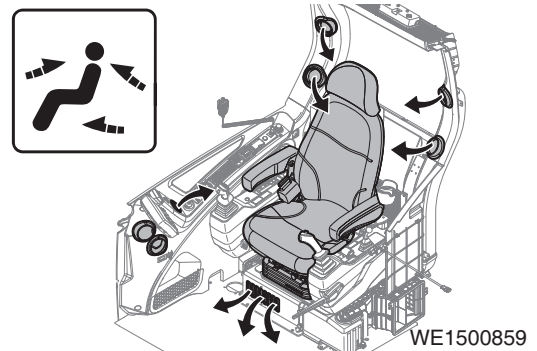


Figure 220

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

This mode is mainly used for heating.

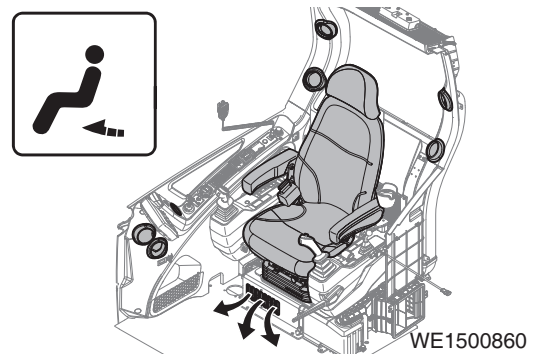


Figure 221

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

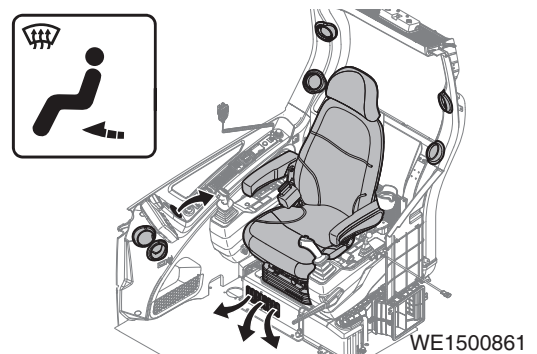


Figure 222

6. 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.



FG000101

Figure 223

- A. "A" Symbol - Draws fresh air into operator's cabin. Used to exchange air within the operator's cabin with fresh air. Used to remove condensation or ice on window (Winter/Rainy Season).
- B. "B" Symbol - Recirculates air within the operator's cabin. Used to quickly warm or cool the operator's cabin.



FG019042

Figure 224

7. 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.



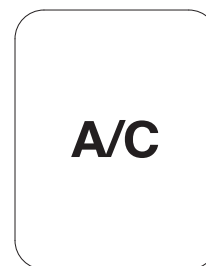
FG000103

Figure 225

8. 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.

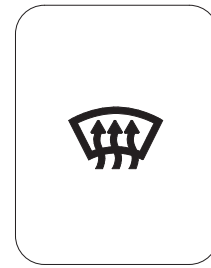


FG000105

Figure 226

9. Defroster Button

Used to direct airflow to front window.

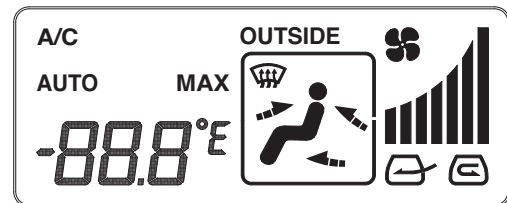


FG000106

Figure 227

10. LCD Display

This display shows the current setting.



FG000107

Figure 228

Memory Function

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

Additional Operating Instructions

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

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

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

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

STEREO

Before operating the CD player, read operation manual enclosed with CD player.

CD Player

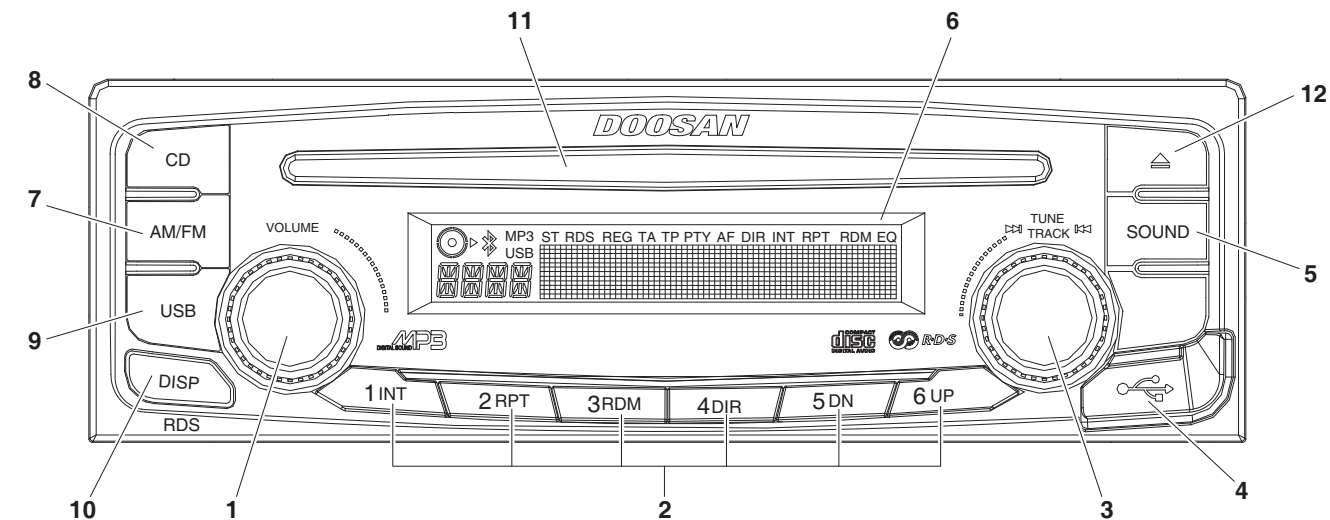


Figure 229

EX1502460

Reference Number	Description
1	Power/Volume Control
2	Preset Station
3	Tuning/Track Control
4	USB Loading Port
5	Sound Mode Selector
6	LCD

Reference Number	Description
7	AM/FM Selection
8	CD Selection
9	USB Selection
10	Display Mode Control
11	CD Slot
12	CD Eject Button

MISCELLANEOUS ELECTRICAL DEVICES

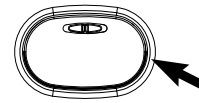
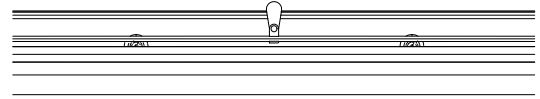
Cabin Light

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

The light will work despite starter switch position.

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

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



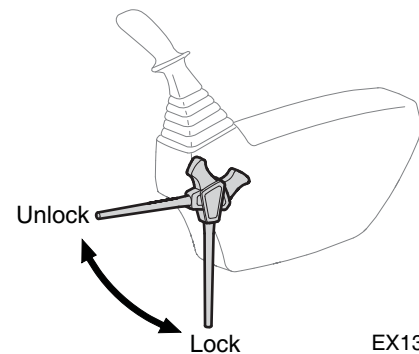
©

FG015827

Figure 230

Pilot Cutoff Switch

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

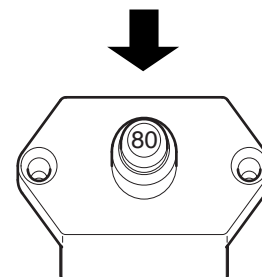
Figure 231

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

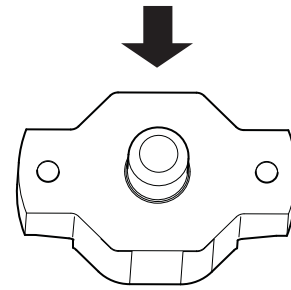
Figure 232

Circuit Breaker (50 A)

A fuel heater circuit breaker (50 A) 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.



EX1401710

Figure 233

Circuit Breaker (30 A)

A circuit breakers (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.



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/Relay Boxes

There is a fuse/relay box (Figure 234) on the right side of the back seat. The fuses prevent electrical devices from overloading or shorting.

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

NOTE: For a further explanation see "Fuse/Relay Boxes" on page 4-96.

Spare fuses and relays are mounted on the junction box.

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

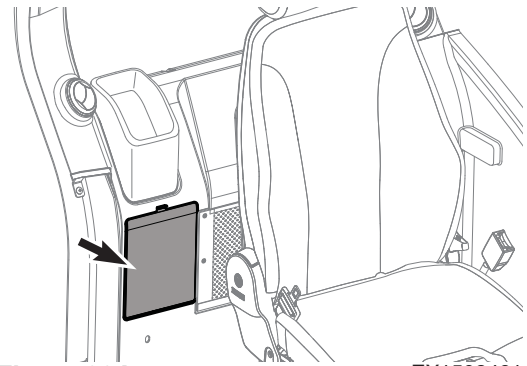


Figure 234

EX1502461



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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 235), raise it up, move the seat to the desired position. Release lever to lock the seat in the selected position. Adjustment range is 210 mm (8.3 in).

2. Adjusting Angle and Depth of Seat

Forward Tilt

Press the adjustment lever (2, Figure 235) to adjust the seat cushion angle. ($0^{\circ}/+2.5^{\circ}/+5^{\circ}$)

Cushion Slide

Press the adjustment lever (3, Figure 235), and adjust the seat cushion forward/backward by max. 60 mm, to fit with the length of the operator's thigh.

3. Suspension Adjustment

Turning lever (4, Figure 235) to clockwise makes the suspension harder. Turning lever to counterclockwise makes the suspension softer. Adjust according to operator's weight by checking the weight indicator of the side of the lever. Adjustment range is from 50 ~ 130 kg (110 ~ 287 lb).

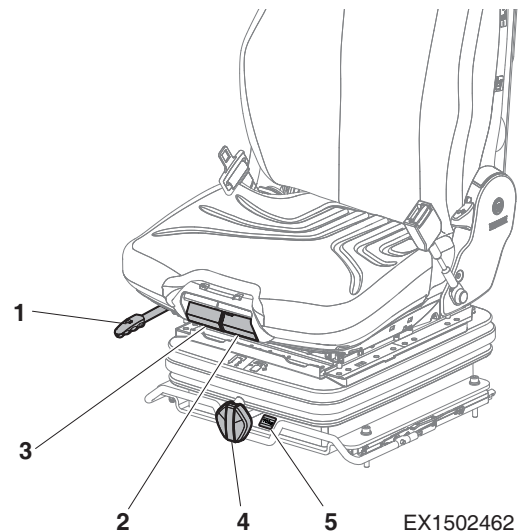


Figure 235

4. Reclining Position Adjustment

Pulling up left lever (1, Figure 236) 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.

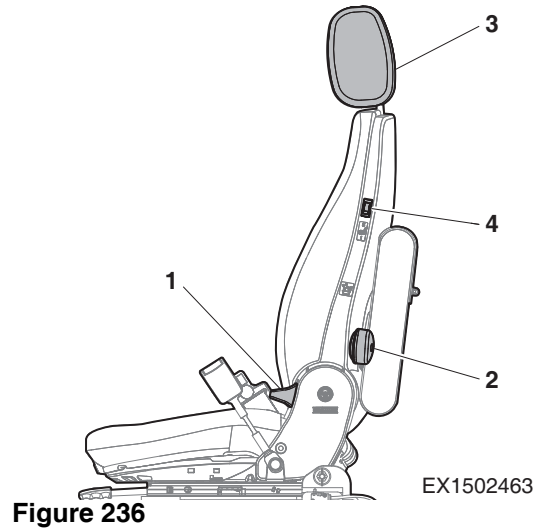
5. Lumbar Support Adjustment

A lumbar support is located in the seat back.

Turn the dial (2, Figure 236) counterclockwise to increase the force of the lumbar support.

6. Headrest

The headrest (3, Figure 236) can be adjusted up/down. Move it by holding both sides.



7. Seat Belt



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Only operate the excavator while seated in the operators position.

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

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

Seat Belt Locking and Unlocking

Insert belt end (1, Figure 237) into buckle (2, Figure 237). 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).

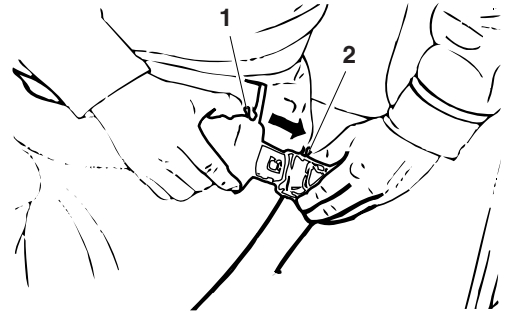


Figure 237

Press button (3, Figure 238) in center of buckle (2, Figure 238) and pull out belt (1, Figure 238) to unlock.

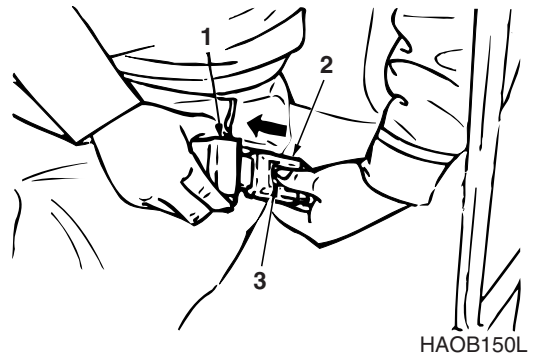


Figure 238

8. Adjusting Angle of Armrest

The angle of each armrest can be adjusted by turning a dial (1, Figure 239) on bottom of armrest. When adjusting the angle, manually raise the armrest before turning the dial.

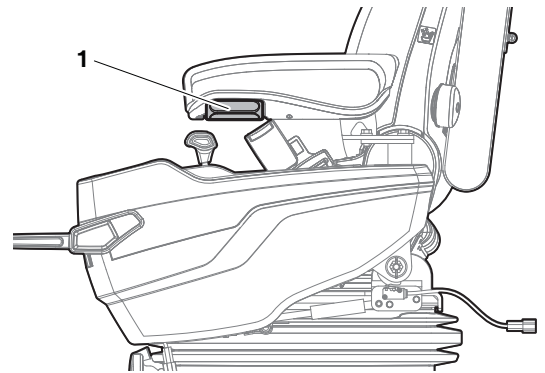


Figure 239

9. Tilting Left Control Stand

For operator's convenience, the left control stands can be tilted up by pulling the lever. (1, Figure 240)

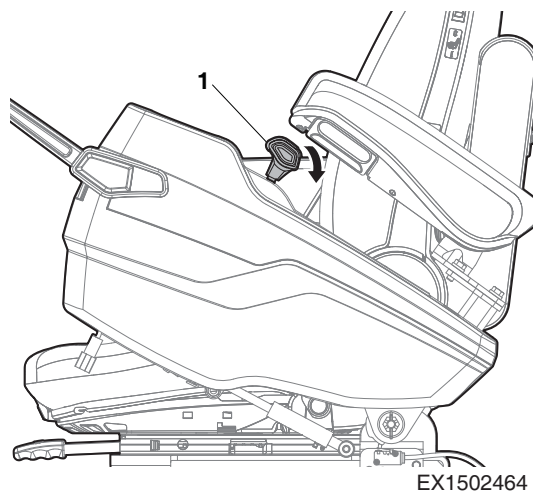


Figure 240

10. Heating Operator's Seat

The seat can be heated. The heater switch (4, Figure 236) 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.

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.

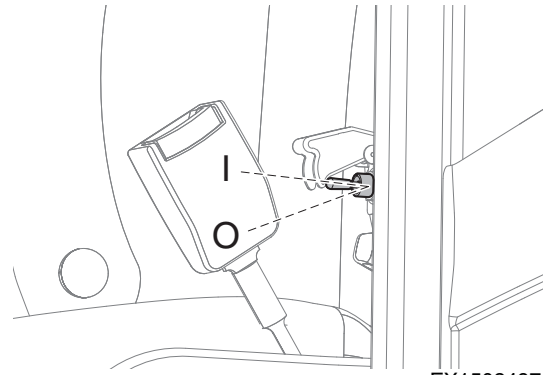


Figure 241

EX1502497

EMERGENCY EXIT GLASS BREAKING TOOL

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

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

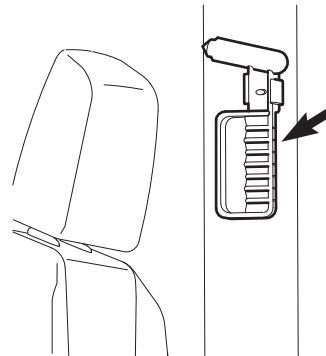


Figure 242

EX1300679



WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

MISCELLANEOUS CONVENIENCE DEVICES

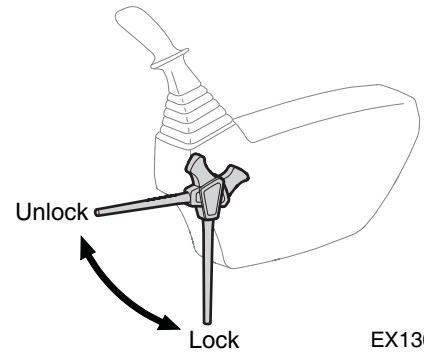
Front Windows



WARNING

AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, move safety lever to "LOCK" position (Figure 243) and stop engine to prevent accidental activation of the work levers and controls.



EX1300566

Figure 243

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 244) are securely latched.

1. Lower bucket or work tool to ground.
2. Move safety lever (Figure 243) 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 244), then pull lock levers (2, Figure 244) to release lock. The top of front window will come out.
6. Pull window up, and push it against lock pin at the rear of cabin. Make sure that it is securely latched.
7. Check that lock levers are securely latched in locked position.

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

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

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

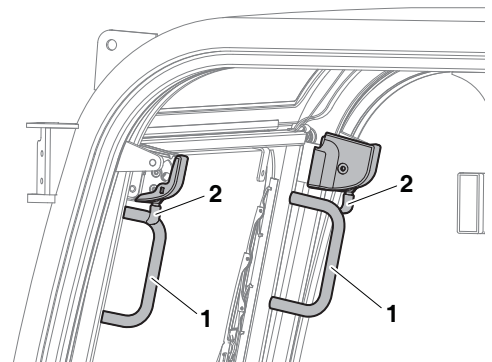


Figure 244

EX1502498



WARNING

AVOID DEATH OR SERIOUS INJURY

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

1. Lower bucket or work tool to ground.
2. Move safety lever (Figure 243) to "LOCK" position, and stop engine.
3. Holding upper handles (1, Figure 245) of front window with left and right-hand, pull lock levers (2, Figure 245) 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 245).
6. Check that lock levers are securely latched in lock position.

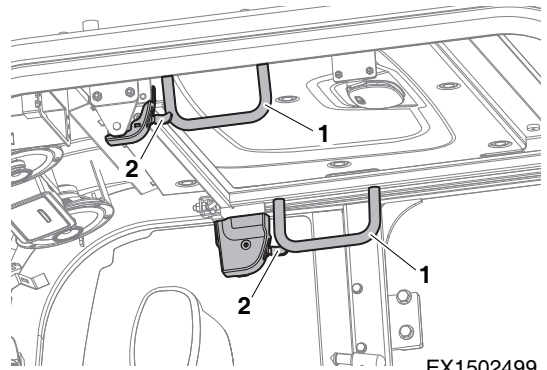


Figure 245

EX1502499

Door Side Latch

1. The door side latch (1, Figure 246) is used to secure door to side of cabin when it is opened.

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

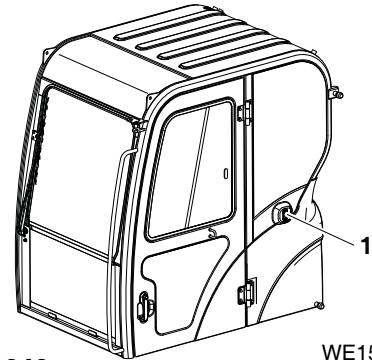


Figure 246

WE1500922

2. To release door from side of cabin, push latch lever (2, Figure 247) down. The latch lever is to the left of operator's seat.

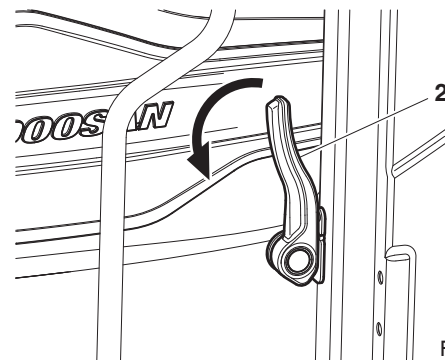


Figure 247

FG021421

Cabin Storage Compartments

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

There is a separated storage compartment (1, Figure 248) at the front right side of the operator's seat.

Two storage (2 and 3, Figure 248) compartments are located below the switches.

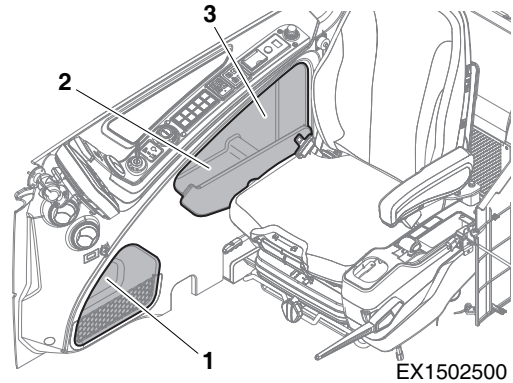


Figure 248

EX1502500

Also there are two storage compartments (1 and 2, Figure 249) behind the operator's seat.

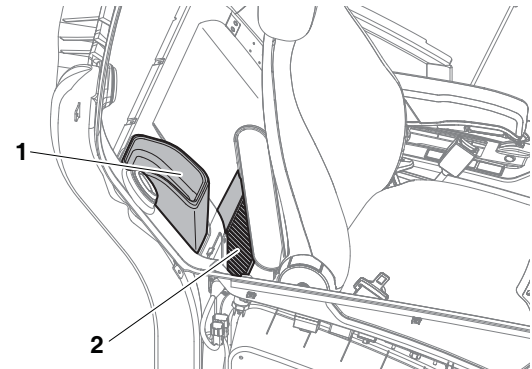


Figure 249

EX1502501

Sunglasses Case

The sunglasses storage case (1, Figure 250) is on the center top of the rear wall of the operator cabin.

Keep this case lid closed before and after use.

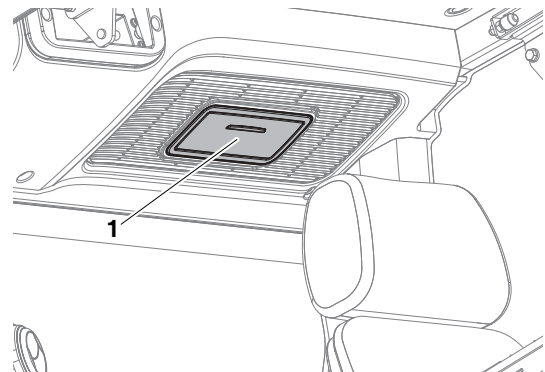


Figure 250

EX1502502

Sun Visor

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

To reduce the amount of sunlight coming in the front window, pull bar (1, Figure 251) down, and hook it on each brackets (2, Figure 251).

To retract sun visor, unhook it from brackets (2, Figure 251) and pull forward slightly. Slowly let the sun visor retract.

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

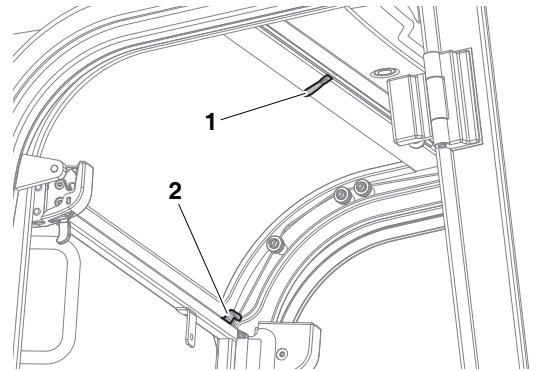


Figure 251

EX1502503

Hanger

A hanger (1, Figure 252) is located on upper left side of operator's cabin.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Always check that hanging objects are secured on hanger.

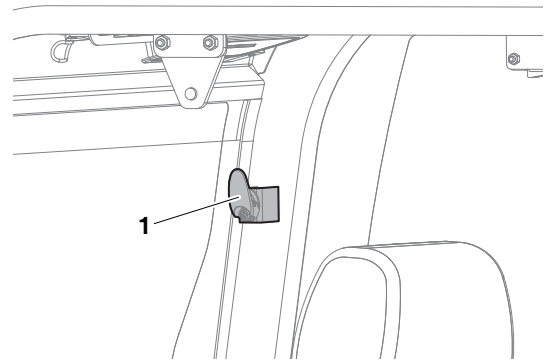


Figure 252

EX1502504

Cup Holder

There is a rubber cup holder inside operator's cabin. Use it to keep your cup firmly in place.

IMPORTANT

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

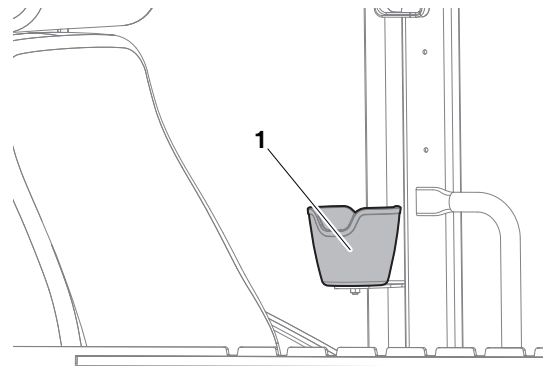


Figure 253

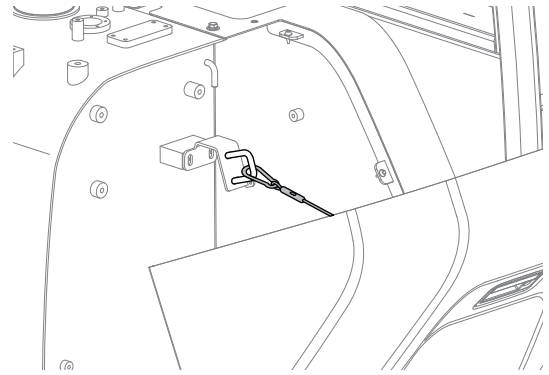
EX1502505

MISCELLANEOUS ACCESS COVERS AND DOORS

Battery Box Cover

Normally Open State

Open the cover gradually until the lock wire is fully straightened.

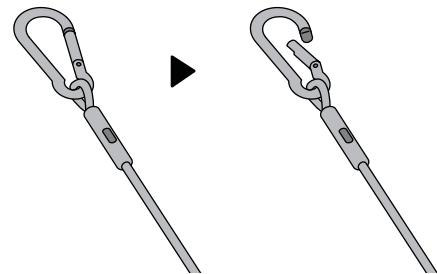


EX1502506

Figure 254

Fully Open State

Undo the latch to fully open the cover.



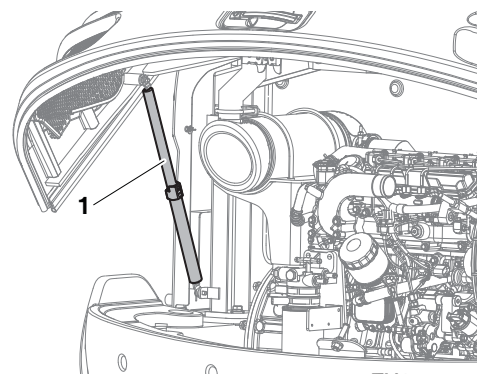
EX1502507

Figure 255

Bonnet

Opening

Open the bonnet slightly. Then, it is fully opened automatically by the compressed air cylinder. (1, Figure 256)

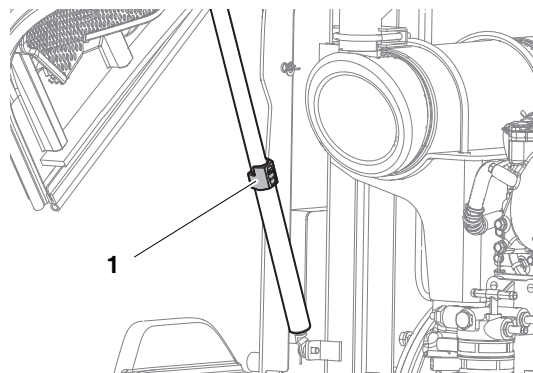


EX1502508

Figure 256

Closing

To close the bonnet, press the close button (1, Figure 257) on the compressed air cylinder.



EX1502509

Figure 257

AIR GUN AND COMPRESSOR

Air Gun

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

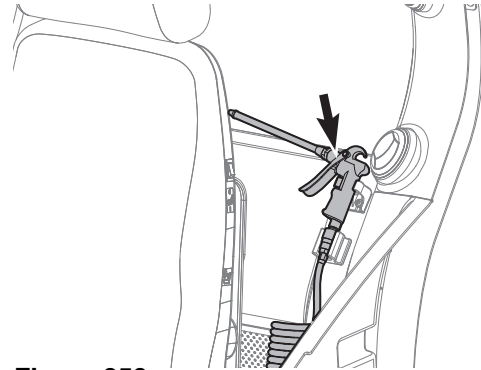


Figure 258

EX1502510

How to Use Air Compressor

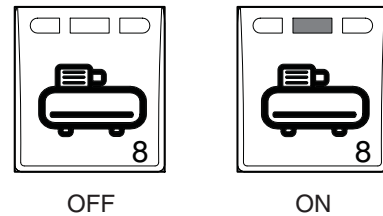
1. Start the engine, and set the air compressor operating switch to "ON".
2. Point the air gun towards the object to be cleaned.
3. Pull the air gun handle to eject compressed air.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

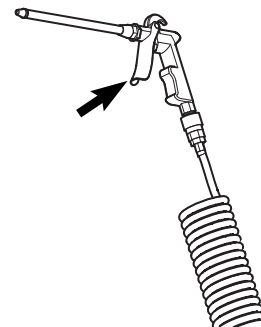


OFF

ON

EX1502400

Figure 259



FG015670

Figure 260

IMPORTANT

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

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

Do not run the air compressor in highly humid places or on a rainy day. Drain the water in the air tank periodically, using the drain valve (1, Figure 261).

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

Keep the area surrounding the air compressor clean. Periodically clean the air suction filter (2, Figure 261).

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

While the air compressor is running, check that needle point of the pressure gauge (3, Figure 261) reads below the maximum pressure (8 bar (114 psi)).

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

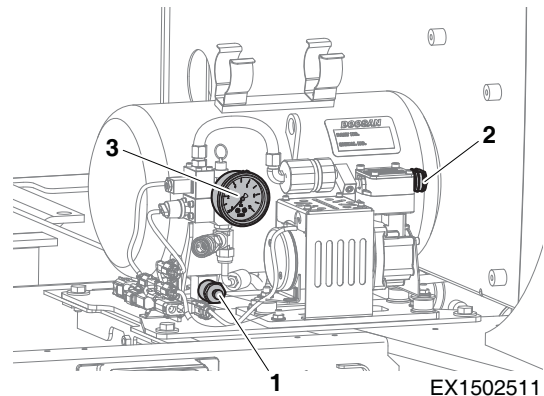


Figure 261

EX1502511



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not allow people or animals inhale compressed air.

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

How to Connect Air Gun

Select and use the quick couplers installed in the operator's cabin and battery box.

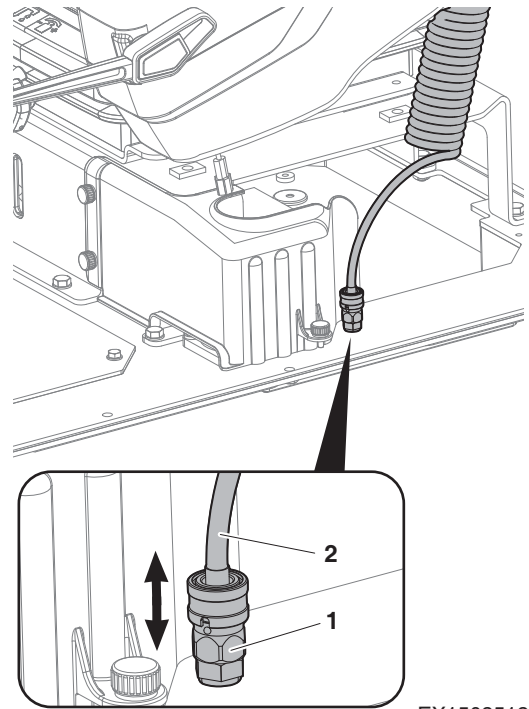
1. Push down the release collar (1, Figure 262) of the quick coupler, at the bottom of the air hose beside the left stand in the cabin, and pull the air hose (2, Figure 262) upwards.
2. Open the cover of the battery room on front right side of the machine.
3. Push the bottom of the air hose into the quick coupler (3, Figure 263) until a 'clicking' sound is heard.



CAUTION

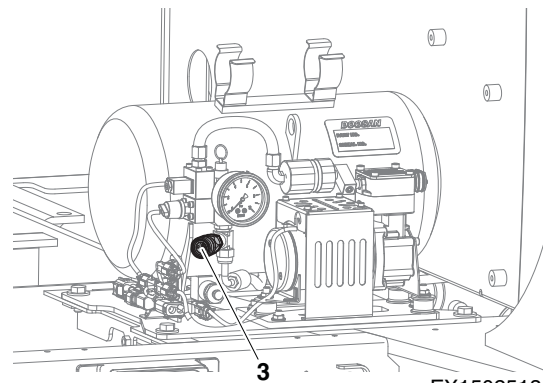
AVOID INJURY

Take care not to squeeze your finger in the coupler gap.



EX1502512

Figure 262



EX1502513

Figure 263

Operation

TO OPERATE A NEW EXCAVATOR

All DOOSAN excavators are inspected before leaving the factory. However, it is required that operator follow these steps during the initial break-in period. Failure to follow these steps can result in damage to the equipment or reduced performance.

Hour	Load
For first 50 hours of operation	Maintain about 80% load of full capacity (Engine rpm: 80% of rated rpm)
After first 50 hours of operation	Full load

If machine is used at full load before it is broken in, it could affect the overall performance and service life of the machine.

- NOTE:**
1. *Check daily for leakage of coolant, fuel, engine oil and hydraulic oil.*
 2. *Inspect all lubricants daily and add appropriate lubricants as required.*
 3. *During operation, monitor all instruments and gauges from time to time.*
 4. *Avoid an extreme engine load.*
 5. *Operate unit at 80% load until engine and all other components are at operating temperatures.*
 6. *Check that work equipment is operating normally.*
 7. *Check machine for loose parts or for damage that may have occurred during shipping.*
 8. *Check for loose wiring or terminals, check gauge operation and battery electrolyte level.*

Lubrication and Filters

1. Change engine oil and replace engine oil filter after first 50 hour of operation.
2. Change hydraulic oil return filter after first 250 hours of operation.
3. Replace transmission and axle gear oil after first 150 hours of operation.

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

STARTING AND STOPPING ENGINE

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

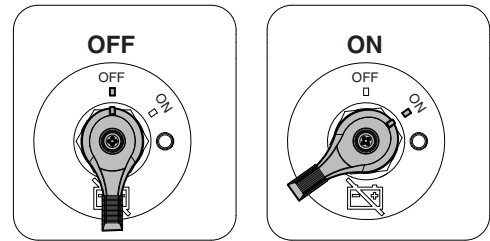
Before starting engine, inspect the following items. If any problem is found, repair it before machine operation. If the oil, fuel or coolant level are below the "LOW" mark, add it. For detail method, see "10 Hour / Daily Service" on page 4-26.

1. Grease boom, arm and front attachment pins.
2. Check engine oil level.
3. Check level of hydraulic oil tank.

4. Check fuel level.
5. Clean dust net in front of oil cooler and intercooler.
6. Check cooling system and refill as required.
7. Check level of window washer liquid.
8. Inspect the bucket teeth and side cutters for signs of wear.
9. Inspect engine fan blade.
10. Check air intake system.
11. Inspect seat belt for any damage and proper operation.
12. Inspect the structure for cracks and faulty welds.
13. Check the operation of all switches.
14. Check the operation of all exterior lights, horn, travel alarm/ swing alarm (if equipped), rear view camera and control console indicator and monitor lights.

Operational Checks Before Starting Engine

1. Turn battery disconnect switch to "ON" position (Figure 1).



EX1500481

Figure 1



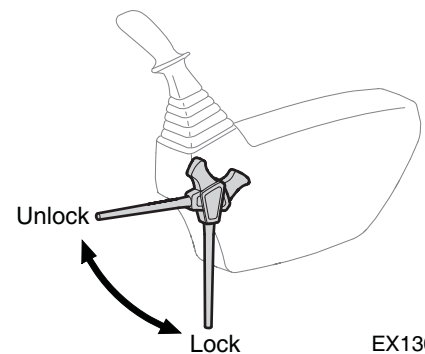
WARNING

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".

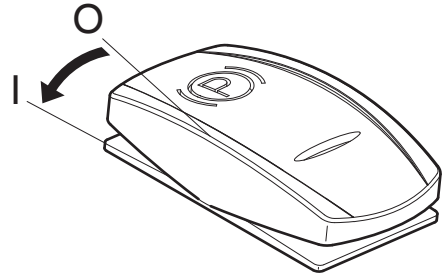
NOTE: Be careful not to move any switches when starting engine.



EX1300566

Figure 2

5. Set parking brake switch to "I" (APPLIED) position.



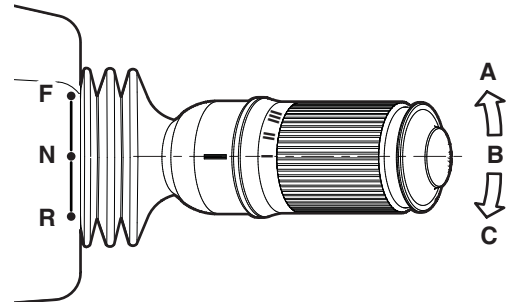
FG017937

Figure 3

6. Make sure transmission is in "B" (NEUTRAL) position (Figure 4).

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

- A. In this position, "FORWARD" direction is selected.
- B. In this position, "NEUTRAL" is selected.
- C. In this position, "REVERSE" direction is selected.



WE1500677

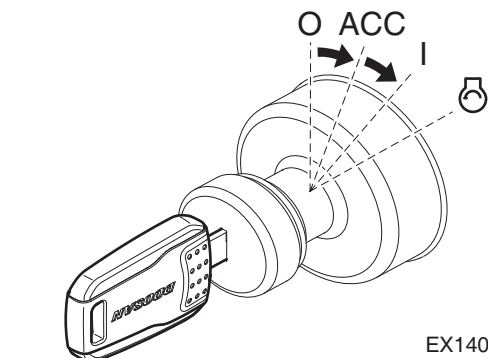
Figure 4

7. Rotate the starter switch to "I" (ON) position (Figure 5). 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.*



EX1402154

Figure 5

Engine Start

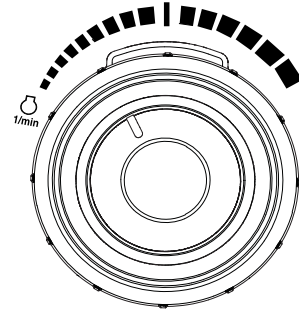


WARNING

AVOID DEATH OR SERIOUS INJURY

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

1. Perform all steps in "Operational Checks Before Starting Engine" on page 3-4.
2. Set engine speed control dial to "LOW IDLE" (Figure 6). If control dial is at "HIGH IDLE", the engine will accelerate suddenly and cause damage to the engine.
3. Sound horn.

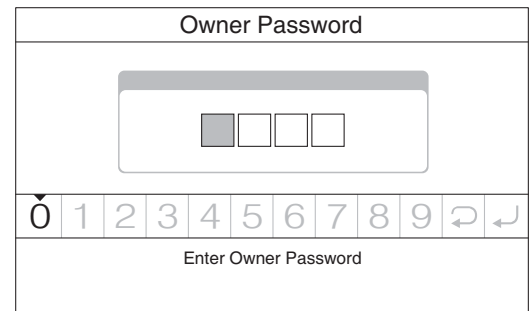


FG018148

Figure 6

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

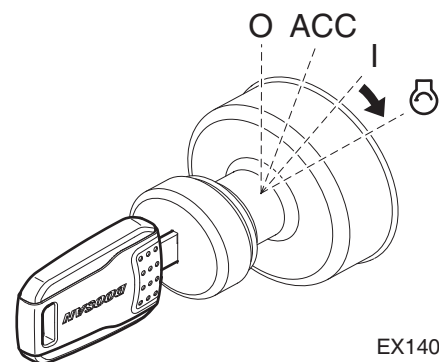
Figure 7

6. Turn starter switch to "START" position (Figure 8). Engine should start in approximately five (5) seconds.

IMPORTANT

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 8).
8. Follow procedures in "Hydraulic System Warm-up" on page 3-13.



EX1402153

Figure 8

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	Charging Warning	OFF
5	Engine Oil Pressure Warning	OFF
6	Engine Coolant Temperature Warning	OFF
7	Engine Check Warning	OFF

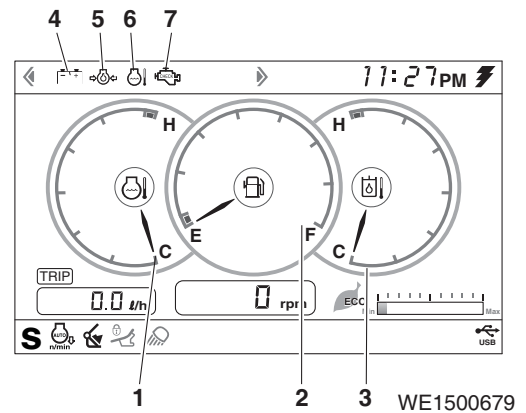


Figure 9

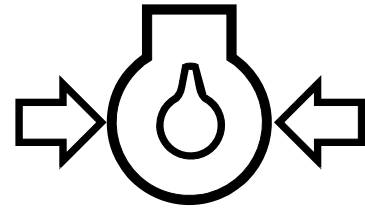
10. Check color of exhaust smoke.
 - No color or light blue - Engine is running in good condition.
 - Black - Incomplete combustion. Check cause.
 - White or dark blue - Engine is burning engine oil. Check cause.
11. Check for usual engine vibration and noises. If any are heard or felt, investigate cause.

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".

IMPORTANT

If the engine oil pressure monitor light does not turn "OFF", after 4 to 5 seconds have passed, stop engine immediately. Check the oil level, check for leakage of oil, and take necessary corrective action.



HAOA620L

Figure 10

Cold Weather Starting

Engine Pre-heater

The engine pre-heater enhances startability by increasing intake air temperature during low-temperature start.

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

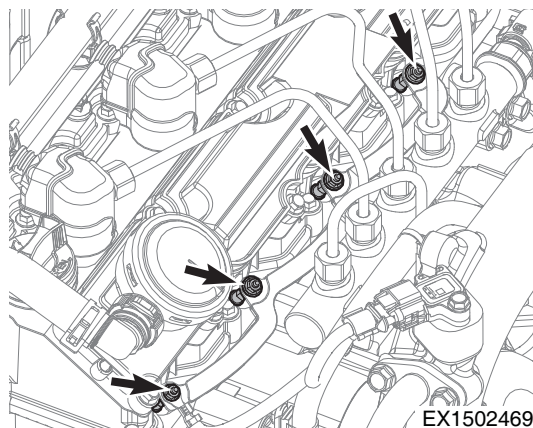


Figure 11

Operation Logic

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

Coolant Temp. (°C)	-30	-25	-20	-10	0	20	30	40
Time (sec.)	28	23	20	17	14	11	9	3

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

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

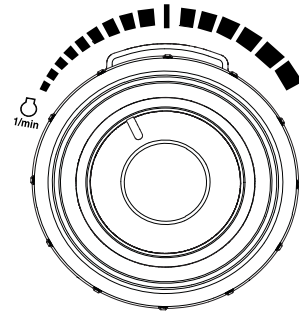


WARNING

AVOID DEATH OR SERIOUS INJURY

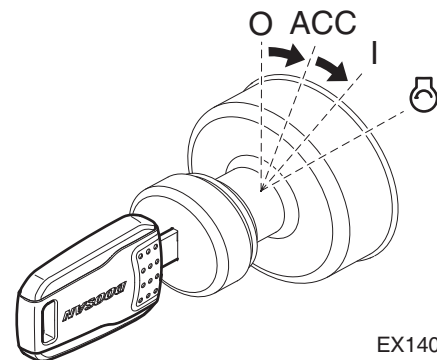
DO NOT USE STARTING FLUIDS. The preheat system could cause the starting fluid to explode.

1. Perform all steps in "Operational Checks Before Starting Engine".
2. Set engine speed control dial to "LOW IDLE" (Figure 12). If control dial is at the "HIGH IDLE", the engine will accelerate suddenly and damage the engine.
3. Sound horn.



FG018148

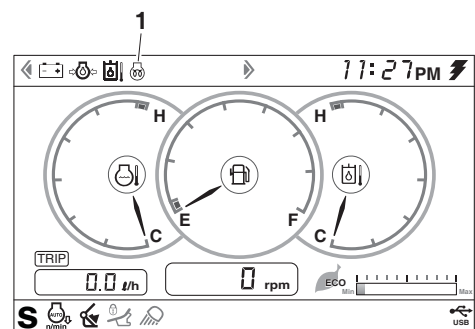
Figure 12



EX1402154

Figure 13

4. Turn starter switch to "I" (ON) position (Figure 13). When preheat cycle is completed, the preheat indicator light (1, Figure 14) will turn "OFF".



WE1500680

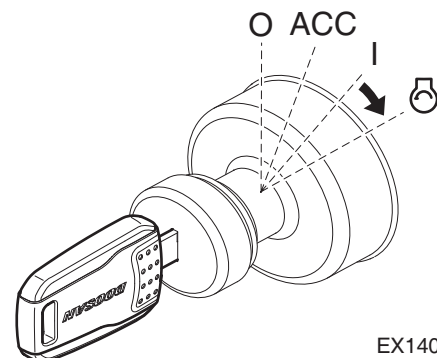
Figure 14

5. After the preheat completion, immediately turn starter switch to "START" position (Figure 15). Engine should start in approximately five (5) seconds.

IMPORTANT

OVERHEATING STARTER CAN CAUSE DAMAGE

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



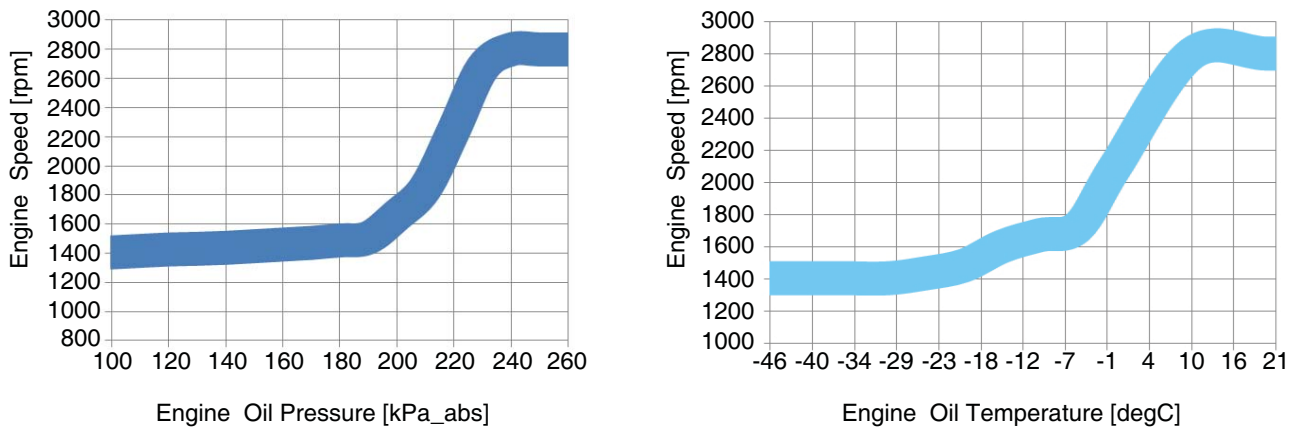
EX1402153

Figure 15

6. After engine has started, release key. Key will return to "I" (ON) position (Figure 15).
7. After the engine starts, check all operating indicators to make sure that all engine systems (oil pressure, coolant, etc.) are in the normal operating range. If any problems are noticed, stop engine.
8. Follow "Hydraulic System Warm-up" procedures in this section. (See page 3-13)

After Start Limit Logic

According to engine oil pressure and temp, machine has the limit logic of the engine rpm to protect the engine.



EX1502890

Figure 16

Starting Engine With a Booster Cable



WARNING

AVOID DEATH OR SERIOUS INJURY

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



HAOA440L

Figure 17

IMPORTANT

The machine has a 12V (-) negative ground electrical system. Use the same capacity 12V booster batteries when jump-starting engine.

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

Connecting the Booster Battery

1. Stop engine of the machine on which booster battery is mounted (3, Figure 18).
2. Connect one end of red cable (1, Figure 18) to the positive (+) terminal of the machine battery, and the other end to the positive (+) terminal of the booster battery (3, Figure 18).
3. Connect one end of black cable (2, Figure 18) to the negative (-) terminal of the booster battery, and then make ground connection to the upper frame of the machine (5, Figure 18) to be started with the other end of black

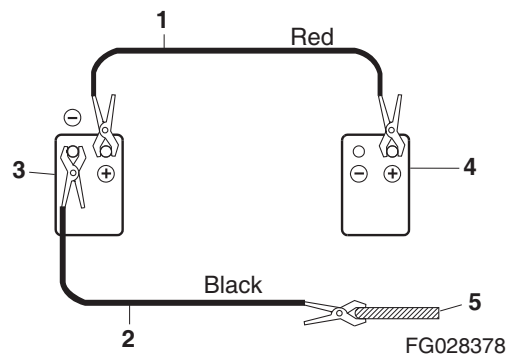


Figure 18

negative (-) cable (2, Figure 18). When making the last connection to upper frame, be sure to connect the cable end as far away from the machine battery as possible. **DO NOT CONNECT DIRECTLY TO THE NEGATIVE BATTERY TERMINAL.**

4. Start the engine.

Disconnecting the Booster Battery

1. Disconnect black negative (-) cable (2, Figure 18) from the machine frame first.
2. Disconnect the other end of black negative (-) cable (2, Figure 18) from the booster battery.
3. Disconnect red positive (+) cable (1, Figure 18) from the booster battery.
4. Disconnect red positive (+) cable (1, Figure 18) from the machine battery.

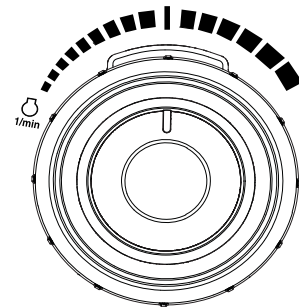
Hydraulic System Warm-up

IMPORTANT

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

The correct operating temperature of the hydraulic oil is 50° ~ 80°C (120° ~ 175°F). Make sure to follow the procedures listed here for hydraulic fluid warm-up.

