



Operation and Maintenance Manual

DX62R-3/DX63-3 Excavator

DX62R-3: Serial Number 1618 and Up
DX63-3: Serial Number 2187 and Up

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October 2021

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Doosan distributors have the most current information available.

REVISION