1. Run engine for approximately five (5) minutes set at the middle of the speed range, without a load.



FG018151

Figure 19

2. Move safety lever (Figure 20) to "UNLOCK" position.

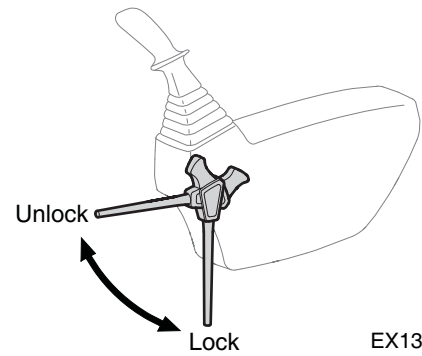


Figure 20

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.

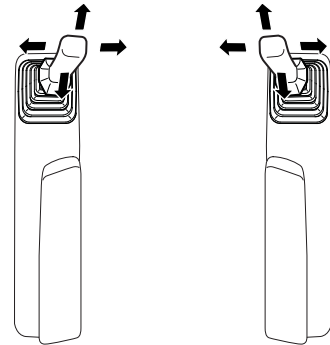


Figure 21

FG018384

Hydraulic System Warm-up – Cold Weather

1. Run engine at "LOW IDLE" (no load) for five (5) minutes (Figure 22).

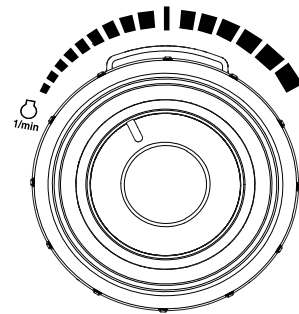


Figure 22

FG018148

2. Run engine for approximately five (5) minutes set at the middle of the speed range, without a load (Figure 23).

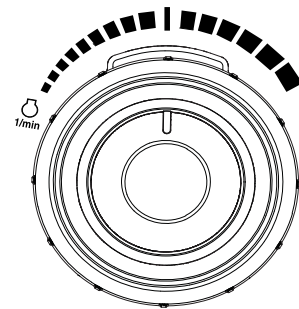
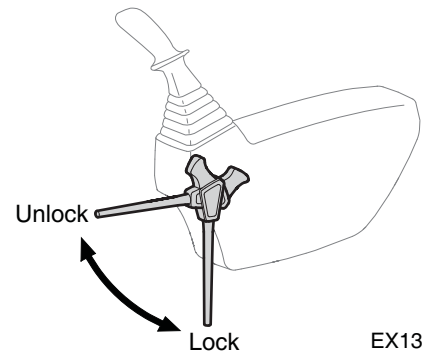


Figure 23

FG018151

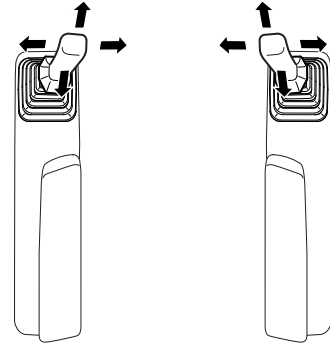
3. Move safety lever (Figure 24) to "UNLOCK" position.



EX1300566

Figure 24

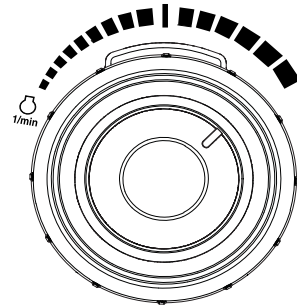
4. Slowly cycle boom, arm and bucket cylinders about five (5) times without a load to circulate the oil through the system. Do this for five (5) minutes.



FG018384

Figure 25

5. Set engine speed control dial to "HIGH IDLE" (Figure 26).
6. Repeat Step 4 for five (5) minutes. If working speeds continue to be slow, continue to operate but use extreme caution because machine function may be erratic.
7. Check for clearance and fully raise the front attachment. Slowly swing clockwise three (3) revolutions. Slowly swing counterclockwise three (3) revolutions.
8. Travel forward and reverse at low speed for two (2) lengths of the machine.



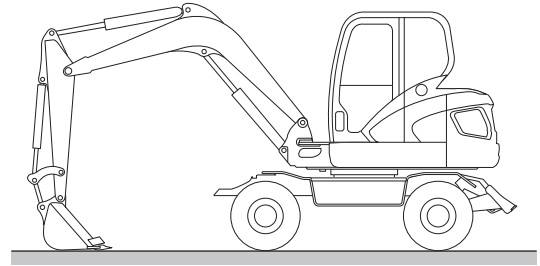
FG018154

Figure 26

Stopping Engine

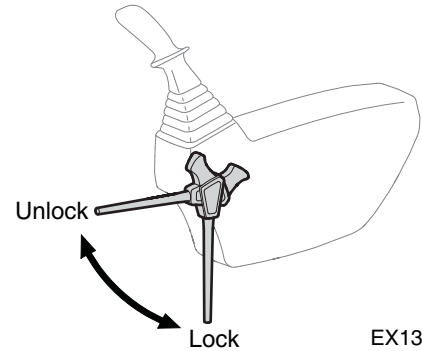
NOTE: Allow engine to idle for three ~ five (3 ~ 5) minutes before stopping the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allowing the engine to idle will allow the engine to cool down.

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 28).



WE1500614

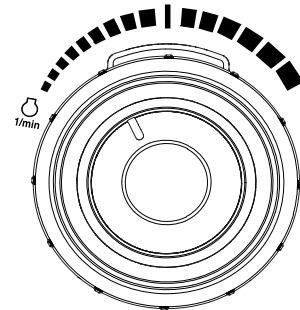
Figure 27



EX1300566

Figure 28

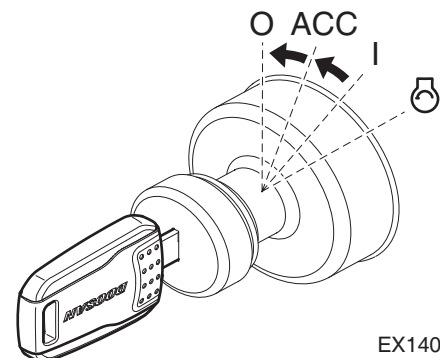
4. Set engine speed control dial to "LOW IDLE" (Figure 29). Allow engine to idle for three ~ five (3 ~ 5) minutes.



FG018148

Figure 29

5. Stop engine by turning key to "O" (OFF) position (Figure 30).
6. Remove key from starter switch.



EX1402155

Figure 30

Checks and Maintenance After Stopping Engine

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

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 31) down into "LOCK" position. When safety lever is in the "LOCK" position, the front attachment, work controls, swing and travel movement will be disabled.

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

2. Move safety lever (Figure 31) to "UNLOCK" position, by pulling it up before starting work.

NOTE: When the engine is not running, but the safety lever is in "UNLOCK" and the starter key is turned "ON", moving the work levers (joysticks) can result in movement of the work equipment. The charged accumulators in the system will provide pilot pressure for control valve spool movement.

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

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

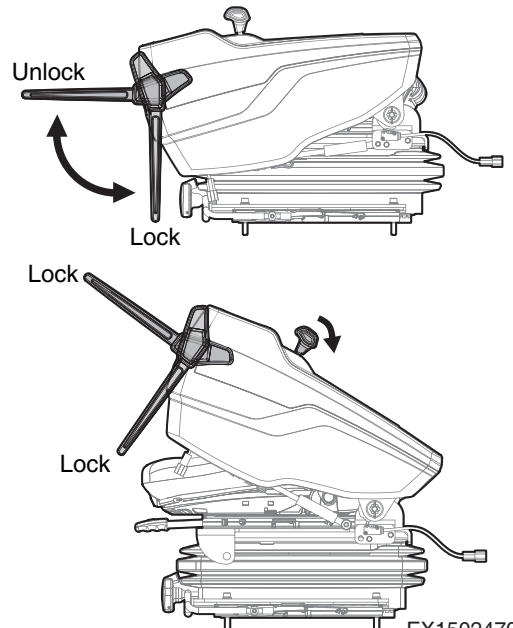


Figure 31

EX1502470

TRAVEL



WARNING

AVOID DEATH OR SERIOUS INJURY

1. Make sure to read and understand all operating instructions before traveling.
 2. Obey all traffic regulations.
 3. Do not travel faster than conditions allow.
 4. Make sure to follow all applicable local and state regulations for travel in public roads.
 5. Before putting the machine into gear, make sure in which direction the machine is facing. Locate the front section of the excavator and select the appropriate gear for travel direction desired.
 6. Before moving, make sure there are no persons or property in the way or on the machine. No riders. Sound the horn to alert workers and bystanders that you are about to move the machine.
 7. Always be sure the path is clear during travel.
 8. Use extreme caution when reversing travel. Be sure there is a clear path behind the machine.
 9. If an alarm buzzer sounds or a warning light turns "ON", stop immediately and determine the cause of the problem.
 10. If an unusual sound or smell is noticed, immediately stop the machine and determine the cause of the problem.
 11. Avoid sudden stops or turns.
 12. Remain in the slowest travel lane possible.
 13. The machine is top heavy. Make sure to make turns at a slow speed.
 14. Take extreme caution when traveling on road shoulders or narrow streets.
 15. Never jump off the machine while it is moving.
 16. Before leaving the operator's seat, make sure to lock out all control systems and stop engine to avoid accidental activation of controls.
-

Before Traveling

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

Over the Road Traveling Procedures

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

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

4. Test the brakes before beginning over-the-road travel.
5. During forward travel the travel speed selector switch can be turned from low speed range II to high-speed range III.

NOTE: *Downshifting from speed range III to speed range II should not be done if the machine is traveling at a high rate of speed. Damage to the transmission could result.*

IMPORTANT

Do not change to creep speed during running in low or high-speed. It can cause serious damage to equipment. Only select, creep speed after stopping machine. When normally traveling, drive in low or high-speed.

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

IMPORTANT

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

NOTE: As the brake pedal is applied, and if it is pressed all the way to the floor, a mechanical lock will engage and hold the pedal in the fully applied position (1, Figure 32). Step on the release lever and the brake pedal will return to the released position.

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

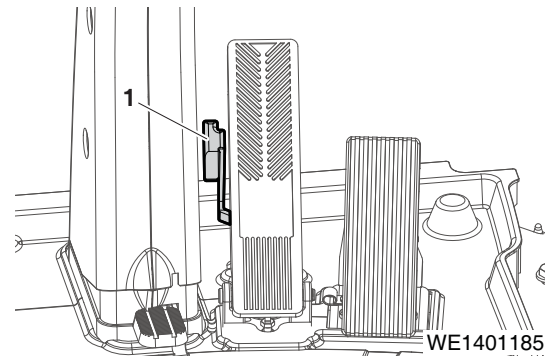


Figure 32

Traveling on a Work Site



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Never turn or travel across on a slope.

Choose a safe alternate route before climbing a slope.

If excavator starts to slip or becomes unstable, lower the bucket immediately into the ground using it as a brake.

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

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

In unavoidable cases level the slope with fill soil, to make the vehicle as horizontal as possible. (Figure 33)

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

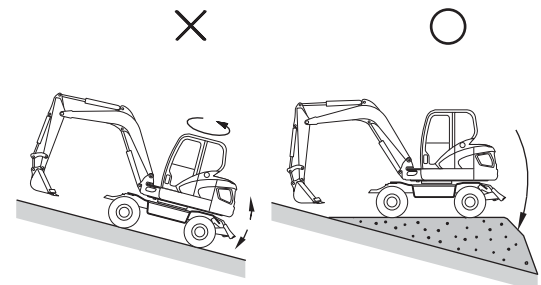


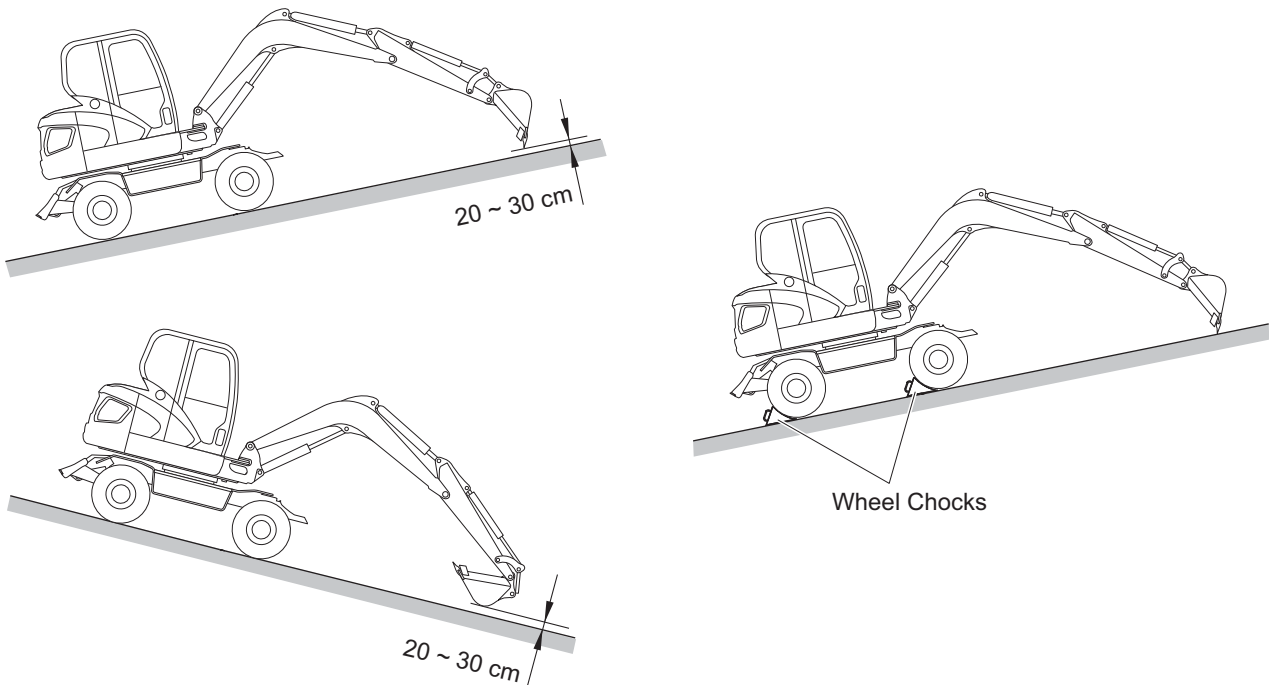
Figure 33

1. Avoid obstacles, never drive over them.
2. Keep away from the shoulders or edges of slopes or excavations.
3. Always travel directly up or down a slope, never sideways.
4. Avoid changing directions or sudden starts or stops on a slope.
5. On a slope, make sure to fully extend the arm and lower the boom until bucket is 20 ~ 30 cm (8" ~ 12") above the ground. (Figure 34) If the machine starts to slide or slip, lower the bucket to the ground to regain control. If the engine stalls, lower the bucket, make sure that all controls are in the "NEUTRAL" position and restart the engine.

6. Never travel up or down a slope with a vertical angle greater than 20° , or sideways on a slope with a vertical angle of greater than 5° .

Traveling on a Slope

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



WE1500681

Figure 34

Parking

1. Slowly release the pressure on the accelerator pedal.

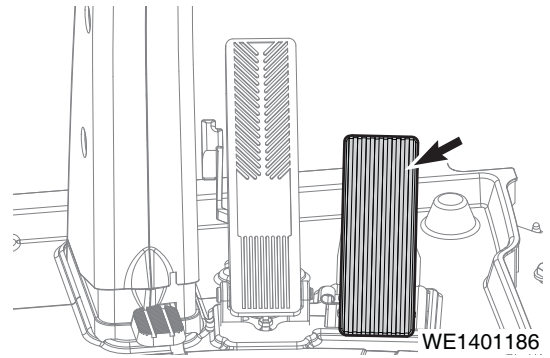


Figure 35

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

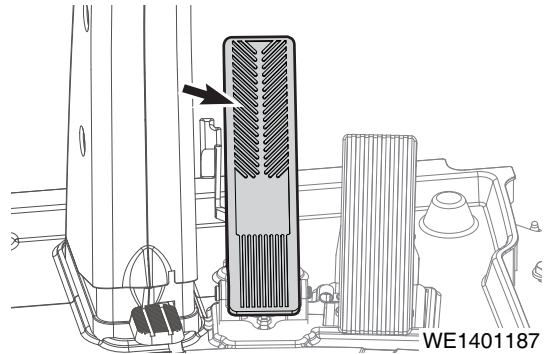


Figure 36

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

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

- A. In this position, "FORWARD" direction is selected.
- B. In this position, "NEUTRAL" is selected.
- C. In this position, "REVERSE" direction is selected.

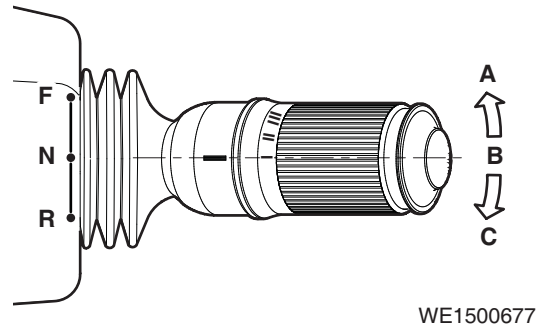


Figure 37

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

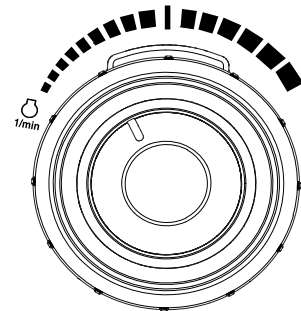
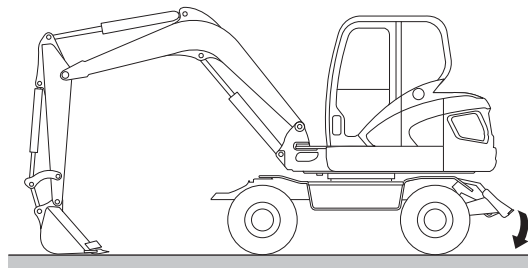


Figure 38

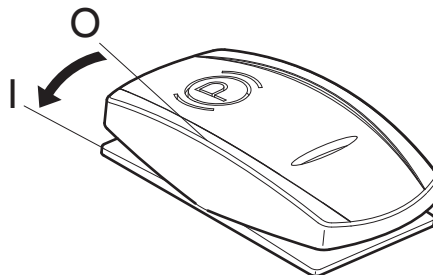
5. Park machine on firm and level ground. Lower bucket or attachment to ground as shown in Figure 39.
6. "LOWER" dozer blade to ground.



WE1500875

Figure 39

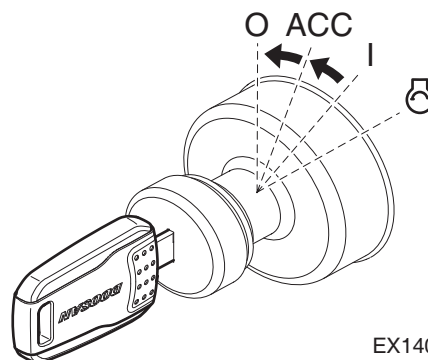
7. Set parking brake switch to "I" position. This will ensure that parking brake is "APPLIED".



FG017937

Figure 40

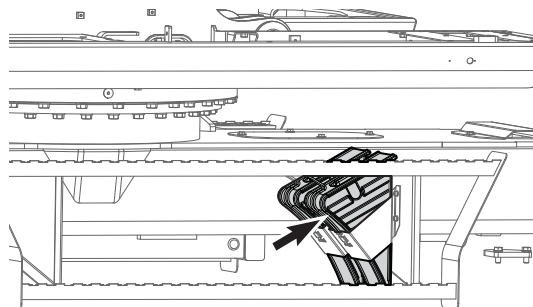
8. Stop engine by turning key to "O" (OFF) position (Figure 41).
9. Remove key from starter switch.



EX1402155

Figure 41

10. If the machine is parked on a slope, insert the wheel chocks on the downhill side of the tires to secure the machine (Figure 34). Wheel chocks are supplied with the machine and are stored on the lower structure directly below the cabin. When the upper structure is facing the front of the machine.



WE1401188

Figure 42

Travel Problems

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

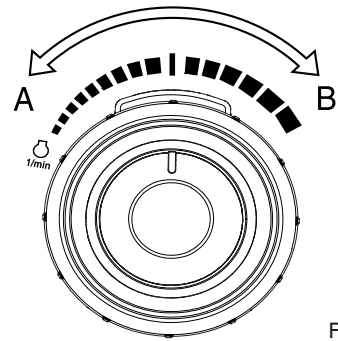
OPERATING INSTRUCTIONS

Engine Speed Control

Engine speed can be manually adjusted using the engine speed control dial. Increase engine speed by rotating the control knob clockwise. Decrease engine speed by rotating the control knob counterclockwise.

IMPORTANT

The engine speed control system has been set at the factory and should not require adjustment as part of routine maintenance.



FG018094

Figure 43

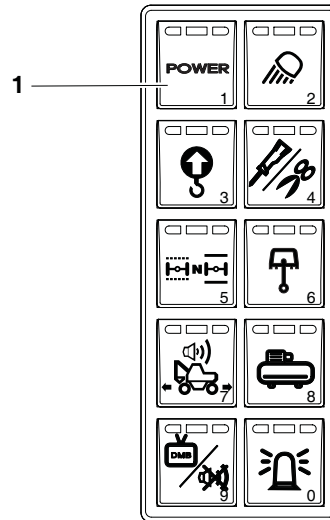
Mode Selection

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

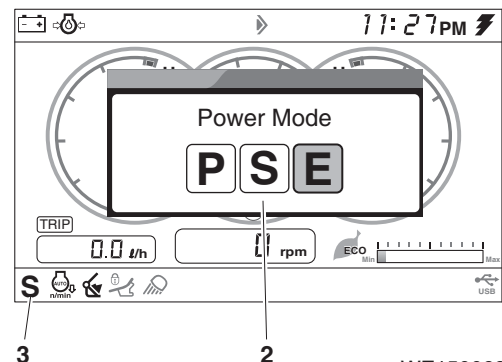
1. When the starter switch is turned "ON" the power mode is automatically defaulted to the standard setting.
2. Select a proper power mode using button (1, Figure 44) before starting work.
3. When the power mode button (1, Figure 44) is pressed, instrument panel displays a power mode selection pop up menu (2, Figure 45).

When power mode is selected, symbol (3, Figure 45) shows on screen.



WE1500632

Figure 44



WE1500633

Figure 45

Mode	Selection Point
Power Mode	<ul style="list-style-type: none"> Fast work. Work in a short period of time.
Standard Mode	<ul style="list-style-type: none"> General work. Optimize speed and fuel consumption.
Economy Mode	<ul style="list-style-type: none"> Light work. Minimize fuel consumption. Reduce noise.

Work Mode

1. When the starter switch is turned "ON" the work mode is automatically defaulted to digging mode.
2. Select a proper work mode using button (2, Figure 46) before starting working.
(Digging/Breaker/Shear Mode)

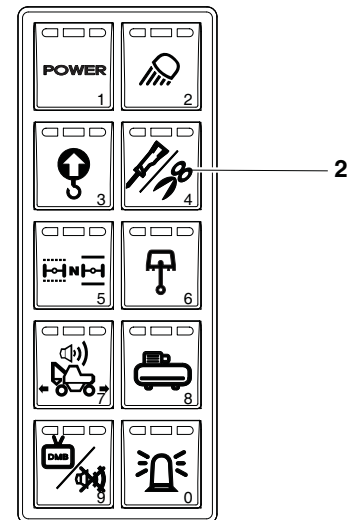


Figure 46

WE1500634

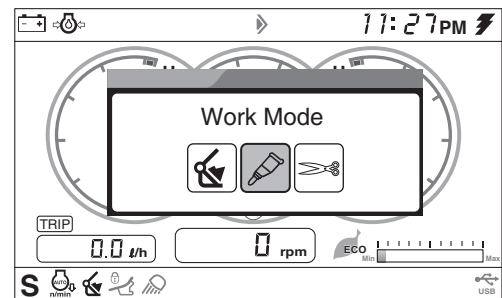


Figure 47

WE1500635

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 (4, Figure 48) is turned "ON", the auto idle function is activated. Deactivate the auto idle function by again pressing the auto idle selector button (3, Figure 48). Now the symbol will be turned "OFF".

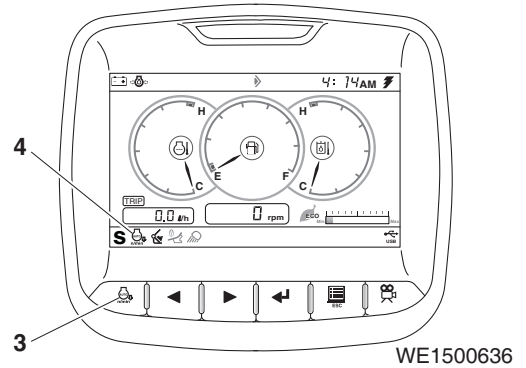


Figure 48



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Work Levers (Joysticks) (ISO Pattern)



WARNING

AVOID DEATH OR SERIOUS INJURY

Check surrounding area before swinging. When operating a lever while in auto idle, proceed with caution because the engine speed will increase rapidly. Keep bystanders away.

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

This equipment is manufactured using the lever control pattern described in ISO standards. Do not change valving, hoses, etc., that would change this control pattern. The boom, arm and bucket movements and swing direction of work levers (joysticks) are as follows:

Left-hand Work Lever (Joystick) (Figure 49 and Figure 50)

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 49 and Figure 52)

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".

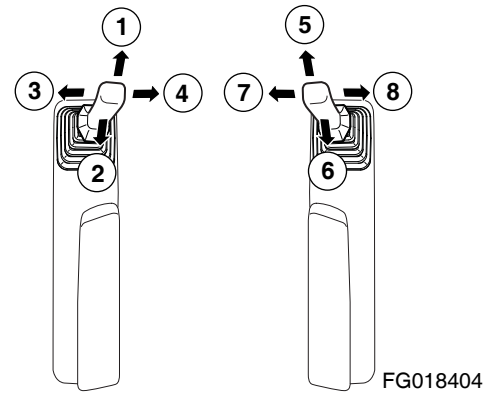


Figure 49

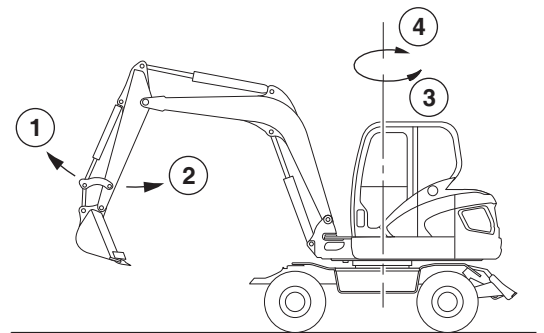


Figure 50

WE1500682

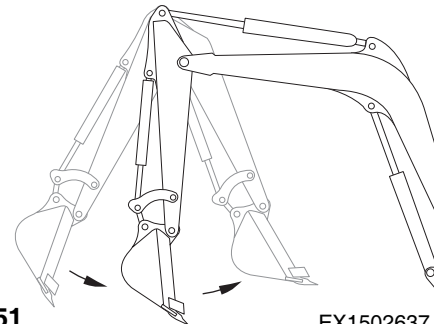


Figure 51

EX1502637

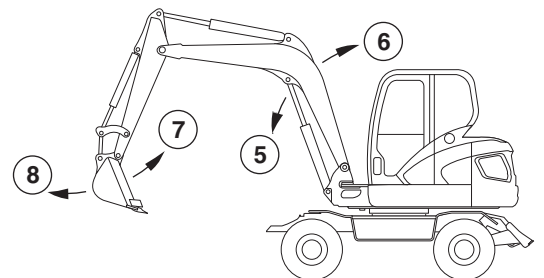


Figure 52

WE1500683

Dozer Blade Control Lever

The dozer blade control lever, located on the right-hand side of the driver's seat, controls the operation of the dozer blade. When the lever is released, it goes to the NEUTRAL position and the blade stops immediately.

1. Pulling lever back "RAISES" dozer blade.
2. Pushing lever forward "LOWERS" dozer blade.

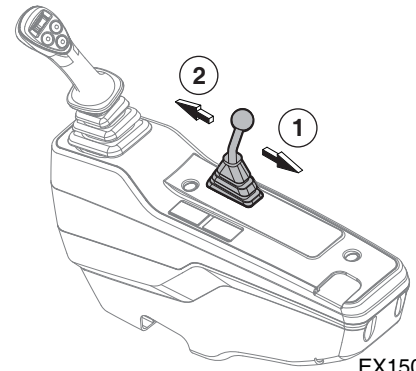


Figure 53

EX1502474

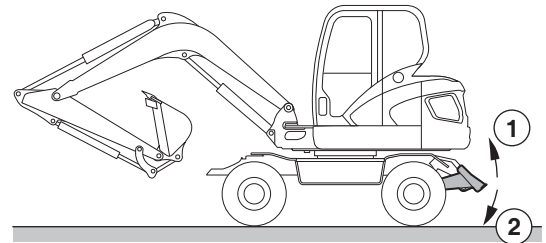


Figure 54

WE1500684

Precautions for Blade Use

1. Use the blade only for earth moving. Do not use the blade to dig. This can damage the blade or the driving system.
2. Do not apply a large or unbalanced, off-center load to the blade. This can damage the blade or the driving system.
3. Do not strike anything with the blade while traveling. This can damage the blade or driving system.
4. When using the blade to raise up the machine, make sure the ground is even for good support and that blade contacts the ground evenly.
5. When the blade is positioned in front of the machine, while excavating or bringing the front attachment in, be careful not to strike and damage the blade.

OPERATING PRECAUTIONS



WARNING

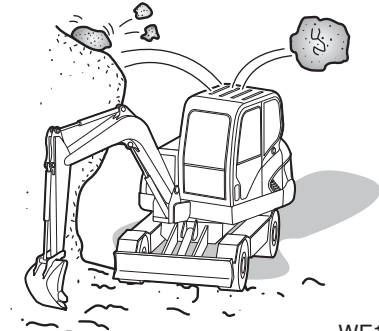
AVOID DEATH OR SERIOUS INJURY

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

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

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

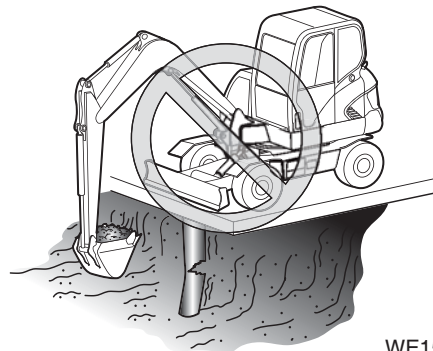
1. Before starting work, inspect terrain and soil conditions. Level ground and drain area if necessary.
2. Install window guards for additional operator protection when working if there is a possibility of falling rocks or other objects. See Figure 55.



WE1500719

Figure 55

3. Check strength of supported structures before working on them to avoid collapse of the structure caused by the weight of the excavator. If insufficient, reinforce it. See Figure 56.



WE1500720

Figure 56

4. When working close to the excavated edge or drop-off, make sure that the machine is sitting on solid ground. Keep the dozer blade (Figure 57) to the front.

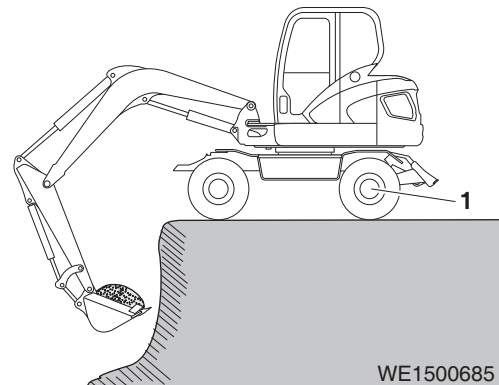


Figure 57

5. Do not allow bottom side of the boom to interfere with or touch the ground or tires when digging a deep hole. See Figure 58.

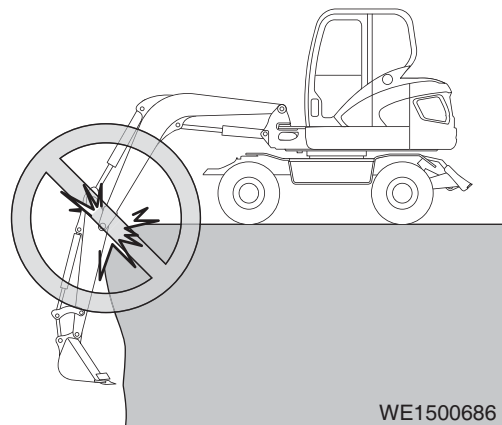


Figure 58

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

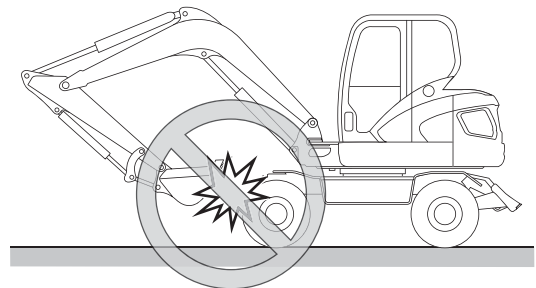


Figure 59

7. Do not excavate underneath the machine. The ground under the machine can collapse and cause the machine to fall and rollover. See Figure 60.

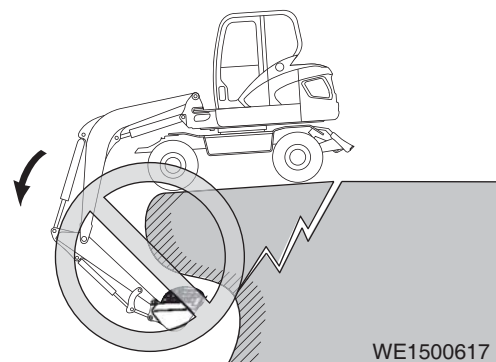


Figure 60

8. Make sure there is adequate clearance from overhead electrical supply lines. Check for underground utility lines before excavating. Call before you dig. See Figure 61.

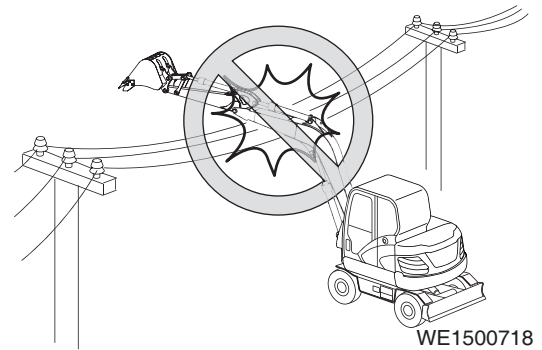


Figure 61

9. If the excavation is in an underground location or in a building, make sure there is adequate overhead clearance and there is adequate ventilation. See Figure 62.

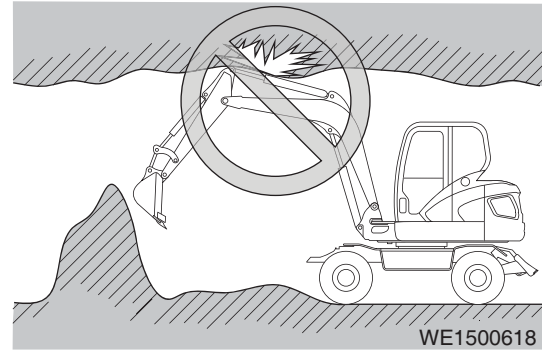


Figure 62

10. Do not continually "bottom out" the hydraulic cylinders. Machine damage can occur if the cylinders are fully extended or retracted. For example: arm cylinder fully retracted and the bucket cylinder is extended to rotate the bucket into the ground. See Figure 63.

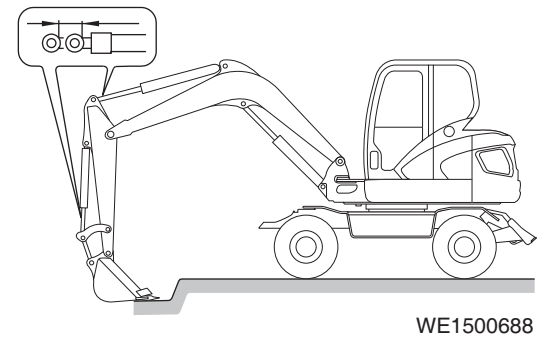


Figure 63

11. Do not dig with the excavator tires raised. This can result in structural and mechanical failures. See Figure 64.

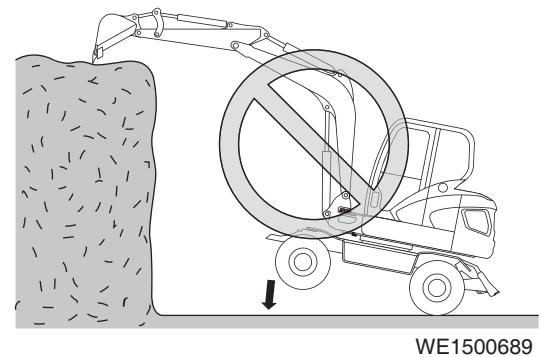


Figure 64

12. Do not use weight of machine to provide additional breakout force. See Figure 65.

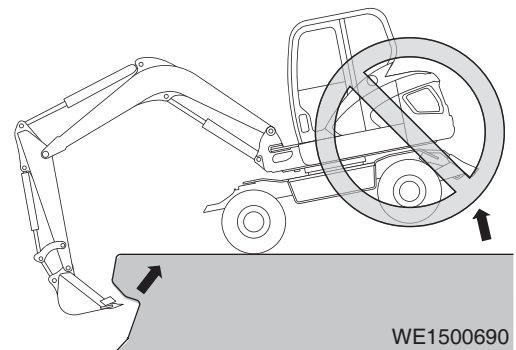


Figure 65

13. Do not use the bucket as a hammer or ramming device. This can cause damage to the front attachment. See Figure 66.

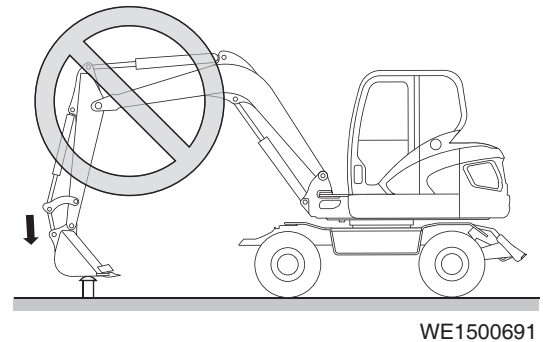


Figure 66

14. Do not move dirt or objects by swinging the excavator into them. This can result in structural and mechanical failures. See Figure 67.

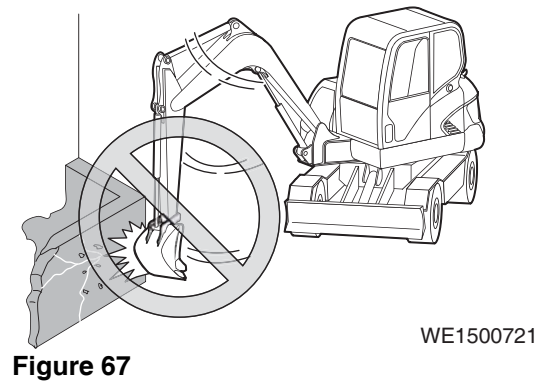


Figure 67

15. Do not use machine travel or swing when the bucket is in the ground to provide additional breakout force. See Figure 68.

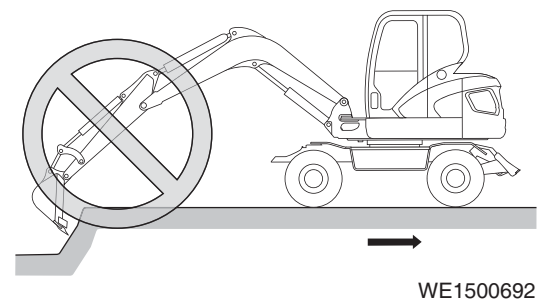
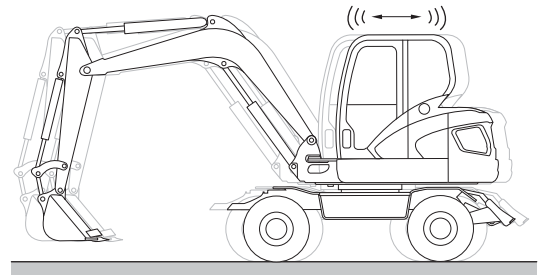


Figure 68

16. When traveling in high range:

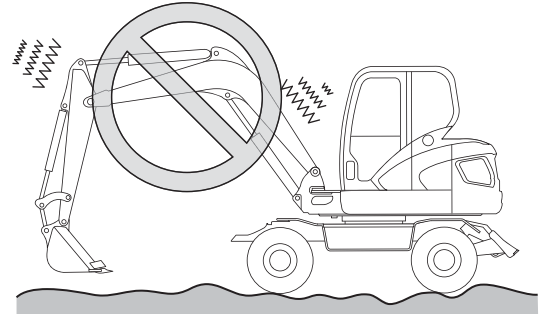
- Avoid sudden starts.
- When traveling in one direction come to a complete stop before reversing directions. Do not rock excavator back and forth.
- Avoid sudden stops.



WE1500693

Figure 69

17. Do not travel at high-speed over rough ground or rocks. This can result in structural and mechanical failures and can reduce the service life of the machine. See Figure 70.



WE1500694

Figure 70

18. If optional long fronts (arm extensions) or attachments or heavy-duty front end attachments are used, the machine balance will be altered. Follow these additional operating precautions. See Figure 71.



WARNING

AVOID DEATH OR SERIOUS INJURY

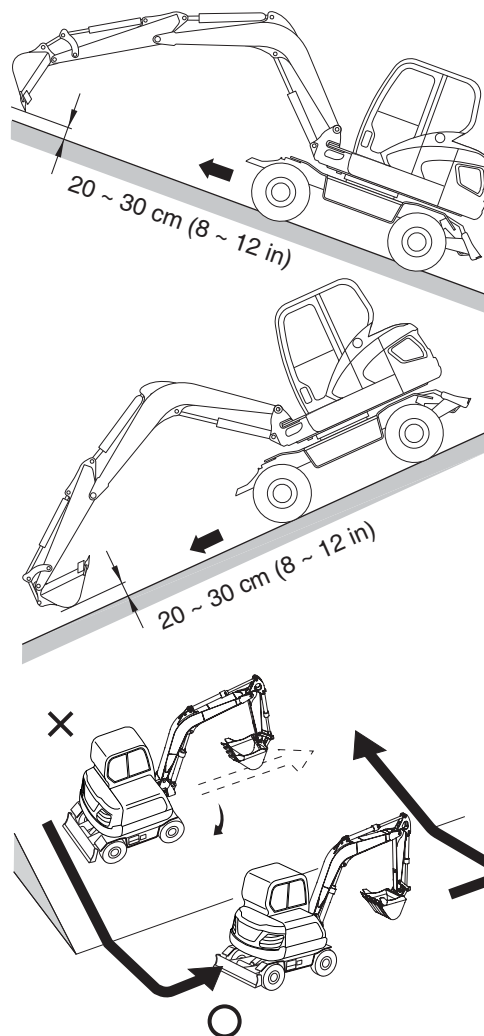
Do not travel downhill with the front end attachments raised.

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

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

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

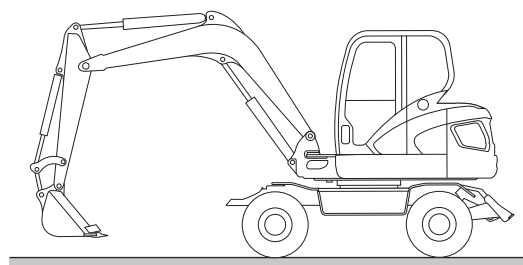
Make sure that all optional equipment has been authorized and installed properly.



WE1500611

Figure 71

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



WE1500695

Figure 72

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

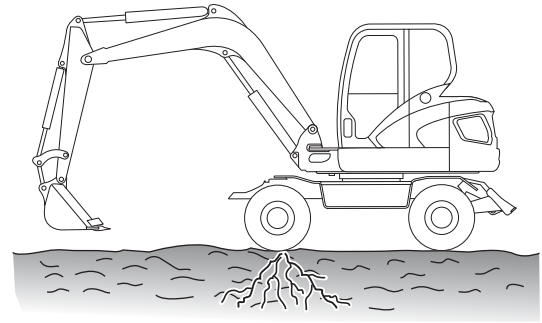


Figure 73

WE1500696

Working in Water

IMPORTANT

When working in water, do not exceed a slope of more than 15°. If the slope is over 15°, the rear part of the upper structure will be immersed in water, resulting in radiator fan and engine ECU damage.

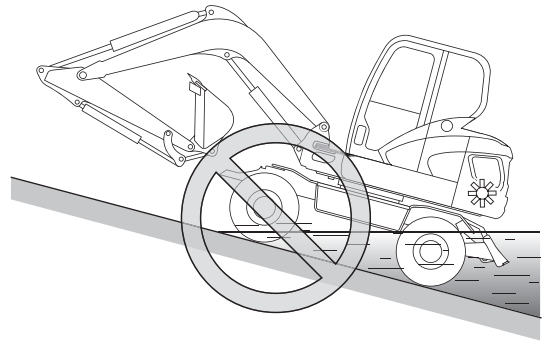


Figure 74

WE1500697

1. When working in water, do not operate in water over center of axle (1, Figure 75).

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

If water gets into swing gear housing, drain water immediately by removing lower inspection cover. Apply new grease.

After working in water, purge old grease on bucket pins.

2. It is possible to work and travel in shallow water if the ground is stable. If the terrain is rough or if the water is flowing heavy it is unsafe to operate the equipment.
3. When working in wet soil, the equipment can sink into the soft ground. Select solid ground to secure the equipment before starting work.

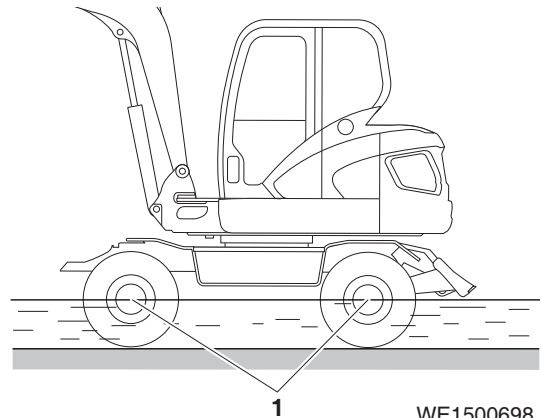


Figure 75

WE1500698

PARKING EXCAVATOR



WARNING

AVOID DEATH OR SERIOUS INJURY

Park machine on firm and level ground. Avoid parking on slopes. If excavator must be parked on a slope, block tires (1) using the supplied wheel chocks and place bucket teeth in ground. See Figure 76.

1. Park machine on firm and level ground. Lower bucket or attachment to ground as shown in Figure 77.
2. "LOWER" dozer blade to ground.

3. Set engine speed control dial on "LOW IDLE".

4. If control levers (joysticks) are moved unintentionally, it can cause accidental movement of the work equipment or attachment. Before leaving operator's seat, move safety lever to "LOCK" position. Stop engine.

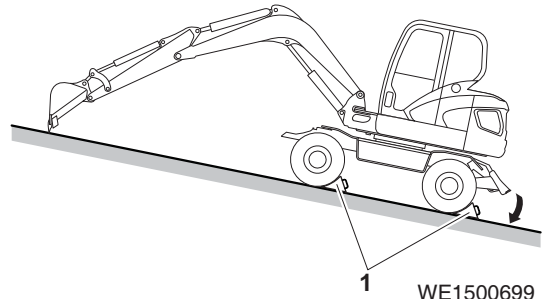


Figure 76

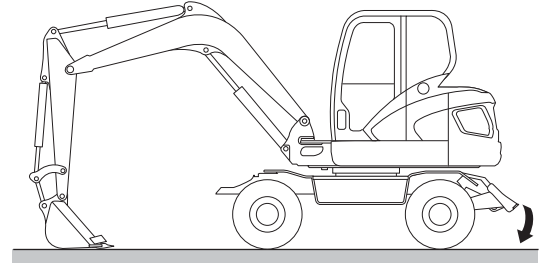


Figure 77

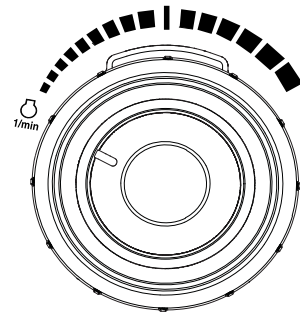


Figure 78

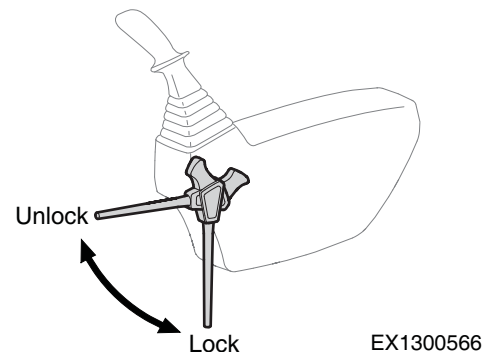


Figure 79

TOWING PROCEDURE



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

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

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

Make sure that the upper structure is secured before towing.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Always wear gloves when handling a wire rope or chain.

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

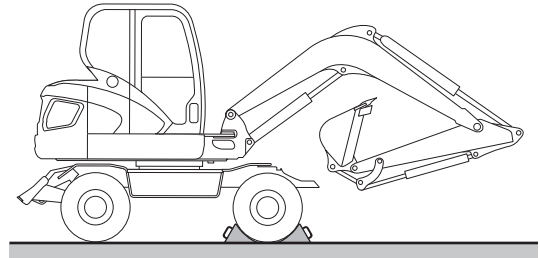
Always have one person in cabin at all times.

IMPORTANT

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

If engine will not start, the parking brake will have to be "MANUALLY RELEASED" before towing machine. See "Releasing Parking Brake Manually" on page 3-42.

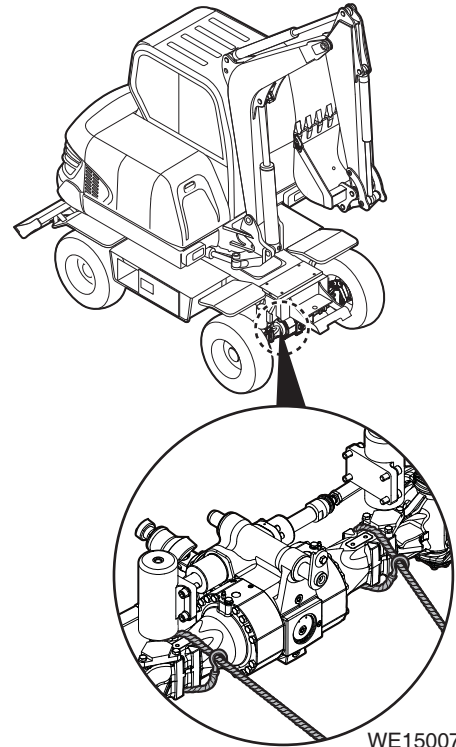
1. Secure equipment with wheel chocks so equipment will not move.



WE1500700

Figure 80

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



WE1500717

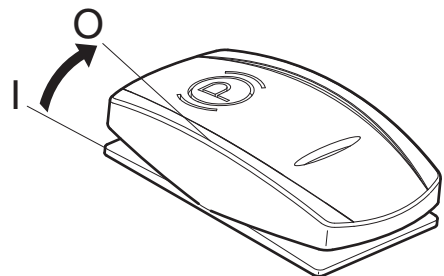
Figure 81

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

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

NOTE: If parking brake will not "RELEASE" when engine is running, parking break will have to be "MANUALLY RELEASED" before towing machine. See "Releasing Parking Brake Manually" on page 3-42.

NOTE: If engine does not operate, transmission will have to be "Manually shifted" before towing machine. See "Shifting transmission to neutral manually." on page 3-43.



WE1500923

Figure 82

4. Remove wheel chocks and tow equipment.



CAUTION

AVOID INJURY

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

Always have one person in cabin at all times.

Releasing Parking Brake Manually

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



CAUTION

AVOID INJURY

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

1. Loosen the unlocking screw (1).
 2. Remove the four stop washer (2).
 3. Tighten screws (1) again.
Make sure that screws are fully tightened.
-

IMPORTANT

Use new O-rings (3) when reassemble bolts.

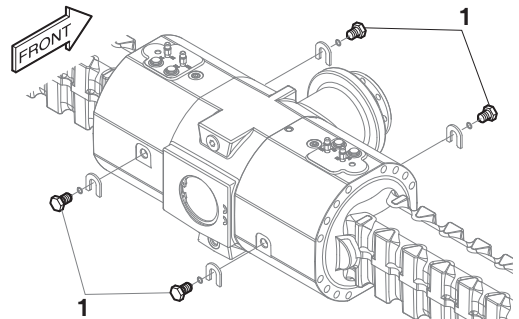


Figure 83

WE1500702

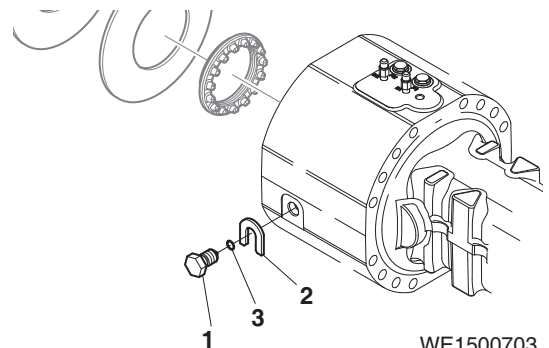


Figure 84

WE1500703

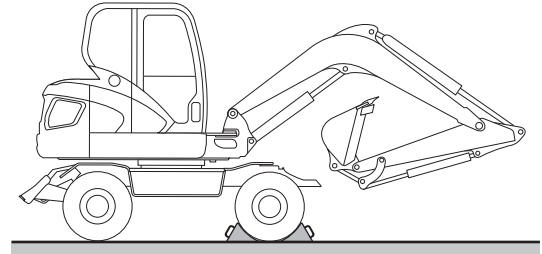
Shifting transmission to neutral manually.

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

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

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

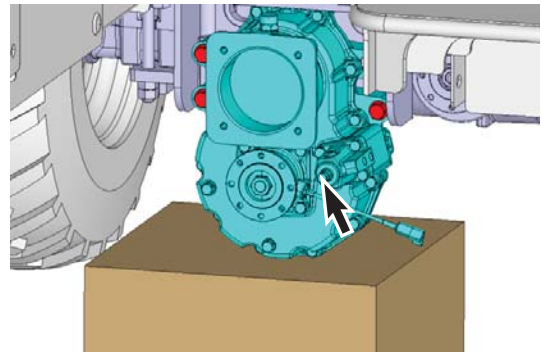
NOTE: *When the transmission is shifted to the neutral state manually, the machine may move, leading to a severe injury or even death.*



WE1500700

Figure 85

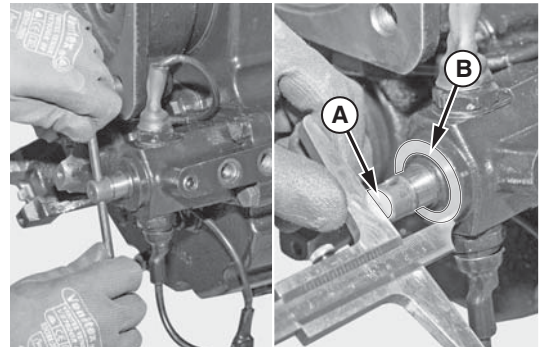
2. It is possible to turn the manual neutral position control lever of the transmission to adjust the gear.



WE1502040

Figure 86

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



WE1502041

Figure 87

Shifting from 1st gear to neutral gear :

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

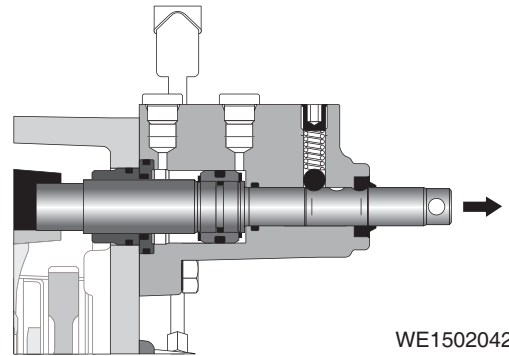


Figure 88

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

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

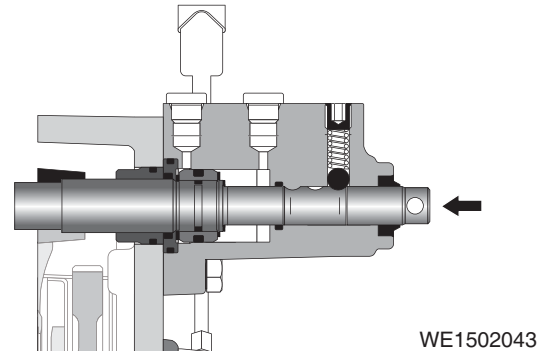


Figure 89

4. When it is approximate 21 mm as shown in the Figure 90, the neutral gear is selected.

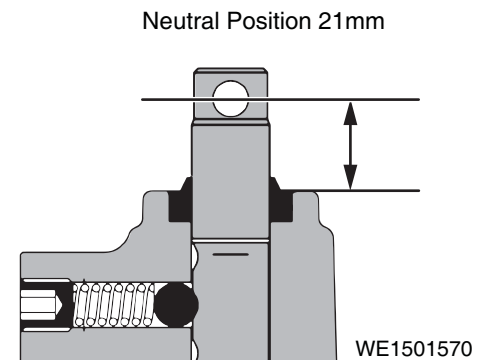


Figure 90

ATTACHMENTS

Bucket Replacement and Reversal



WARNING

AVOID DEATH OR SERIOUS INJURY

Wear eye protection, hard hat, gloves, and other protective equipment when tools are being used and flying objects are possible.

Striking pins with a hammer can cause flying objects, keep bystanders clear of the area.

When removing pins, stand to the side of the bucket and do not place feet or body under a raised attachment.

When removing, inserting, or aligning pins, never insert your fingers into the pinholes.

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

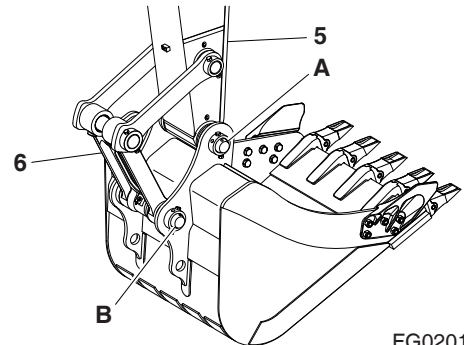
Stop the machine on a firm and flat surface. When performing work with more than one person, appoint a lead and follow that person's instructions and signals.

Replacement

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

IMPORTANT

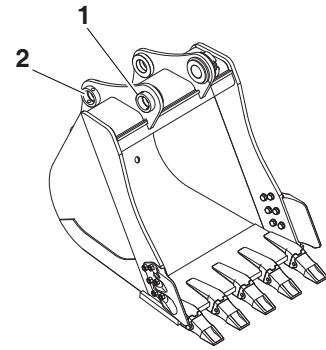
When removing the pins, place the bucket so it is resting slightly on the ground. If down pressure is applied to the bucket, the resistance will be increased and it will be difficult to remove pins. After removing the pins, make sure they are clean and do not allow mud, sand, or other debris to get on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



FG020108

Figure 91

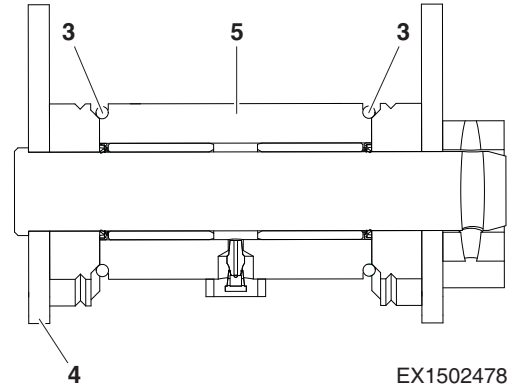
2. Remove double nut from bolt for arm pin (A, Figure 91) and link pin (B, Figure 91), remove bolt, pull out arm pin (A) and link pin (B, Figure 91), and then remove bucket.
3. Align the arm (5, Figure 91) with holes (1, Figure 92) of the replacement bucket and the link (6, Figure 91) with holes (2, Figure 92), then insert grease coated pins (A, Figure 91) and (B, Figure 91) into hole (1, Figure 92) and hole (2, Figure 92) respectively.



FG018432

Figure 92

4. When installing the bucket, for arm pin portion (A, Figure 91), fit O-rings (3, Figure 93) on bucket (4, Figure 93) in the position shown in the diagram on the right. After inserting the pin, position them in the standard groove.
5. Install the stopper bolts and nuts for each pins.
6. Lubricate with grease thoroughly until grease comes out from the end face.



EX1502478

Figure 93

IMPORTANT

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

Reversal (If Applicable)

1. Place the bucket on a flat surface.

IMPORTANT

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

2. Remove double nut on the stopper bolt for arm pin (A, Figure 94) and link pin (B, Figure 94), remove bolt, pull out arm pin (A, Figure 94) and link pin (B, Figure 94), and then remove bucket.

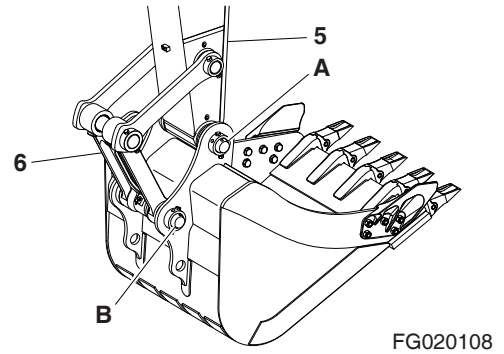


Figure 94

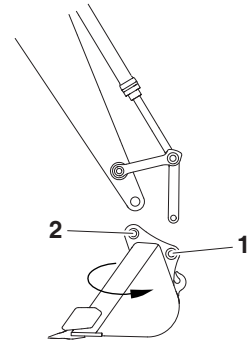


Figure 95

3. After removing the bucket, reverse it.
4. Align arm (5, Figure 94) with replacement bucket hole (1, Figure 95), then align link (6, Figure 94) with hole (2, Figure 95), then insert greased coated pins (A, Figure 94) and (B, Figure 94) into hole (1, Figure 95) and hole (2, Figure 95) respectively.

IMPORTANT

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

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

IMPORTANT

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

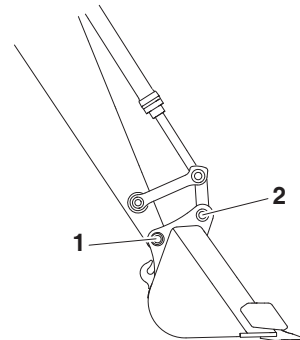


Figure 96

HYDRAULIC ATTACHMENTS (OPTIONAL)

Breaker Operation

IMPORTANT

If a hydraulic breaker and hydraulic piping is installed without DOOSAN's written authorization, it can damage the excavator and this will not be covered under the excavator warranty.

Selection of Hydraulic Breaker

If a hydraulic breaker is installed, consider equipment's stability and suitability for such modification. Also, consider hydraulic oil pressure and quantity. When selecting a hydraulic breaker, consult with a DOOSAN distributor.

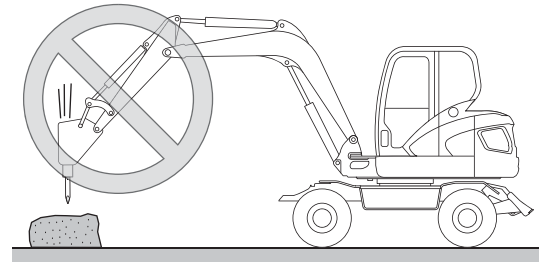
Hydraulic Hoses and Tubing for Breaker

1. When installing hydraulic breaker, assemble according to instructions provided with kit.
2. If breaker is taken off excavator, be sure to plug and cap all hoses and tubing to prevent contamination from entering hydraulic system.
3. Plug and cap all connectors and fittings on breaker to prevent contamination.
4. Check all hydraulic connections for signs of leaks or loose components before starting operation.

Breaker Operating Precautions

NOTE: Hydraulic pressure and flow settings may need to be changed. Refer to the Maintenance Section of this manual for further information.

1. Make sure to read and understand the breaker operator's manual.
2. Inspect all mechanical and hydraulic connections.
3. Do not use the breaker as a hammer. See Figure 97.
4. Do not drop breaker from extreme heights.
This can damage breaker or the excavator.

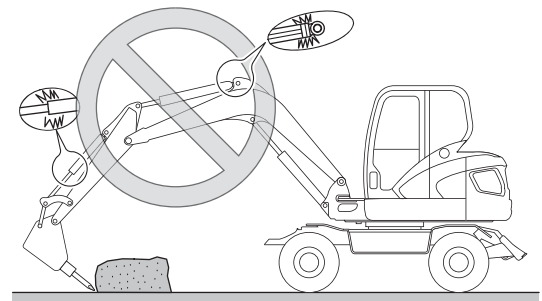


WE1500704

Figure 97

5. Do not operate the breaker with the boom or arm cylinders fully extended (bottomed out). See Figure 98.

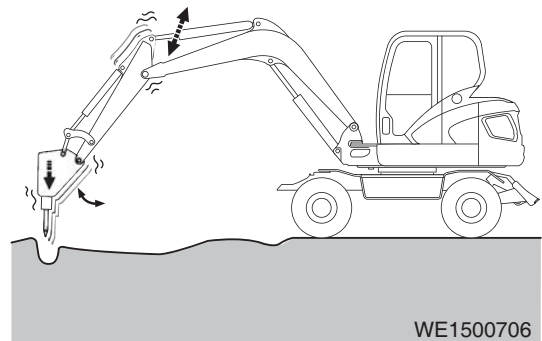
Leave over 100 mm (4 in) of clearance between rod end of cylinder and cylinder head. This will help prevent damage to cylinders during breaker operation.



WE1500705

Figure 98

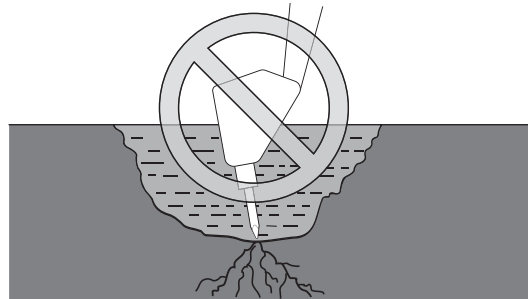
6. Do not use the breaker if the hydraulic hoses vibrate excessively. See Figure 99. If excavator is operated under this condition, structural and hydraulic components can be damaged.



WE1500706

Figure 99

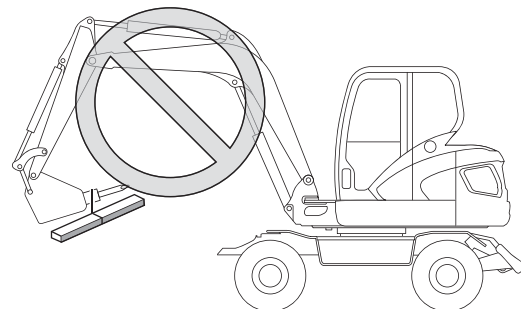
7. Do not allow the breaker body to go into water if not equipped for underwater operation. The breaker seal can be damaged and rust, foreign material or water can enter the hydraulic system and cause damage. Only insert the breaker tool (chisel) into water. See Figure 100.



EX1502480

Figure 100

8. Do not lift or tow with a breaker. See Figure 101.



WE1500707

Figure 101

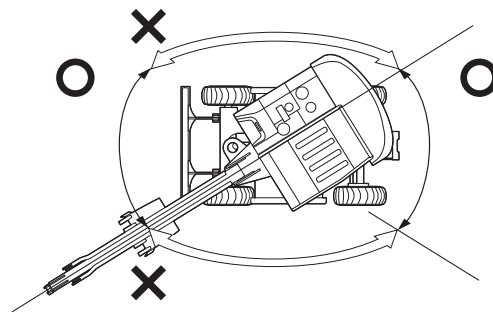
9. Operate the breaker only to the front and rear of the excavator. Do not use the breaker to either side of the excavator. Do not swing the breaker from side to side when operating it. See Figure 102.



WARNING

AVOID DEATH OR SERIOUS INJURY

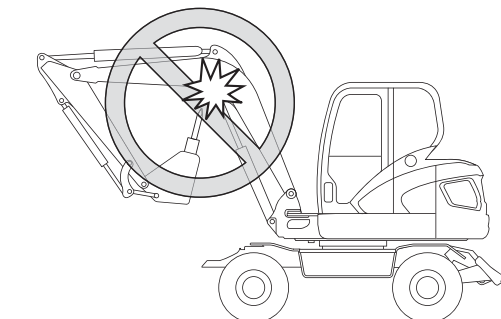
Operating a breaker with the upper structure turned 90° to the lower structure can result in tipping over the machine or reduction in service life.



WE1500722

Figure 102

10. Do not curl the breaker tool tip into the arm or boom when traveling or parking the excavator. See Figure 103.



WE1500708

Figure 103

To Activate Breaker

1. Set work mode to breaker position using button (2, Figure 104)

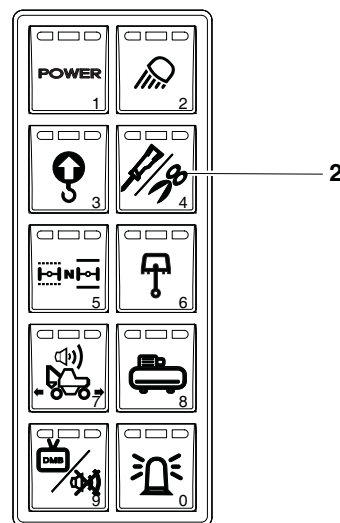
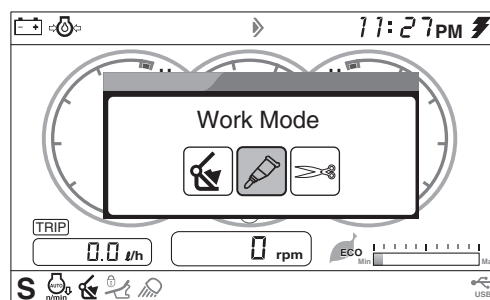


Figure 104

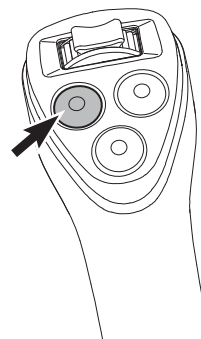
WE1500634



WE1500635

Figure 105

2. Press the left button (Figure 106) on the top of right-hand work lever (joystick) to activate hydraulic breaker.
3. Release the left button (Figure 106) on the top of right-hand work lever (joystick) to deactivate hydraulic breaker.



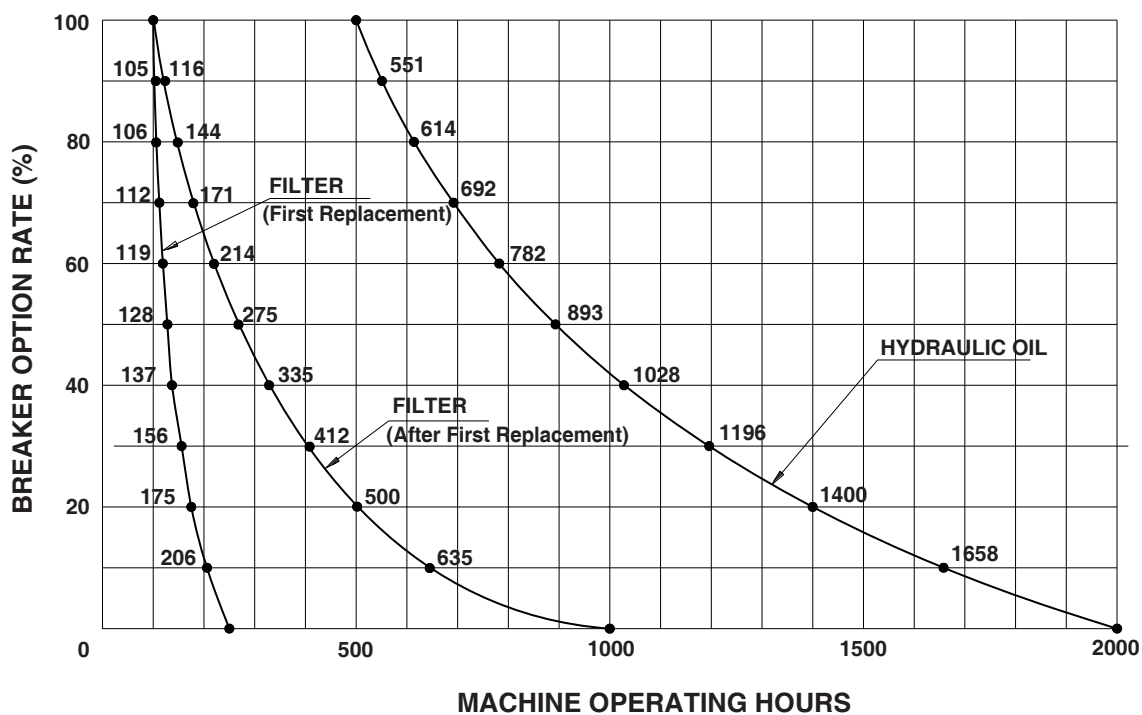
EX1403214

Figure 106

Hydraulic Oil and Filter Service Intervals

When using a hydraulic breaker, the viscosity breakdown and contamination of hydraulic oil is faster because the work condition is more severe than during normal digging work. To prevent the hydraulic components (especially pump) from having a shortened life cycle, replace the hydraulic oil and main hydraulic oil return filter using the following schedule.

Attachment	Operation Rate	Hydraulic Oil	Filter
Bucket Work	100%	2,000 Hours	250 Hours (First Replacement) 1,000 Hours (After First Replacement)
Hydraulic Breaker Work	100%	500 Hours	100 Hours
* These service intervals only apply, when genuine DOOSAN hydraulic oil and filter are used. If any other brands are used, the guaranteed change interval must be reduced in half.			



FG000767

Figure 107

NOTE: The replacement intervals of hydraulic oil and filter depend upon amount of time hydraulic breaker is being used. These service intervals must be followed as opposed to regularly scheduled maintenance.

Shear Operation (Optional)



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not operate or work on this work tool unless you have read and understand the instructions and warnings given in this manual for both the work tool and the machine.

Failure to follow the instructions or heed the warnings could result in death or serious injury.

Contact your DOOSAN distributor for replacement manuals. Proper care and maintenance is your responsibility.

NOTE: *Selection of a hydraulic shear must be done with extra care.*

Use of a hydraulic shear not recommended by DOOSAN could result in structural damage to the machine.

Consult your DOOSAN distributor for hydraulic shear information.

Be sure that no one is near the work tool to prevent injury. Keep the work tool under control always to prevent injury. When a demolition tool is used, all personnel should maintain a minimum distance of 10 m (33 ft).

Close all windows. Make sure that all required operator protective guards are in place. Wear all required personal protective equipment. Follow the instructions given in this manual for the work tool.



WARNING

AVOID DEATH OR SERIOUS INJURY

Death or serious injury could occur from the demolition of pipes, vessels, tanks or other containers that may contain gas, flammable materials, or hazardous chemicals.

Do not perform any demolition work on these items until all of their contents have been removed.

Follow all laws and regulations for the removal and disposal of these materials.

To Activate Shear (Optional)

1. Set work mode to "SHEAR" position using button (2, Figure 108)

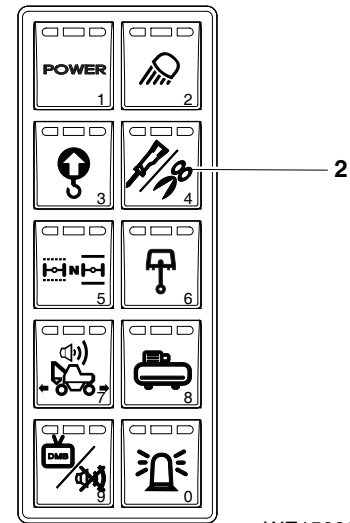




Figure 108

WE1500634

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

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

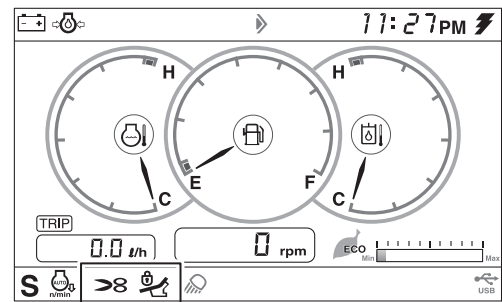


Figure 109

WE1500709

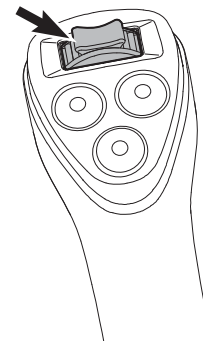


Figure 110

EX1403216

IMPORTANT

Cutting train or crane rails, engine crankshafts, welded fabrications, bearing, shafts, and other hard metals will increase the wear rate on the cutting edges and the shear.

IMPORTANT

Using the demolition tool to level the work site or push over standing structures can damage the machine or the demolition tool. Use appropriate equipment to do site preparation or maintenance operations.

Align the machine with the work area. Operate the hydraulic shear while you travel backward.

IMPORTANT

To avoid structural damage to the machine, do not break road surfaces by placing the cutting edge of the hydraulic shear on the ground and moving the machine.

To peel and remove road surface with the hydraulic shear, place the cutting edge of the stationary jaw between the road surface and the road bed. Use the work tool cylinder to separate the road surface and the road bed.

IMPORTANT

Operating the demolition tool with the cylinders fully retracted or fully extended could cause structural damage to the machine.

IMPORTANT

Using the machine hydraulic cylinder or the demolition tool rotating device to aid in the breaking or shearing process can damage the machine or the demolition tool rotating device. Use only the arm hydraulic cylinders to perform demolition operations.

IMPORTANT

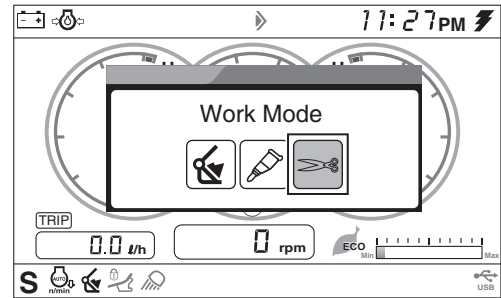
Hitting the demolition tool against the ground or solid object to dislodge an obstruction or free the cutting arm can damage the demolition tool or the machine. Use a pry bar or cutting torch to free the cutting arm or dislodge the obstruction.

Always check the cutting edge alignment after the jaws are working properly.

Two-Way/Breaker Pedal Valve Operation (Optional)

Activating Shear with Pedal Valve

1. Set work mode to "SHEAR" position using "Work Mode Selector Switch" of keypad.

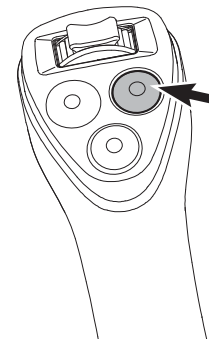


WE1500710

Figure 111

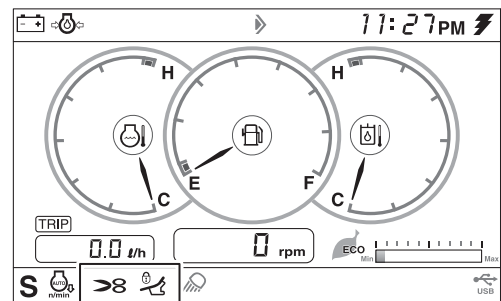
2. Change the control method to pedal valve using the right button (Figure 112) on the top of right-hand work lever (joystick).

NOTE: Check the currently set control type on the gauge panel, and adjust it as necessary. (Figure 113)



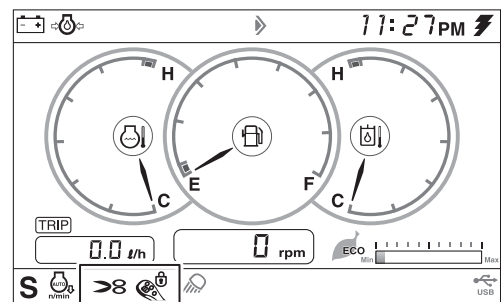
EX1403848

Figure 112



WE1500863

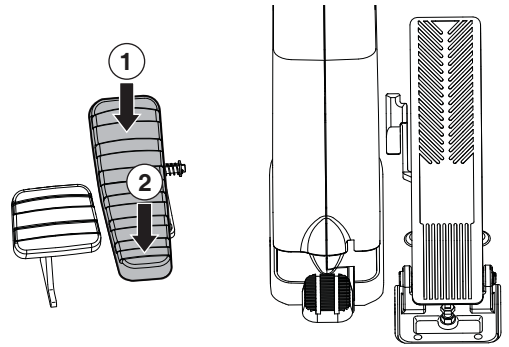
Figure 113 Joystick control



WE1500864

Figure 114 Pedal Control

- Two-way operation is possible by pedal back and forth between position (1 and 2, Figure 115). When pedal is in its center (at rest) position, valve is in "NEUTRAL" and hydraulic oil flow is stopped.



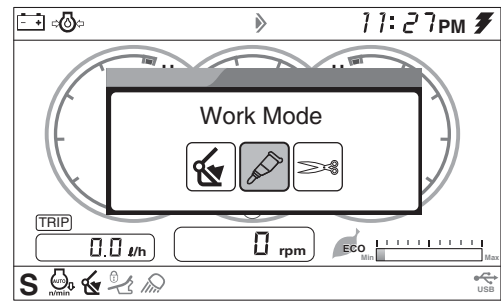
WE1500712

Figure 115

- Before operating attachment, be sure to check function controlled by direction of pedal movement.

Activating Breaker with Pedal Valve

- Set work mode to "BREAKER" position using keypad.
- Pressing end (1, Figure 115) is used to activate hydraulic breaker.
- When pedal is in its center (at rest) position, valve is in "NEUTRAL" and hydraulic oil flow is stopped.



WE1500635

Figure 116

Rotating Operation (Optional)

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.

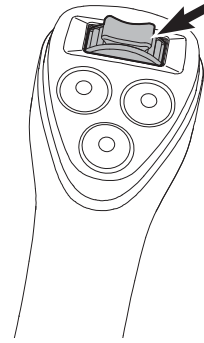


Figure 117

EX1403215

Quick Coupler Operation

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

To Engage Attachment



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

- Do not operate the machine if there are other workers or people in the work area. Also, never allow people to stand or walk under the work tool or attachment while operating.
- Do not start or perform any work unless you are properly trained. You should understand how to use the quick coupler according to the instructions.
- Make sure that quick coupler is "FULLY ENGAGED AND LOCKED" every time after you change work tools or attachments.
- Perform the recommended daily inspection and maintenance for proper operation.
- Attachments used with the machine should not exceed the rated capacity and load limits of the excavator.
- Check for changes to load radius, maximum operating capacity and read and follow load rating charts before lifting loads or objects.



WARNING

AVOID DEATH OR SERIOUS INJURY

Never use attachments or buckets which are not approved by DOOSAN. Buckets and attachments for safe loads of specified densities are approved for each model.

Unapproved attachments can cause death or serious injury.

1. Park the excavator and attachment on firm and level ground.
2. Move quick coupler switch to "I" (**UNLOCKED**) position (Figure 118).

NOTE: Refer to the Operating Controls Section of this manual for further information.

When the quick coupler switch is in the "I" (**UNLOCKED**) position, a warning message will appear on the multifunction display screen and a warning buzzer will sound in the cabin.

NOTE: To retract quick coupler lock, fully extend the bucket cylinder (bucket crowd) and maintain hydraulic relief condition for 5 seconds or more with switch in the "I" (**UNLOCKED**) position.

NOTE: Whenever the quick coupler switch is moved to "I" (**UNLOCKED**) position, a quick coupler release system activated symbol and a warning message will appear on the display screen and a warning buzzer will sound. When moving switch to "O" (**LOCKED**) position, the symbol and warning message will disappear and buzzer will stop.

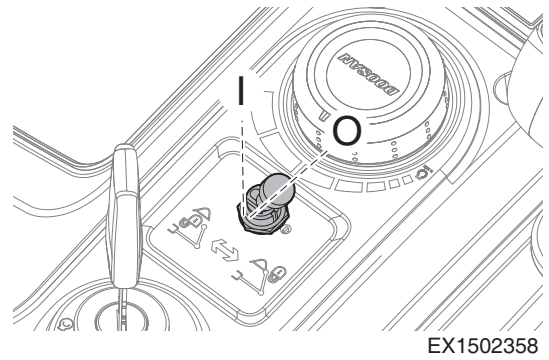


Figure 118

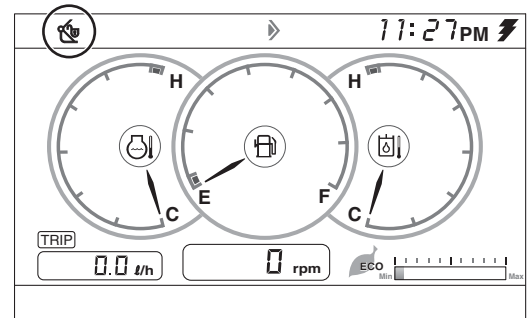


Figure 119

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

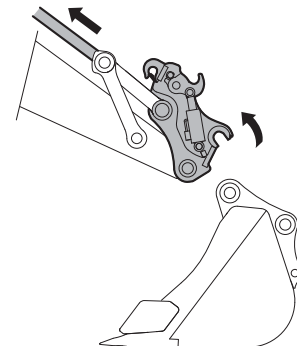


Figure 120

4. Move the arm (1, Figure 121) and raise it until hook (2) engages the upper pin or interface of attachment.

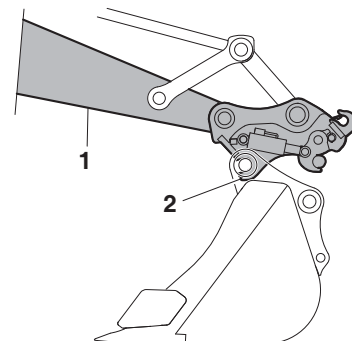
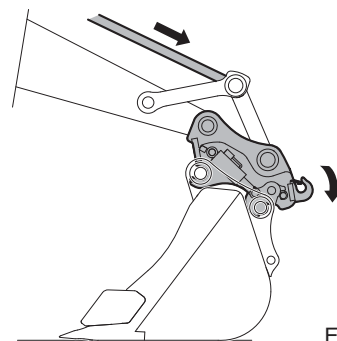


Figure 121

5. Extend the bucket cylinder (bucket crowd) to engage quick coupler to lower attachment pin or interface.

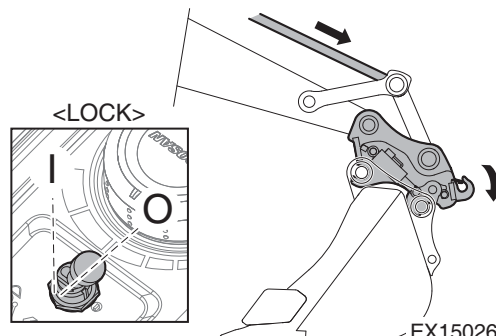


EX1400299

Figure 122

6. Set quick coupler switch to "O" (**LOCKED**) position.
7. Fully extend the bucket cylinder (bucket crowd) to fully engage and lock quick coupler to attachment.

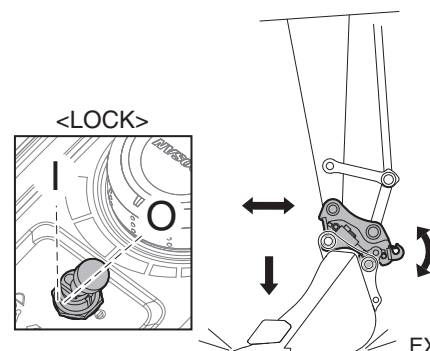
NOTE: To engage the quick coupler lock, fully extend the bucket cylinder (bucket crowd) maintain hydraulic relief condition for **10 seconds** with the quick coupler switch moved in the "O" (**LOCKED**) position.



EX1502627

Figure 123

8. Shake the attachment vigorously and lower the boom to the ground and apply down pressure to the quick coupler and attachment to check that attachment is fully engaged and locked to the quick coupler (Figure 124).



EX1502629

Figure 124

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

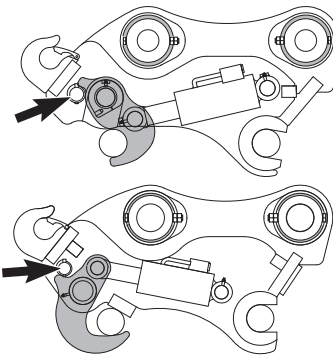
Operate quick coupler and attachment through its full range of motion to check for interference between attachment and machine that could damage the cabin, boom, coupler or attachment.



WARNING

AVOID DEATH OR SERIOUS INJURY

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



Push Type

Pull Type

EX1300735

Figure 125

To Release Attachment

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

When the quick coupler switch is in the "I" (**UNLOCKED**) position, a warning message will appear on the multifunction display screen and a warning buzzer will sound in the cabin.

NOTE: To retract quick coupler lock, fully extend the bucket cylinder (bucket crowd) and maintain hydraulic relief condition for 5 seconds or more in bucket crowd position, with the switch in the "I" (**UNLOCKED**) position.

NOTE: Whenever the quick coupler switch is moved to "I" (**UNLOCKED**) position, a quick coupler release system activated symbol and a warning message will appear on the display screen and a warning buzzer will sound. When moving switch to "O" (**LOCKED**) position, the symbol and warning message will disappear and buzzer will stop.

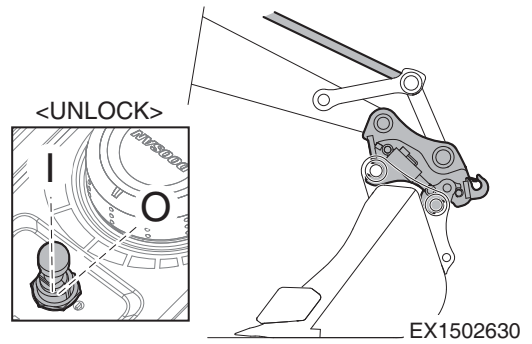


Figure 126

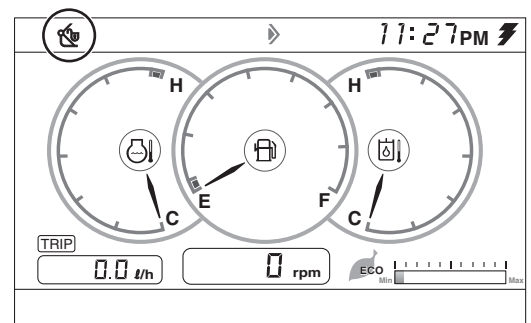


Figure 127

3. Retract the bucket cylinder to move the quick coupler toward the machine (Figure 128).

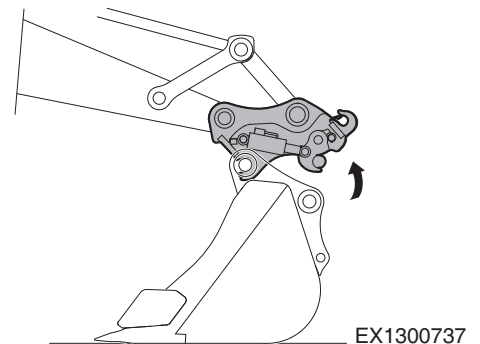


Figure 128

4. Move quick coupler switch to "O" (**LOCKED**) position. Lower and move arm away from attachment and toward the machine.

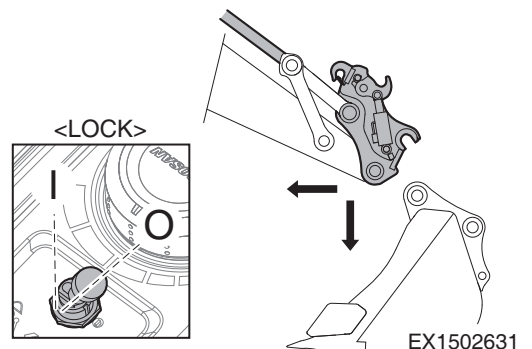


Figure 129

LIFTING OBJECTS

IMPORTANT

There may be local or government laws or regulations governing the use of excavators for the lifting of heavy loads. Always contact local and government agencies and follow all applicable laws and regulations.

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

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

To prevent injury, do not exceed the rated load capacity of the machine. If the machine is not on level ground, load capacities will vary.

Short slings will prevent excessive load swing.

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

Always try to maintain the lifting eye (Figure 130) straight below the centerline of the arm and bucket pin. In this manner the weight of the load is being primarily held only by the pin, and not by the bucket cylinder, link, and link pins.

When a lifting eye is used, the sling/lifting device must be fastened to the eye in a manner that will not allow it to come loose.

The highest lift capacity of the machine is over the front and rear of the machine.

If the machine is equipped with a dozer, the highest lift capacity is over the rear (Figure 130).

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

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

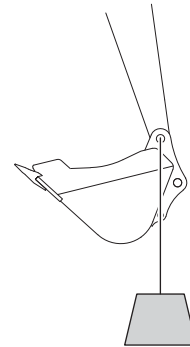


Figure 130

EX1300739

Lifting Unknown Weight

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



WARNING

AVOID DEATH OR SERIOUS INJURY

If a load is picked-up from the front zone and swung into the side zone, a tip over could result. Do not exceed the rated load capacity for the lift zone that will be used.

Lifting Known Weight

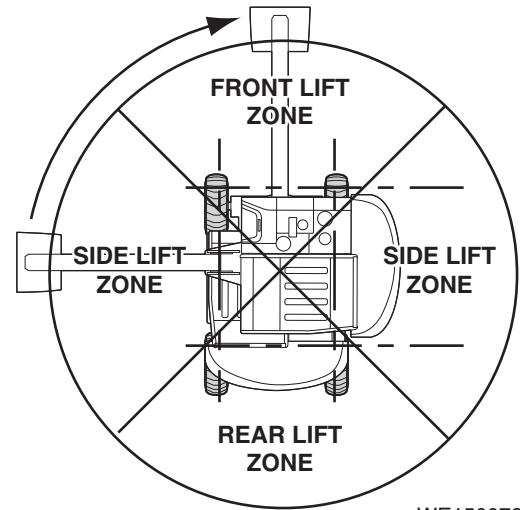
The load rating chart is the determining factor when lifting known weights. Refer to "Excavator Rated Lift Capacity Tables" on page 7-9 of this Operation & Maintenance Manual. Whenever possible, lift and swing loads between the front idler area.

Pick and Carry

The machine can pick and carry loads. It is recommended that when traveling with a suspended load, you evaluate the prevailing conditions and determine the work site precautions required in each case. The following factors must be considered before attempting to pick and carry a load.

Align the boom with the forward direction of machine travel. Maintain this boom position when turning the machine. Turn only when necessary, at the slowest speed, and at a wide turning radius.

1. Use the shortest lifting radius distance possible.
2. Keep the load as close to the ground as conditions will permit.
3. Provide tag lines to prevent load from swinging back and forth. This can cause a change in the lift radius could exceed the load chart rating or cause a tip over.
4. Travel speed will depend on work site conditions.
5. Avoid sudden starts and stops.



WE1500727

Figure 131

LIFTING OBJECTS WITH QUICK COUPLER

The lifting point capacity (1, Figure 132) for the quick coupler lift eye is marked on the product identification plate. This is the maximum lift capacity when using a coupler for lifting.

Before lifting objects using the quick coupler lift eye, remove any attachment that is connected to the quick coupler.

The highest lift capacity of the machine is over the front and rear of the machine. If the machine is equipped with a dozer, the highest lift capacity is over the rear.



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not exceed the Rated Lift Capacity. Read and understand lift capacity charts for your excavator.

Be aware of the maximum machine lift capacity for your machine configuration and for the lift cycle and range of movement. The rated lift capacity of the quick coupler may be less than the rated capacity of the excavator or vice versa. It is important that lower of the two values is used to determine the rated lift capacity when the quick coupler is used with the excavator.

Lift capacity of the excavator is reduced when fitted with a quick coupler. Review the lift capacity charts of your excavator model and make allowances for the weight of the quick coupler and any additional work group attachments (such as thumbs) that may be fitted and used with the quick coupler and excavator.

The weight of the quick coupler can be found on the information plate fixed to the quick coupler body (Figure 132) and in the Quick Coupler Operation & Maintenance Manual.




WARNING

AVOID DEATH OR SERIOUS INJURY

- **Never permit personnel to stand in the maximum swing reach area while operating equipment.**
- **Never move a load above other personnel.**

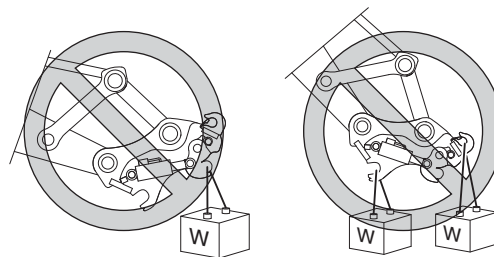
Ensure all personnel and unnecessary equipment is moved clear of the operation site and cordon off the area using barricades or other methods to prevent bystanders from entering the work area.

		Doosan Infracore Co., Ltd 7-11 Hwasu Dong, Dong-gu, Incheon, Korea	
DESCRIPTION		DESIGNATION	
SERIAL NO.		DOOSAN NO.	
MACHINE TYPE			
HYDRAULIC FLOW RATE			
GAL/MIN		LT/MIN	
HYDRAULIC WORKING PRESSURE			
MPa		PSI	
CAPACITY		SAE RATED	
ASSY LOCATION		LIFT EYE SWL	
Y.O.M		WEIGHT	
CE			

HACA0090

Figure 132

Use only the specified lift eye position for lifting loads. Never use the attachment pin connection hooks of the quick coupler for lifting suspended loads (Figure 133).



EX1402192

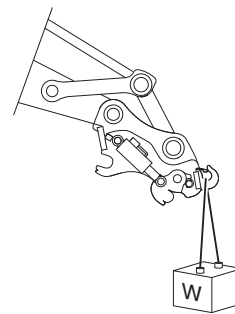
Figure 133 Wrong Lifting Procedure

Lifting objects with a quick coupler should always be done with the quick coupler vertical so load and lifting accessories can hang free without contacting the coupler body (Figure 134).

Failure to follow the proper lifting instructions can result in equipment failure and the loss of the suspended load.

Always remove all lifting devices before engaging the quick coupler to any attachment.

For additional inspection, maintenance, and service schedule information refer to Quick Coupler Operation & Maintenance Manual.



EX1402193

Figure 134 Correct Lifting Procedure

OPERATION UNDER ABNORMAL CONDITIONS

NOTE: See "Maintenance in Special Conditions" on page 4-112 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.

1. Preheat the engine before start-up.
 - Preheat the engine before start-up. Wait 3 to 4 seconds after preheating until voltage of the battery return, and then actuate the starter 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, efficacy of the battery is reduced accordingly. Insulation of the battery prevents reduction of efficacy, and supports improvement of starting power of the starter.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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 4-20, in this manual or Shop Manual for details.

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

6. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-16, in this manual or lubrication chart on machine.
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. 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.
-

IMPORTANT

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 4-29 and "Check for Leaks in Hydraulic System" on page 4-27, of this manual. Check for water content before filling fuel tank. High temperatures and cooling off cause condensation in storage drums.
4. Lubricate as specified in "Lubrication and Service Chart" on page 4-16, in this manual or Lubrication Decal on machine.
5. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from sun, dirt and dust.
 - A. Cover machine if no suitable shelter is available. Protect engine compartment and hydraulics from dirt and debris.
 - B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season. Rust and paint blisters will appear on metal surfaces and fungus growth on other surfaces.
 - C. Protect all unfinished, exposed surfaces with a film of preservative lubricating oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation In Dusty and Sandy Areas

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

2. Use care when servicing fuel system to prevent dust and sand from entering tank.
3. Service air cleaner at frequent intervals, check air restriction indicator daily and keep dust cup and dust valve clean. Prevent dust and sand from entering engine parts and compartments as much as possible.
4. Lubricate and perform services outlined on current lubrication chart on machine and "Lubrication and Service Chart" on page 4-16. Clean all lubrication fittings before applying lubricant. Sand mixed with lubricant becomes very abrasive and accelerates wear on parts.
5. Protect machine from dust and sand as much as possible. Park machine under cover to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

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

1. Keep all exposed surfaces coated with preservative lubricating 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 lubricating oil. Pay attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or "Lubrication and Service Chart" on page 4-16, in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

Operation at High Altitudes

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

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

Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

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

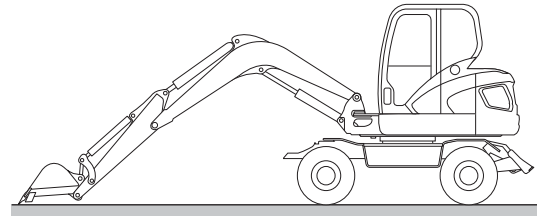
LONG TERM STORAGE

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:



WE1500713

Figure 135

Before Storage

Keep the excavator in the position shown in Figure 135 to prevent rust of the hydraulic piston rods.

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

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

During Storage

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

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

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

- Every 90 days, use a hydrometer to measure the protection of the coolant. Refer to the antifreeze/coolant protection chart to determine protection of the cooling system. Add coolant as required.

After Storage

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

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.

DOOSAN Genuine Replacement Parts

Use DOOSAN genuine parts specified in Parts Book as replacement parts.

DOOSAN Genuine Lubricants

For lubrication of the machine, use DOOSAN 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 4-110.

Hydraulic Hose Installation

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

Checks After Inspection and Maintenance Works

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

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

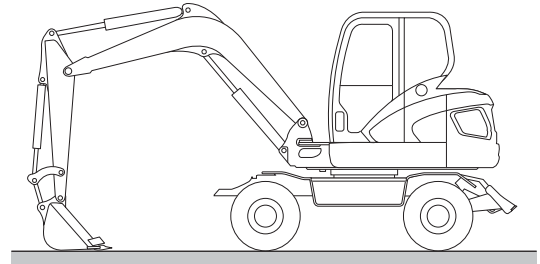
Safety Precautions

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).

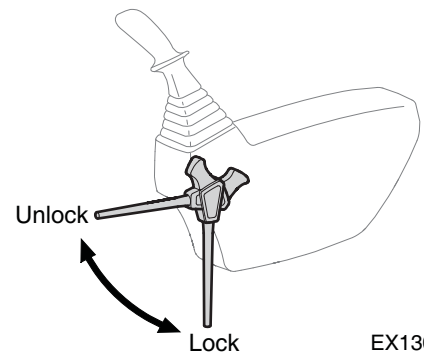
1. Position the machine on even, firm and level ground.
2. Put attachment on ground.



WE1500614

Figure 1

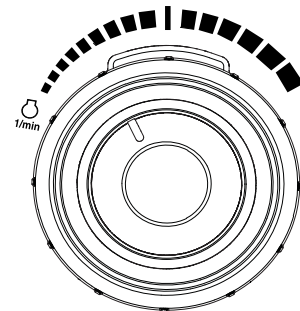
3. Move safety lever to "LOCK" position.



EX1300566

Figure 2

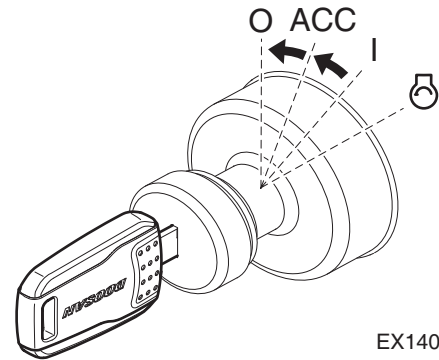
4. Allow engine to run at "LOW IDLE" for a minimum of five minutes to allow engine to cool. If this is not done, heat surge can occur.



FG018148

Figure 3

5. Stop engine by turning key to "O" (OFF) position. After releasing hydraulic system and tank pressure, remove starter switch key.



EX1402155

Figure 4

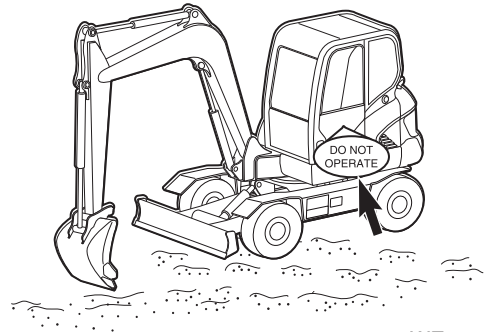
6. Before starting maintenance work, place a "DO NOT OPERATE" Warning Tag on cabin door or work lever.



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.



WE1500738

Figure 5

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

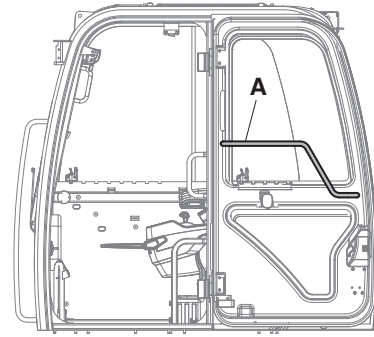


Figure 6

EX1502675

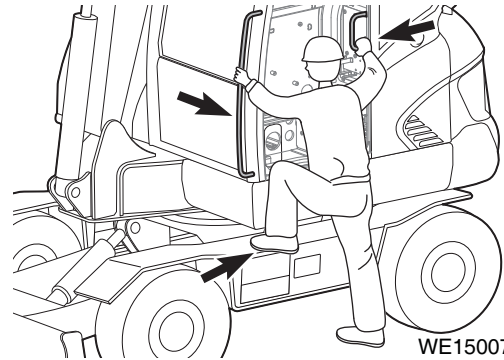


Figure 7

WE1500716

HANDLING OIL, FUEL, 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 DOOSAN distributor.
- When changing oil, always replace related filters at same time.

Fuel

NOTE: *Only use Ultra Low Sulfur Diesel (ULSD) fuel and API CJ-4/ACEA E9 grade engine oil.*

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.

IMPORTANT

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 (≤ 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 DOOSAN factory defects. Therefore the cost of repairs would not be covered by a DOOSAN warranty.

Engine Oil

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

DOOSAN engine oils that meet API CJ-4 are required for use in the applications listed below.

DOOSAN 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 DOOSAN warranty for your machine.

Other systems may apply.

Therefore the cost of repairs would not be covered by a DOOSAN warranty.

Grease

- Grease is used to prevent seizure and noises at joints.
- This construction equipment is used under heavy-duty conditions. Always use recommended grease and follow change intervals and recommended ambient temperatures given in this manual.
- Always wipe off all old grease that is pushed out when greasing.

Wipe off old grease where sand or dirt sticking in the grease can cause wear of rotating parts.

Coolant and Water for Dilution

- The coolant has the important function of preventing corrosion and preventing freezing.
Even in areas where freezing is not an issue, use of antifreeze coolant is essential.
DOOSAN machines are supplied with DOOSAN coolant. DOOSAN 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 DOOSAN antifreeze solution.
When using DOOSAN coolant, there is no need to use a corrosion resistor. For details, see "Engine Cooling System" on page 4-100.
- 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 4-100 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 DOOSAN coolant to water differs according to ambient temperature.
For details of ratio when mixing, see "Antifreeze Concentration Tables" on page 4-102.
DOOSAN 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.

Filters

- Filters are extremely important safety parts. They prevent impurities in hydraulic oil, fuel and air circuits from causing problems.

Replace all filters periodically. See details given in "Lubrication and Service Chart" on page 4-16.

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

- Never try to clean filter (cartridge type) and use them again. Always replace with new filters.
- When replacing oil filters, check if any metal particles are attached to oil filter. If any metal particles are found, contact your DOOSAN distributor.
- Do not open packages of spare filters until just before they are to be used.
- Always use DOOSAN 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 DOOSAN.
- External electromagnetic interference can cause malfunction of the control system controller. Before installing a radio receiver or other wireless equipment, contact your DOOSAN 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 "3. Power Socket for 12 Volt" on page 2-13.

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. DOOSAN 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 DOOSAN distributor.
- Only use Ultra Low Sulfur Diesel (ULSD) fuel and API CJ-4/ACEA E9 grade engine oil.

Lubrication










Lubrication is an important part of preventive maintenance. If the machine is lubricated in a specified way, the life of equipment and components can be considerably extended. The "Lubrication and Service Chart" on page 4-16 makes lubrication work much easier and reduces the risk of forgetting lubrication intervals.









IMPORTANT

Wipe off grease fittings and grease gun before greasing to prevent sand and dirt particles from penetrating into components.

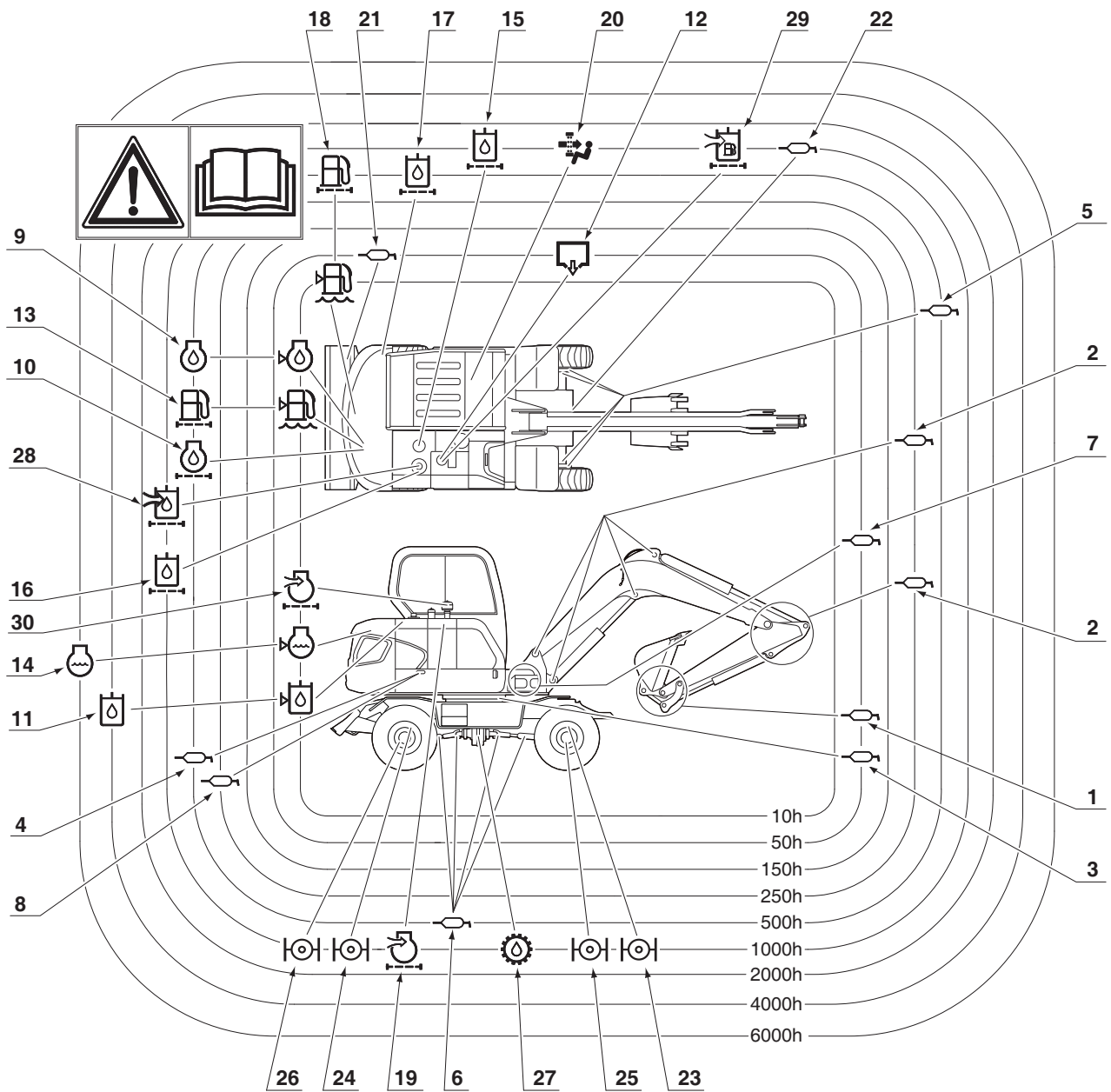
Symbols for "Lubrication and Service Chart"

The lubrication and service chart is on the inside of the cabin door. The symbols used in the lubrication and service chart are illustrated in the following table.

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

Symbol	Description
	Air Cleaner Filter
	Fuel Filter
	Air Conditioner Filter
	Drain Water
	Fuel Cap Filter
	Level Check
	Pre Cleaner
	Axle Oil

LUBRICATION AND SERVICE CHART



WE1500811

Figure 8

SERVICE DATA										
No.	Items to Check	Service	Qty.	Service Interval						
				10	50	150	250	500	1000	2000
1	Arm, Bucket Joint Pin	Grease	6	F100	W10					
2	Boom, Arm Joint Pin	Grease	11	F100			W10			
3	Swing Bearing	Grease	3		W10					
4	Pinion Gear (Swing)	Grease	1							
5	Front Axle Steering Knuckle	Grease	4					W10		
6	Driveshafts	Grease	8					W10		
7	Boom Swing Bracket Pin	Grease	2	F100	W10					
8	Boom Swing Cylinder Pin	Grease	2	F100			W10			
9	Engine Oil	Engine Oil	9.2 L	V	F					
10	Engine Oil Filter	Cartridge	1		F					
11	Hydraulic Oil Tank (Full)**	hydraulic oil	95 L	V						
12	Fuel Tank	Diesel	118 L	V	D					
13	Water Separator & Pre Fuel Filter (Fuel Prefilter)	Cartridge	1	D,V						
14	Radiator	Coolant (Antifreeze)	11.2 L	V						
15	Hydraulic Oil Return Filter	Element	1				F			
16	Hydraulic Oil Suction Filter	Strainer	1						C	
17	Pilot Filter	Filter	1				F			
18	Main Fuel Filter (Water Separator)	Cartridge	1	D,V						
19	Air Cleaner (Outer)	Filter	1					C		
	Air Cleaner (Inner)	Filter	1							
20	Air Conditioner Filter	Element	2					C		
21	Dozer Blade Pin	Grease	4	F100	W10					
22	Front Axle Pin	Grease	3		W10					
23	Axle Case (Front)	Gear oil	5.1 L			F				
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.										
EG: Ethylene Glycol - DOOSAN Genuine Antifreeze Solution (Drain and replace using this interval.) See "Engine Cooling System" on page 4-100, for further explanation.										
: Replacement On Every Interval.										
NOTE: For additional service items see list of "Maintenance Intervals" on page 4-23.										
*: When the machine is operated under dusty work sites, the air breather filter needs to be cleaned or replaced regularly even before the expected replacement date.										
**: If DOOSAN Genuine Oil used, hydraulic oil change interval is 4,000 hours.										

SERVICE DATA										
No.	Items to Check	Service	Qty.	Service Interval						
				10	50	150	250	500	1000	2000
24	Axle Case (Rear)	Gear oil	4.6 L			F				
25	Hub Reduction Gear Case (Front)	Gear oil	0.4 L			F				
26	Hub Reduction Gear Case (Rear)	Gear oil	0.4 L			F				
27	Transmission	Gear oil	1.5 L			F				
28	Air Breather Filter*	Filter	1							
29	Fuel Cap Filter	Filter	1							
30	Pre Cleaner	Element	1	V	C					
	Radiator Core	Core	1					C		
	Oil Cooler Core	Core	1					C		
	Intercooler Core	Core	1					C		
	Aircon Condenser Core	Core	1					C		
V: Maintenance and Refill.										
C: Cleaning.										
D: Drain Water.										
F: First Time Exchange Only.										
F100: Every 10 Hours For First 100 Hours.										
W10: Every 10 Hours If Operating In Water.										
EG: Ethylene Glycol - DOOSAN Genuine Antifreeze Solution (Drain and replace using this interval.) See "Engine Cooling System" on page 4-100, for further explanation.										
: Replacement On Every Interval.										
NOTE: For additional service items see list of "Maintenance Intervals" on page 4-23.										
*: When the machine is operated under dusty work sites, the air breather filter needs to be cleaned or replaced regularly even before the expected replacement date.										
**: If DOOSAN Genuine Oil used, hydraulic oil change interval is 4,000 hours.										

FLUID CAPACITIES

Component		Capacity
Engine	Oil Pan with Filter	9.2 L (2.4 U.S. gal.)
	Cooling System	11.2 L (3.0 U.S. gal.)
Fuel Tank		118 L (31.2 U.S. gal.)
Hydraulic Oil	Tank Level	62 L (16.4 U.S. gal.)
	Full	95 L (25.1 U.S. gal.)
	System	148 L (39.1 U.S. gal.)
Transmission		1.5 L (0.4 U.S. gal.)
Axle	Front Differential	5.1 L (1.3 U.S. gal.)
	Front Hub Reduction Gear	2 x 0.2 L (2 x 0.53 U.S. gal.)
	Rear Differential	4.6 L (1.2 U.S. gal.)
	Rear Hub Reduction Gear	2 x 0.2 L (2 x 0.53 U.S. gal.)

TABLE OF RECOMMENDED LUBRICANTS

IMPORTANT

It is highly recommend to use DOOSAN 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 4-16 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												
Hydraulic Oil Tank	⁶⁾ Hydraulic Oil												
Fuel Tank	Diesel Fuel												

Reservoir	Kind of Fluid	Ambient Temperature											
		-58	-40	-22	-4	14	32	50	68	86	104	122°F	
		-50	-40	-30	-20	-10	0	10	20	30	40	50°C	
Grease Fitting	Grease					1)Multipurpose Lithium Grease NLGI No. 2							
Cooling System	Coolant	Add Antifreeze 1)(50% antifreeze - 50% distilled water) (Note that mixing ratio is for reference purpose only, and is not an absolute standard.)											
Transmission	Gear Oil					1)SAE 80W-90 API GL5							
Axle Hub and Differential	Gear Oil							SAE 90					
								1)SAE 80W-90					
								SAE 140					
1) Installed at factory.													
2) (5W40) - Recommended for use at extremely low temperature below -20°C.													
3) (10W40) - Filled at factory. Doosan genuine engine oil is recommended for use.													
4) (15W40) - Doosan genuine engine oil is recommended for use.													
5) (Engine oil) - Engine oil must meet API CJ-4/ACEA E9.													
6) Hydraulic oil change interval is 4,000 hours, only when DOOSAN Genuine Oil is used. If other brands of oil is used, guaranteed change interval is 2,000 hours. Note that mixing ratio is for reference purpose only, and is not an absolute standard.													
API: American Petroleum Institute.													
ACEA: Association des Constructeurs Européens d'Automobiles.													
ASTM: American Society of Testing and Materials.													
ISO: International Organization for Standardization.													
NLGI: National Lubricating Grease Institute.													
SAE: Society of Automotive Engineers.													

IMPORTANT

Do not mix oils from different manufacturers. DOOSAN 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.

IMPORTANT

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.

MAINTENANCE INTERVALS

SERVICE ITEM	PAGE
10 Hour / Daily Service	
Inspect All Tires for Correct Tire Pressure and Signs of Damage or Abnormal Wear	4-26
Grease Boom, Arm and Front Attachment Pins (for First 100 Hours)	4-26
Grease Dozer Blade Pins (for First 100 Hours)	4-26
Check Engine Oil Level	4-26
Check for Leaks in Hydraulic System	4-27
Check Level of Hydraulic Oil Tank	4-27
Check for Leaks in Fuel System	4-29
Check Fuel Level	4-29
Check Main Fuel Filter (Water Separator) and Drain Water As Required	4-30
Check Water Separator & Pre Fuel Filter (Fuel Prefilter) and Drain Water As Required	4-31
Clean Dust Net in Front of Oil Cooler and Radiator	4-32
Check Cooling System and Refill As Required	4-33
Check Level of Window Washer Liquid	4-33
Inspect Bucket Teeth and Side Cutters for Signs of Wear	4-34
Inspect Cooling Fan Blade	4-34
Check Air Intake System (Pre Cleaner) and Emission Control System Components	4-35
Inspect Seat Belt for Proper Operation	4-35
Inspect Mirrors for Damage and Adjust and Clean as Required	4-35
Inspect Structure for Cracks and Faulty Welds	4-36
Check Operation of All Switches and Travel Alarm (If Equipped)	4-36
Check the Operation of Pilot Cutoff Switch	4-36
Check Operation of All Exterior Lights, Horn and Control Console Indicator and Display Monitor	4-37
Start Engine, Check Starting Ability, and Observe Exhaust Color at Start-up and at Normal Operating Temperature. Listen for Any Abnormal Sounds.	4-37
Check Operation of All Controls and Linkages	4-38
50 Hour / Weekly Service	
Perform All Daily Service Checks	4-39
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** These checks need to be completed by an authorized DOOSAN distributor.

10 HOUR / DAILY SERVICE

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

1. Inflate tires to proper operating pressure for working conditions. See "Tire Changing Procedure" on page 4-107

Grease Boom, Arm and Front Attachment Pins (for First 100 Hours)

Grease every 10 hours for first 100 hours and every 250 hours thereafter (See page 4-45).

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

Grease Dozer Blade Pins (for First 100 Hours)

1. Grease every 10 hours for first 100 hours and every 50 hours thereafter. (See page 4-40)

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

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

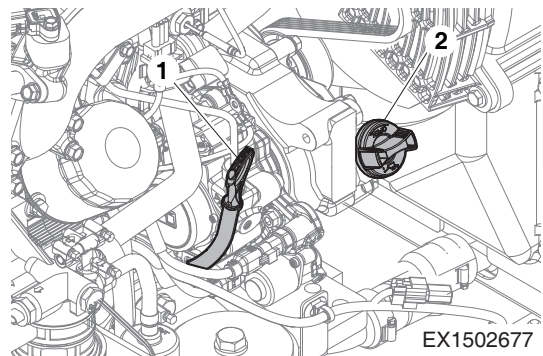


Figure 9

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

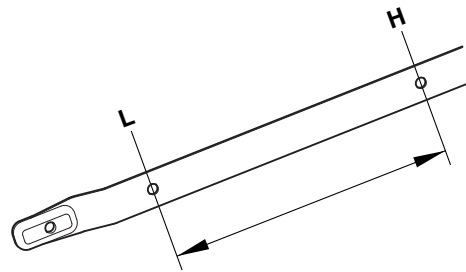


Figure 10

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



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow system to cool before attempting to service any hydraulic components.

The hydraulic tank is pressurized. Tip breather cap up slowly to allow the pressurized air to vent. After the pressure has been released, remove service covers.

1. Park machine on firm and level ground. Lower boom and position bucket on ground as shown in Figure 12.
2. Move engine speed to "LOW IDLE".



Figure 11

ARO1760L

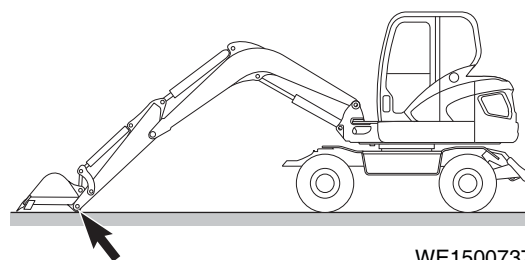


Figure 12

WE1500737

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

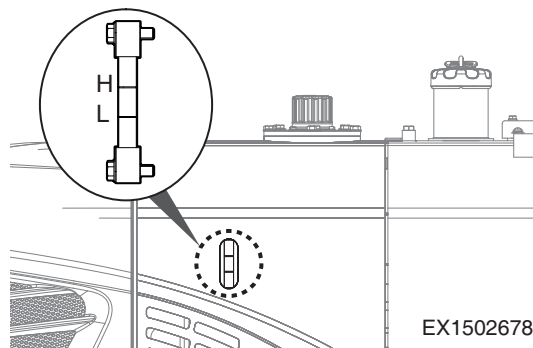


Figure 13

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.

IMPORTANT

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.

IMPORTANT

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 15) at the bottom of the tank into an approved container, using a hose at the point (plug).

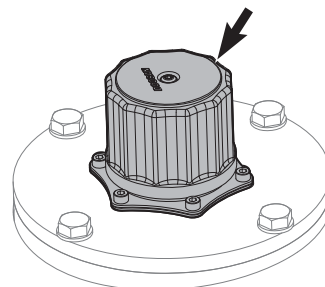


Figure 14

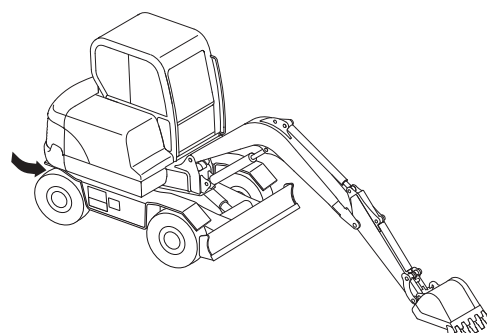


Figure 15

IMPORTANT

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

Disconnect the drain hose and install the protecting cap.

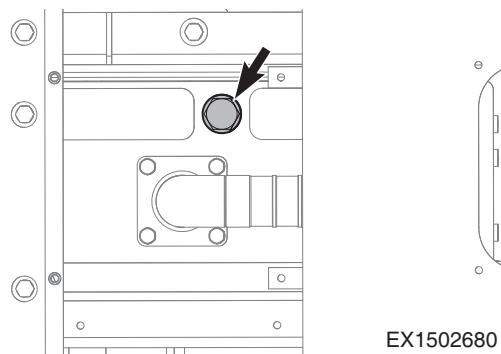


Figure 16

EX1502680

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.

1. At end of each workday, fill fuel tank. Add fuel through fuel fill tube (1, Figure 17). 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.

NOTE: Only use Ultra Low Sulfur Diesel (ULSD) fuel and API CJ-4/ACEA E9 grade engine oil.

2. Make sure that fuel fill hose is grounded to the excavator before fueling begins.
3. Check the amount of fuel in the tank by observing the fuel tank sight gauge (2, Figure 17).

NOTE: See "Fluid Capacities" on page 4-19 for capacity.

4. The excavator may be equipped with the optional battery operated fuel fill pump. Put the suction hose of the pump into the fuel resupply tank. Turn the switch in the pump compartment "ON", and the fuel will be pumped into the excavator fuel tank.

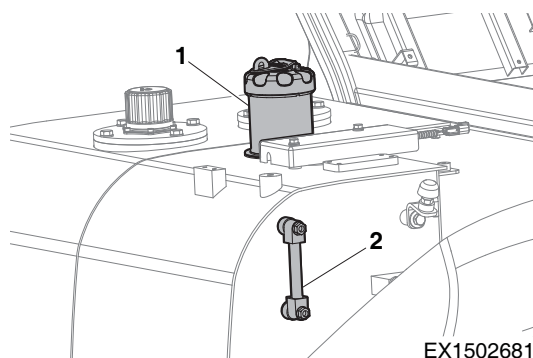


Figure 17

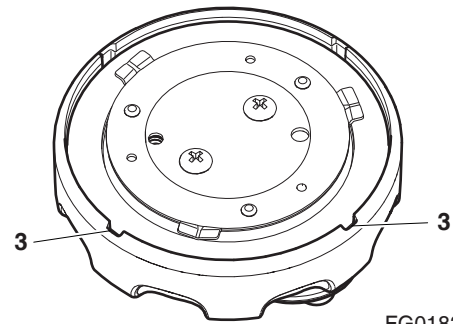
EX1502681

NOTE: See "Fuel Transfer Pump" on page 4-103, for further information.

5. Do not overfill the tank.
6. Securely tighten cap after fueling.

NOTE: If breather holes (3, Figure 18) 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.

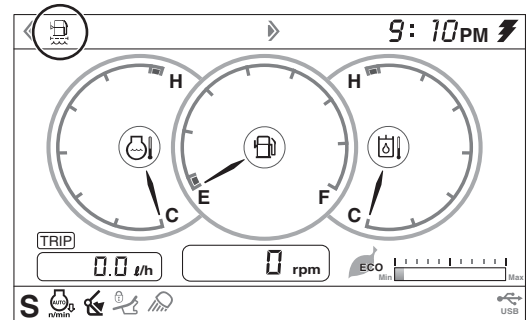


FG018302

Figure 18

Check Main Fuel Filter (Water Separator) and Drain Water As Required

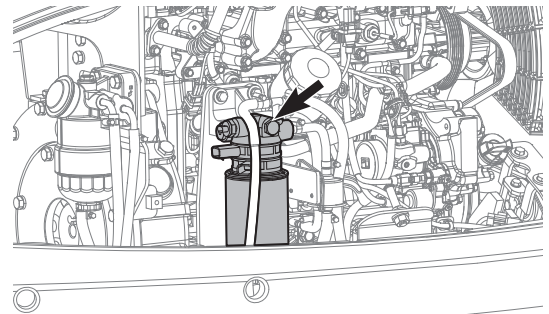
NOTE: If water in fuel warning symbol (Figure 19) on display monitor comes "ON", drain the collected water in main fuel filter and fuel prefilter.



WE1500739

Figure 19

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



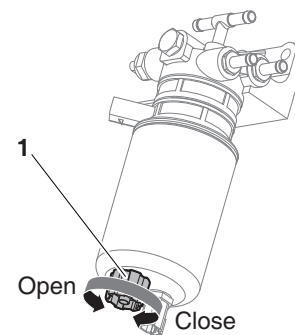
EX1502683

Figure 20

4. Drain water or sediment by opening drain valve (1, Figure 21) on bottom of filter.

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

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



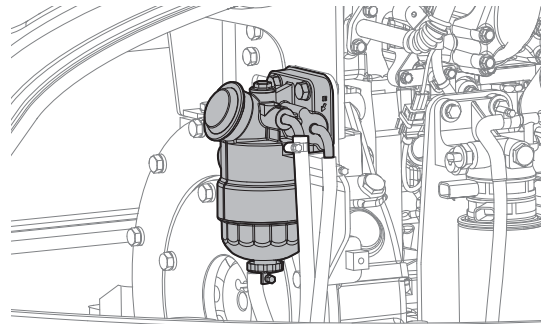
EX1502684

Figure 21

Check Water Separator & Pre Fuel Filter (Fuel Prefilter) and Drain Water As Required

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

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



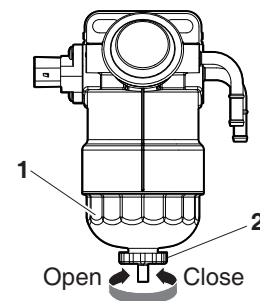
EX1502685

Figure 22

5. Position a small container under fuel prefilter. Drain water or sediment by opening drain valve (2, Figure 23) on bottom of bowl (1).

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

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



EX1502686

Figure 23

Clean Dust Net in Front of Oil Cooler and Radiator

IMPORTANT

If running excavator in dusty area, check dust net everyday and clean it if dirty.



WARNING

AVOID DEATH OR SERIOUS INJURY

If using compressed air or water to clean the dust net, wear safety goggles for proper eye protection.

1. Open the bonnet.
2. Loosen wing bolt(s) and remove dust net.
3. Clean with compressed air or water.

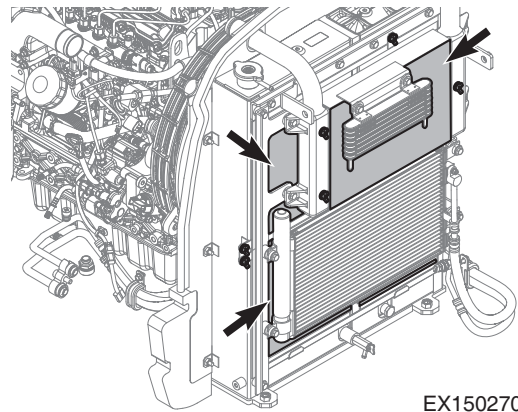


Figure 24

Check Cooling System and Refill As Required



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

NOTE: Do not mix ethylene glycol and propylene glycol antifreeze together.

1. When the engine is cold, check the coolant level inside the surge tank. Refer to coolant concentration table. (See page 4-102)
2. Check to make sure that coolant transfer line from the surge tank to the radiator and the engine water pump are free and clear of obstructions, or is not pinched.
3. Check the level of coolant in the surge tank. The normal cold engine fluid level must be between "FULL" and "LOW" marks on tank.
4. If the coolant is below the "LOW" mark, add genuine part of 50% concentration coolant to the tank.

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

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

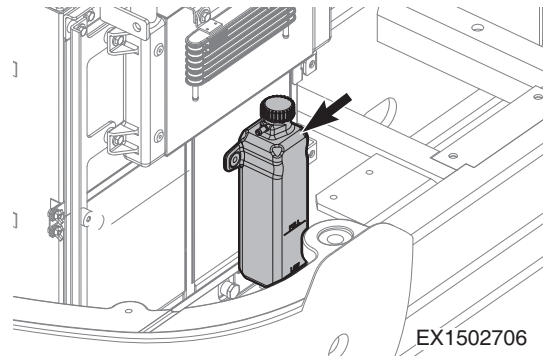


Figure 25

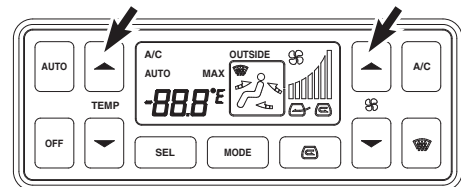


Figure 26

Check Level of Window Washer Liquid

1. Open battery room cover and check fluid level in windshield washer tank.
2. Open fill cap and add fluid.

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

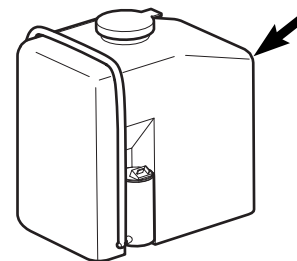


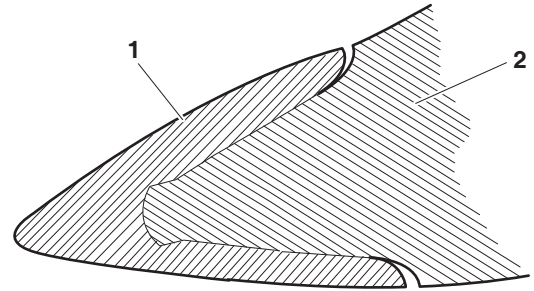
Figure 27

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 28.

NOTE: *These instructions are only for DOOSAN OEM buckets. If you are using other manufacturers' buckets, refer to their specific instructions.*

Reference Number	Description
1	Point
2	Adapter



EX1502667

Figure 28

Inspect Cooling Fan Blade



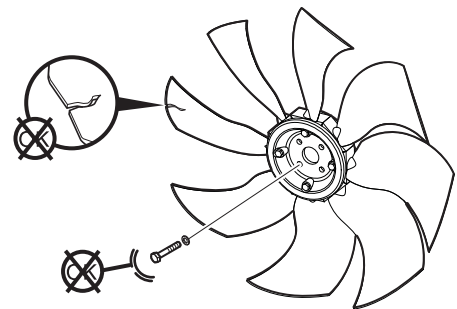
WARNING

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.



EX1502707

Figure 29

Check Air Intake System (Pre Cleaner) 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 amount of dust accumulated inside the pre cleaner.
 4. Check the exhaust pipe and several exhaust system components, and check the V-clamp tightness to prevent leaking gases.
 5. If damaged, wrinkled, or loose, replace or retighten or contact your nearest DOOSAN distributor.
-

IMPORTANT

Severe engine damage will result from running with unfiltered air.

Do not operate engine if any leaks or damage are found on air intake system.



HAOA050L

Figure 30

Inspect Seat Belt for Proper Operation

See "Seat Belt" on page 1-32 for further information.

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 Pilot Cutoff Switch

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.

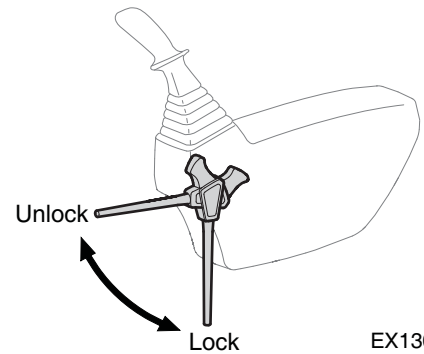
Contact your **DOOSAN** distributor immediately if the controls do not deactivate. **DO NOT MODIFY THE SYSTEM.**

Inspection and Maintenance of the Pilot Cutoff Switch

1. Check for and keep bystanders away from the work area. Sit in operator's seat and fasten seat belt.
2. Start engine and move safety lever up into "UNLOCK" position.
3. Operate the work group (joystick) levers in all directions to check that boom, arm, bucket (or other attachment) and swing functions operate correctly. Also, check that travel controls operate properly.

NOTE: *Hydraulic system must be warmed up to operating temperatures.*

4. Raise the boom and arm so the bucket (or other attachment) is about 1 m (3 ft.) off the ground.



EX1300566

Figure 31

5. Move the safety lever down into "LOCK" position to deactivate the work group and travel functions. Move the work group (joystick) levers. There must be no movement of the boom, arm, and attachment or swing functions when the controls are moved.
6. Move safety lever up into "UNLOCK" position. Raise the boom so the bucket (or other attachment) is about 3 m (10 ft.) off the ground. Operate the work group (joystick) lever to lower the boom slowly. While boom is lowering, move the safety lever down into "LOCK" position. Boom movement must stop. Repeat these steps for arm, bucket (attachment), swing and travel functions.
7. Lower work group to the ground and stop engine.

NOTE: *If the PILOT CUTOFF SWITCH (safety lever) does not deactivate the work group and travel functions as described above or if any parts are damaged, bent or missing, contact your DOOSAN 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

IMPORTANT

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

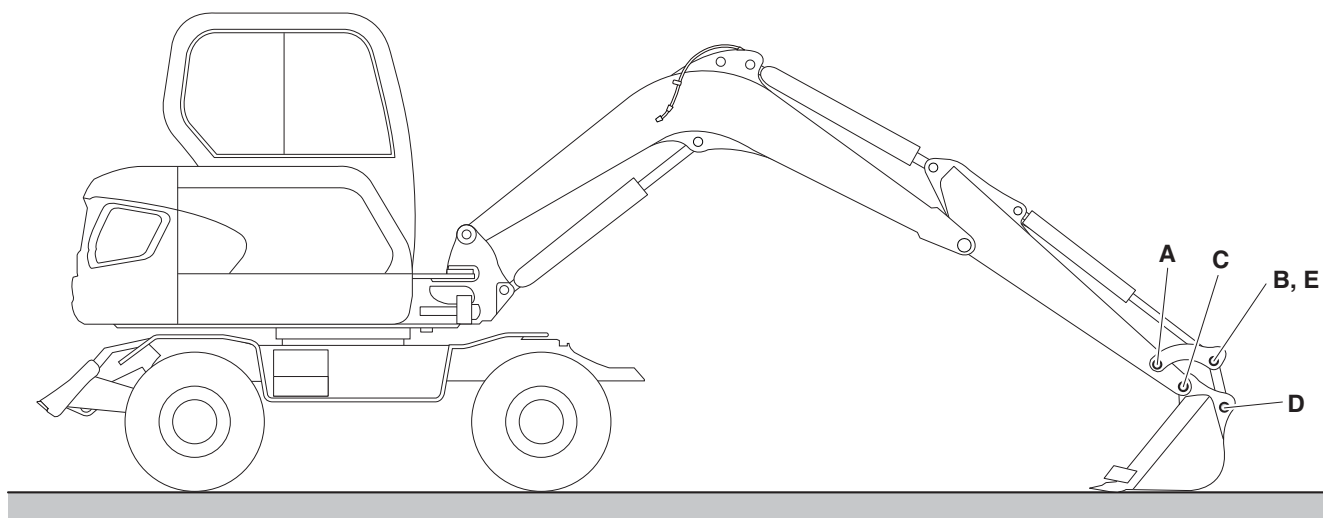
Perform All Daily Service Checks

Grease 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.



WE1500740

Figure 32

Reference Number	Description
A	Arm Link Joint Pin (1 Point)
B	Link Joint Pin (1 Points)
C	Arm Bucket Joint Pin (1 Point)

Reference Number	Description
D	Bucket Link Joint Pin (1 Point)
E	Bucket Cylinder Rod Pin (1 Point)

- A. Arm link joint pin (1 point)
- B. Link joint pin (1 points)
- C. Arm bucket joint pin (1 point)
- D. Bucket link joint pin (1 point)
- E. Bucket cylinder rod pin (1 point)

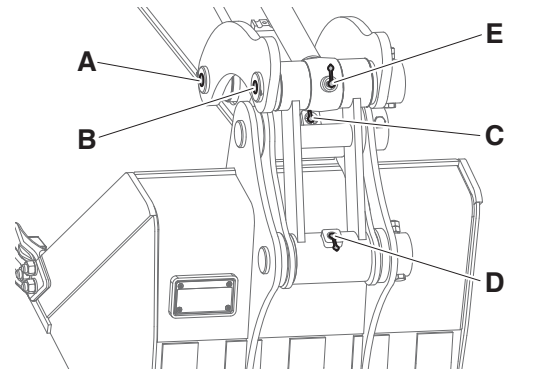


Figure 33

EX1502776

Grease Dozer Blade Pin



WARNING

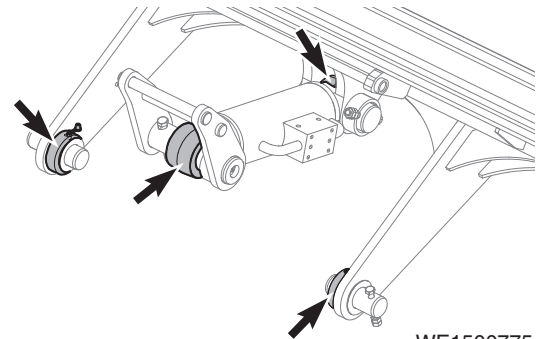
AVOID DEATH OR SERIOUS INJURY

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

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

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

1. Lower dozer blade to the ground.
2. Inject grease at 4 points using grease gun. (Figure 34)
3. After greasing, clean off the old grease that has been purged.



WE1500775

Figure 34

Grease Front Axle Pin

NOTE: If the unit has been running or working in water the front attachment must be greased daily or every 10 hour.

1. Lower the front attachment to ground.
2. Press the grease fitting and inject grease with the grease gun on the marked point.
3. After greasing, clean off the old grease that has been purged.

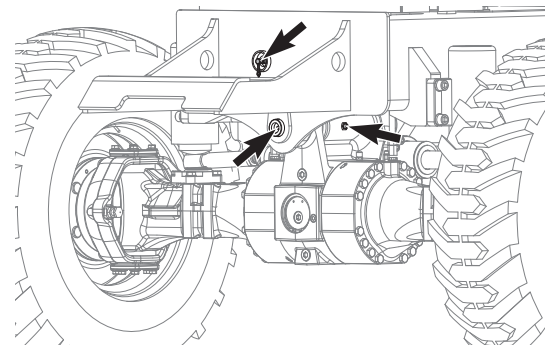


Figure 35

WE1501687

Grease Swing Bearing

1. There are three grease fittings for the swing bearing. Do not over lubricate. Purge old grease with new. Remove all purged grease.

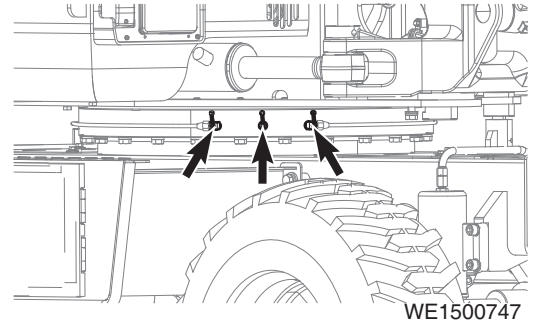


Figure 36

Grease Boom Swing Bracket (for first 100 hours)

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

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

1. Lower the front attachment to ground.
2. Press the grease fitting and inject grease with grease gun on the marked points. After injection, clean off the old grease that has been purged.

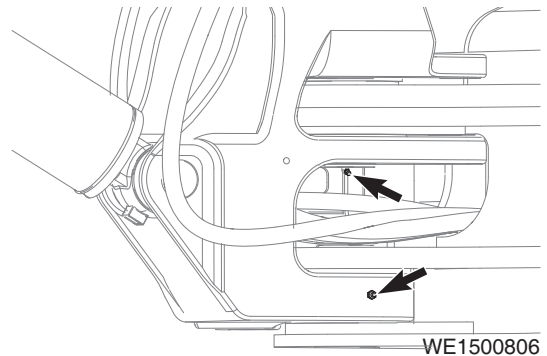


Figure 37

Drain Water and Sediment from Fuel Tank

1. Perform this procedure before operating the machine.
2. Drain water and sediment from bottom of fuel tank into an approved container.

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

NOTE: *Always completely fill fuel tank at end of each workday to prevent condensation from forming on the inside walls of the tank.*

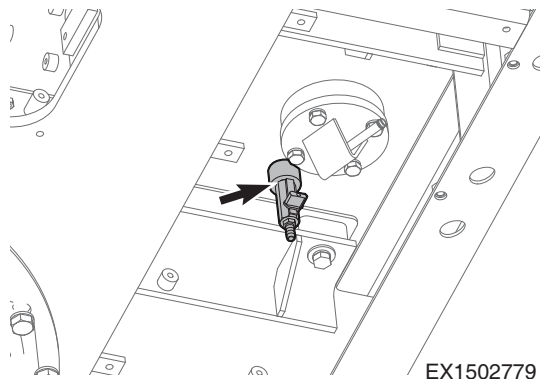


Figure 38

Check Air Compressor and Drain Water as Required

1. Set air compressor operating switch to "OFF" position.
2. Using air gun in the cabin, completely release all air in compressor tank.
3. The air compressor drain valve is on the bottom of the air compressor (1, Figure 39).
4. Put a pan under the drain valve, push valve handle sideways to drain water.

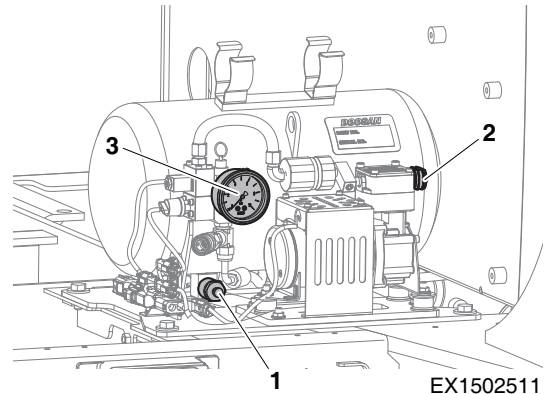


Figure 39

EX1502511



WARNING

AVOID DEATH OR SERIOUS INJURY

The drain valve does not work when the pressure in the air compressor tank is 1 bar (1.0 kg/cm², 14 psi) or above. Compressed air inside tank must be released first.

Wear safety goggles to protect your eyes from water and/or flying objects from drain valve.

Clean Pre Cleaner

1. Remove pre cleaner cover by loosening the wing bolt.
2. Fully discharge the dirt and dust inside the pre cleaner.

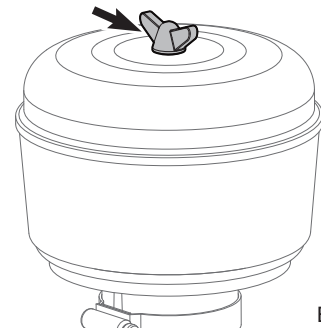


Figure 40

EX1502780

Check Engine Fan Belt for Cracks, Wear and Correct Tension (After First 50 Hours)

1. Inspect after first 50 hours of operation and every 250 hours thereafter. For details, See "Check Engine Fan and Alternator Belts Tension" on page 4-48.

Change Engine Oil and Filter (After First 50 Hours)

1. Change engine oil and filter after first 50 hours of operation or rebuild, then every 500 thereafter. For details, See "Change Engine Oil and Filter" on page 4-51.

Inspect for Any Loose or Missing Nuts and Bolts

1. All nuts and bolts must be inspected after first 50 hours of operation. There after every 250 hours.

150 HOUR / 3 WEEK SERVICE

Perform All 10 Hours/Daily and 50 Hour Service Checks

Drain and Refill Front Axle Case Oil (After First 150 Hours)

1. The front axle case oil must be drained and refilled after the first 150 hours of operation or rebuild, and every 1,000 hours thereafter. (See page 4-65)

Drain and Refill Rear Axle Case Oil (After First 150 Hours)

1. The rear axle case oil must be drained and refilled after the first 150 hours of operation or rebuild, and every 1,000 hours thereafter. (See page 4-65)

Drain and Refill Hub Reduction Gear Oil (After First 150 Hours)

The hub reduction gear oil must be drained and refilled after the first 150 hours of operation or rebuild, and every 1,000 hours thereafter. (See page 4-66)

Drain and Refill Transmission Fluid (After First 150 Hours)

1. The transmission fluid must be drained and refilled after the first 150 hours of operation and at every 1,000 hours thereafter. (See page 4-64)

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.

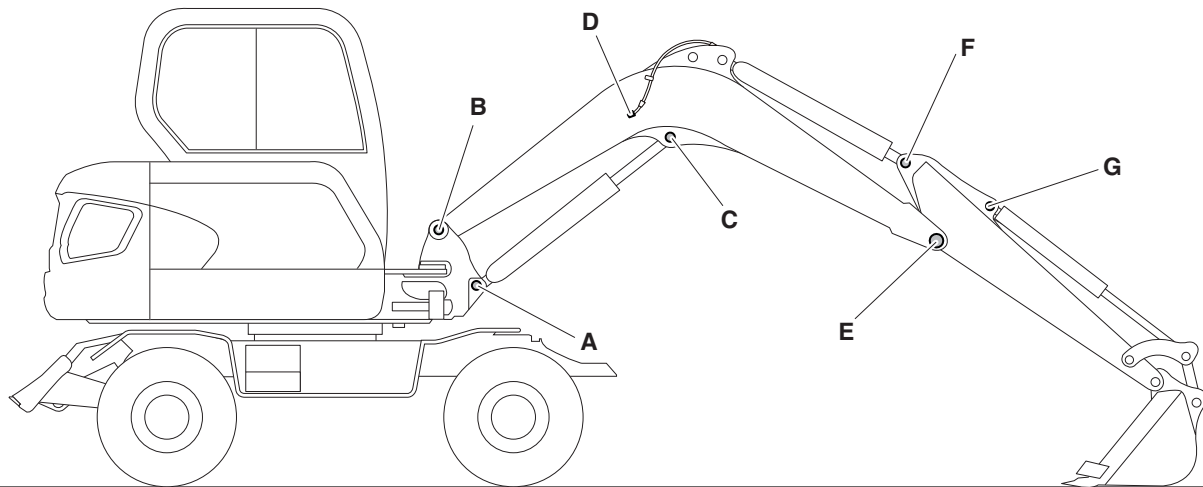


Figure 41

WE1500741

Reference Number	Description
A	Boom Cylinder Head Pin (1 Points)
B	Boom Foot Pin (1 Points)
C	Boom Cylinder Rod Pin (1 Points)
D	Arm Cylinder Head Pin (1 Point)

Reference Number	Description
E	Boom Arm Joint Pin (1 Points)
F	Arm Cylinder Rod Pin (1 Point)
G	Bucket Cylinder Head Pin (1 Point)

- A. Boom Cylinder Head Pin (1 Point)
- B. Boom Foot Pin (1 Point)

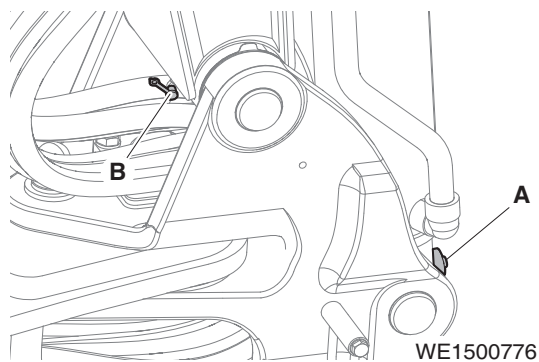


Figure 42

- C. Boom Cylinder Rod Pin (1 Point)

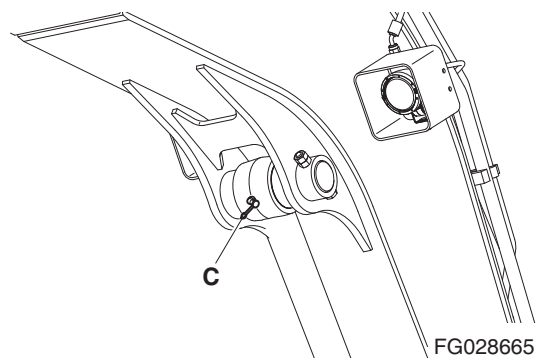


Figure 43

- D. Arm Cylinder Head Pin (1 Point)

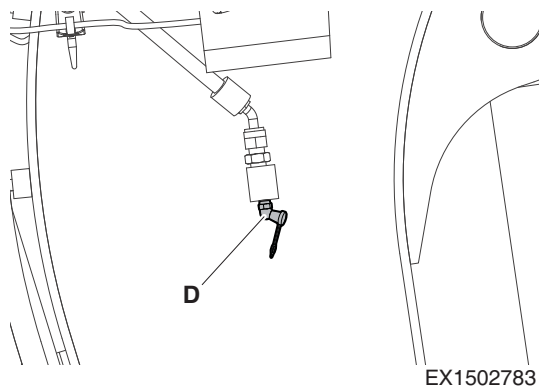


Figure 44

- E. Boom Arm Joint Pin (1 Point)
- F. Arm Cylinder Rod Pin (1 point)

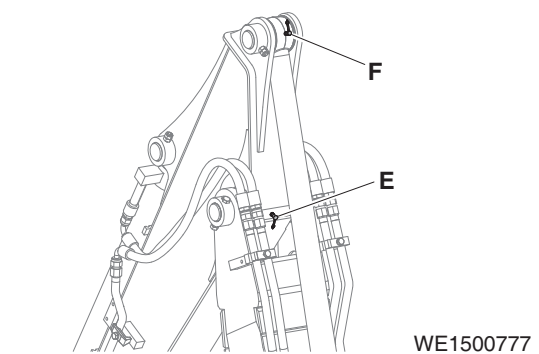


Figure 45

G. Bucket Cylinder Head Pin (1 Point)

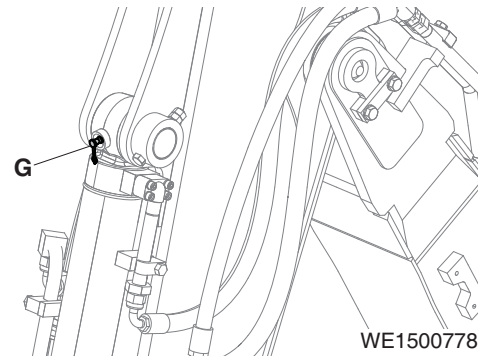


Figure 46

Grease Boom Swing Cylinder (for first 100 hours)

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

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

1. Lower the front attachment to ground.
2. Press the grease fitting and inject grease with grease gun on the marked points. After injection, clean off the old grease that has been purged.

A. Boom Cylinder Head (1 Point)

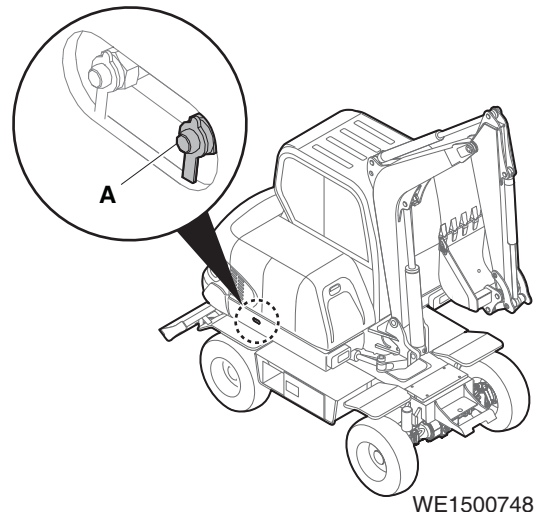


Figure 47

B. Boom Cylinder Rod

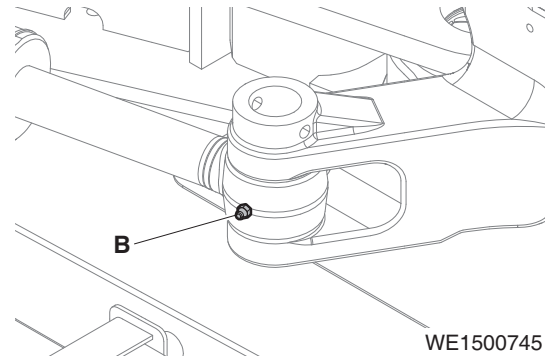


Figure 48

Check Engine Fan and Alternator Belts Tension

IMPORTANT

A loose fan belt can cause engine overheating, poor charging, and/or premature belt wear. A belt that is too tight can cause damage to the water pump, alternator bearing, or belt.

1. Inspect every 250 hours. (Inspect after first 50 hours of operation.)
2. With the engine shut off, check the tension of the fan belt by pressing downwards on the belt, midway between the fan pulley and alternator pulley. The belt should flex. To adjust the belt, loosen the alternator adjustment plate bolts, adjust the belt tension and retighten the bolts.

Belt Tension (N)	
New	667 N (68 kgf)
Used	600 N (61 kgf)

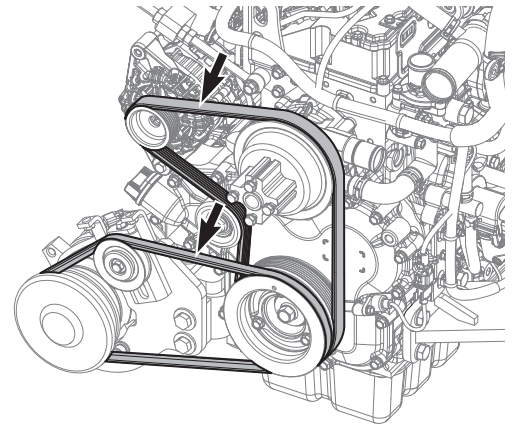


Figure 49

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 4-61).*

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 4-95 for further information.

Inspect for Any Loose or Missing Nuts and Bolts

Inspect Fuel System Hose Clamps

Change Pilot Filter (After First 250 Hours)

NOTE: *Change pilot filter after 250 hours on new machine and every 500 hours thereafter. (See page 4-64)*

500 HOUR / 3 MONTH SERVICE

Perform All Daily, 50 and 250 Hour Service Checks

Grease Swing Gear and Pinion



WARNING

AVOID DEATH OR SERIOUS INJURY

Greasing swing gear and pinion must be done by only one person.

1. Lower boom and position bucket on ground.
2. Move safety lever to "LOCK" position.
3. Run engine for five minutes at "LOW IDLE".
4. Stop engine.
5. Remove key from starter switch.
6. Inject grease through the grease fitting (A, Figure 50) using a grease gun.
7. Lift bucket about 20 cm (8 in) from ground. Turn upper body 90° at a time for full turn, greasing the swing gear at each stop.

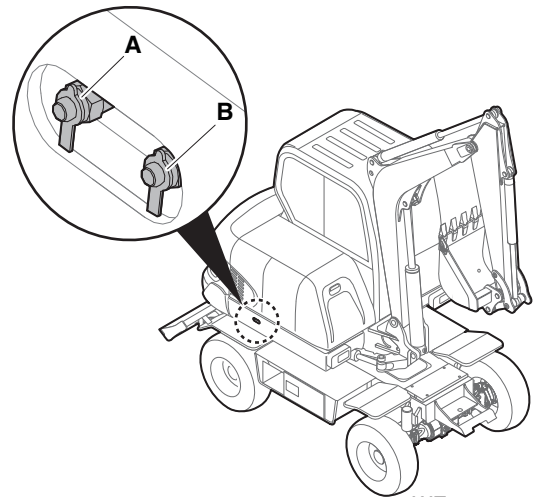


Figure 50

WE1500780

Change Engine Oil and Filter

NOTE: *Change engine oil and filter after first 50 hours of operation or rebuild, then every 500 thereafter.*



WARNING

AVOID DEATH OR SERIOUS INJURY

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

1. Position a larger container under the engine.
2. Remove cap of drain cock and install the separately provided drain hose.
3. Drain the engine oil.

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

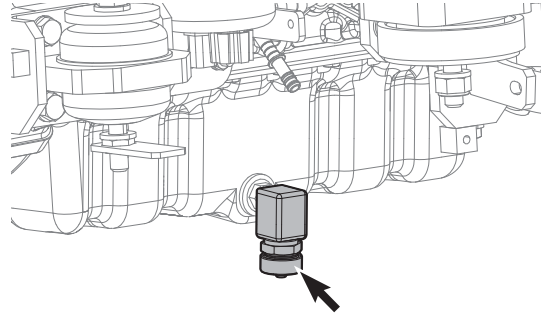
IMPORTANT

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

4. Place a suitable container below the oil filter assembly.
5. Remove oil filter with a suitable tool.
6. Clean the sealing surface.

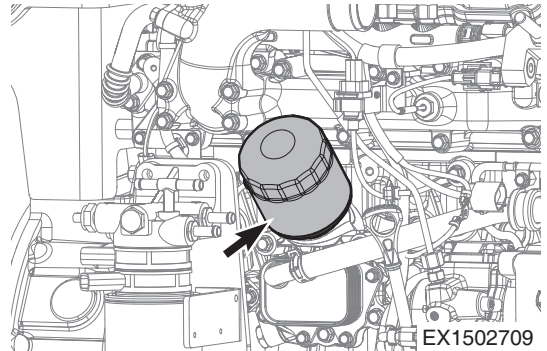
NOTE: *Do not fill the oil filters with oil before installing them.
This oil would not be filtered and could be contaminated.
Contaminated oil can cause accelerated wear to engine components.*

7. Apply clean engine oil to gasket for the new oil filter (1, Figure 53).
8. Install the new oil filter. Spin on the oil filter until gasket contacts the sealing surface. Then rotate the oil filter 3/4 of a full turn. Remove container and disposal of the waste oil according to local regulations.



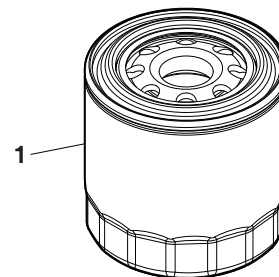
EX1502708

Figure 51



EX1502709

Figure 52



EX1502710

Figure 53

9. Refill the engine with the correct oil through the oil fill port (Figure 54). Refer to the Lubrication Table of this manual for the recommended oil for the operating conditions.

NOTE: See "Fluid Capacities" on page 4-19 for capacity.

10. Start engine. Run engine for five minutes at "LOW IDLE" and check engine oil pressure light.
11. Stop engine. Look for signs of leaks at filter. Recheck oil level after fifteen minutes.

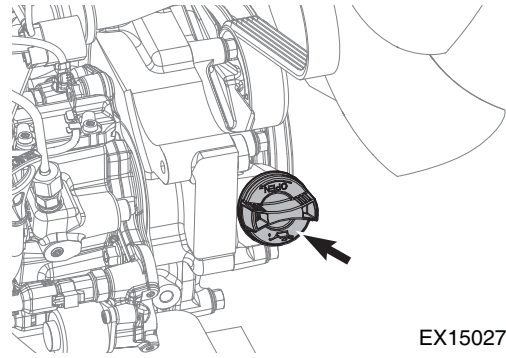


Figure 54

EX1502711

Clean Air-conditioning Filter

1. Remove three bolts and outer cover from operator's seat base.



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

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

2. Remove inner cover by pulling knob outward while pressing the right and left of the cover handle. (Figure 56)

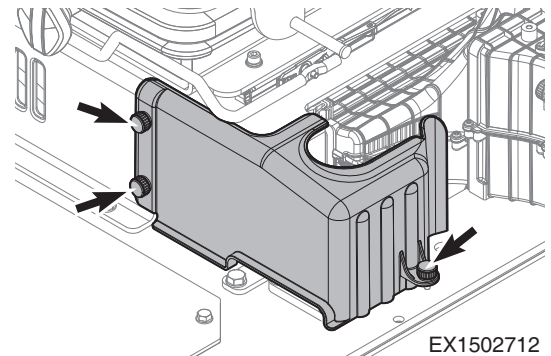


Figure 55

EX1502712

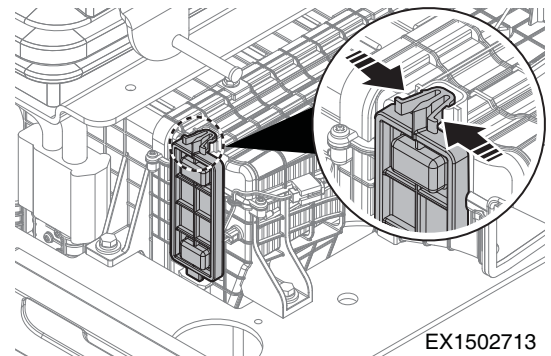


Figure 56

EX1502713

3. Remove two filters from seat base. Clean filter using compressed air. If filter is still not clean, replace with a new one. (Figure 57)
4. After inserting filters, install inner and outer cover. Secure cover in place with three bolts.

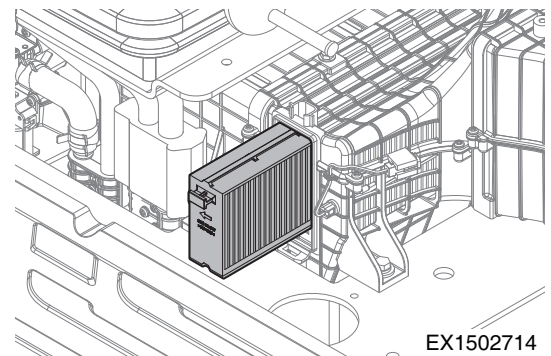


Figure 57

EX1502714

Clean Radiator, Oil Cooler, Intercooler, Fuel Cooler and Air Conditioner Condenser Cores



WARNING

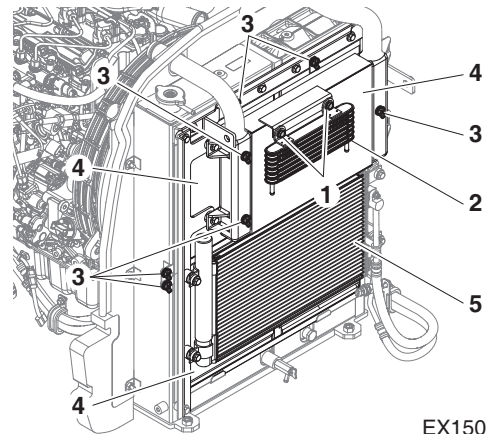
AVOID DEATH OR SERIOUS INJURY

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 bonnet and loosen the fuel cooler bolts (1, Figure 58).
2. Remove the fuel cooler (2, Figure 58).
3. Loosen the wing bolts (3, Figure 58) and remove dust nets (4, Figure 58) from in front of inter cooler, oil cooler and radiator.
4. 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.

5. Clean air conditioner condenser core (5, Figure 58) with compressed air, steam or water.



EX1502716

Figure 58

IMPORTANT

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.

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 59) 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.

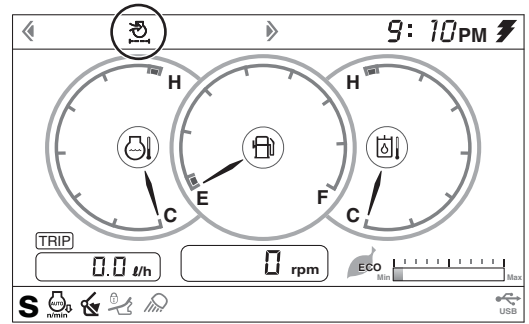
NOTE: When it reaches every 500 hours or If indicator symbol (Figure 59) on display monitor comes "ON" the air cleaner must be serviced.

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 60) from bottom of air cleaner housing cover (2). Inspect seal lips for wear or damage. Replace valve if necessary.

3. Remove access cover (2, Figure 61) by loosening the latches (3).

4. Remove outer filter (4, Figure 61) from the housing. Do not remove inner filter (5).



WE1500742

Figure 59

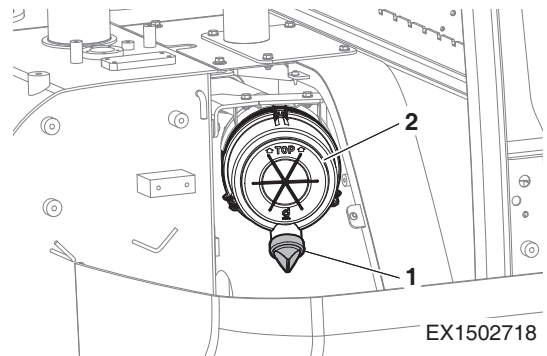


Figure 60

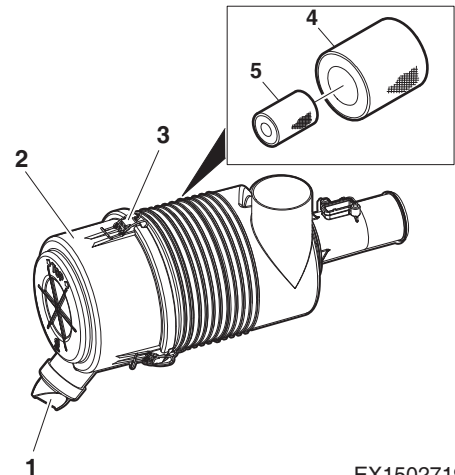


Figure 61

EX1502719

5. Clean the outer filter (4, Figure 61) by blowing compressed air from the inside of the filter towards the outside. Do not use more than 205 kPa (30 psi) air pressure.

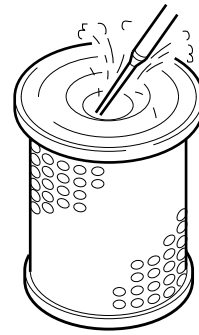


Figure 62

HDO5046I

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.
9. After filter service be sure to install cover with arrows pointing "UP" (A).

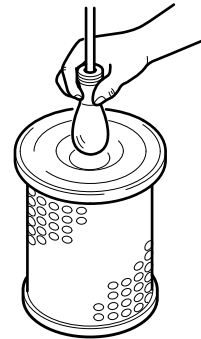


Figure 63

FG000412

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.*

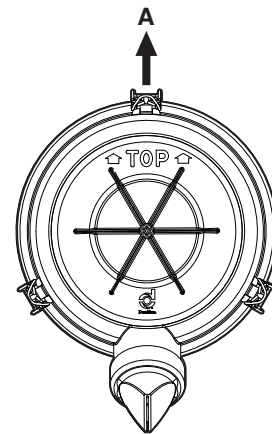


Figure 64

EX1502720

Change Main Fuel Filter (Water Separator)



WARNING

AVOID DEATH OR SERIOUS INJURY

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

1. Locate fuel filter inside engine compartment.
2. Turn the cock valve to "CLOSE" position.
3. Position a small container under fuel filter.
4. Unscrew fuel filter from head assembly. Discard fuel filter.

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

5. After cleaning filter head, install new fuel filter. Screw filter on head until gasket contacts head, and turn filter 3/4 turn more with a filter wrench.

6. Turn the cock valve to "OPEN" position.

NOTE: *Coat fuel filter gasket with fuel.*

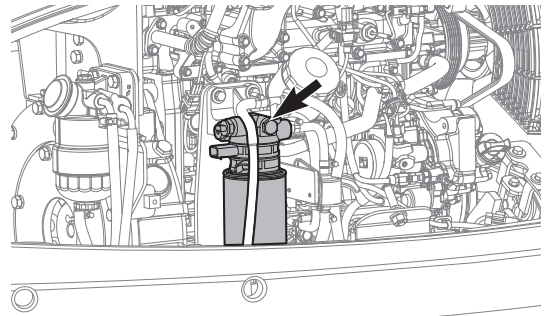
NOTE: *Fill fuel filter with clean fuel. This will help reduce fuel system priming.*

Fuel System Priming

If air remains in the fuel inlet line to the engine, it can cause the engine to run in an abnormal condition. Air may impact the starting capability of the engine, and may also result in surging engine speeds.

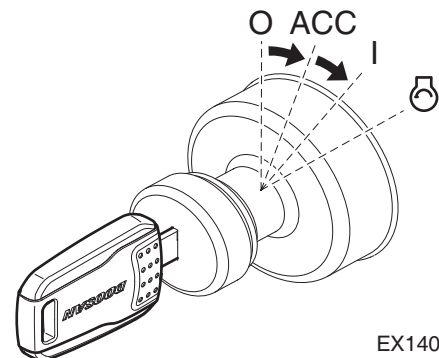
If the machine happens to have run out of fuel, or if the fuel filter has been replaced, air may need to be bled using the following procedure:

1. Stop engine.
2. Fill fuel tank.
3. Turn starter switch to "I" (ON) position to activate electric fuel pump. Wait more than 2 minutes.
4. Start engine and check fuel system for leaks.



EX1502683

Figure 65



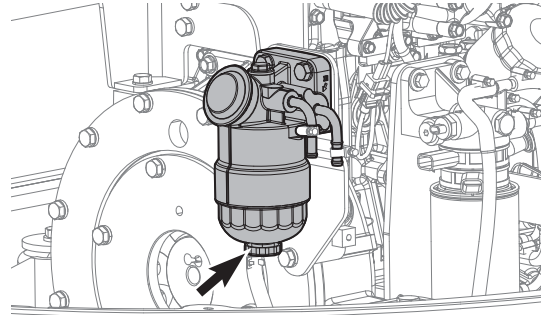
EX1402154

Figure 66

Change of Water Separator & Pre Fuel Filter (Fuel Prefilter)

1. Open the bonnet.
2. Turn the cock valve to "CLOSE" position.
3. Position a small container under prefilter. Drain fuel by opening drain valve on bottom of filter.

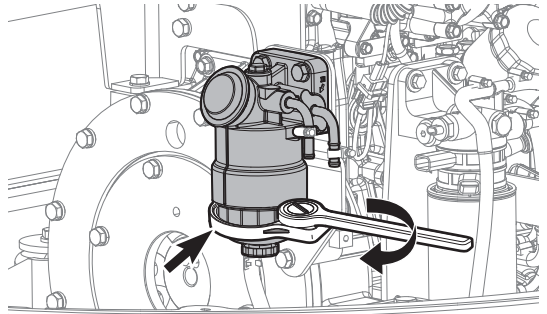
NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*



EX1502721

Figure 67

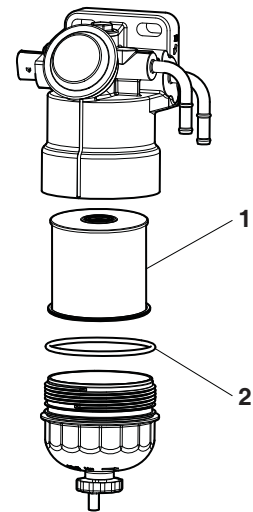
4. Remove bowl using supplied tool.
5. Remove element (1, Figure 69) and replace the new element.



EX1502722

Figure 68

6. Coat surface of O-ring (2, Figure 69) with fuel, and tighten the bowl with tool.
7. Turn the cock valve to "OPEN" position.



EX1502723

Figure 69

Grease Drive Shaft

1. Front Drive Shaft Front U-joint (1 Point)
2. Front Drive Shaft Spline (1 Point)

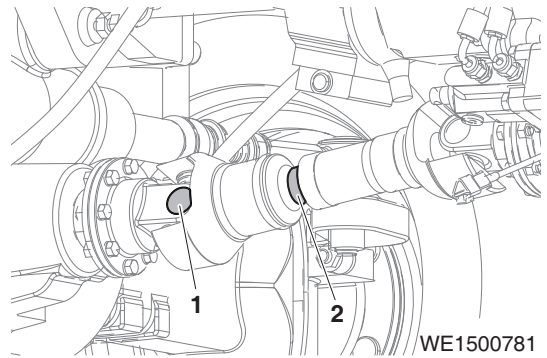


Figure 70

3. Front Drive Shaft Rear U-joint (1 Point)

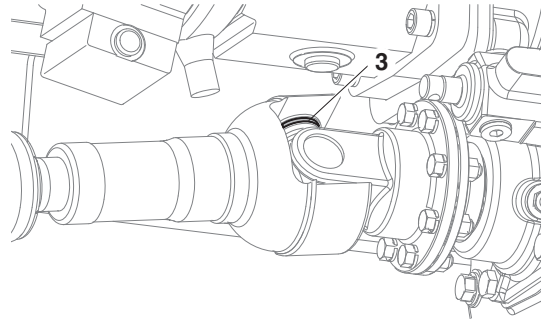


Figure 71

4. Rear Drive Shaft Front U-joint (1 Point)

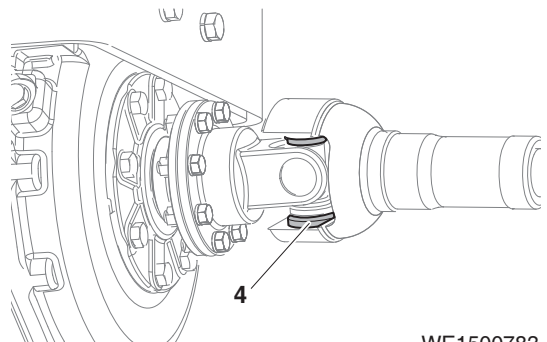


Figure 72

5. Rear Drive Shaft Spline (1 Point)
6. Rear Drive Shaft Rear U-joint (1 Point)

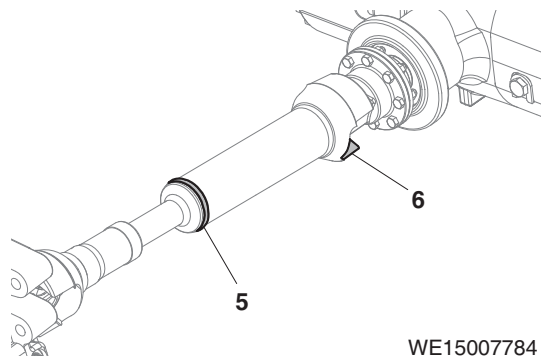


Figure 73

Grease Front Axle Steering Knuckle

NOTE: If the unit has been running or working in water the front attachment must be greased 3 months or every 500 hours.

1. Press the grease fitting and inject grease with the grease gun on the marked point.

NOTE: There is an upper and lower grease fitting on each end of the front axle.

2. After greasing, clean off the old grease that has been purged.

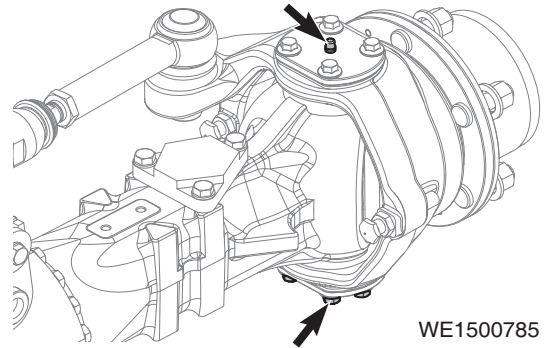


Figure 74

Change Pilot Filter

NOTE: Change pilot filter after first 50 hours of operation or rebuild, and every 1,000 hours thereafter.

NOTE: If pilot filter clogged warning light on instrument panel comes "ON" the pilot filter must be serviced.



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after normal machine operation.

Allow the system to cool down before changing pilot filter.

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip breather cap up (1, Figure 77) slightly to release the internal pressure.
3. Locate pilot system filter assembly.
4. Unscrew canister (5, Figure 75) 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 75).

NOTE: Used filter should always be disposed of according to local regulations.

6. After changing pilot filter, vent air from pump and check level of hydraulic oil tank.

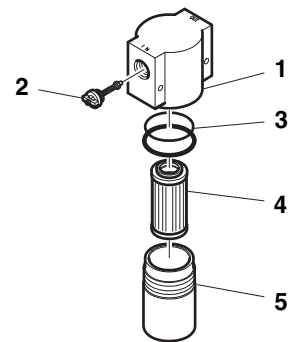


Figure 75

1,000 HOUR / 6 MONTH SERVICE

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

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 76) slightly to release the internal pressure.
3. Unscrew the bolt (1, Figure 76) and take off the breather cap (2).
4. Change a filter cartridge (3, Figure 76) and assemble the breather cap by tightening the bolt.

NOTE: *The used filter should always be disposed of according to local regulations.*

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

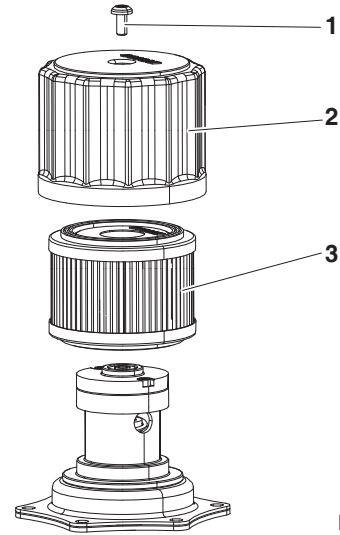


Figure 76

FG013207

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.



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.

IMPORTANT

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 77) slightly to release the internal pressure.
3. Remove bolts (2, Figure 77) and service cover (3). Remove O-ring (4), spring (5), valve (6) and then filter (7).
4. Remove filter and discard.

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

5. Install new filter and a new O-ring. Install bypass strainer, valve and spring. Install service cover plate.
6. Run engine for ten minutes at "LOW IDLE" to purge air from circuit.
7. Check level in hydraulic oil tank (See page 4-27). Add oil if necessary.

8.

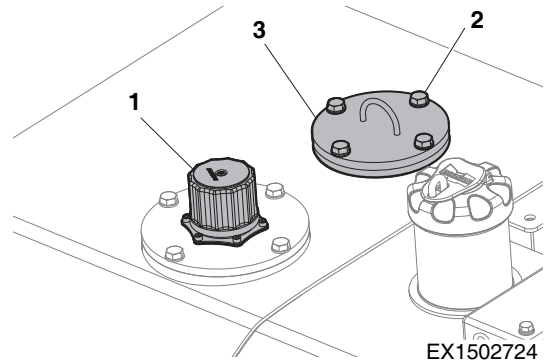


Figure 77

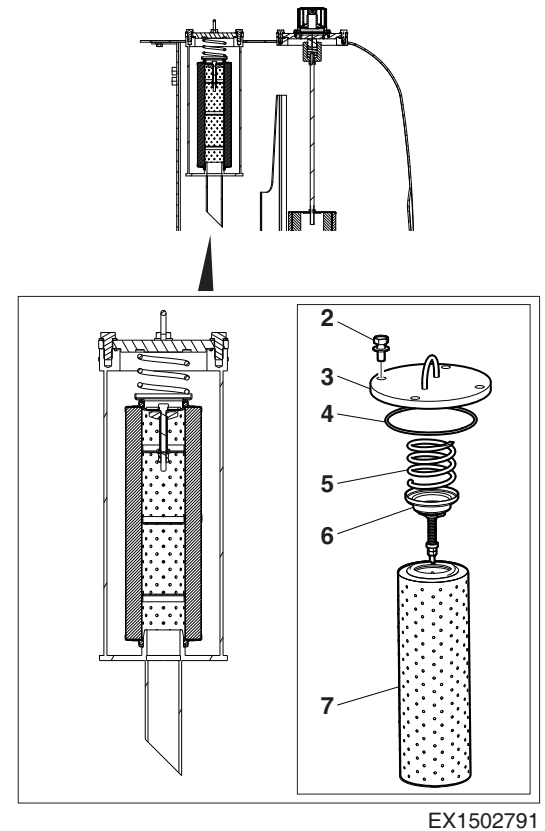


Figure 78

Clean Hydraulic Oil Suction Filter



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.

IMPORTANT

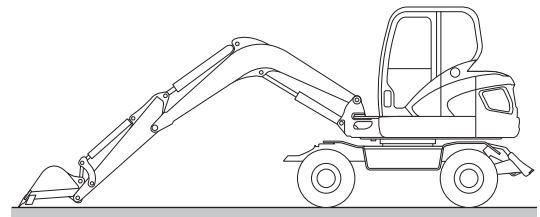
Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the fill port and filter ports.

1. Park machine on firm and level ground. Swing upper structure parallel to tires. Lower boom and position bucket on ground as shown in Figure 80.
2. Set parking brake switch "I" (APPLIED) position.
3. Move safety lever to "LOCK" position.
4. Stop engine.
5. Release pressurized air from hydraulic tank by tip breather cap up (1, Figure 83).



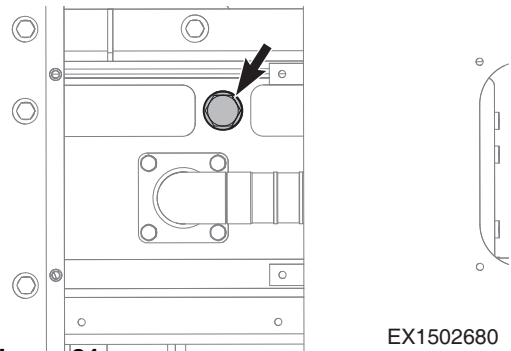
ARO1760L

Figure 79



WE1500713

Figure 80

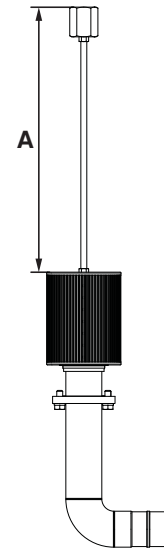


EX1502680

Figure 81

6. Carefully remove bolts and cover (2, Figure 83) from top of hydraulic oil tank. There is a spring (3, Figure 83) under the cover that will force the cover up.
7. Remove spring (3, Figure 83) and suction filter (5, Figure 83), by pulling on rod (4, Figure 83).
8. Clean inside and outside of suction filter. Replace suction filter if it is broken.
9. Position suction filter (5, Figure 83) on boss portion of suction pipe (6, Figure 83).

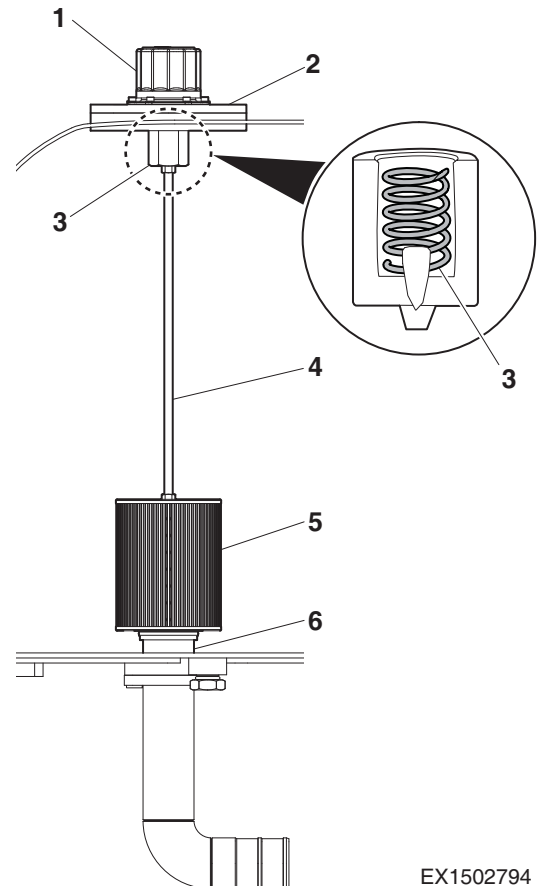
NOTE: Measurement "A" is 446 mm (17.6 in).



EX1502793

Figure 82

10. Place spring (3, Figure 83) on rod (4, Figure 83) and assemble cover (2, Figure 83).



EX1502794

Figure 83

Drain and Refill Transmission Fluid

NOTE: The transmission fluid must be drained and refilled after first 150 hours of operation. There after every 1,000 hours of operation.

NOTE: The oil level must be checked on level ground. When replacing fluid, only use approved grade transmission fluid.

1. The gear oil drain and fill holes are located on the front lower section of the transmission.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain (1, Figure 84) and fill (2) holes of the transmission.
3. Place a drain pan under the drain plug and remove the drain plug.
4. Clean the drain plug. Inspect the O-ring for deterioration or damage and replace if necessary. Reinstall drain plug.
5. Remove the fill plug (2, Figure 84) and fill to the bottom of the fill hole with approved transmission fluid.

NOTE: See "Fluid Capacities" on page 4-19, for capacity.

6. Clean the fill plug. Inspect the fill plug O-ring for deterioration or damage and replace if necessary. Reinstall the fill plug.

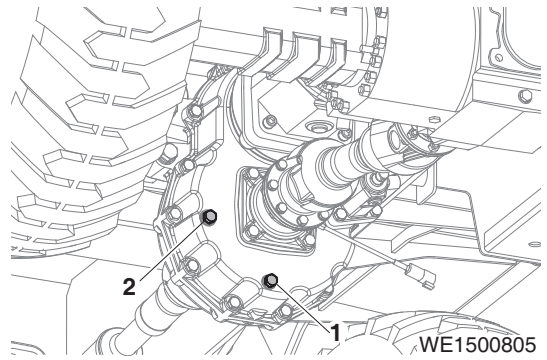


Figure 84

Drain and Refill Front Axle Case Oil

NOTE: The front axle case oil must be drained and refilled after the first 150 hours of operation and at every 1,000 hours thereafter.

NOTE: The oil level must be checked on level ground. When replacing fluid, only use approved grade axle fluid.

1. The oil drain holes are located in the lower section of the axle case and the fill hole is located in the rear section of the axle case.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain (1, Figure 85) and fill (2) holes of the axle case.
3. Place a drain pan under the drain plug and remove the drain plug.
4. Clean the drain plug. Inspect the O-ring for deterioration or damage and replace if necessary. Reinstall drain plug.
5. Remove the fill plug (2, Figure 85) and fill to the bottom of the fill hole with approved gear oil.

NOTE: See "Fluid Capacities" on page 4-19, for capacity.

6. Clean the fill plug. Inspect the fill plug O-ring for deterioration or damage and replace if necessary. Reinstall the fill plug.

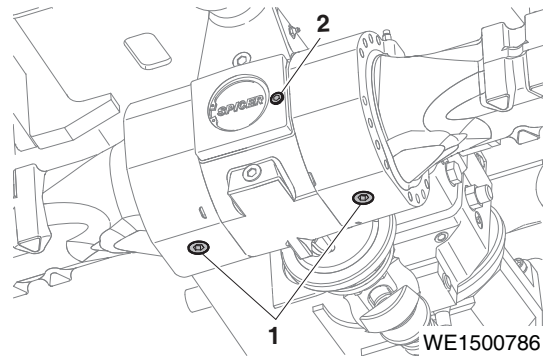


Figure 85

Drain and Refill Rear Axle Case Oil

NOTE: The rear axle case oil must be drained and refilled after the first 150 hours of operation and at every 1,000 hours thereafter.

NOTE: The oil level must be checked on level ground. When replacing fluid, only use approved grade axle fluid.

1. The oil drain (1, Figure 86) holes are located in the lower section of the axle case and the fill (2) hole is located in the rear section of the rear axle case.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain (1, Figure 86) and fill (2) holes of the axle case.
3. Place a drain pan under the drain plug and remove the drain plug.
4. Clean the drain plug. Inspect the O-ring for deterioration or damage and replace if necessary. Reinstall drain plug.
5. Remove the fill plug (2, Figure 86) and fill to the bottom of the fill hole with approved gear oil.

NOTE: See "Fluid Capacities" on page 4-19, for capacity.

6. Clean the fill plug. Inspect the fill plug O-ring for deterioration or damage and replace if necessary. Reinstall the fill plug.

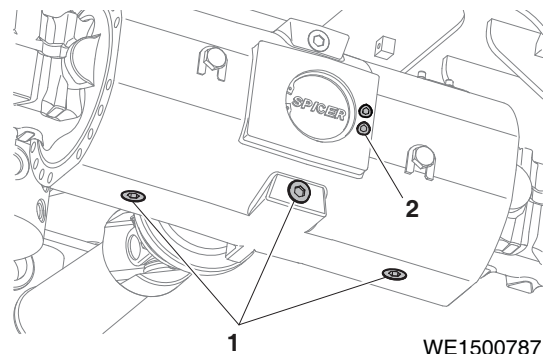


Figure 86

Drain and Refill Hub Reduction Gear Oil

NOTE: The hub reduction gear oil must be drained and refilled after the first 150 hours of operation and at every 1,000 hours there after.

NOTE: The oil level must be checked on level ground. When replacing fluid, only use approved grade axle fluid.

1. Move the excavator slowly and position the drain/fill hole to the lowest position.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain/fill (1) hole of the reduction gear.
3. Place a drain pan under the drain plug and remove the plug.
4. Move the excavator slowly and position the oil level mark (2) on the gear housing parallel to the ground.
5. Fill to the bottom of the fill hole with approved gear oil.

NOTE: See "Fluid Capacities" on page 4-19, for capacity.

6. Clean the drain/fill plug. Inspect the plug O-ring for deterioration or damage and replace if necessary. Reinstall the plug.
7. Repeat the process for the remaining hubs.

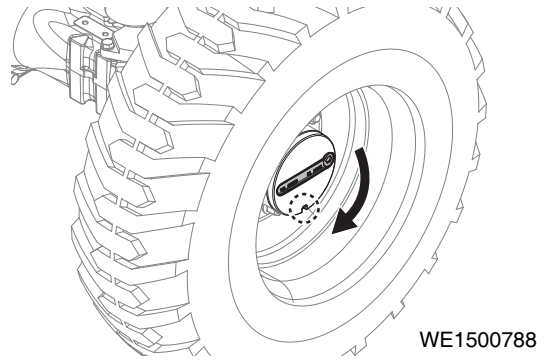


Figure 87

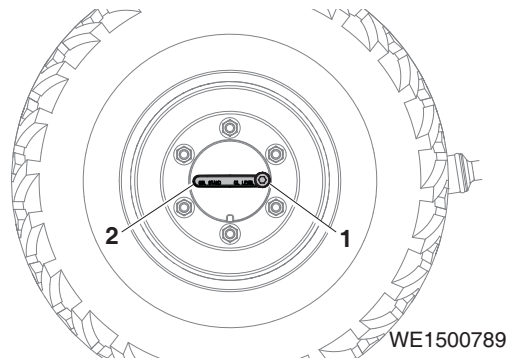


Figure 88

Change Air-conditioning Filter

1. Remove three bolts and outer cover from operator's seat base.



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

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

2. Remove inner cover by pulling knob outward while pressing the right and left of the cover handle. (Figure 90)

3. Remove two filters from seat base and replace that with the new filters. (Figure 91)
4. After replacing filters, install inner and outer cover. Secure cover in place with three bolts.

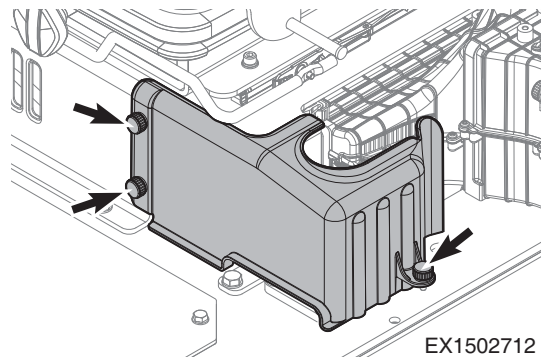


Figure 89

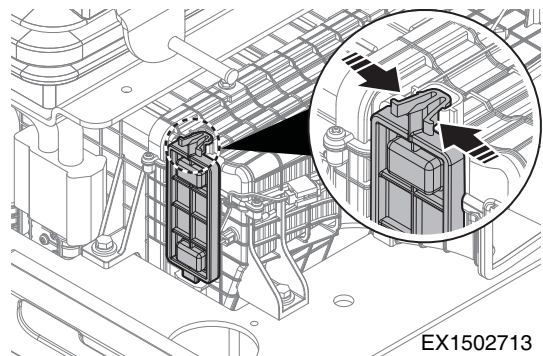


Figure 90

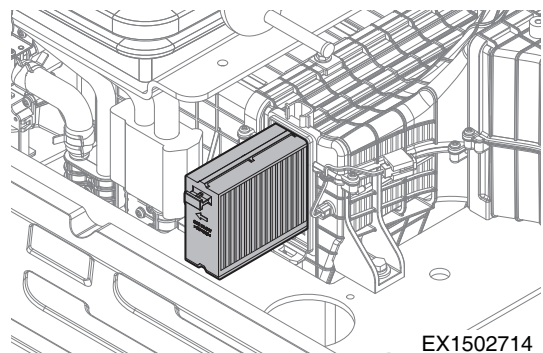


Figure 91

Check Air Conditioner Refrigerant



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not smoke while servicing or recharging air-conditioning system.

Contact with refrigerant can result in frost bite. Wear Protective glasses and gloves when refrigerant lines are opened.

See a Doosan distributor for servicing or recharging the air conditioner refrigerant.

IMPORTANT

Overfilling refrigerant can cause dangerous high-pressure and poor cooling action. Low refrigerant level can cause compressor damage.

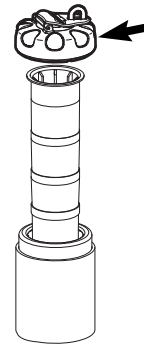
Always maintain refrigerant at normal level.

NOTE: *The regulation refrigerant injection quantity: 500
 ± 20 g*

Change Fuel Cap Filter

IMPORTANT

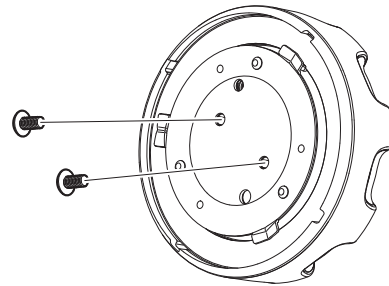
External shock or damage to fuel cap can cause permanent damage to filter.



FG020189

Figure 92

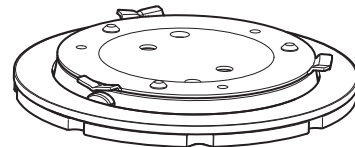
1. Remove screws and filter assembly from fuel cap (Figure 93).



FG015684

Figure 93

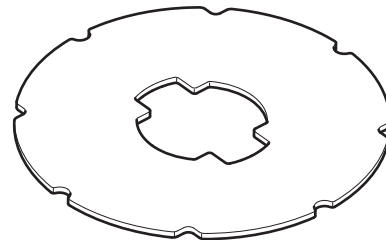
2. After disassembly, carefully lay it as shown in Figure 94.



FG015685

Figure 94

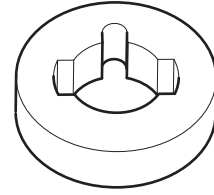
3. After disassembly (Figure 94), remove rubber piece as shown on (Figure 95).



FG015686

Figure 95

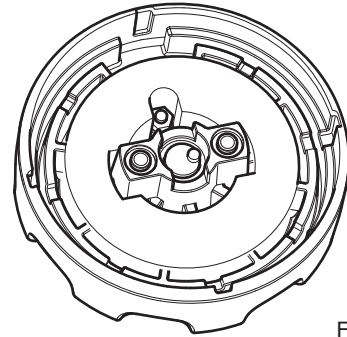
4. After disassembly as shown in (Figure 95), replace filter (Figure 96) with a new one.



FG015687

Figure 96

5. After installing new filter, assemble fill cap in reverse order.



FG015688

Figure 97

Check and Adjust Engine**

Contact your DOOSAN distributor for checking and adjusting the following items:

- Engine Compression Pressure.
- Injection Pressure.
- Injection Timing.

**These checks need to be completed by an authorized DOOSAN distributor.

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 battery room cover, remove 3 latches (3, Figure 99), then remove cover.
2. Remove evacuator valve (1, Figure 99) 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 99), rock it lightly up and downward, and swing the element to pull it out. Remove inner element (5, Figure 99) after doing this.
4. Wipe off the dirt stuck to the air cleaner cover and the inside of the air cleaner housing.

NOTE: When replacing the outer element, replace the inner element simultaneously. Do not reuse the inner element.

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

5. Install a new inner element. Insert the inner element properly so it does not move.
6. Push the new outer element (4, Figure 99) in straight to the air cleaner body.

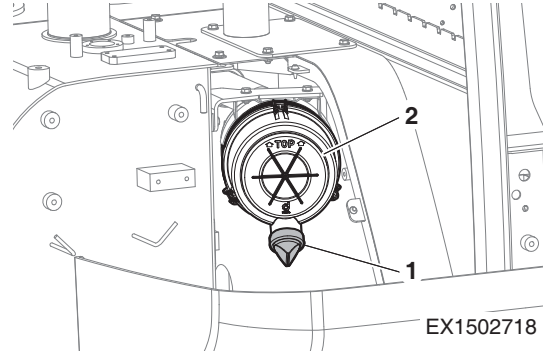


Figure 98

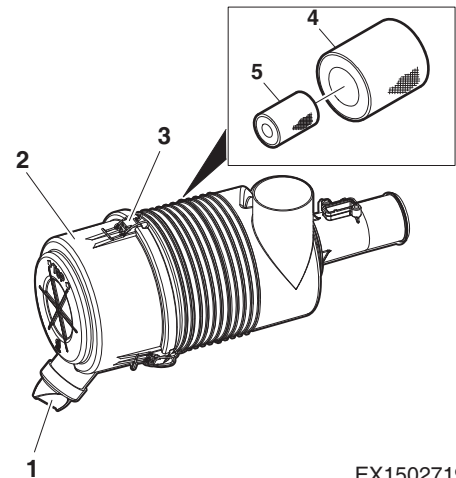


Figure 99

IMPORTANT

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. After filter service be sure to install cover with arrows pointing "UP" (A).

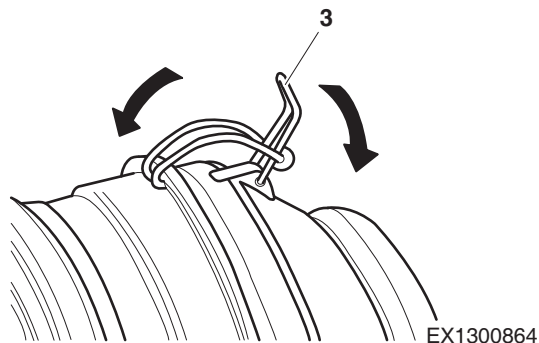


Figure 100

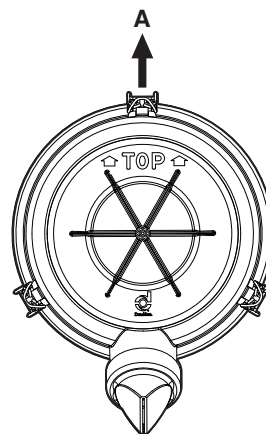


Figure 101

Change Radiator Coolant

NOTE: Do not mix ethylene glycol and propylene glycol antifreeze together. See "Engine Cooling System" on page 4-100, for further details.



WARNING

AVOID DEATH OR SERIOUS INJURY

Allow the engine to cool before releasing the radiator cap. Make sure to loosen the cap slowly to release any remaining pressure.

Radiator cleaning is performed while the engine is running. Take extreme caution when working on or near a running engine. Make sure to lock out and tag the controls notifying personnel that service work is being performed.

Do not remove radiator cap and surge tank cap unless it is required. Check the coolant level in the surge tank.

IMPORTANT

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 DOOSAN genuine antifreeze solution.

To achieve the best cooling performance, keep the mixing ratio of the antifreeze and water by 50 : 50. Using water only can corrode the coolant circuit.

In bitterly cold working conditions, the customer should frequently check the performance of the coolant for appropriateness for the weather and then determine change cycle of the coolant.

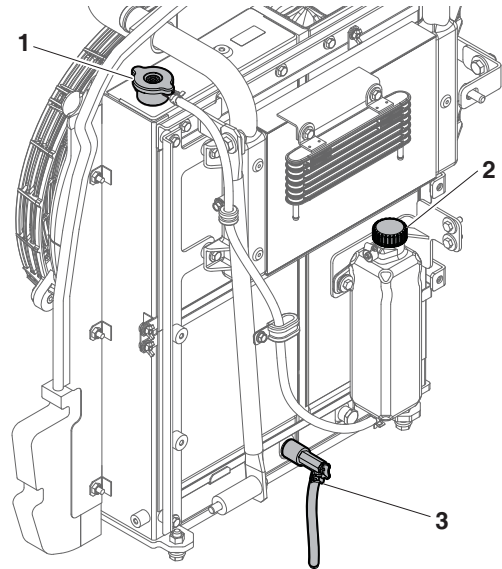
1. Slowly open the radiator cap (1, Figure 102) and the surge tank cap (2, Figure 102) to allow any pressure to escape.

NOTE: See "Fluid Capacities" on page 4-19 for capacity.

NOTE: Some models may have no surge tank or radiator cap. This instruction is only applicable to those with the cap.

2. Place a container under the radiator and open the drain plug (3, Figure 102).

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



EX1502795

Figure 102

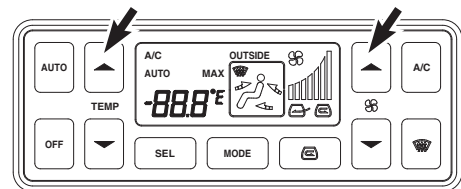
3. Fill cooling system with a flushing solution.

NOTE: *The speed of filling must be within 5 LPM to prevent overflow.*

4. Run engine at low idle until coolant temperature gauge reaches the "WHITE ZONE". Run engine for another ten minutes.
5. Allow engine to cool.
6. Drain flushing fluid and fill system with water.
7. Run engine again to allow water to completely circulate.
8. After allowing engine to cool, drain water and fill system with proper antifreeze mixture for ambient temperature. Refer to coolant concentration table. See "Antifreeze Concentration Tables" on page 4-102
9. Run engine without radiator cap and surge tank cap installed, so all air will be purged from system. Fill radiator to fill neck.
10. Drain and fill surge tank.

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

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



EX1502248

Figure 103

Hydraulic Oil Exchange



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.

IMPORTANT

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 DOOSAN Genuine Oil is used. If another brand of oil is used, a change interval of 1,000 hours is necessary.

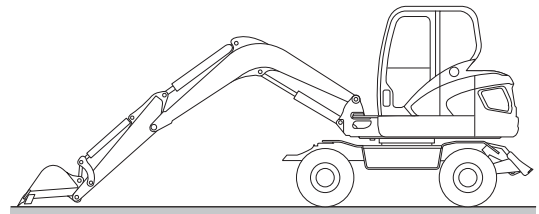
NOTE: *Based on the type of excavating being completed, the working conditions (extremely hot or dusty) and the extra front end attachments being used (hydraulic breaker, etc.), the hydraulic fluid will need to be changed more frequently.*

1. Park machine on firm and level ground. Swing upper structure parallel to tires. Lower boom and position bucket on ground as shown in Figure 105.
2. Set parking brake switch "I" (APPLIED) position.
3. Move safety lever to "LOCK" position.
4. Stop engine.
5. Release pressurized air from hydraulic tank by tip breather cap up (1, Figure 108).



ARO1760L

Figure 104



WE1500713

Figure 105

6. Drain hydraulic oil from tank into a container capable of holding 105 L (28 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.*

7. Carefully remove bolts and cover (2, Figure 108) from top of hydraulic oil tank. There is a spring (3, Figure 108) under the cover that will force the cover up.
8. Remove spring (3, Figure 108) and suction filter (5, Figure 83), by pulling on rod (4, Figure 108).
9. Clean inside and outside of suction filter. Replace suction filter if it is broken.
10. Position suction filter (5, Figure 108) on boss portion of suction pipe (6, Figure 108).

NOTE: *Measurement "A" is 446 mm (17.6 in).*

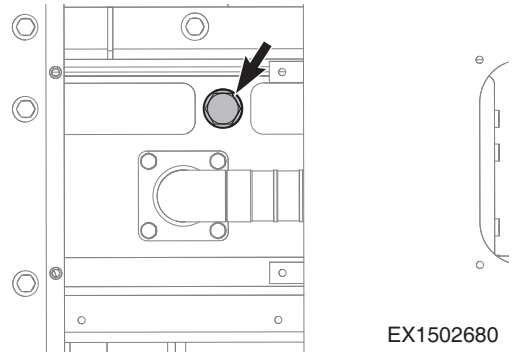


Figure 106

EX1502680

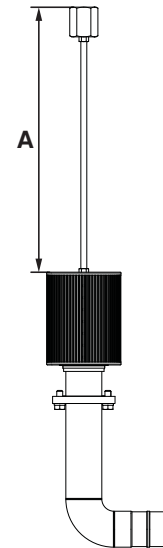


Figure 107

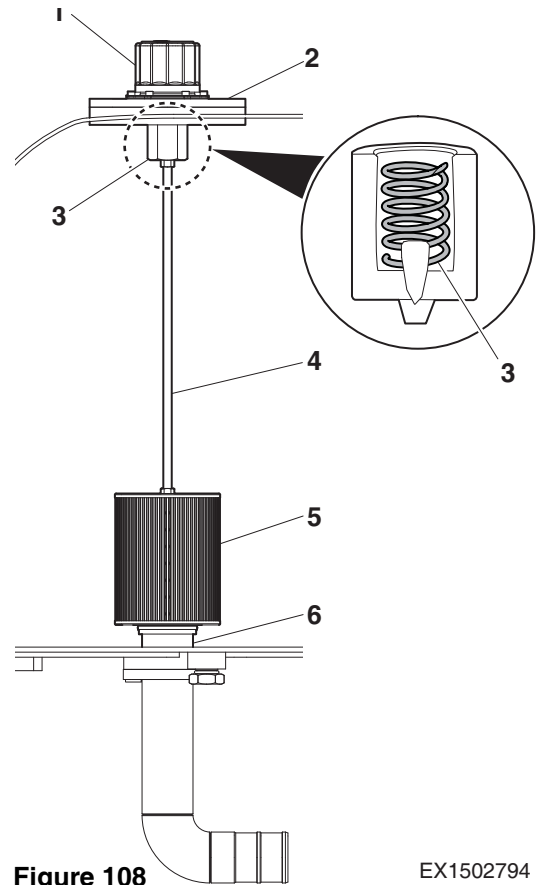
EX1502793

11. Fill the hydraulic oil tank. Check level using sight gauge on side of tank.
12. Place spring (3, Figure 108) on rod (4, Figure 108) and assemble cover (2, Figure 108).
13. After replacing and cleaning the hydraulic oil, filter, and strainer, vent the system. See "Venting and Priming Hydraulic System" on page 4-110

IMPORTANT

When the hydraulic breaker is being used, because of the higher heat generated by this unit, use replacement intervals recommended under the "Hydraulic Oil and Filter Service Intervals" on page 3-52.

14. Check level of hydraulic oil tank. (See page 4-27)



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 DOOSAN distributor.

4,000 HOUR / BIENNIAL SERVICE

Major Parts - Periodic Replacement

For proper operation and work, perform periodic inspections. These parts are those most often subjected to abrasion, heat and fatigue. Replace these parts with new ones at the designated time intervals, even if the old parts look satisfactory.

Replace all related parts such as gaskets and O-rings with original equipment manufacturer's parts.

Major Component		Parts Name to be Replaced Periodically	Time to Replace
Engine		Fuel Hose (Tank to cock valve)	2 years or 4,000 hours
		Fuel Hose (Cock Valve to Fuel Prefilter)	
		Fuel Hose (Fuel prefilter to fuel feed pump)	
		Fuel Hose (Fuel feed pump to fuel main filter)	
		Fuel Hose (Fuel main filter to engine)	
		Fuel Hose (Engine to Fuel Cooler)	
		Fuel Hose (Fuel Cooler to Tank)	
		Heater Hose (Heater to engine)	
		Heater Hose (Heater to radiator)	
		Air Conditioner Hose	
Hydraulic System	Body	Pump Suction Hose	
		Pump Discharge Hoses	
		Pump Side Branch Hoses	
		Swing Motor Hoses	
		Travel Motor Hoses	
	Work Device	Boom Cylinder Line Hoses	
		Arm Cylinder Line Hoses	
		Bucket Cylinder Line Hoses	

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. DOOSAN 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 4-78, 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 Filter" on page 4-52

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 4-53

Check Magnetic Clutch

Check the magnetic clutch for dirt and interference.

Push the "A/C" switch to energize and check magnetic clutch.

Check Belt Tension

NOTE: See "Check Engine Fan and Alternator Belts Tension" on page 4-48

BOLT AND NUT INSPECTION

Inspect ALL fasteners after the first 50 hours of operation and every 250 hours thereafter. If any are loose or are missing, tighten them or install new hardware. Always use a calibrated torque wrench.

IMPORTANT

Always clean fasteners before tightening.

If counterweight is loose, contact a DOOSAN distributor for maintenance information.

No.	Point to be Inspected		Bolt Dia. (mm)	Qty.	Bolt Head Size	Torque		
						N.m	kg.m	ft lb
1	Joint bolt with engine mounting bracket and engine	pump side	12	8	19	108	11	80
		fan side	12	8	19	108	11	80
2	Joint bolt with engine mounting bracket and frame	pump side	14	2	22	177	18	130
		fan side	14	2	22	177	18	130
3	Radiator mounting bolt		12	4	19	108	11	80
4	Mounting bolt for hydraulic oil tank		12	4	19	108	11	80
5	Mounting bolt for fuel tank		12	4	19	108	11	80
6	Mounting bolt for pump		12	2	10 (S)	108	11	80
7	Mounting bolt for control valve		10	4	17	64	6.5	47
8	Mounting bolt for swing device		16	6	14 (S)	265	27	195
9	Mounting bolt for swing motor		12	2	10 (S)	108	11	80
10	Mounting bolt for battery		10	3	17	49	5	36
11	Joint bolt with cabin mounting rubber and frame		12	8	19	108	11	80
	Joint nut with cabin mounting rubber and cabin		16	4	24	206	21	152
12	Joint bolt with swing bearing and upper frame		16	24	24	265	27	195
	Joint bolt with swing bearing and bottom frame		16	24	24	265	27	195
13	Tightening bolt for rear axle		20	8	29	441 ~ 490	45 ~ 50	325 ~ 361
14	Tightening bolt for driveshaft		10	32	14	49 ~ 59	5 ~ 6	36 ~ 43
15	Tightening bolt for travel motor		12	4	10 (S)	98	10	72
16	Tightening bolt for ram cylinder		16	8	14 (S)	245	25	180
17	Tightening bolt for center joint		12	4	19	108	11	80
18	Tire wheel nut		18	24	27	441 ~ 490	45 ~ 50	325 ~ 361
19	Tightening bolt for counterweight		20	3	30	539	55	398
20	Nut front pin		12	18	19	196	20	145
21	Mounting nut for exhaust system	Bracket - Support	10	8	17	20	2	14
22	Mounting bolt for air compressor		10	4	17	64	6.5	47

1. Joint bolt with engine mounting bracket and engine.

1) Pump side

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

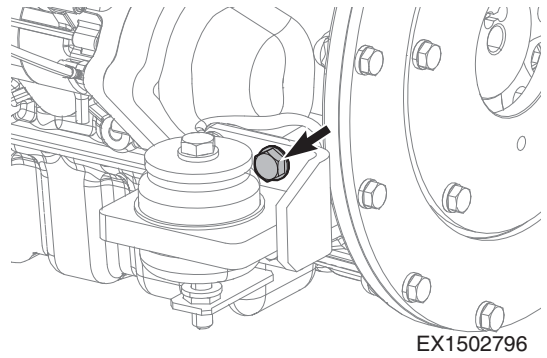


Figure 109

2) Fan side

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

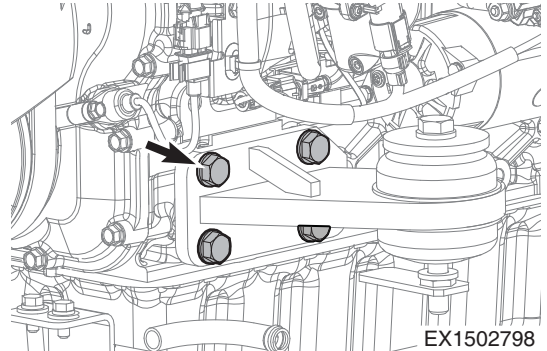


Figure 110

2. Joint bolt with engine mounting bracket and frame.

1) Pump side

- Tool: 22 mm (🔧)
- Torque: 177 N.m (18 kg.m, 130 ft lb)

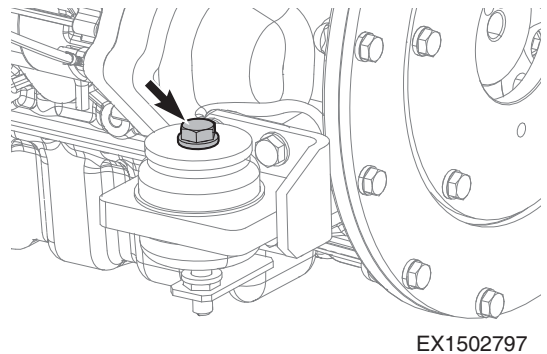


Figure 111

2) Fan side

- Tool: 22 mm (🔧)
- Torque: 177 N.m (18 kg.m, 130 ft lb)

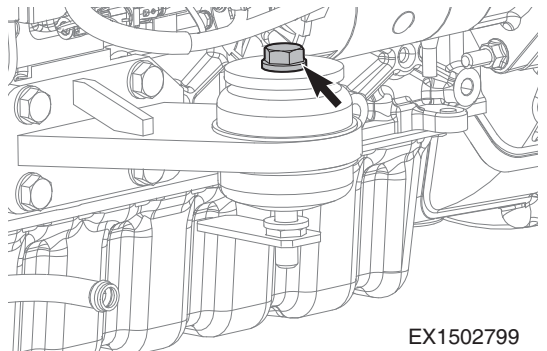


Figure 112

3. Radiator mounting bolt.

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

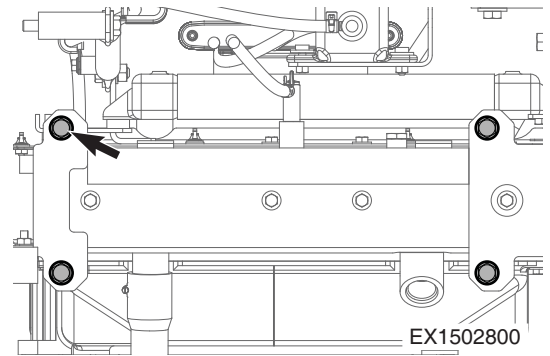


Figure 113

4. Mounting bolt for hydraulic oil tank.

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

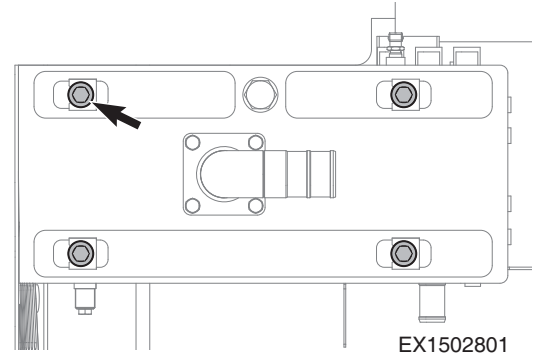


Figure 114

5. Mounting bolt for fuel tank.

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

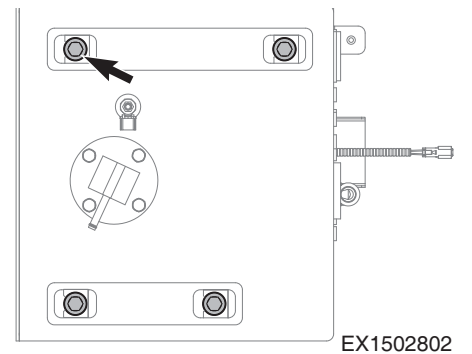


Figure 115

6. Mounting bolt for pump.

- Tool: 10 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

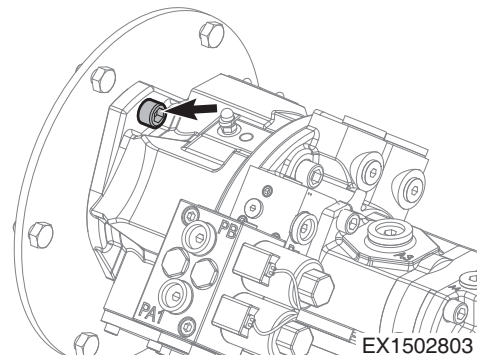


Figure 116

7. Mounting bolt for control valve.

- Tool: 17 mm (🔧)
- Torque: 64 N.m (6.5 kg.m, 47 ft lb)

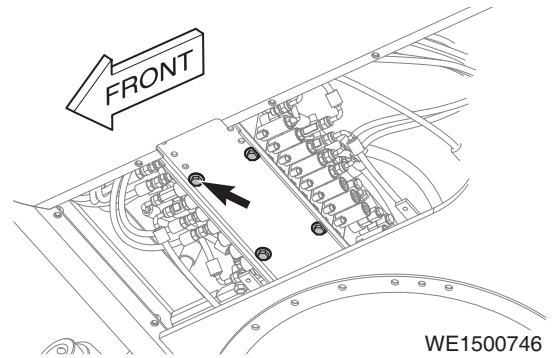


Figure 117

8. Mounting bolt for swing device.

- Tool: 14 mm (🔧)
- Torque: 265 N.m (27 kg.m, 195 ft lb)

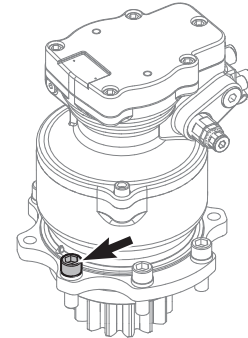


Figure 118

9. Mounting bolt for swing motor.

- Tool: 10 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

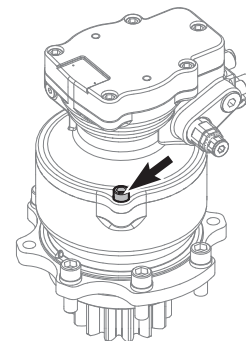


Figure 119

10. Mounting bolt for battery.

- Tool: 17 mm (🔧)
- Torque: 49 N.m (5 kg.m, 36 ft lb)

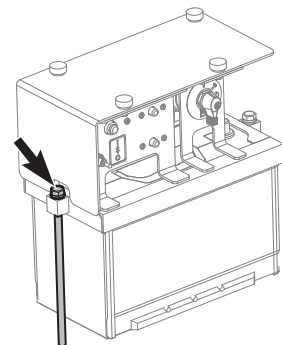


Figure 120

11. Joint bolt with cabin mounting rubber and frame.

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

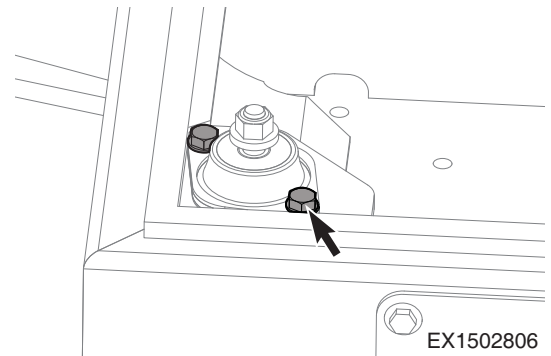


Figure 121

Joint nut with cabin mounting rubber and cabin.

- Tool: 24 mm (🔧)
- Torque: 206 N.m (21 kg.m, 152 ft lb)

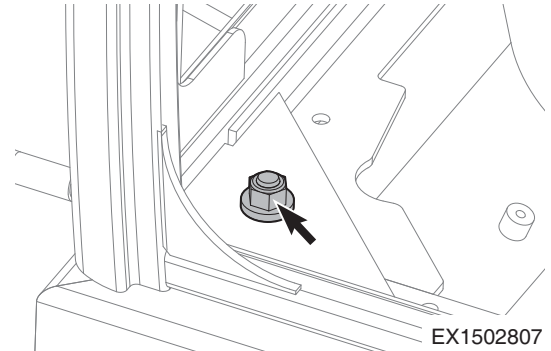


Figure 122

12. Joint bolt with swing bearing and upper frame.

- Tool: 24 mm (🔧)
- Torque: 265 N.m (27 kg.m, 195 ft lb)

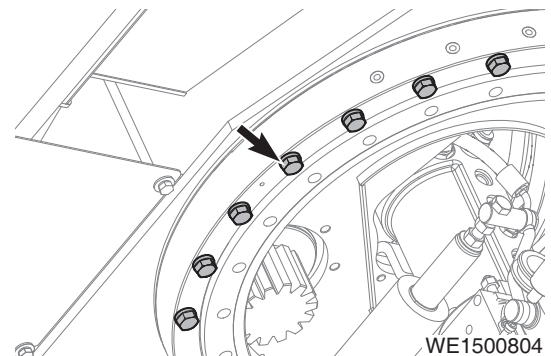


Figure 123

Joint bolt with swing bearing and bottom frame.

- Tool: 24 mm (🔧)
- Torque: 265 N.m (27 kg.m, 195 ft lb)

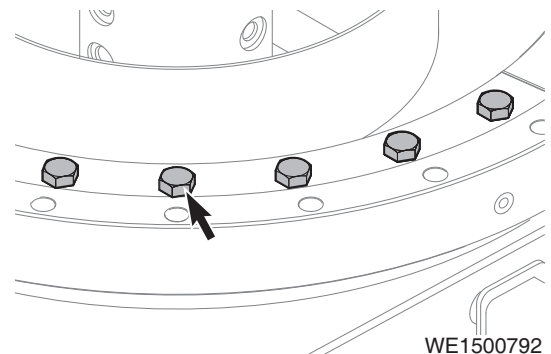



Figure 124

13. Tightening Bolt for Rear Axle.

- Tool: 29 mm ()
- Torque: 441 ~ 490 N.m (45 ~ 50 kg.m, 325 ~ 361 ft lb)

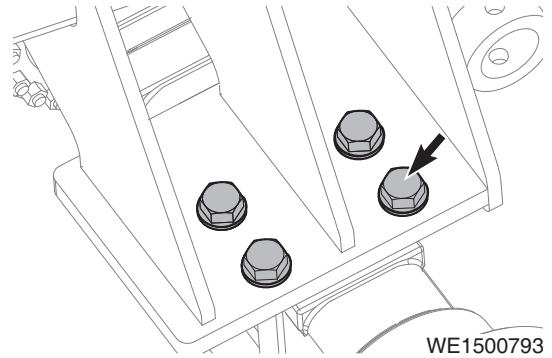



Figure 125

14. Tightening Bolt for Driveshaft.

- Tool: 14 mm ()
- Torque: 49 ~ 59 N.m (5 ~ 6 kg.m, 36 ~ 431 ft lb)

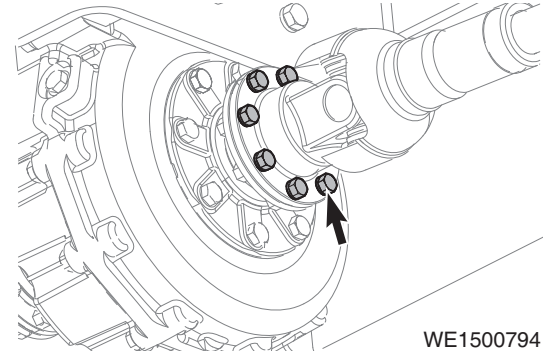



Figure 126

15. Tightening Bolt for Travel Motor.

- Tool: 10 mm ()
- Torque: 98 N.m (10 kg.m, 72 ft lb)

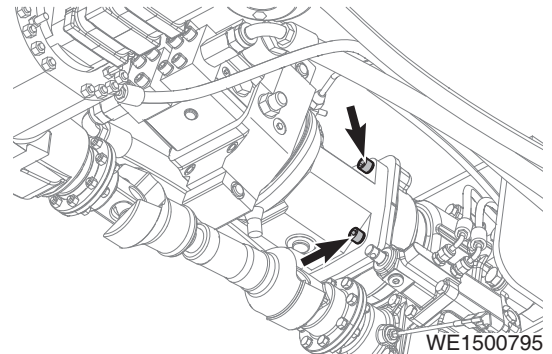



Figure 127

16. Tightening Bolt for Ram Cylinder.

- Tool: 14 mm ()
- Torque: 245 N.m (25 kg.m, 180 ft lb)

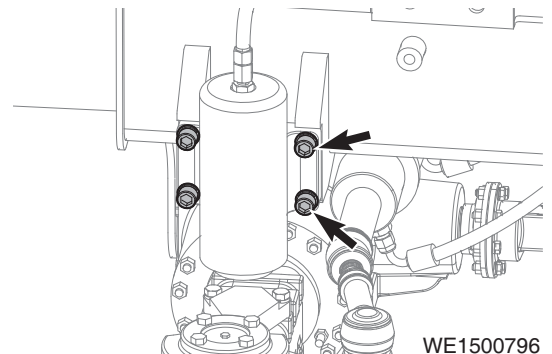


Figure 128

17. Tightening Bolt for Center Joint

- Tool: 19 mm (🔧)
- Torque: 108 N.m (11 kg.m, 80 ft lb)

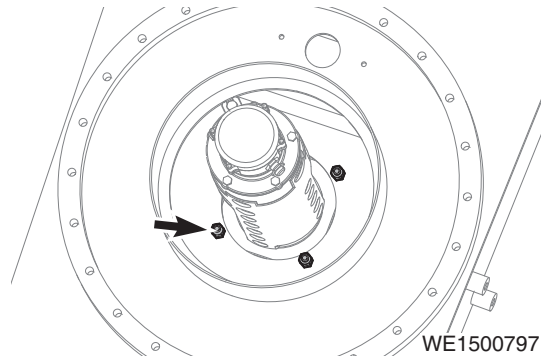


Figure 129

18. Tire Wheel Nut

- Tool: 27 mm (🔧)
- Torque: 441 ~ 490 N.m (45 ~ 50 kg.m, 325 ~ 361 ft lb)

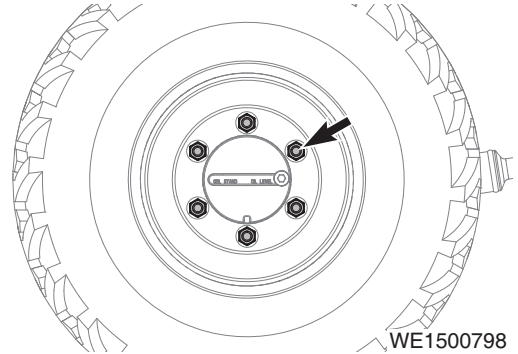


Figure 130

19. Tightening Bolt for Counterweight

- Tool: 30 mm (🔧)
- Torque: 539 N.m (55 kg.m, 398 ft lb)

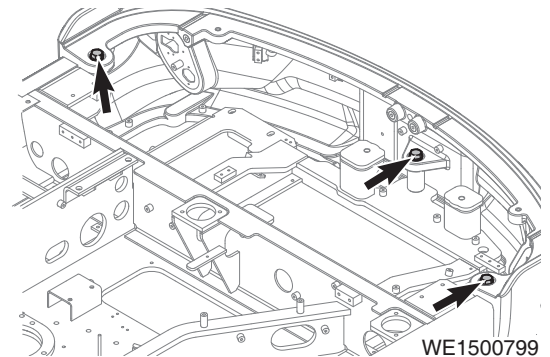


Figure 131

20. Nut for front pin

- Tool: 19 mm (🔧)
- Torque: 196 N.m (20 kg.m, 145 ft lb)

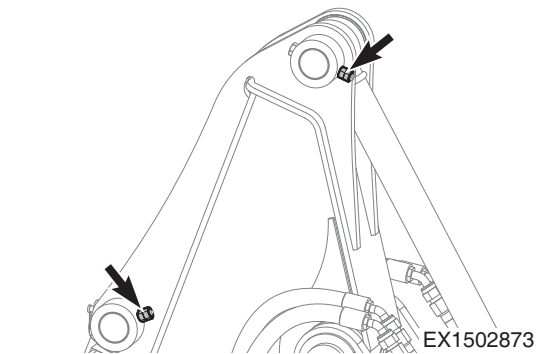


Figure 132

21. Mounting bolt for exhaust system.

1) Bracket - Support

- Tool: 17 mm (🔧)
- Torque: 20 N.m (2 kg.m, 14 ft lb)

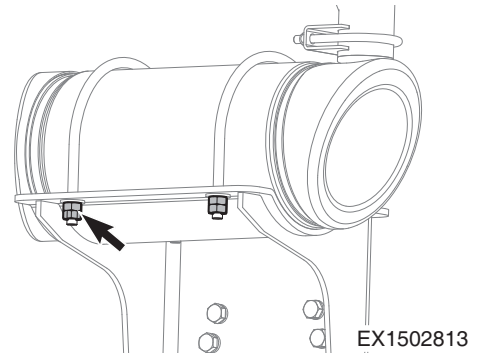


Figure 133

22. Mounting bolt for air compressor.

- Tool: 17 mm (🔧)
- Torque: 64 N.m (6.5 kg.m, 47 ft lb)

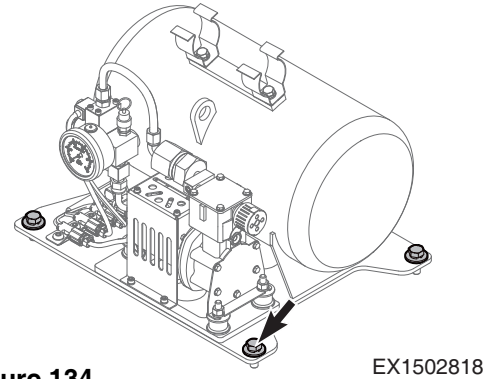


Figure 134

BUCKET

Bucket Tooth Replacement



WARNING

AVOID DEATH OR SERIOUS INJURY

Due to the possibility of flying metal objects and to avoid death or serious injury, always wear safety helmet, protective gloves and eye protection when changing bucket teeth.

Curl the bucket upwards and place the round rear surface of the bucket firmly on the ground. Stop engine and lock out the hydraulic controls before working on the bucket.

NOTE: These instructions are only for DOOSAN OEM buckets. If you are using other manufacturers buckets, refer to their specific instructions.

Inspect locking pin assembly and replace it if the following conditions exist:

1. The locking pin is too short when both surfaces are aligned.
2. The rubber has been torn and bosses of the steel balls are liable to slip off.
3. Pressing steel ball causes the boss to go inside.

Procedures of Bucket Tooth Replacement

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 135, Figure 136.
2. To replace a tooth, use a hammer (1, Figure 137) and punch (2, Figure 137) to drive locking pin (4, Figure 138) and locking rubber (3, Figure 138) out of tooth adapter.
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 with a hammer, drive pin in until lock washer seats in locking groove.

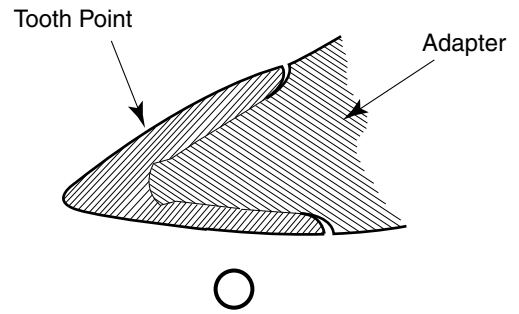


Figure 135

FG010724

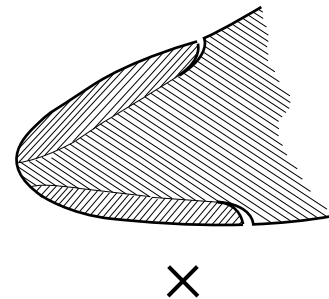


Figure 136

FG010083

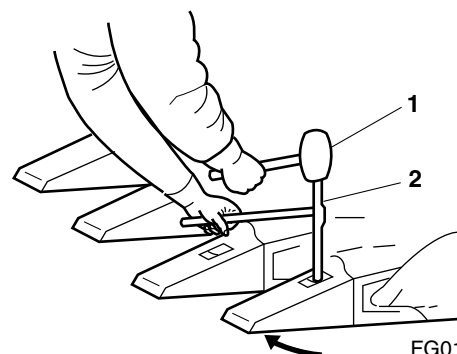
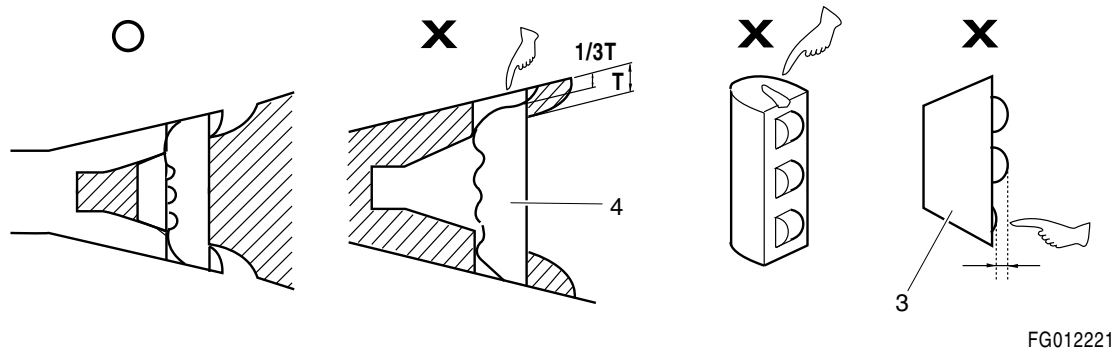


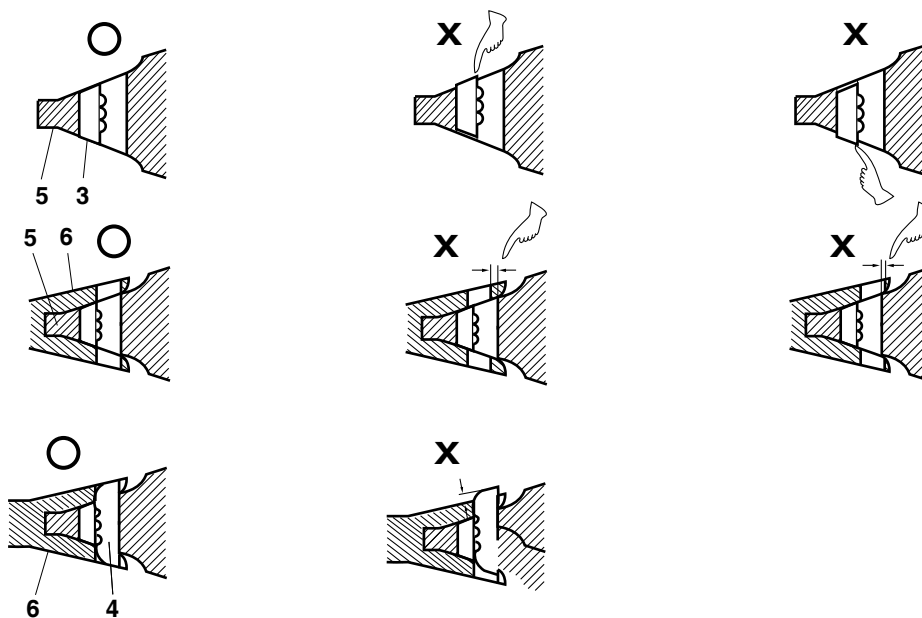
Figure 137

FG010527



FG012221

Figure 138



HFO3043I

Figure 139

Bucket O-ring Replacement



WARNING

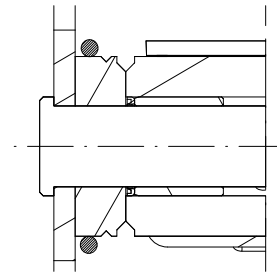
AVOID DEATH OR SERIOUS INJURY

Due to possibility of flying metal 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 141) onto boss (2) around bucket pin (3). Remove bucket pin and move arm or bucket link (4) out of way.

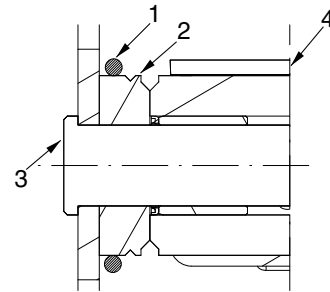
3. Remove old O-ring and temporarily install new O-ring (1, Figure 141) onto bucket boss (2). Make sure that O-ring groove on both bucket link (4) and boss have been cleaned.
4. Realign arm or link with bucket pinhole and insert bucket pin (3, Figure 141).

5. Roll new O-ring (1, Figure 141) into O-ring groove.



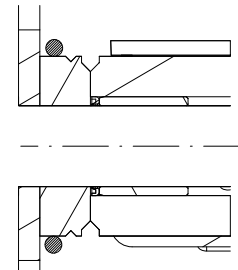
FG010163

Figure 140



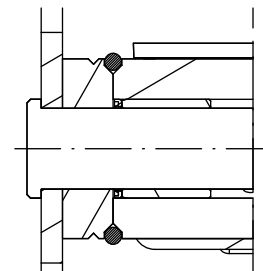
FG011218

Figure 141



FG010164

Figure 142



FG010165

Figure 143

Bucket Shimming Procedures

New Bucket Installation

1. If a new bucket is being installed on excavator, measure inside dimension between bucket ears and outside dimension across arm mounting boss.
2. Subtract clearance on both sides from difference of two and shim accordingly, before assembly.



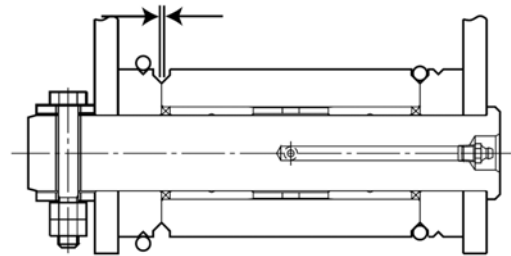
WARNING

AVOID DEATH OR SERIOUS INJURY

To check end play (side to side) clearance at bucket attachment point, the bucket must be free to move but at all other times lower it to the ground or use support blocks to immobilize this assembly. Stop engine and tag and lock out controls to prevent accidental machine movement during this procedure.

Shimming Procedures for Installed Bucket

1. With bucket attached, curl bucket and arm outward and lower boom so bucket teeth are pointing away from excavator, just a few inches off ground. This position provides easy accessibility for dimensional measurements.
2. Force bucket to one side and check for end play (side to side) clearance under O-rings at attachment point. Clearance must be between 0.2 ~ 0.7 mm (0.008 ~ 0.027 in) on each end of arm boss, between side face of boss and inside edge of ear busing. Too tight a fit can cause excessive wear while too much clearance may produce excessive noise and potentially hazardous slack control.
3. Recheck end play by forcing bucket towards opposite side and repeating clearance measurements.
4. If an adjustment is required, remove bolt and pin. Add or remove shims have been provided for A/S as required. Install pin and bolt. Torque bolts to 42 N.m (4.3 kg.m, 31 ft lb).



FG007698

Figure 144

Replace Bucket



WARNING

AVOID DEATH OR SERIOUS INJURY

Prevent injury from flying metal pieces. Wear safety goggles, safety helmet and safety gloves.

Bucket Disassembly

1. Place bucket as shown in illustration.

IMPORTANT

In next step, O-rings are removed with pins. Be careful not to damage them.

2. Remove bolts holding pins A and B, remove pins, and remove bucket.

NOTE: *If pins do not come out easily, the bucket may be resting on the ground too "heavily".*

Bucket Installation

1. Clean and grease pins and pinholes.
2. Install new bucket as shown in illustration.
3. Install pins, aligning arm hole A with push link hole B. Install O-rings.
4. Apply grease to pins.
5. Run engine at low idle and move bucket slowly through one stroke to make sure parts are installed correctly.

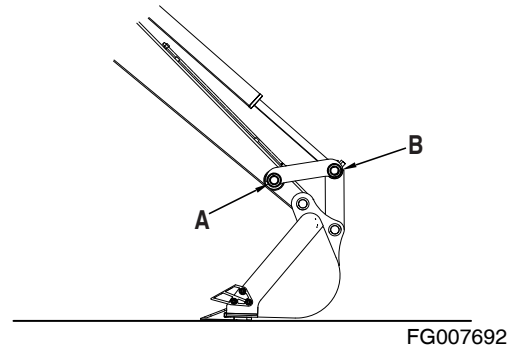


Figure 145

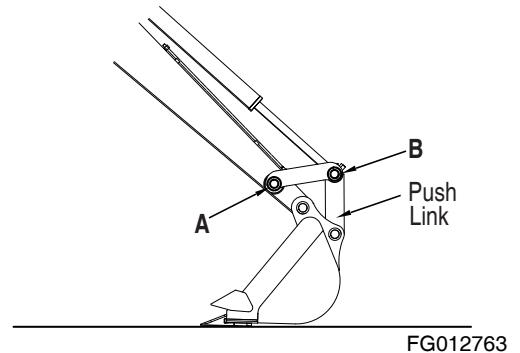


Figure 146

ELECTRICAL SYSTEM

NOTE: *Never disassemble electrical or electronic parts.
Consult a DOOSAN distributor before servicing.*

Battery



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

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

When working with batteries, always wear safety goggles.

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

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

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

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

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

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

Batteries in Cold Weather

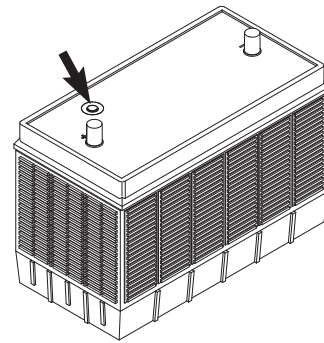
In colder weather, a greater drain is placed on the batteries when they are used for the preheat cycle and when starting a cold engine. Battery performance decreases as the temperature gets lower.

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

Inspection of Battery Electrolyte Level

This machine has a maintenance free battery. 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.



FG028451

Figure 147

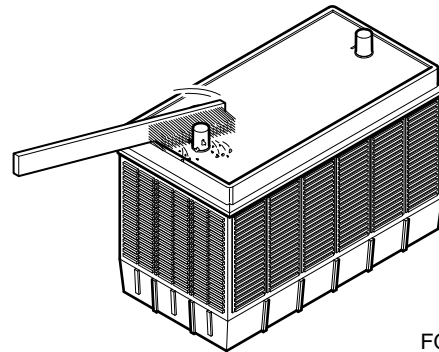
Check Charging State

Check charging state through the charging indicator.

- GREEN: Sufficiently charged.
- BLACK: Insufficient charged.
- TRANSPARENT: Replace battery.

Check Battery Terminals

Be certain that battery is held securely in its compartment. Clean the battery terminals and the battery cable connectors. A solution of baking soda and water will neutralize acid on the battery surface, terminals, and cable connectors. Petroleum jelly or grease can be applied to the connectors to help prevent corrosion.



FG010162

Figure 148

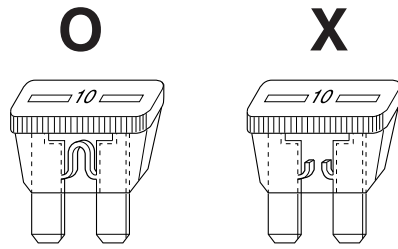
Battery Replacement

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/relay box are used to protect the various electrical circuits and their components from being damaged. See Figure 149. The fuses used are standard automotive type fuses.
2. The section on "Fuse/Relay Identification" on page 4-98 lists the circuits and the fuse amperage required for each circuit. If a fuse blows, determine the cause and repair any electrical faults or failures.
3. Do not insert a higher amperage fuse into a lower amperage slot. Serious damage to the electrical components or fire can result.



HAOC670L

Figure 149

IMPORTANT

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

Relays

The relays are in the fuse/relay box. If the problem is not solved after replacing the fuse, check the function of the relay.

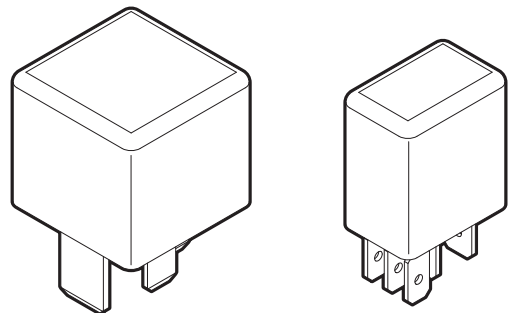


Figure 150

EX1502819

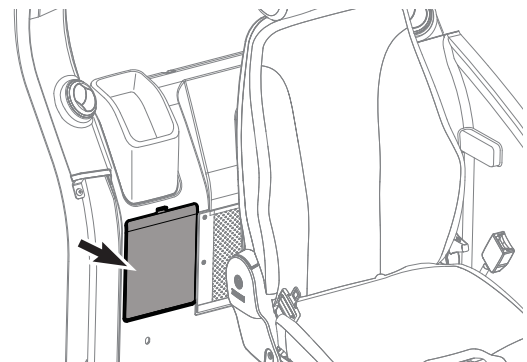
Fuse/Relay Boxes

There is a fuse/relay box (Figure 151) on the back right side of the seat. The fuses prevent electrical devices from overloading or shorting.

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

Spare fuses and relays are mounted on the junction box.

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



EX1502461

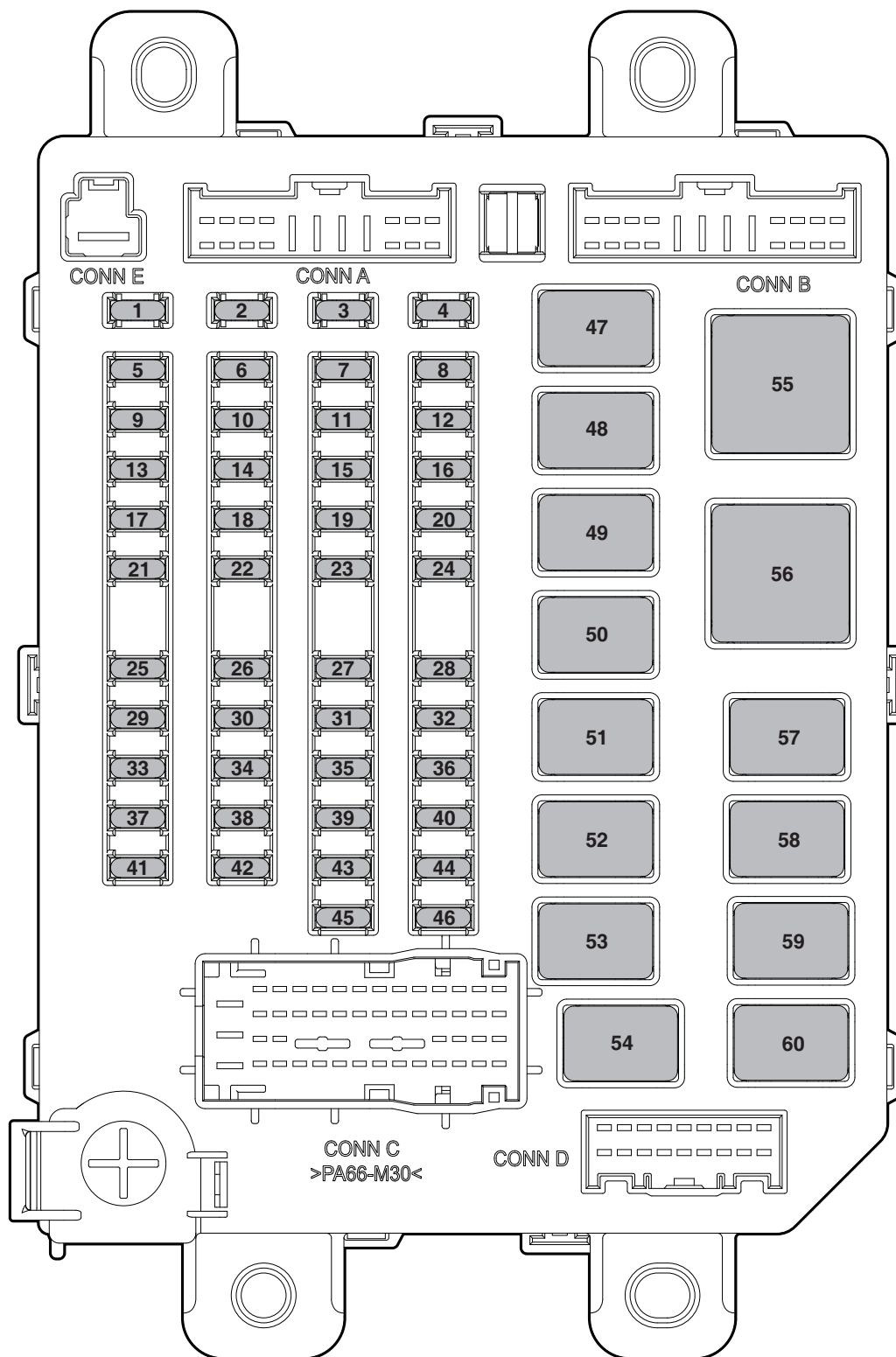
Figure 151



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.



EX1502820

Figure 152

No.	Name	Capacity
1	Spare	5A
2	Spare	10A
3	Spare	20A
4	Spare	30A
5	ACC	20A
6	Fuel Pump	20A
7	Preheat Feedback	2A
8	Boom Swing Solenoid	5A
9	Illumination	20A
10	ECU	25A
11	Tail Light	20A
12	Relay 1	5A
13	Spare	10A
14	Room Light	2A
15	Spare	30A
16	Parking Solenoid	5A
17	Blink Unit	5A
18	Spare	5A
19	Spare	30A
20	Air Compressor	30A
21	Key Switch, Gauge Panel	10A
22	Stereo/Aircon Backup power	5A
23	Cigar Light	15A
24	Washer	5A
25	Horn	5A
26	Wiper	5A
27	Relay 2	5A
28	Spare	30A
29	VCU	5A
30	Pressure Sensor, Keypad	5A

No.	Name	Capacity
31	Joystick Switch	5A
32	Cabin Working Light	15A
33	Airconditioner	30A
34	Gauge Panel Key on Signal	2A
35	Fuel Feed Pump	5A
36	Travel Alarm	5A
37	Steering Combination Light	15A
38	Seat Heater, Microphone	20A
39	Starter Relay 2	2A
40	Head Light	15A
41	Spare	30A
42	Parking Switch, Pilot Cut Off	5A
43	Solenoid Valve	15A
44	Rotation Beacon	5A
45	Spare	10A
46	Working Light	15A
47	Boom Swing Solenoid	Relay
48	Parking Solenoid	Relay
49	Washer	Relay
50	Head Light	Relay
51	Cabin Working Light	Relay
52	Working Light	Relay
53	Stop Light	Relay
54	ECU	Relay
55	Air Compressor	Relay
56	Spare	Relay
57	Travel Alarm	Relay
58	Rotation Beacon	Relay
59	Horn	Relay
60	ACC	Relay

ENGINE COOLING SYSTEM

General

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

Always use distilled water in the radiator. Contaminants in tap water neutralize the corrosion inhibitor components. If tap water must be used, Refer to "Table of Standards for Allowed Tap Water" on page 4-102. Water that has been treated with a water softener also contains salt that will cause corrosion of components. Water from creeks and stagnant pools usually contain dirt, minerals and/or organic material that are deposited in the cooling system and impair cooling efficiency. As such, the use of distilled water is recommended.

Engine coolant shall be mixed with antifreeze solution and water in ratio of 50 : 50.

Coolant shall be checked every 500 hours of operation for ensuring adequate concentration of antifreeze solution and additives.

Engine overheating is often caused by bent or clogged radiator fins. The spaces between the fins can be cleaned by use of air or water under pressure. When straightening bent fins, use care not to damage the tubes or break the bonding joint between the fins and the tubes.



WARNING

AVOID DEATH OR SERIOUS INJURY

Pressure at air nozzle must not exceed 2 kg/cm² (28 psi). Always wear goggles when using compressed air.

Do not pour cold water into radiator when engine is hot and water level is below the top of the tubes. Such action could result in damage to engine cylinder heads.

Heavy-duty diesel engines require a balanced mixture of water and antifreeze. Drain and replace the mixture 1 year or 2,000 hours of operation, whichever comes first. This will eliminate buildup of harmful chemicals.

Antifreeze is essential in any climate. It broadens the operating temperature range by lowering the coolant's freezing point and by raising its boiling point. Do not use more than 50% antifreeze in the mixture unless additional antifreeze protection is required. Never use more than 60% antifreeze under any condition.

Types of Antifreeze

Ethylene Glycol - DOOSAN 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.

IMPORTANT

Do not mix solutions from different manufacturers. Otherwise, the performance may be deteriorated. It is recommended to use the standard product from DOOSAN.

In extreme temperatures, the performance of the coolant must be checked frequently and the coolant change cycle adjusted as necessary.

Engine parts that are made of aluminum are quickly worn out by nitrite, and therefore you should make sure to use nitrite-free coolant.

Antifreeze Concentration Tables

Ethylene Glycol - DOOSAN 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 DOOSAN 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

IMPORTANT

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

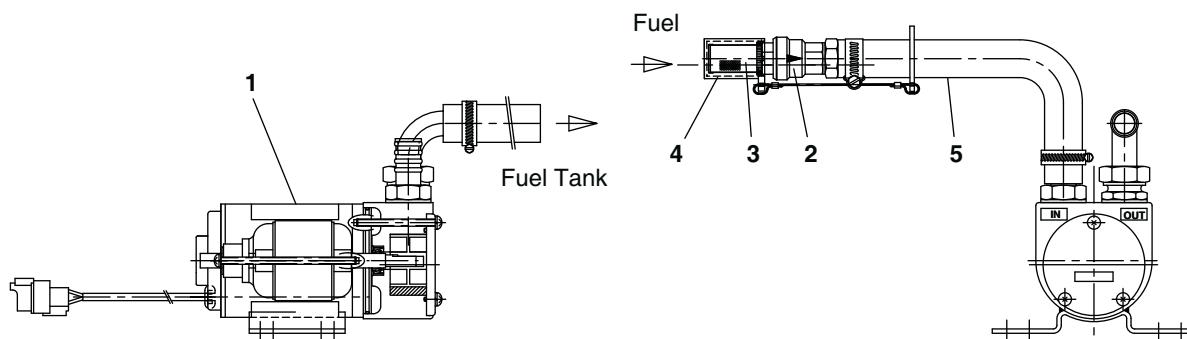
AVOID DEATH OR SERIOUS INJURY

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

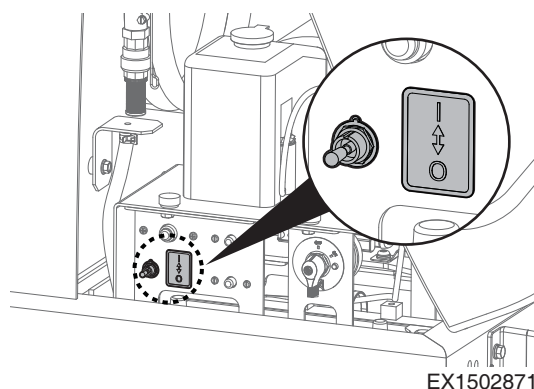
Reference Number	Description
1	Body
2	Check Valve
3	Strainer

Reference Number	Description
4	Strainer Cap
5	Inlet Hose

1. 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.

2. Insert inlet hose (5, Figure 153) into refueling tank.
3. Push fuel pump "START" switch (Figure 154) inside of battery box on front side.
4. Once fuel transfer is completed, the pump will automatically turn "OFF".
5. 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.
6. Install strainer cap (4, Figure 153) on inlet strainer (3, Figure 153) and return hose (5, Figure 153) to storage position.



EX1502871

Figure 154

HANDLING OF ACCUMULATOR



WARNING

AVOID DEATH OR SERIOUS INJURY

Even though the engine is stopped, the hydraulic accumulators for the pilot system are still charged. Do not disconnect any pilot system hoses until accumulator pressure has been released from the circuit. To release pressure, turn the starter switch to "I" (ON) position and operate all hydraulic control levers and forward/reverse travel levers. Even though the engine is stopped, hydraulic actuated components may move while releasing pilot pressure. Keep all personnel and bystanders away from excavator while performing this operation.

- Move safety lever to "LOCK" position after stopping engine.
- DO NOT mishandle accumulator(s), because they contain high-pressure nitrogen gas.
- DO NOT puncture or apply heat or fire to an accumulator.
- DO NOT weld on accumulator, or try attaching anything to it.
- When replacing an accumulator, contact a DOOSAN 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.

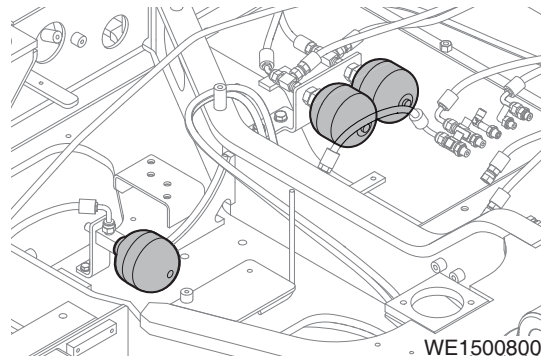


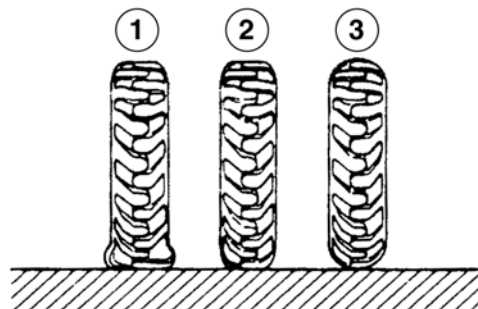
Figure 155

TIRES AND WHEELS

Properly inflated tire (2, Figure 156) is an important factor in determining tire performance and tire life. A tire that is under inflated (1, Figure 156) does not properly support machine, and will wear out quickly. Overinflated tires (3, Figure 156) have poor traction and puncture easily.

Use a pressure gauge to measure tire pressure. Always measure tire pressure before machine has been working, when tires are cold. Use table below to determine correct pressure for front or rear tires when driving machine, or when working machine.

Check tires for damage and embedded objects. Check valve stems for damage.



HCB3049S

Figure 156

Tire Dimension	Working Pressure		Remarks
	Front Tire	Rear Tire	
12-16.5-12PR	5.25 kg/cm ² (75 psi)	5.25 kg/cm ² (75 psi)	Standard
8.25-15-14PR	8 kg/cm ² (115 psi)	8 kg/cm ² (115 psi)	Twin (Optional)

Check Tire for Damage



WARNING

AVOID DEATH OR SERIOUS INJURY

Improper servicing or changing tires and rims can cause explosion resulting in serious injury or death.

Do not service or change tires and rims unless properly trained and equipped.

Contact your nearest DOOSAN excavator dealer or tire manufacturer's local dealer for tire servicing or changing.



WARNING

AVOID DEATH OR SERIOUS INJURY

Overheated tire may explode causing serious injury or death.

If overheated tire is suspected, do not approach tire to distance of less than 15 m (50 ft).

Stay away until tire and rim cool down.

If the following defects are found in tires, for safety reasons the tires must be replaced with new tires.

For the replacement contact DOOSAN excavator dealer or a tire manufacturer's local dealer.

- Bead wire is broken or bent, or the tire is greatly deformed.
- Wear is excessive and the carcass ply (including breaker) is exposed for more than 1/4 of the circumference.
- Damage to the carcass exceeds 1/3 of the tire width.
- Tire layers are separated.
- Radial cracks reach the carcass.
- Deformation or damage which makes the tire unsuitable for use.

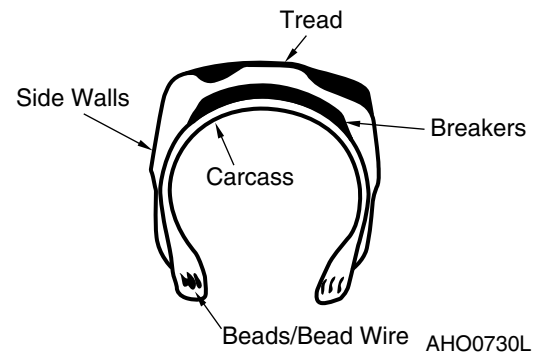


Figure 157

Tire Changing Procedure



CAUTION

AVOID INJURY

1. Before changing tires, move safety lever to "LOCKED" position. Place a warning tag on controls so that no one begins to operate machine while tires are being changed.
2. Secure other tires not being changed by using wheel chocks.

When mounting tires, be certain that tires are mounted with direction of rotation mark facing in proper direction. If no rotation direction arrow is visible, examine tread marks and position them to face the front of machine for proper traction and wear.

NOTE: *Unmatched tires will cause uneven wear and put unnecessary load on the final drive. Use recommended, matched tires for proper wear and performance.*

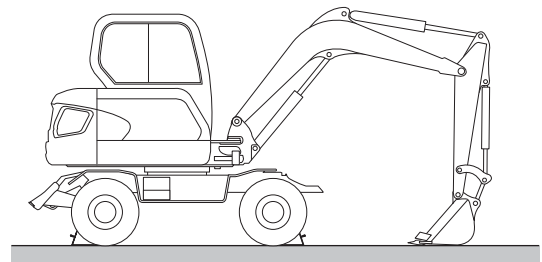


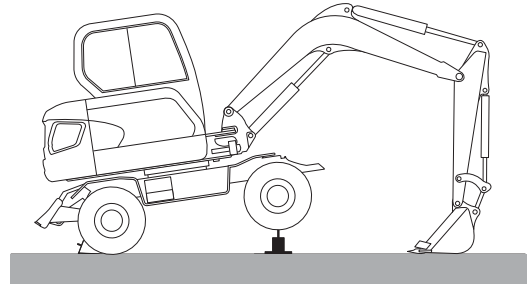
Figure 158



HAOM290L

Figure 159

1. Park machine on secure and level ground able to support weight of machine.
2. Using a jack rated for weight of machine, raise machine to a height so that tires have enough clearance. Place appropriate stands under frame to support machine.
3. Lower bucket or work tool to ground.

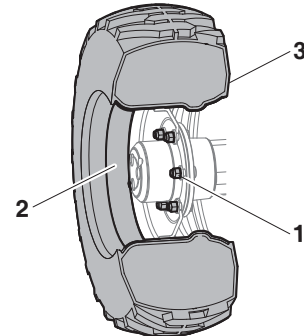


WE1500744

Figure 160

4. Tire assembly cross section view

Reference Number	Description
1	Wheel Nut
2	Tire Rim
3	Tire



WE1500801

Figure 161

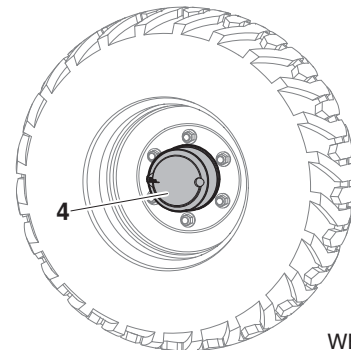


CAUTION

AVOID INJURY

When assembling tire, you should only assemble after checking the assembling direction position of each assembling bolt, nut and washer.

5. Remove tire (2) out of axle hub (4) after releasing wheel nut (1) by means of wheel wrench.



WE1500802

Figure 162

6. When mounting the tire at the bottom of the axle, make sure that the tire rim does not damage the wheel bolt (5) of the axle.



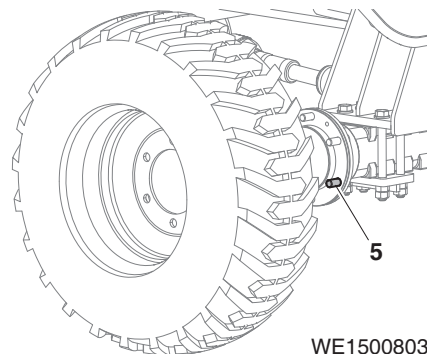
CAUTION

AVOID INJURY

Check the assembling direction and location of the bolts, the nuts and the washers of the tire and then assemble them.

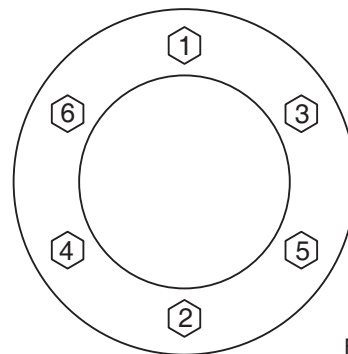
7. Follow tightening pattern (Figure 164) when tightening wheel nuts. Tighten to specified torque.

- Tightening torque 45 ~ 50 kg.m (324 ~ 360 lb ft)



WE1500803

Figure 163

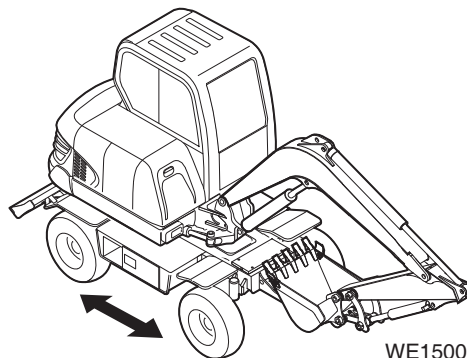


FG010836

Figure 164

8. Run machine forward and backward several times to ensure proper assembly and seating of the washers. Retighten wheel nuts to ensure proper torque.

- Torque 45 ~ 50 Kg.m (324 ~ 360 lb ft)



WE1500814

Figure 165

VENTING AND PRIMING HYDRAULIC SYSTEM

Main System Pump

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

1. Keep engine less than 1,000 rpm and operate each actuator more than 3 cycle.
2. Allow engine to idle more than 5 minutes.
3. With the engine stopped, remove vent plug (Figure 166) to see if any oil is present.
4. If oil is not present, fill oil tank with oil.
5. Install vent plug (Figure 166) first.
6. Slowly loosen vent plug (Figure 166) several turns, until hydraulic oil flows out of plug. This shows that air has been released.
7. Tighten the plug (Figure 166).

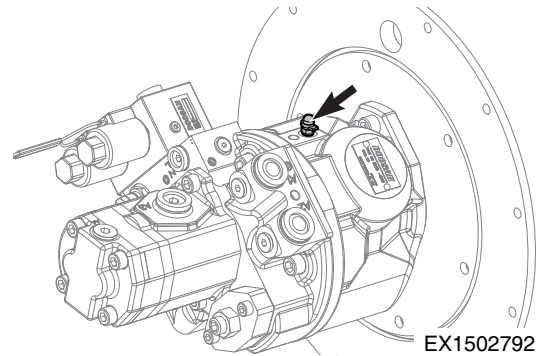


Figure 166

Hydraulic Cylinders

IMPORTANT

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.

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 3-68 for other recommendations.

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

Transportation

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

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

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

If the actual height exceed the limitation on the trailer, the operator must submit special permission to the government. Consult to the national or regional Road authorities.

Or, to avoid height limit, one may disassemble front linkage or guardrail during transportation.



WARNING

AVOID DEATH OR SERIOUS INJURY

Whenever removal or reassemble guardrail, always use external ladder to access. And NEVER climbing up machine without guardrail and external ladder.

Consult to the Doosan dealer.

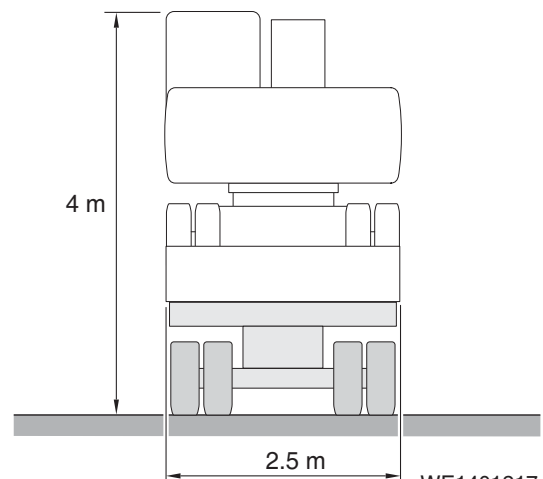


Figure 1

WE1401217

LOADING AND UNLOADING

Warning for Counterweight and Front Attachment Removal



WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT remove machine counterweight, front attachment or any other part. This could cause tipping or roll-over resulting in death or serious injury.

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

When transporting the machine, know the width, height, length, and weight.

When loading or unloading the machine, make sure to run the engine at the lowest speed setting and travel at the slowest speed possible.

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

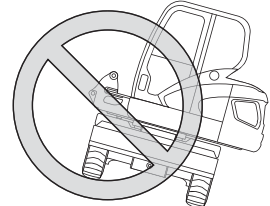
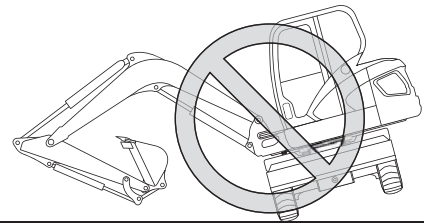
Make sure that ramp surface is free of grease, debris, or mud that could cause the machine to slip or slide.

Make sure that trailer is parked on firm and level ground before attempting to load/unload the excavator.

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

Make sure that swing lock pin is fully engaged before transporting the machine to prevent accidental rotation of the upper structure.

Make sure to secure the excavator onto the trailer as required by local transportation laws and regulations.



WE1500615

Figure 1

SHORT DISTANCE SELF-POWERED TRAVEL

1. Follow the Travel Instructions in Section 3 of this manual.
2. Make sure to fully "ENGAGE" the Swing Lock pin to secure the upper frame assembly before traveling more than a very short distance.
3. If traveling across a bridge, make sure that its capacity is rated for the weight of the machine and that it is wide enough. Add extra bracing as required.

TRAILER LOADING/UNLOADING PROCEDURES

1. Make sure that trailer is parked on firm and level ground. See Figure 2.
2. Make sure that ramps that are being used are designed to handle the weight of the excavator. If required, add blocking under the ramp to provide additional support.
3. The ramp angle must be less than a 15° grade. Ramps steeper than this can cause a problem when loading or unloading.

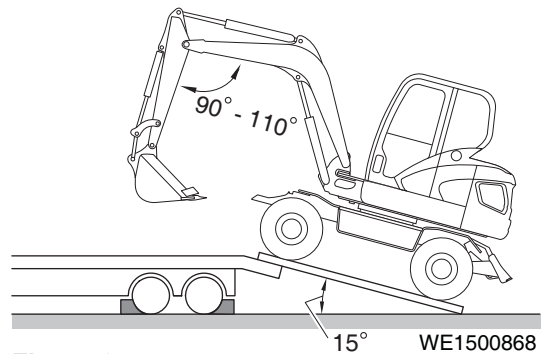


Figure 2

4. Set the travel speed selector switch to "I" position and step on the accelerator pedal slowly.
5. If the machine is equipped with work equipment, position the work equipment toward the front of the excavator, and travel forward to load it.

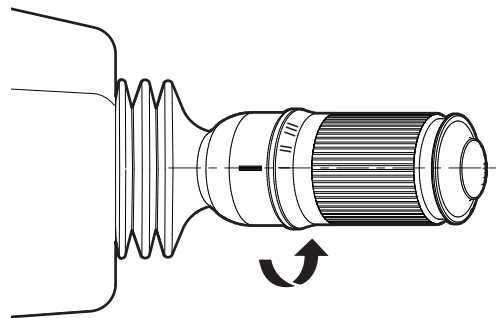


Figure 3

6. The unit does not require disassembly for normal over-the-road transportation. If the boom and arm need to be removed, the counterweight will place more weight on the rear of the machine. Make sure to back the excavator onto the trailer so the counterweight end of the excavator is positioned on the ramp first. (Figure 4)

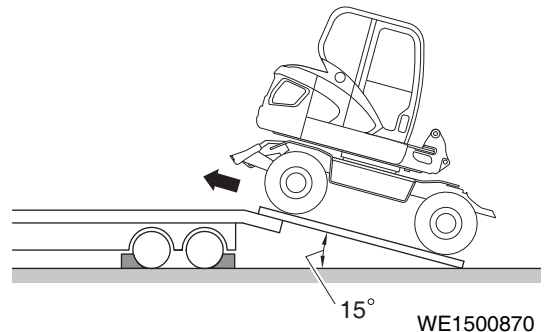


Figure 4

7. Store the front attachment in the "Transport position" and set the Function Lock in the "TRANSPORT" position. (Figure 5)

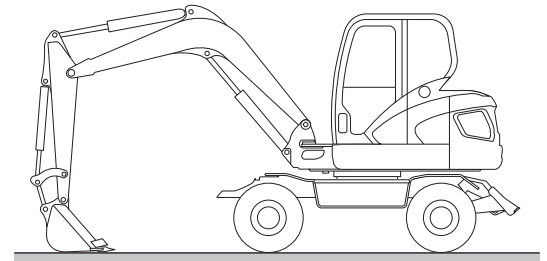
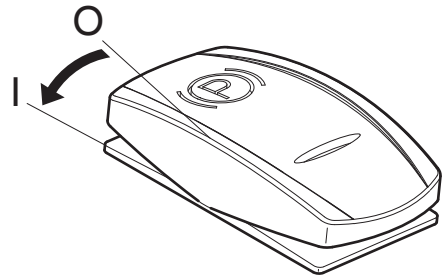


Figure 5

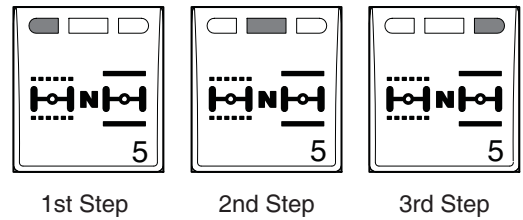
8. Set parking brake switch to "I" (APPLIED) position.



FG017937

Figure 6

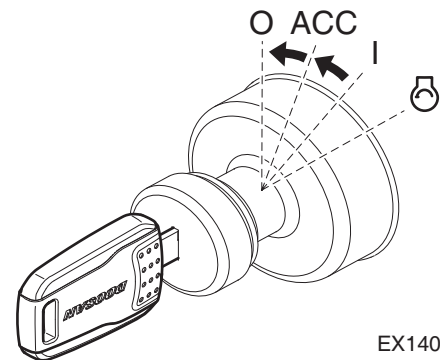
9. Set ram cylinder lock switch in "3rd Step" (LOCK) position.



WE1500625

Figure 7

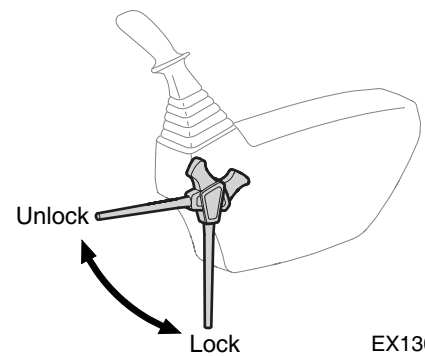
10. Stop engine by turning key to "O" (OFF) position (Figure 8).
11. Remove key from starter switch.



EX1402155

Figure 8

12. Move safety lever to "LOCK" position.



EX1300566

Figure 9

13. Turn battery disconnect switch to "OFF" position (Figure 10).
14. Lock all doors and access covers.
15. Adjust direction of rotating beacon and TMS antenna.

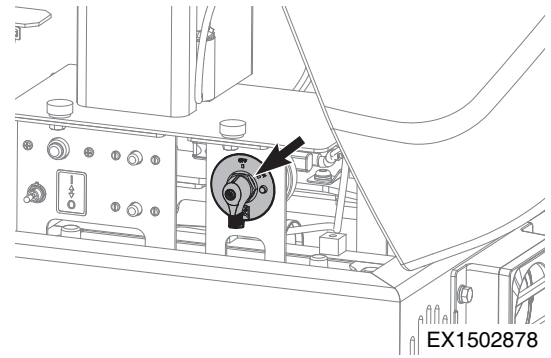


Figure 10

16. Before transporting the excavator, make sure that swing lock pin has been fully engaged. This will prevent the upper structure from accidentally rotating during transportation.
17. Make sure to secure the excavator onto the trailer before transporting. Use chains or cable tie-downs as required by local transportation laws. Use the wheel chocks supplied with the machine to secure machine.
18. Refer to "Specification" on page 7-1 of this manual for overall machine height and width dimensions. Make sure to position the excavator as shown. If not transported in this position, the height measurements may be different.

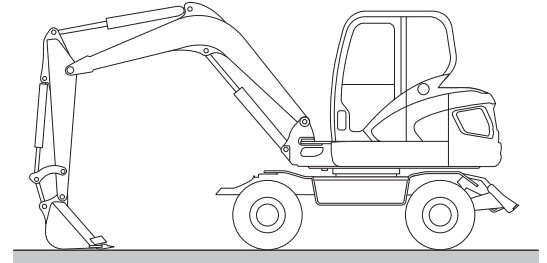
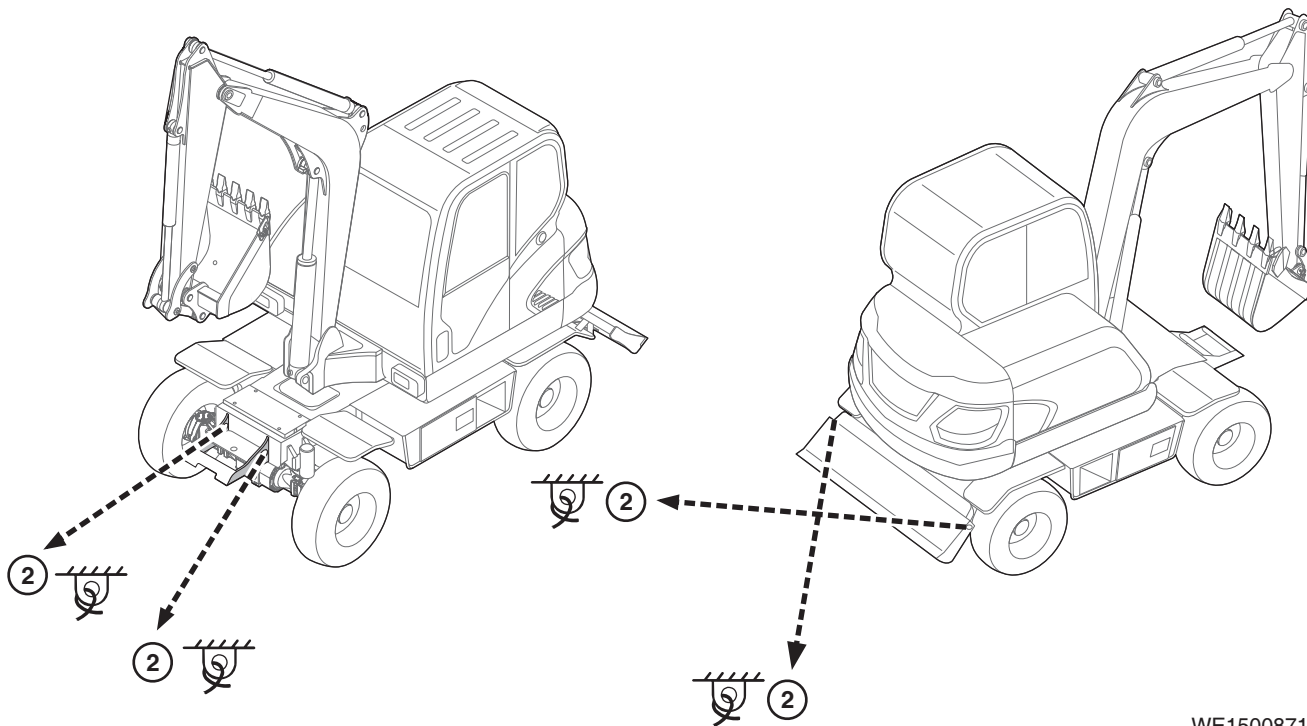


Figure 11

WE1500614



WE1500871

Figure 12

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.

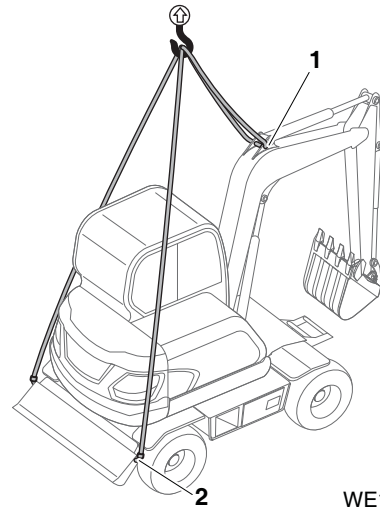
When lifting, move the safety lever to "LOCK" position to prevent the machine from moving unexpectedly.

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. Make sure the boom is fully raised.
3. Make sure the dozer blade is fully raised.
4. Move safety lever to "LOCK" position. Stop engine.
5. Ensure there is nothing around the operator's compartment, close the cabin door and front glass securely.
6. Bind wire ropes to the rug (1, Figure 13) of boom and dozer blade (2) each.
7. Use spreader bars between the wire rope and the machine to prevent damage to the rope or machine. When lifting, keep the machine horizontal and lift the machine slowly to keep it balanced.
8. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.



WE1500872

Figure 13

Troubleshooting

Whenever an operating problem with the machine occurs, take corrective action immediately by checking for the cause of the problem.

If the cause of the operating problem cannot be determined, contact your DOOSAN distributor. Never perform an adjustment or the disassembly of the hydraulic, electrical or electronic components without first contacting a DOOSAN distributor.



WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary 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 cause death or serious injury.

ELECTRICAL SYSTEM

Problem	Cause	Correction
Battery will not hold a charge.	Low battery power.	Clean and retighten.
	Alternator belt loose or bad.	Tighten or replace belt.
	Loose or corroded terminals.	Tighten or replace as required.
	Alternator faulty.	Repair or replace as required.
Low battery power.	Internal battery short.	Replace battery.
	Short-circuit in wiring.	Repair as required.
Engine speed is not controllable.	Speed control dial failed.	Replace control dial.
	Throttle controller failed.	Replace controller.
	Speed control motor failed.	Repair or replace as required.
	Blown fuse.	Replace fuse.
	Wiring harness damaged.	Repair or replace as required.
	Connector failed.	Repair or replace as required.

Problem	Cause	Correction
Work mode (Power mode or Economy mode) selector does not work.	Blown fuse.	Replace fuse.
	Work mode selector switch failed.	Replace switch.
	Connector failed.	Replace connector.
	Wiring harness damaged.	Repair or replace as required.
	EPOS controller failed.	Repair or replace as required.
Working mode selector does not work.	Blown fuse.	Replace fuse.
	Working mode selector switch.	Replace switch failed.
	Connector failed.	Replace connector.
	Wiring harness damaged.	Repair or replace as required.
	EPOS controller failed.	Repair or replace as required.

ENGINE

Problem	Cause	Correction
Starter does not operate.	Low battery power.	Charge battery.
	Poor terminal contact.	Clean and tighten connections.
	Starter switch failed.	Replace switch.
	Starter relay failed.	Replace relay.
	Starter controller failed.	Replace controller.
	Wiring harness faulty.	Replace harness.
	Battery relay failed.	Replace relay.
	Blown fuse.	Replace fuse.
Starter engages, engine does not start.	Fuel gelled in cold weather.	Replace fuel.
	Fuel filters plugged.	Replace filters.
	Water or dirt in fuel system.	Clean system and add new fuel.
	Air in fuel system.	Purge air from system.
	Engine stop control failed.	Contact your DOOSAN dealer.
	Engine stop relay failed.	Replace relay.
	Blown fuse.	Replace fuse.
Engine starts, runs only at low speed or shuts down.	Engine oil viscosity incorrect.	Change oil.
	Clogged or dirty fuel injectors.	Clean injectors.
	Fuel filters plugged.	Replace filters.

Problem	Cause	Correction
Engine knocks, runs unevenly or surges.	Low engine oil.	Refill.
	Plugged air intake system.	Clean system and replace filter.
	Injection pump out of adjustment.	Contact your DOOSAN dealer.
	Plugged fuel filter.	Replace fuel filter.
	Water or dirt in fuel system.	Clean system and add new fuel.
	Clogged or dirty fuel injectors.	Clean injectors.
Engine has poor power.	Plugged air intake system.	Clean system and replace filter.
	Clogged or dirty fuel injectors.	Clean injectors.
	Fuel filters plugged.	Replace filters.
	Engine speed control cable out of adjustment.	Readjust.
	Injection pump out of adjustment.	Contact your DOOSAN dealer.
	Valve backlash faulty.	Adjust backlash.
Engine runs hot.	Low coolant level.	Add coolant.
	Thermostat faulty.	Replace thermostat.
	Radiator cap faulty.	Replace radiator cap.
	Radiator core plugged.	Clean radiator.
	Oil cooler core plugged.	Clean oil cooler.
	Fan belt loose or damaged.	Tighten or replace as required.
	Temperature sensor faulty.	Replace sensor.
Starting difficult.		
Starting motor trouble.	Refer to diagnostics.	
Fuel system trouble.	Refer to diagnostics.	
Lack of compression pressure	Valve's poor shut, stem distortion.	Repair or replace.
	Valve spring damage.	Replace valve spring.
	Cylinder head gasket's leak.	Replace gasket.
	Wear of piston, piston ring or liner.	Adjust.
Idle operation abnormal.	Injection timing incorrect.	Check by SCAN-200.
	Air mixing at high-pressure pump.	Remove air.
Engine output insufficient.		
Continuous output insufficient.	Valve clearance incorrect.	Adjust.
	Valve tightness poor.	Repair.
	Cylinder head gasket's leak.	Replace gasket.

Problem	Cause	Correction
Continuous output insufficient.	Wear, stick, damage of piston ring.	Replace piston ring.
	Injection timing incorrect.	Check.
	Fuel injection amount insufficient.	Check.
	Injector injection pressure improper or stuck.	Adjust or replace.
	Supply pump's function lowered.	Repair or replace.
	Fuel pipe system clogged.	Repair.
	Air suction amount insufficient.	Clean or replace air cleaner.
	Turbo charger poor.	Repair or replace.
	Intercooler pipe air leak.	Hose clamp adjust.
Output insufficient when in acceleration.	Compression pressure insufficient.	Disassemble engine.
	Injection timing incorrect.	Check.
	Fuel injection amount insufficient.	Check.
	Injector injection pressure, injection angle improper.	Repair, replace.
	Supply pump's function lowered.	Repair or replace.
	Air intake amount insufficient.	Clean or replace air cleaner.
Overheating.	Engine oil insufficient or poor.	Replenish or replace.
	Cooling water insufficient.	Replenish or replace.
	Fan belt loosened, worn, damaged.	Adjust or replace.
	Cooling water pump's function lowered.	Repair or replace.
	Water temperature regulator's operation poor.	Replace.
	Valve clearance incorrect.	Adjust.
	Exhaust system's resistance increased.	Clean or replace.
Engine noisy.	For noises arise compositely such as rotating parts, lapping parts etc., there is necessity to search the cause of noises accurately.	
Crankshaft.	As the wear of bearing or crankshaft progress, the oil clearances increase.	Replace bearing and grind crankshaft.
	Uneven wear of crankshaft	Grind or replace.
	Oil supply insufficient because of oil passage clogging.	Clean oil passage.
	Stuck bearing.	Replace bearing and grind.

Problem	Cause	Correction
Connecting rod and connecting rod bearing.	Uneven wear of con rod bearing.	Replace bearing.
	Uneven wear of crank pin.	Grind crankshaft.
	Connecting rod distortion.	Repair or replace.
	Stuck bearing.	Replace and grind crankshaft.
	Oil supply insufficiency as clogging at oil passage progresses.	Clean oil passage.
Piston, piston pin and piston ring.	Piston clearance increase as the wear of piston and piston ring progresses.	Replace piston and piston ring.
	Wear of piston or piston pin.	Replace.
	Piston stuck.	Replace piston.
	Piston insertion poor.	Replace piston.
	Piston ring damaged.	Replace piston.
Others.	Wear of crankshaft, thrust bearing.	Replace thrust bearing.
	Camshaft end play increased.	Replace thrust plate.
	Idle gear end play increased.	Replace thrust washer.
	Timing gear backlash excessive.	Repair or replace.
	Valve clearance excessive.	Adjust valve clearance.
	Abnormal wear of tappet, cam.	Replace tappet, cam.
	Turbo charger inner part damaged.	Repair or replace.
Fuel consumption excessive.	Injection timing incorrect.	Check.
	Fuel injection amount excessive.	Adjust.
Oil consumption excessive.		
Oil level elevated.	Clearance between cylinder liner and piston.	Replace.
	Wear of piston ring, ring groove.	Replace piston, piston ring.
	Piston ring's damage, stick, wear.	Replace piston ring.
	Piston ring opening's disposition improper.	Correct position.
	Piston skirt part damaged or abnormal wear.	Replace piston.
	Oil ring's oil return hole clogged.	Replace piston ring.
	Oil ring's contact poor.	Replace piston ring.
Oil level lowered.	Looseness of valve stem and guide.	Replace in set.
	Wear of valve stem seal.	Replace seal.
	Cylinder head gasket's leak.	Replace gasket.

Problem	Cause	Correction
Oil leak.	Looseness of connection parts.	Replace gasket, repair.
	Various part's packing poor.	Replace packing.
	Oil seal poor.	Replace oil seal.

TURBOCHARGER

Problem	Cause	Correction
Excessive black smoke.	Air cleaner filter clogged.	Replace or clean.
	Restrictions in air duct.	Check and correct.
	Leakage at intake manifold.	Check and correct.
	Turbo charger seized up and not rotating.	Disassemble/repair or replace.
	Turbine blades and compressor blades coming in contact with each other or damaged.	Disassemble/repair or replace.
	Exhaust piping deformed or clogged.	Check and correct.
Excessive white smoke.	Oil leak into turbine and compressor.	Disassemble/repair or replace.
	Worn or damaged seal ring because of excessive wear of bearing.	Disassemble/repair or replace.
Low engine output.	Gas leak at each part of exhaust system.	Check and correct.
	Air cleaner filter restricted.	Replace or clean.
	Turbo charger fouled or damaged.	Disassemble/repair or replace.
	Leakage at discharge port on compressor side.	Check and correct.
Unusual sound or vibration.	Rotor assembly coming in contact.	Disassemble/repair or replace.
	Unbalanced rotation of rotor.	Disassemble/repair or replace.
	Seized up.	Disassemble/repair or replace.
	Each joint loosened.	Check and correct.

COOLING FAN

Problem	Cause	Correction
Cooling fan always runs at maximum speed.	Fan clutch harness is not connected.	Reconnect the connector.
	Fan clutch harness damaged.	Replace as required.
Fan speed is oscillating or lower than minimum speed.	Fan clutch damaged.	Replace as required.

LUBRICATION SYSTEM

Problem	Cause	Correction
Oil consumption excessive.	Poor oil.	Use suggested oil.
	Oil seal or packing leaky.	Replace.
	Pistons or piston rings worn.	Replace pistons and/or piston rings.
	Cylinder liner worn.	Replace cylinder liner.
	Piston rings sticking.	Replace pistons and/or piston rings.
	Valve guide oil seals or valve guides, or valve stem worn.	Replace.
Oil pressure too low.	Poor oil.	Use suggested oil.
	Relief valve sticking.	Replace.
	Restrictions in oil pump strainer.	Clean strainer.
	Oil pump gear worn.	Replace.
	Oil pump feed pipe cracked.	Replace.
	Oil pump defective.	Correct or replace.
	Oil pressure gauge defective.	Correct or replace.
	Various bearings worn.	Replace.
Oil deteriorates quickly.	Restriction in oil filter.	Replace filter.
	Gases leaking.	Replace piston rings and cylinder liner.
	Poor oil.	Use suggested oil.

HYDRAULIC SYSTEM

Problem	Cause	Correction
None of the controls function (loud noise from pumps).	Hydraulic pump failed.	Contact your DOOSAN dealer.
	Low hydraulic oil level.	Add hydraulic oil as required.
	Suction line plugged or damaged.	Clean or replace as required.
None of the controls function (no noise from pumps).	Pilot pump failure.	Contact your DOOSAN dealer.
	Cut off solenoid valve failed.	Replace solenoid.
	Pilot cutoff switch is ON.	Adjust pilot cutoff switch clearance.
	"WORK/TRAVEL" selector switch is "TRAVEL" mode.	Select "Work Mode".
All actuators have low power.	Low hydraulic oil level.	Add hydraulic oil as required.
	Suction filter clogged.	Clean filter.
	Hydraulic pumps faulty.	Contact your DOOSAN dealer.
	Main relief pressure too low.	Contact your DOOSAN dealer.
	Hydraulic pumps excavating.	Bleed air from hydraulic pumps.
Only one or two actions have little or no power.	Overload relief pressure too low.	Reset pressure.
	Makeup check valve leaking.	Clean or replace as required.
	Control valve spool faulty.	Replace valve spool.
	Dirt in valve spool.	Clean or replace as required.
	Actuator failed.	Repair or replace as required.
	Cylinder seal failed.	Repair or replace as required.
	Cylinder rod damaged.	Repair or replace as required.
	Remote control valve failed.	Replace control valve.
	Wrong pilot line connection.	Reconnect pilot lines.
Oil temperature too high.	Oil cooler faulty.	Contact your DOOSAN dealer.
	Fan motor or fan pump failure.	Contact your DOOSAN dealer.

AIR COMPRESSOR (OPTIONAL)

Problem	Cause	Correction
Compressor does not run.	Power supply failure.	Check power connection.
	Blown fuse.	Check the power supply line polarity (+, -), and replace the fuse.
	Motor overheat.	Let the motor be cooled down for about 10 minutes, and restart it.
	Motor operated for more than 30 minutes continuously.	Let the motor be cooled down for about 10 minutes, and restart it.
	Purge valve failure.	Check/replace the purge valve.
Motor hums or runs slowly.	Low voltage.	Check the input voltage. (24V min.)
	Worn brush.	Replace the brush.
Tank pressure is lowered when the compressor is turned off - pressure gauge.	Loose joint.	Check pipeline joints.
Excessive moisture in the air ejected from the air gun.	Drain valve open/leak.	Check the drain valve.
	Check valve leak.	Overhaul or replace the check valve. Warning! Never remove check valve when the tank is pressurized.
	Too much water in the tank.	Drain the tank. Warning! Drain the tank when the pressure in the tank is less than 1 bar.
Compressor keeps running.	Pressure switch failure.	Replace the pressure switch.
	Excessive air use.	Restart the compressor after checking that air tank pressure is charged up to 8 bar.
Compressor vibrates.	Loose mounting bolt(s).	Tighten the mounting bolt(s).
	Mounting rubber pad is worn or missing.	Replace the mounting rubber pad.
Air pressure is lower than normal.	Drain valve is open.	Close the drain valve.
	Clogged air suction filter.	Clean/replace suction air filter.
	Leak at joint.	Check/tighten the joints.

SWING SYSTEM

Problem	Cause	Correction
No swinging motion.	Swing brake valve faulty.	Replace brake valve.
	Hydraulic timer faulty.	Replace timer.
	Low brake release pressure.	Adjust pressures.
	Swing motor failed.	Replace swing motor.
	Remote control valve failed.	Replace control valve.
	Wrong pilot line connection.	Reconnect pilot lines.
Swing motion jerky.	Swing gear worn.	Replace swing gear.
	Swing bearing damaged.	Replace bearing.
	Improper lubrication.	Add grease.

TRAVEL SYSTEM

Problem	Cause	Remedy
Travel motion does not function.	Axle failure.	Repair.
	Activate the emergency actuation.	Deactivate the emergency actuation.
	Electric accelerator pedal failure.	Repair or exchange.
	Transmission control valve failure.	Repair or exchange.
	Transmission failure.	Repair.
	Center joint leaking.	Repair or exchange.
	Brake will not release.	Repair.
	Travel motor failure.	Repair.
	Hydraulic accelerator valve failure.	Repair.
	Wrong pilot line connection.	Repair.
	Transmission control pressure set too low.	Repair.
	Forward, reverse solenoid valve failure.	Repair or exchange.
Travel speed is too low.	Control valve set pressure too low.	Reset.
	Travel motor relief set pressure low.	Reset.
	Brake is slightly engaged.	Repair.

Problem	Cause	Remedy
Noise from transmission.	Low gear oil.	Refill.
	Deterioration of gear oil.	Replace.
	Internal parts worn.	Repair or exchange.
	Gear or bearing damaged.	Repair or exchange.
Gear will not change.	Bent or unbalanced driveshaft.	Repair or exchange.
	Loose universal joint.	Tighten.
	Substantial wear of spline.	Exchange.
	Spider bearing worn.	Exchange.
	Lack of grease.	Lubricate.
Noise from axle.	Excessive gear wear.	Exchange.
	Damage to gear.	Exchange.
	Lack of gear oil.	Refill.
	Deterioration of gear oil.	Replace.
	Worn bearing.	Exchange.
	Rattling at shaft spline.	Exchange.

STEERING

Problem	Cause	Remedy
Steering wheel difficult to turn.	Steering pump failure.	Repair or exchange.
	Steering valve failure.	Repair or exchange.
	Priority valve failure.	Repair or exchange.
	Steering cylinder failure.	Repair or exchange.
	Relief valve set pressure low.	Reset.
	Tire air pressure low.	Adjust.
Vibration of steering wheel.	Rattling of hub bearing.	Repair or exchange.
	Wheel misalignment.	Adjust.
	King pin parts worn.	Exchange.
	Unbalanced right and left tires.	Adjust or exchange.

BRAKES

Problem	Cause	Remedy
Brakes not working.	Brake pressure is too low	Repair or exchange
	Brake pump failure	Repair or exchange
	Brake disks worn	Exchange or adjust clearance
	Burned out brake disks	Exchange
	Accumulator gas leaking	Refill N ₂ gas or exchange
	Air in brake lines	Bleed air
	Brake oil leakage	Repair
Brakes dragging.	Burned out brake disks	Exchange
	Broken or weak brake return springs	Exchange
Noise when brakes are applied.	Lack of gear oil in hub	Refill
	Deterioration of gear oil in hub	Exchange

Specification

STANDARD SPECIFICATION

Component				Specification	
				Metrics	English
Type				DX55W Wheel Type Hydraulic Excavator	
Operating Weight		Single		5.79 Metric tons	6.38 US ton
		Twin		5.92 Metric tons	6.52 US ton
Bucket	SAE			0.175 m ³	0.23 yd ³
	CECE			0.15 m ³	0.20 yd ³
Performance	Travel Speed	Froward	Low (I)	0 ~ 10 km/h	0 ~ 6 MPH
			High (II)	0 ~ 30 km/h	0 ~ 19 MPH
		Reverse	Low (I)	0 ~ 10 km/h	0 ~ 6 MPH
			High (II)	0 ~ 30 km/h	0 ~ 19 MPH
	Swing Speed			9.3 rpm	
	Digging Capability	Arm		2.7 Metric ton	3.0 US ton
		Bucket		3.8 Metric ton	4.2 US ton
	Gradeability			35° (70%)	
	Minimum Swing Radius			2.5 m	8' 5"
Engine	Model			TIER4 D24A	
	Type			Water Cooled - Direct Injection	
	Rated Net Output			43 kW @ 2,400 rpm	58 ps @ 2,400 rpm
	Maximum Torque			204.7 Nm @ 1,550 rpm	151 lb ft @ 1,550 rpm
	Fuel Tank Capacity			118 L	31.2 U.S. gal.l
Hydraulic Pump	Type			Split, Axial Piston	
	Discharging Pressure			240 kg/cm ²	3,400 psi
	Minimum Discharge Quantity			2x60+38.9+21.4 L/min	2x15.9+10.3+5.65 U.S. gal./min
	Hydraulic Oil Capacity	Tank Level		62 L	16.4 U.S. gal.
		Full		95 L	25.1 U.S. gal.
		System		148 L	39.1 U.S. gal.
Travel System	Drive System			Hydraulic Drive/Forward, Reverse 2 Speed	
	Tire Size	Single		12 - 16.5 - 12PR	
		Twin		8.25 - 15 - 14PR	
	Brake Type			Full Hydraulic Wet Disk Brake Type	

OVERALL DIMENSIONS

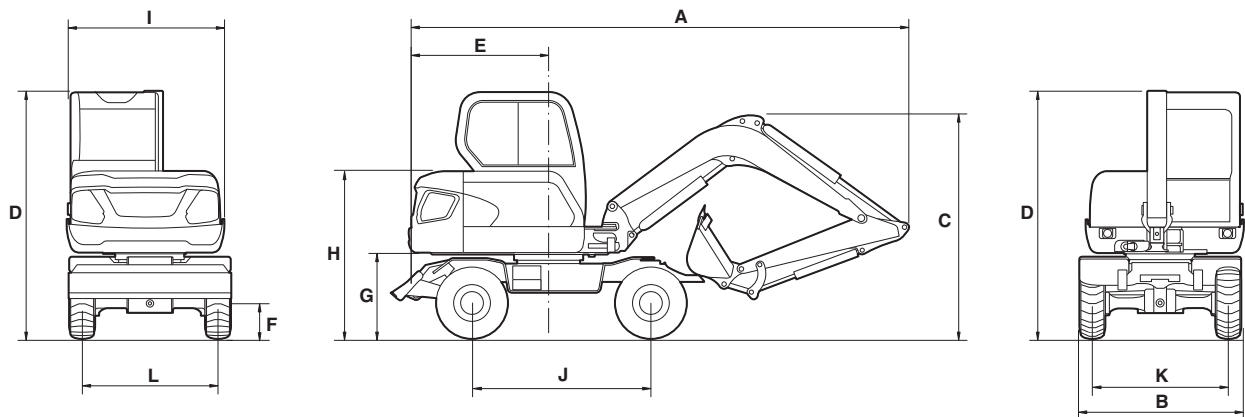
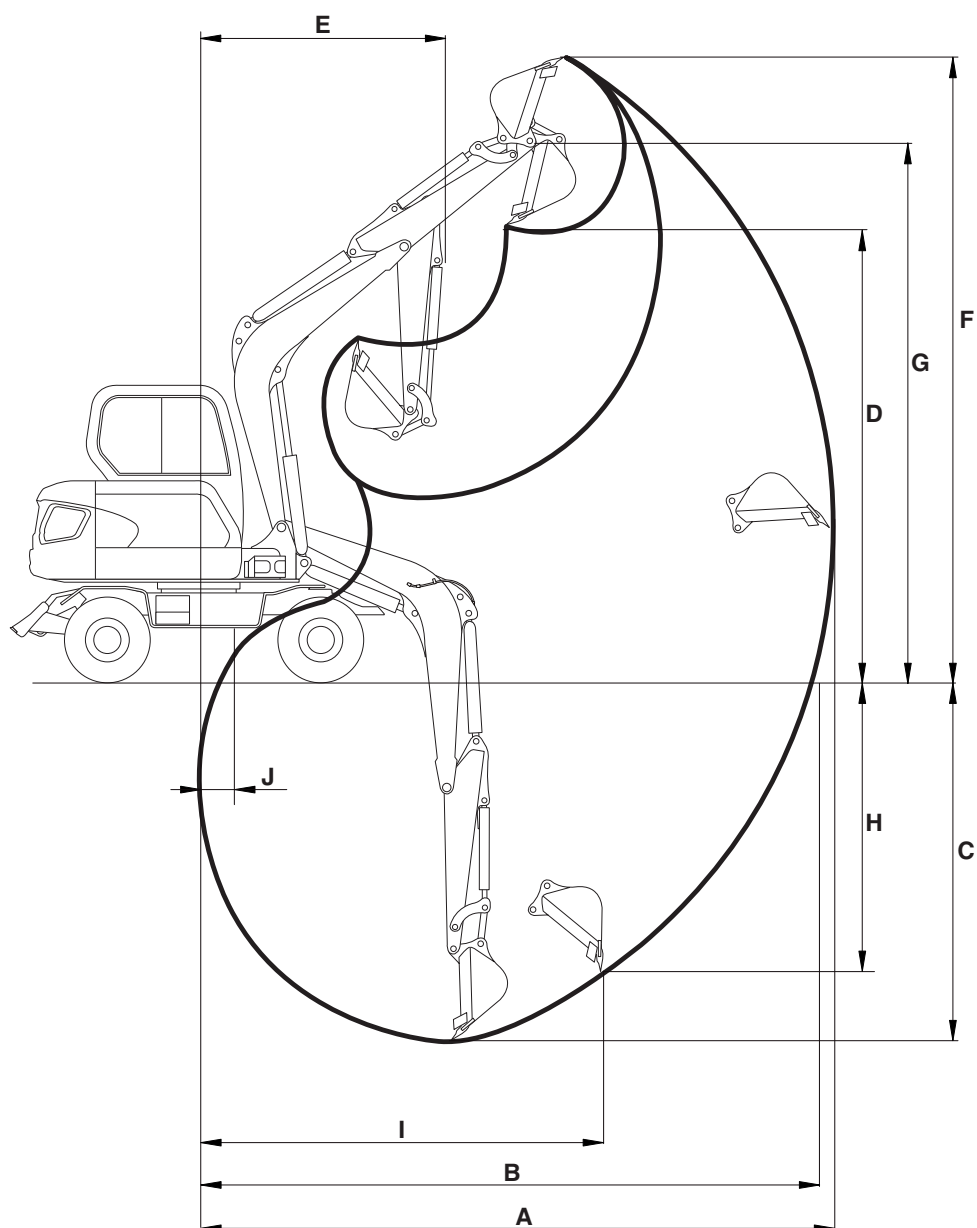


Figure 1

WE1500810

No.	Description	Dimension	
		3.0 m (9' 10") Boom	
		Single Tire	Twin Tire
A	Shipping Length	6,120 mm (20' 1")	
B	Shipping Width	1,920 mm (6' 4")	2,290 mm (7' 6")
C	Shipping Height (Boom)	2,855 mm (9' 4")	
D	Height Over Cab	2,855 mm (9' 4")	
E	Counter Weight Swing Clearance	1,650 mm (5' 5")	
F	Ground Clearance	290 mm (11")	
G	Frame Clearance	980 mm (3' 3")	
H	Engine Cover Height	1,935 mm (6' 4")	
I	Upper Housing Width	1,850 mm (6' 1")	
J	Wheel Base	2,100 mm (6' 11")	
K, L	Tread Width	1,600 mm (5' 3")	2,275 mm (7' 6")

WORKING RANGE



WE1500728

Figure 2

No.	Description	Dimension	
		3.0 m (9' 10") Boom	
		1.6 m (5' 3") Arm	1.9 m (6' 3") Arm
A	Max. Digging Reach	6,108 mm (20')	6,400 mm (21')
B	Max. Digging Reach (Ground)	5,888 mm (19' 4")	6,190 mm (20' 4")
C	Max. Digging Depth	3,495 mm (11' 6")	3,795 mm (12' 5")
D	Max. Dumping Height	4,324 mm (14' 2")	4,510 mm (14' 10")
E	Min. Swing Radius	2,448 mm (8')	2,464 mm (8' 1")
F	Max. Digging Height	5,976 mm (19' 7")	6,170 mm (20' 3")
G	Max. Bucket Pin Height	5,150 mm (16' 11")	5,339 mm (17' 6")
H	Max. Vertical Wall Depth	2,805 mm (9' 2")	3,115 mm (10' 3")
I	Max. Radius Vertical	3,873 mm (12' 8")	3,928 mm (12' 11")
J	Min. Digging Reach	2,805 mm (9' 2")	3,115 mm (10' 3")

DISASSEMBLED PARTS, DIMENSION AND WEIGHT

Components

Boom

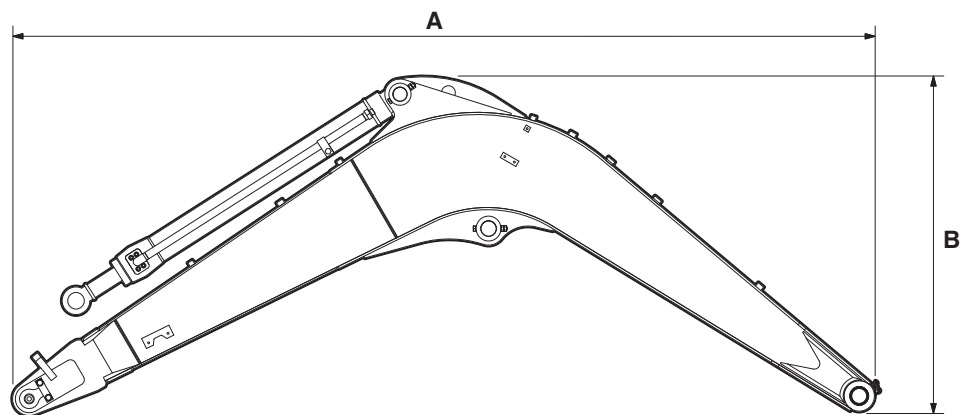
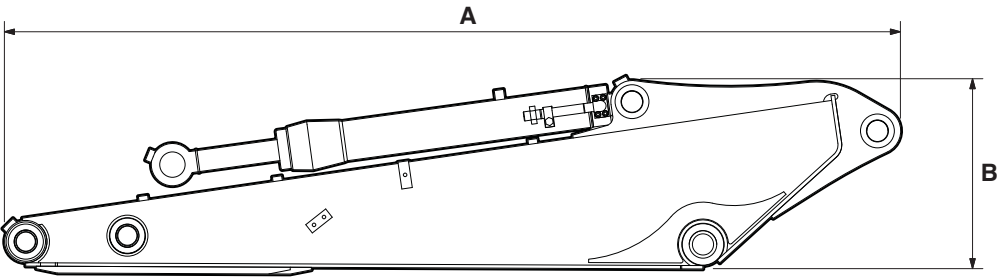


Figure 3

EX1502907

Description		3.0 m (9' 10")
Length (A)	mm (ft in)	3,115 (10' 3")
Length (B)		1,219 (4' 0")
Width		236 (0' 9")
Weight	kg	319
	lb	704

Arm

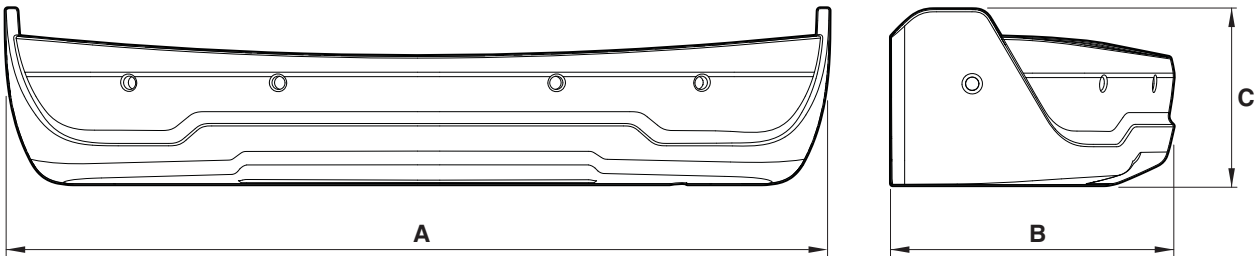


EX1502908

Figure 4

Description		1.6 m (5' 3")	1.9 m (6' 3")
Length (A)	mm (ft in)	2,116 (6' 11")	2,413 (7' 11")
Length (B)		445 (1' 6")	484 (1' 7")
Width		156 (0' 6")	156 (0' 6")
Weight	kg	212	233
	lb	468	513

Counterweight



EX1502909

Figure 5

Description		Counterweight
Length (A)	mm (ft in)	1,852 (6' 1")
Length (B)		635 (2' 1")
Length (C)		394 (1' 4")
Weight	kg	233
	lb	514

DIGGING FORCE

Description		Unit	3.0 m (9' 10") Boom	
			1.6 m (5' 3") Arm	1.9 m (6' 3") Arm
Bucket Radius		mm (in)	887.4 (2' 11")	887.4 (2' 11")
Breakout Force	Normal (SAE)	kN	37.2	37.2
		kg	3,795	3,795
		lb	8,367	8,367
	Normal (ISO)	kN	41.6	41.6
		kg	4,237	4,237
		lb	9,341	9,341
Tearout Force	Normal (SAE)	kN	26.8	24
		kg	2,728	2,448
		lb	6,014	5,396
	Normal (ISO)	kN	27.6	24.6
		kg	2,809	2,511
		lb	6,194	5,537

EXCAVATOR RATED LIFT CAPACITY TABLES

IMPORTANT

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.



WARNING

AVOID DEATH OR SERIOUS INJURY

Keep bystanders away from the boom cylinder. While operating, boom, arm or bucket hydraulic hoses could burst causing high-pressure oil to spray or sudden lowering of the load or front structure. This could cause death or serious injury.

When changing the hydraulic hoses, record the part numbers of the hoses to factory log book.

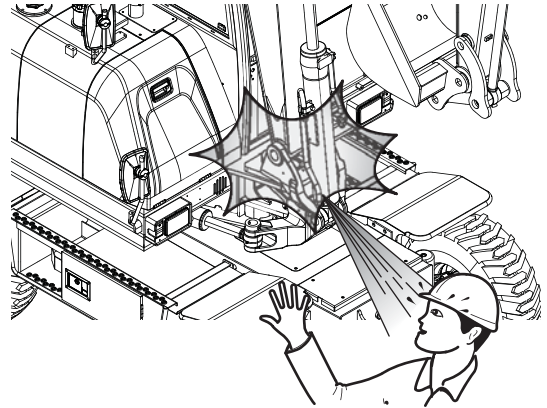


Figure 6



WARNING

AVOID DEATH OR SERIOUS INJURY

All rated lift capacities are based on the machine and the load both remaining level at all times. **DO NOT EXCEED THE RATED LIFT CAPACITY.** Lifting loads greater than those shown in the rated capacity tables can cause tipping, equipment failure and/or structural failure of the machine.

Operate the excavator on firm and level ground and surfaces that can support the weight of the excavator and the loads that will be lifted. Avoid operating the excavator, if these conditions exist:

- Soft or uneven ground.
- Unlevel terrain.
- Side loads.
- Modifications or poor maintenance of the excavator.
- Failure to lift squarely over the end or over the side of the machine.

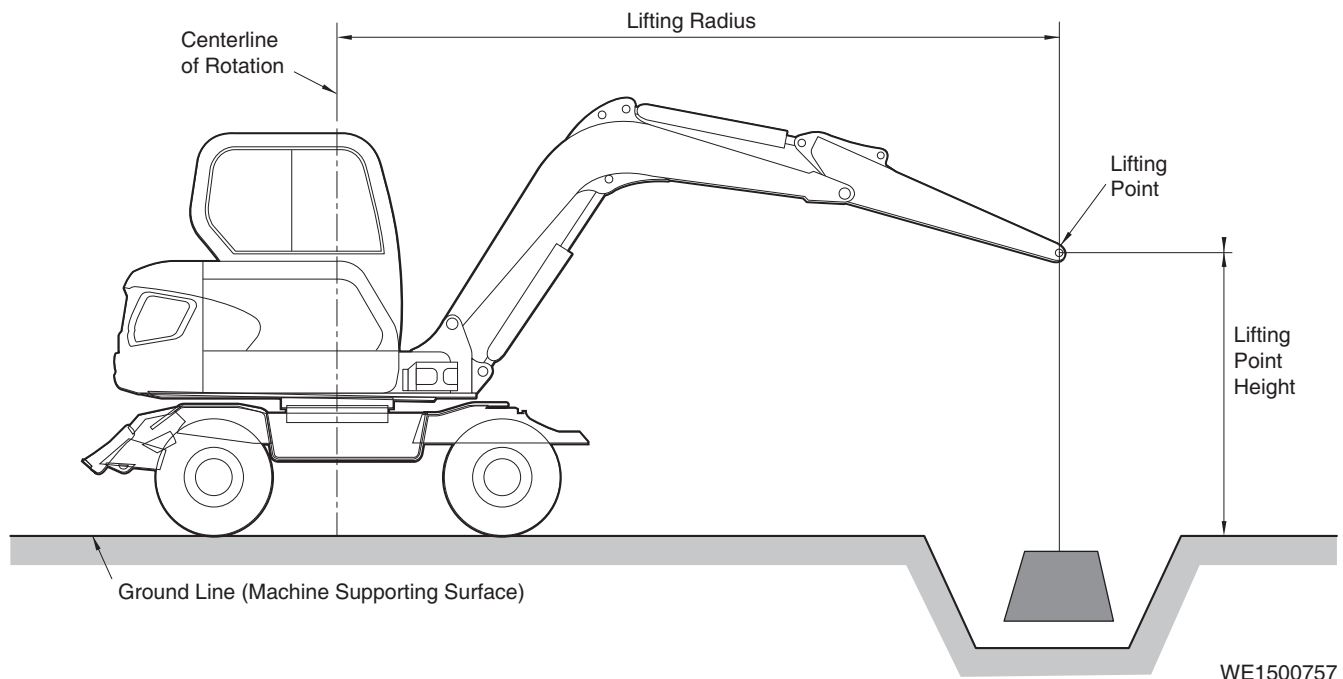
When a load is in the air, the operator must:

- Avoid use of uneven slings that can cause side loads when traveling with a load or swinging the load.

- Avoid lifting loads that can become unbalanced if the hook line is twisted and starts to rotate. If the surface area of the load is large enough, wind gusts can create side loads.
- Keep the arm end point directly over the load. Use tag lines on opposite sides of the load to help stabilize the load and prevent side loads caused by wind gusts.

The following rated loads are in compliance with ISO 10567 and applicable ISO standards for hydraulic excavators performing lifting operations on firm supporting surfaces. An asterisk (*) next to the load rating indicates rated load does not exceed 87% of hydraulic capacity. All other ratings do not exceed 75% of tipping capacity.

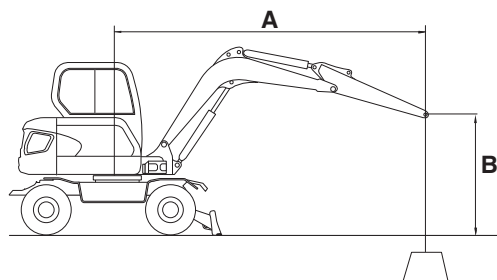
Do not attempt to lift or hold any load that exceeds rated load capacity at the specified distances (from the machine's rotation centerline and height - see "Lifting Radius" and "Lifting Point Height" in the reference drawing, Figure 7).





The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine net lifting load. The lift point must be on the end of the arm, as shown in Figure 7.

IMPORTANT

Select the Digging Mode switch on the Instrument Panel before using the excavator for lifting work. Engine and hydraulic oil should both be fully warmed up to operating temperature before operating.















Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500758

Figure 8













METRIC

1,000 kg

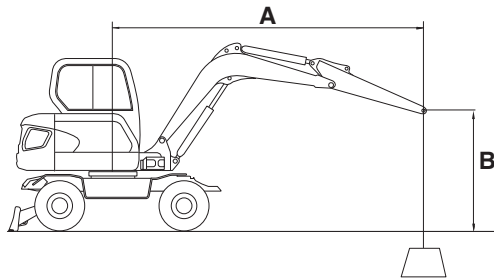
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	1.17			* 1.04	0.96	4.49
3							* 1.36	1.14			* 1.00	0.81	4.98
2					* 2.24	1.67	* 1.65	1.10	1.27	0.79	* 1.02	0.74	5.20
1					2.76	1.57	1.75	1.05	1.25	0.77	* 1.11	0.73	5.19
0			* 2.22	* 2.22	2.71	1.53	1.71	1.02			1.26	0.77	4.94
-1	* 2.96	* 2.96	* 4.00	2.96	2.71	1.53	1.71	1.02			1.48	0.89	4.43
-2			* 3.96	3.03	* 2.44	1.57					* 1.92	1.28	3.47

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	2.58			* 2.28	2.12	14.73
15							* 2.99	2.52			* 2.20	1.78	16.33
10					* 4.93	3.68	* 3.65	2.42	2.81	1.73	* 2.25	1.63	17.06
5					6.07	3.46	3.85	2.31	2.76	1.69	* 2.45	1.60	17.02
0			* 4.89	* 4.89	5.97	3.37	3.78	2.25			2.78	1.69	16.22
-5	* 6.52	* 6.52	* 8.81	6.53	5.97	3.37	3.77	2.25			3.26	1.97	14.53
-10			* 8.74	6.68	* 5.39	3.45					* 4.23	2.82	11.38

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. The total weight of machine is 5,638 kg (12,430 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.



Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500759

Figure 9

METRIC

1,000 kg

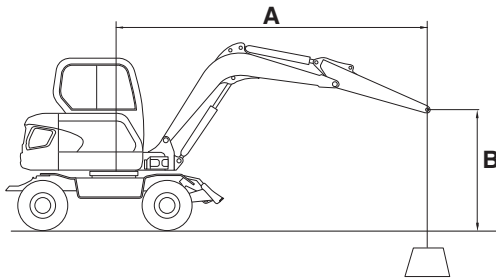
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	1.17			* 1.04	0.96	4.49
3							* 1.36	1.14			* 1.00	0.81	4.98
2					* 2.24	1.67	* 1.65	1.10	* 1.46	0.79	* 1.02	0.74	5.20
1					* 2.89	1.57	* 1.96	1.05	* 1.58	0.77	* 1.11	0.73	5.19
0			* 2.22	* 2.22	* 3.13	1.53	* 2.13	1.02			* 1.30	0.77	4.94
-1	* 2.96	* 2.96	* 4.00	2.96	* 3.03	1.53	* 2.08	1.02			* 1.71	0.89	4.43
-2			* 3.96	3.03	* 2.44	1.57					* 1.92	1.28	3.47

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	2.58			* 2.28	2.12	14.73
15							* 2.99	2.52			* 2.20	1.78	16.33
10					* 4.93	3.68	* 3.65	2.42	* 3.21	1.73	* 2.25	1.63	17.06
5					* 6.37	3.46	* 4.31	2.31	* 3.47	1.69	* 2.45	1.60	17.02
0			* 4.89	* 4.89	* 6.91	3.37	* 4.70	2.25			* 2.86	1.69	16.22
-5	* 6.52	* 6.52	* 8.81	6.53	* 6.67	3.37	* 4.58	2.25			* 3.78	1.97	14.53
-10			* 8.74	6.68	* 5.39	3.45					* 4.23	2.82	11.38

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. The total weight of machine is 5,638 kg (12,430 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.



Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500760

Figure 10

METRIC

1,000 kg

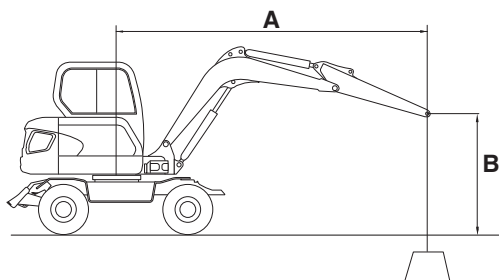
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	1.09			* 1.04	0.90	4.49
3							* 1.36	1.06			* 1.00	0.75	4.98
2					* 2.24	1.54	* 1.65	1.02	1.27	0.73	* 1.02	0.69	5.20
1					2.76	1.45	1.75	0.97	1.25	0.71	* 1.11	0.67	5.19
0			* 2.22	* 2.22	2.71	1.41	1.71	0.94			1.26	0.71	4.94
-1	* 2.96	* 2.96	* 4.00	2.68	2.71	1.41	1.71	0.94			1.48	0.83	4.43
-2			* 3.96	2.75	* 2.44	1.44					* 1.92	1.18	3.47



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	2.40			* 2.28	1.98	14.73
15							* 2.99	2.35			* 2.20	1.65	16.33
10					* 4.93	3.40	* 3.65	2.24	2.81	1.61	* 2.25	1.51	17.06
5					6.07	3.19	3.85	2.14	2.76	1.56	* 2.45	1.48	17.02
0			* 4.89	* 4.89	5.97	3.10	3.78	2.08			2.78	1.57	16.22
-5	* 6.52	* 6.52	* 8.81	5.91	5.97	3.10	3.77	2.08			3.26	1.82	14.53
-10			* 8.74	6.05	* 5.39	3.18					* 4.23	2.61	11.38

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. The total weight of machine is 5,638 kg (12,430 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500761

Figure 11













METRIC

1,000 kg

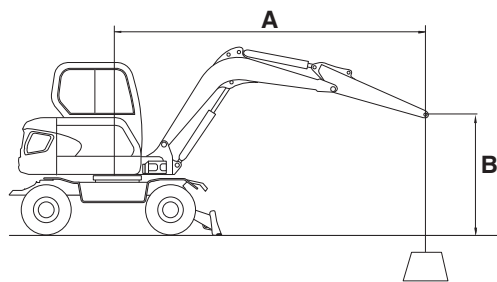
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	1.09			1.01	0.90	4.49
3							1.21	1.06			0.85	0.75	4.98
2					1.77	1.54	1.16	1.02	0.83	0.73	0.78	0.69	5.20
1					1.67	1.45	1.11	0.97	0.81	0.71	0.77	0.67	5.19
0			* 2.22	* 2.22	1.63	1.41	1.08	0.94			0.81	0.71	4.94
-1	* 2.96	* 2.96	3.23	2.68	1.63	1.41	1.08	0.94			0.94	0.83	4.43
-2			3.30	2.75	1.67	1.44					1.36	1.18	3.47



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	2.40			2.24	1.98	14.73
15							2.66	2.35			1.87	1.65	16.33
10					3.91	3.40	2.55	2.24	1.83	1.61	1.72	1.51	17.06
5					3.69	3.19	2.45	2.14	1.78	1.56	1.69	1.48	17.02
0			* 4.89	* 4.89	3.60	3.10	2.39	2.08			1.79	1.57	16.22
-5	* 6.52	* 6.52	7.12	5.91	3.60	3.10	2.38	2.08			2.08	1.82	14.53
-10			7.27	6.05	3.68	3.18					2.99	2.61	11.38

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. The total weight of machine is 5,638 kg (12,430 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500762

Figure 12













METRIC

1,000 kg

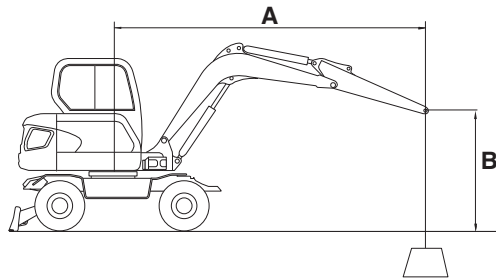
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	0.86	4.83
3							* 1.20	1.15	* 1.23	0.81	* 0.84	0.73	5.29
2					* 1.98	1.70	* 1.52	1.10	1.28	0.79	* 0.86	0.68	5.49
1					* 2.71	1.58	1.75	1.05	1.25	0.76	* 0.93	0.66	5.48
0			* 2.14	* 2.14	2.70	1.52	1.71	1.02	1.23	0.75	* 1.06	0.70	5.25
-1	* 2.52	* 2.52	* 3.50	2.92	2.69	1.51	1.70	1.00			1.32	0.79	4.77
-2	* 3.85	* 3.85	* 4.45	2.98	* 2.69	1.54					1.78	1.06	3.92

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	1.89	15.86
15							* 2.65	2.55	* 2.71	1.78	* 1.86	1.61	17.34
10					* 4.36	3.74	* 3.35	2.43	2.82	1.73	* 1.90	1.49	18.01
5					* 5.98	3.48	3.86	2.32	2.76	1.68	* 2.04	1.47	17.98
0			* 4.71	* 4.71	5.96	3.36	3.77	2.24	2.72	1.64	* 2.34	1.54	17.24
-5	* 5.55	* 5.55	* 7.72	6.44	5.93	3.33	3.74	2.22			2.90	1.75	15.66
-10	* 8.50	* 8.50	* 9.80	6.57	* 5.93	3.39					3.92	2.33	12.88

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. The total weight of machine is 5,657 kg (12,472 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.



Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500763

Figure 13

METRIC

1,000 kg

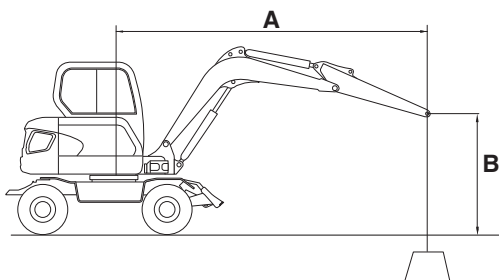
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	0.86	4.83
3							* 1.20	1.15	* 1.23	0.81	* 0.84	0.73	5.29
2					* 1.98	1.70	* 1.52	1.10	* 1.35	0.79	* 0.86	0.68	5.49
1					* 2.71	1.58	* 1.86	1.05	* 1.51	0.76	* 0.93	0.66	5.48
0			* 2.14	* 2.14	* 3.08	1.52	* 2.08	1.02	* 1.60	0.75	* 1.06	0.70	5.25
-1	* 2.52	* 2.52	* 3.50	2.92	* 3.08	1.51	* 2.11	1.00			* 1.35	0.79	4.77
-2	* 3.85	* 3.85	* 4.45	2.98	* 2.69	1.54					* 1.78	1.06	3.92



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	1.89	15.86
15							* 2.65	2.55	* 2.71	1.78	* 1.86	1.61	17.34
10					* 4.36	3.74	* 3.35	2.43	* 2.98	1.73	* 1.90	1.49	18.01
5					* 5.98	3.48	* 4.09	2.32	* 3.32	1.68	* 2.04	1.47	17.98
0			* 4.71	* 4.71	* 6.79	3.36	* 4.59	2.24	* 3.54	1.64	* 2.34	1.54	17.24
-5	* 5.55	* 5.55	* 7.72	6.44	* 6.80	3.33	* 4.66	2.22			* 2.97	1.75	15.66
-10	* 8.50	* 8.50	* 9.80	6.57	* 5.93	3.39					* 3.92	2.33	12.88

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. The total weight of machine is 5,657 kg (12,472 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500764

Figure 14













METRIC

1,000 kg

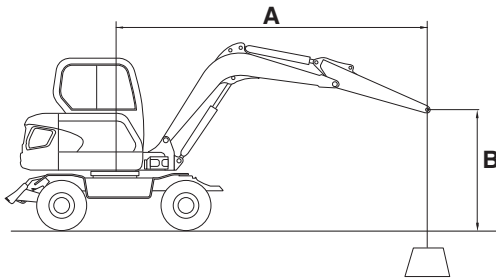
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	0.80	4.83
3							* 1.20	1.08	* 1.23	0.75	* 0.84	0.68	5.29
2					* 1.98	1.57	* 1.52	1.03	1.28	0.73	* 0.86	0.63	5.49
1					* 2.71	1.46	1.75	0.97	1.25	0.71	* 0.93	0.62	5.48
0			* 2.14	* 2.14	2.70	1.40	1.71	0.94	1.23	0.69	* 1.06	0.64	5.25
-1	* 2.52	* 2.52	* 3.50	2.64	2.69	1.39	1.70	0.93			1.32	0.74	4.77
-2	* 3.85	* 3.85	* 4.45	2.70	* 2.69	1.41					1.78	0.98	3.92



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	1.76	15.86
15							* 2.65	2.37	* 2.71	1.65	* 1.86	1.50	17.34
10					* 4.36	3.46	* 3.35	2.26	2.82	1.61	* 1.90	1.38	18.01
5					* 5.98	3.21	3.86	2.15	2.76	1.56	* 2.04	1.36	17.98
0			* 4.71	* 4.71	5.96	3.09	3.77	2.07	2.72	1.52	* 2.34	1.42	17.24
-5	* 5.55	* 5.55	* 7.72	5.82	5.93	3.06	3.74	2.05			2.90	1.62	15.66
-10	* 8.50	* 8.50	* 9.80	5.95	* 5.93	3.12					3.92	2.16	12.88

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. The total weight of machine is 5,657 kg (12,472 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Single Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500765

Figure 15













METRIC

1,000 kg

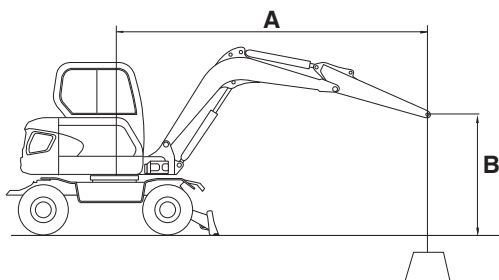
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	0.80	4.83
3							* 1.20	1.08	0.85	0.75	0.77	0.68	5.29
2					1.80	1.57	1.17	1.03	0.83	0.73	0.71	0.63	5.49
1					1.69	1.46	1.11	0.97	0.81	0.71	0.70	0.62	5.48
0			* 2.14	* 2.14	1.63	1.40	1.08	0.94	0.79	0.69	0.74	0.64	5.25
-1	* 2.52	* 2.52	3.19	2.64	1.62	1.39	1.07	0.93			0.84	0.74	4.77
-2	* 3.85	* 3.85	3.25	2.70	1.64	1.41					1.12	0.98	3.92

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	1.76	15.86
15							* 2.65	2.37	1.88	1.65	1.70	1.50	17.34
10					3.98	3.46	2.57	2.26	1.83	1.61	1.57	1.38	18.01
5					3.72	3.21	2.45	2.15	1.78	1.56	1.55	1.36	17.98
0			* 4.71	* 4.71	3.59	3.09	2.37	2.07	1.74	1.52	1.62	1.42	17.24
-5	* 5.55	* 5.55	7.03	5.82	3.56	3.06	2.35	2.05			1.85	1.62	15.66
-10	* 8.50	* 8.50	7.16	5.95	3.62	3.12					2.47	2.16	12.88

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. The total weight of machine is 5,657 kg (12,472 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.



Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500766

Figure 16

METRIC

1,000 kg

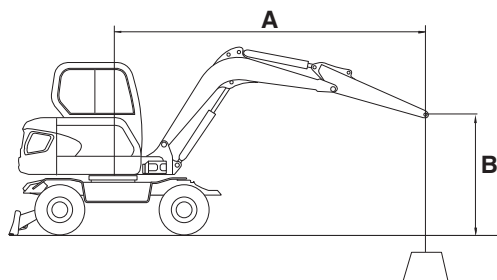
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	* 1.21			* 1.04	* 1.04	4.49
3							* 1.36	* 1.36			* 1.00	* 1.00	4.98
2					* 2.24	2.17	* 1.65	1.41	1.35	1.01	* 1.02	0.95	5.20
1					* 2.89	2.06	1.84	1.36	1.33	0.99	* 1.11	0.94	5.19
0			* 2.22	* 2.22	2.86	2.02	1.81	1.33			* 1.30	0.99	4.94
-1	* 2.96	* 2.96	* 4.00	* 4.00	2.86	2.02	1.81	1.33			1.57	1.16	4.43
-2			* 3.96	* 3.96	* 2.44	2.06					* 1.92	1.67	3.47

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	* 2.68			* 2.28	* 2.28	14.73
15							* 2.99	* 2.99			* 2.20	* 2.20	16.33
10					* 4.93	4.78	* 3.65	3.10	2.97	2.23	* 2.25	2.10	17.06
5					* 6.37	4.55	4.07	3.00	2.92	2.18	* 2.45	2.07	17.02
0			* 4.89	* 4.89	6.30	4.46	4.00	2.93			* 2.86	2.19	16.22
-5	* 6.52	* 6.52	* 8.81	* 8.81	6.30	4.46	3.99	2.93			3.45	2.55	14.53
-10			* 8.74	* 8.74	* 5.39	4.55					* 4.23	3.67	11.38

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. The total weight of machine is 6,005 kg (13,239 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.



Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500767

Figure 17

METRIC

1,000 kg

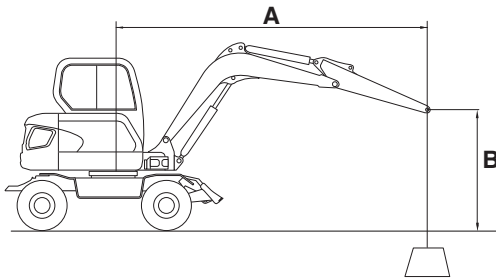
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	* 1.21			* 1.04	* 1.04	4.49
3							* 1.36	* 1.36			* 1.00	* 1.00	4.98
2					* 2.24	2.17	* 1.65	1.41	* 1.46	1.01	* 1.02	0.95	5.20
1					* 2.89	2.06	* 1.96	1.36	* 1.58	0.99	* 1.11	0.94	5.19
0			* 2.22	* 2.22	* 3.13	2.02	* 2.13	1.33			* 1.30	0.99	4.94
-1	* 2.96	* 2.96	* 4.00	* 4.00	* 3.03	2.02	* 2.08	1.33			* 1.71	1.16	4.43
-2			* 3.96	* 3.96	* 2.44	2.06					* 1.92	1.67	3.47



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	* 2.68			* 2.28	* 2.28	14.73
15							* 2.99	* 2.99			* 2.20	* 2.20	16.33
10					* 4.93	4.78	* 3.65	3.10	* 3.21	2.23	* 2.25	2.10	17.06
5					* 6.37	4.55	* 4.31	3.00	* 3.47	2.18	* 2.45	2.07	17.02
0			* 4.89	* 4.89	* 6.91	4.46	* 4.70	2.93			* 2.86	2.19	16.22
-5	* 6.52	* 6.52	* 8.81	* 8.81	* 6.67	4.46	* 4.58	2.93			* 3.78	2.55	14.53
-10			* 8.74	* 8.74	* 5.39	4.55					* 4.23	3.67	11.38

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. The total weight of machine is 6,005 kg (13,239 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500768

Figure 18













METRIC

1,000 kg

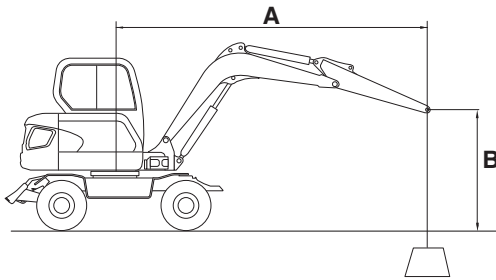
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
5											* 1.20	* 1.20	3.59
4							* 1.21	* 1.21			* 1.04	* 1.04	4.49
3							* 1.36	1.30			* 1.00	0.92	4.98
2					* 2.24	1.90	* 1.65	1.25	1.35	0.90	* 1.02	0.84	5.20
1					* 2.89	1.80	1.84	1.20	1.33	0.88	* 1.11	0.83	5.19
0			* 2.22	* 2.22	2.86	1.76	1.81	1.17			* 1.30	0.88	4.94
-1	* 2.96	* 2.96	* 4.00	3.46	2.86	1.76	1.81	1.17			1.57	1.02	4.43
-2			* 3.96	3.53	* 2.44	1.80					* 1.92	1.47	3.47



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		
													A (ft)
25											* 2.64	* 2.64	11.78
20							* 2.68	* 2.68			* 2.28	* 2.28	14.73
15							* 2.99	2.86			* 2.20	2.03	16.33
10					* 4.93	4.20	* 3.65	2.75	2.97	1.98	* 2.25	1.86	17.06
5					* 6.37	3.98	4.07	2.65	2.92	1.93	* 2.45	1.84	17.02
0			* 4.89	* 4.89	6.30	3.89	4.00	2.59			* 2.86	1.94	16.22
-5	* 6.52	* 6.52	* 8.81	7.63	6.30	3.88	3.99	2.58			3.45	2.26	14.53
-10			* 8.74	7.79	* 5.39	3.97					* 4.23	3.23	11.38

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. The total weight of machine is 6,005 kg (13,239 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500769

Figure 19













METRIC

1,000 kg

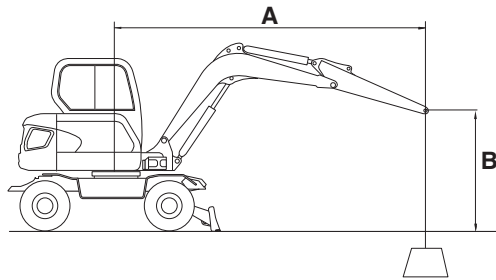
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5											* 1.20	* 1.20	3.59
4							* 1.21	* 1.21			* 1.04	* 1.04	4.49
3							1.31	1.30			0.92	0.92	4.98
2					1.92	1.90	1.26	1.25	0.90	0.90	0.85	0.84	5.20
1					1.82	1.80	1.21	1.20	0.88	0.88	0.84	0.83	5.19
0			* 2.22	* 2.22	1.78	1.76	1.18	1.17			0.89	0.88	4.94
-1	* 2.96	* 2.96	3.50	3.46	1.78	1.76	1.18	1.17			1.03	1.02	4.43
-2			3.58	3.53	1.82	1.80					1.48	1.47	3.47

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25											* 2.64	* 2.64	11.78
20							* 2.68	* 2.68			* 2.28	* 2.28	14.73
15							2.88	2.86			2.04	2.03	16.33
10					4.23	4.20	2.77	2.75	1.99	1.98	1.87	1.86	17.06
5					4.01	3.98	2.67	2.65	1.95	1.93	1.85	1.84	17.02
0			* 4.89	* 4.89	3.92	3.89	2.60	2.59			1.95	1.94	16.22
-5	* 6.52	* 6.52	7.73	7.63	3.92	3.88	2.60	2.58			2.27	2.26	14.53
-10			7.88	7.79	4.00	3.97					3.25	3.23	11.38

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. The total weight of machine is 6,005 kg (13,239 lb). Included are the; boom 3.0 m (9' 10"), arm 1.6 m (5' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.



Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500770

Figure 20

METRIC

1,000 kg

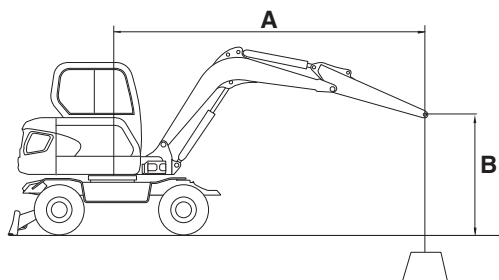
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	* 0.87	4.83
3							* 1.20	* 1.20	* 1.23	1.03	* 0.84	* 0.84	5.29
2					* 1.98	* 1.98	* 1.52	1.42	1.35	1.01	* 0.86	* 0.86	5.49
1					* 2.71	2.08	1.85	1.36	1.32	0.99	* 0.93	0.86	5.48
0			* 2.14	* 2.14	2.86	2.02	1.81	1.33	1.30	0.97	* 1.06	0.91	5.25
-1	* 2.52	* 2.52	* 3.50	* 3.50	2.84	2.01	1.80	1.31			* 1.35	1.03	4.77
-2	* 3.85	* 3.85	* 4.45	4.14	* 2.69	2.03					* 1.78	1.38	3.92



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	* 1.92	15.86
15							* 2.65	* 2.65	* 2.71	2.28	* 1.86	* 1.86	17.34
10					* 4.36	* 4.36	* 3.35	3.12	2.97	2.23	* 1.90	* 1.90	18.01
5					* 5.98	4.58	4.07	3.00	2.92	2.18	* 2.04	1.90	17.98
0			* 4.71	* 4.71	6.30	4.45	3.99	2.92	2.88	2.14	* 2.34	2.00	17.24
-5	* 5.55	* 5.55	* 7.72	* 7.72	6.27	4.42	3.96	2.90			* 2.97	2.28	15.66
-10	* 8.50	* 8.50	* 9.80	9.12	* 5.93	4.48					* 3.92	3.03	12.88

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. The total weight of machine is 6,024kg (13,281 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom : 3.0 m (9' 10")
 Arm : 1.9 m (6' 3")
 Bucket : Without Bucket
 Counterweight : 243 kg (536 lb)
 Wheel : Twin Wheel
 Dozer : Dozer Down
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

WE1500771

Figure 21













METRIC

1,000 kg

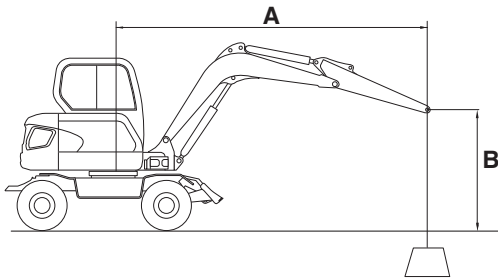
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	* 0.87	4.83
3							* 1.20	* 1.20	* 1.23	1.03	* 0.84	* 0.84	5.29
2					* 1.98	* 1.98	* 1.52	1.42	* 1.35	1.01	* 0.86	* 0.86	5.49
1					* 2.71	2.08	* 1.86	1.36	* 1.51	0.99	* 0.93	0.86	5.48
0			* 2.14	* 2.14	* 3.08	2.02	* 2.08	1.33	* 1.60	0.97	* 1.06	0.91	5.25
-1	* 2.52	* 2.52	* 3.50	* 3.50	* 3.08	2.01	* 2.11	1.31			* 1.35	1.03	4.77
-2	* 3.85	* 3.85	* 4.45	4.14	* 2.69	2.03					* 1.78	1.38	3.92



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	* 1.92	15.86
15							* 2.65	* 2.65	* 2.71	2.28	* 1.86	* 1.86	17.34
10					* 4.36	* 4.36	* 3.35	3.12	* 2.98	2.23	* 1.90	* 1.90	18.01
5					* 5.98	4.58	* 4.09	3.00	* 3.32	2.18	* 2.04	1.90	17.98
0			* 4.71	* 4.71	* 6.79	4.45	* 4.59	2.92	* 3.54	2.14	* 2.34	2.00	17.24
-5	* 5.55	* 5.55	* 7.72	* 7.72	* 6.80	4.42	* 4.66	2.90			* 2.97	2.28	15.66
-10	* 8.50	* 8.50	* 9.80	9.12	* 5.93	4.48					* 3.92	3.03	12.88

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. The total weight of machine is 6,024kg (13,281 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500772

Figure 22













METRIC

1,000 kg

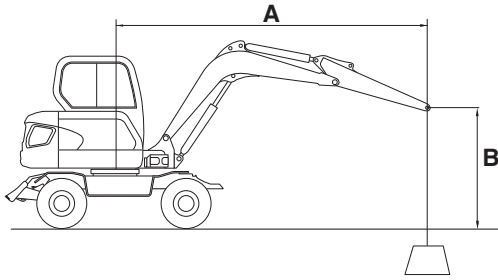
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	* 0.87	4.83
3							* 1.20	* 1.20	* 1.23	0.92	* 0.84	0.84	5.29
2					* 1.98	1.93	* 1.52	1.26	1.35	0.90	* 0.86	0.78	5.49
1					* 2.71	1.82	1.85	1.20	1.32	0.87	* 0.93	0.76	5.48
0			* 2.14	* 2.14	2.86	1.76	1.81	1.17	1.30	0.86	* 1.06	0.80	5.25
-1	* 2.52	* 2.52	* 3.50	3.42	2.84	1.75	1.80	1.16			* 1.35	0.91	4.77
-2	* 3.85	* 3.85	* 4.45	3.48	* 2.69	1.77					* 1.78	1.21	3.92



FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	* 1.92	15.86
15							* 2.65	* 2.65	* 2.71	2.03	* 1.86	1.84	17.34
10					* 4.36	4.26	* 3.35	2.77	2.97	1.98	* 1.90	1.71	18.01
5					* 5.98	4.00	4.07	2.65	2.92	1.93	* 2.04	1.68	17.98
0			* 4.71	* 4.71	6.30	3.87	3.99	2.57	2.88	1.89	* 2.34	1.77	17.24
-5	* 5.55	* 5.55	* 7.72	7.54	6.27	3.85	3.96	2.55			* 2.97	2.01	15.66
-10	* 8.50	* 8.50	* 9.80	7.68	* 5.93	3.91					* 3.92	2.68	12.88

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. The total weight of machine is 6,024kg (13,281 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.















Boom	: 3.0 m (9' 10")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 243 kg (536 lb)
Wheel	: Twin Wheel
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

WE1500773

Figure 23













METRIC

1,000 kg

A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5							* 1.04	* 1.04			* 0.99	* 0.99	4.03
4							* 1.04	* 1.04			* 0.87	* 0.87	4.83
3							* 1.20	* 1.20	0.92	0.92	0.84	0.84	5.29
2					1.95	1.93	1.26	1.26	0.90	0.90	0.78	0.78	5.49
1					1.83	1.82	1.21	1.20	0.88	0.87	0.77	0.76	5.48
0			* 2.14	* 2.14	1.77	1.76	1.18	1.17	0.86	0.86	0.81	0.80	5.25
-1	* 2.52	* 2.52	3.46	3.42	1.76	1.75	1.16	1.16			0.92	0.91	4.77
-2	* 3.85	* 3.85	3.53	3.48	1.79	1.77					1.22	1.21	3.92

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		20		25		MAX. REACH		A (ft)
													
25							* 2.30	* 2.30			* 2.17	* 2.17	13.22
20							* 2.29	* 2.29			* 1.92	* 1.92	15.86
15							* 2.65	* 2.65	2.04	2.03	1.86	1.84	17.34
10					4.30	4.26	2.79	2.77	1.99	1.98	1.72	1.71	18.01
5					4.04	4.00	2.67	2.65	1.94	1.93	1.69	1.68	17.98
0			* 4.71	* 4.71	3.91	3.87	2.59	2.57	1.90	1.89	1.78	1.77	17.24
-5	* 5.55	* 5.55	7.64	7.54	3.88	3.85	2.57	2.55			2.03	2.01	15.66
-10	* 8.50	* 8.50	7.77	7.68	3.94	3.91					2.69	2.68	12.88

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. The total weight of machine is 6,024kg (13,281 lb). Included are the; boom 3.0 m (9' 10"), arm 1.9 m (6' 3"), 243 kg (536 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
7. Lift capacities are in compliance with ISO 10567.

APPROXIMATE WEIGHT OF WORKLOAD MATERIALS

IMPORTANT

Weights are approximations of estimated average volume and mass. Exposure to rain, snow or groundwater; settling or compaction because of overhead weight and chemical or industrial processing or changes because of thermal or chemical transformations could all increase value of weights listed in table.

Material	Density 1,200 kg/m ³ (2,000 lb/yd ³), or less	Density 1,500 kg/m ³ (2,500 lb/yd ³), or less	Density 1,800 kg/m ³ (3,000 lb/yd ³), or less	Density 2,100 kg/m ³ (3,500 lb/yd ³), or less
Charcoal	401 kg/m ³ (695 lb/yd ³)	-	-	-
Coke, blast furnace size	433 kg/m ³ (729 lb/yd ³)	-	-	-
Coke, foundry size	449 kg/m ³ (756 lb/yd ³)	-	-	-
Coal, bituminous slack, piled	801 kg/m ³ (1,350 lb/yd ³)	-	-	-
Coal, bituminous r. of m., piled	881 kg/m ³ (1,485 lb/yd ³)	-	-	-
Coal, anthracite	897 kg/m ³ (1,512 lb/yd ³)	-	-	-
Clay, DRY, in broken lumps	1,009 kg/m ³ (1,701 lb/yd ³)	-	-	-
Clay, DAMP, natural bed	-	-	1,746 kg/m ³ (2,943 lb/yd ³)	-
Cement, portland, DRY granular	-	-	1,506 kg/m ³ (2,583 lb/yd ³)	-
Cement, portland, DRY clinkers	-	1,362 kg/m ³ (2,295 lb/yd ³)	-	-
Dolomite, crushed	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Earth, loamy, DRY, loose	-	1,202 kg/m ³ (2,025 lb/yd ³)	-	-
Earth, DRY, packed	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Earth, WET, muddy	-	-	1,762 kg/m ³ (2,970 lb/yd ³)	-
Gypsum, calcined, (heated, powder)	961 kg/m ³ (1,620 lb/yd ³)	-	-	-

Material	Density 1,200 kg/m³ (2,000 lb/yd³), or less	Density 1,500 kg/m³ (2,500 lb/yd³), or less	Density 1,800 kg/m³ (3,000 lb/yd³), or less	Density 2,100 kg/m³ (3,500 lb/yd³), or less
Gypsum, crushed to 3 inch size	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Gravel, DRY, packed fragments	-	-	-	1,810 kg/m ³ (3,051 lb/yd ³)
Gravel, WET, packed fragments	-	-	-	1,922 kg/m ³ (3,240 lb/yd ³)
Limestone, graded above 2	-	1,282 kg/m ³ (2,160 lb/yd ³)	-	-
Limestone, graded 1-1/2 or 2	-	1,362 kg/m ³ (2,295 lb/yd ³)	-	-
Limestone, crushed	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Limestone, fine	-	-	1,602 kg/m ³ (2,705 lb/yd ³)	-
Phosphate, rock	-	1,282 kg/m ³ (2,160 lb/yd ³)	-	-
Salt	929 kg/m ³ (1,566 lb/yd ³)	-	-	-
Snow, light density	529 kg/m ³ (891 lb/yd ³)	-	-	-
Sand, DRY, loose	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Sand, WET, packed	-	-	-	1,922 kg/m ³ (3,240 lb/yd ³)
Shale, broken	-	1,362 kg/m ³ (2,295 lb/yd ³)	-	-
Sulfur, broken	529 kg/m ³ (891 lb/yd ³)	-	-	-

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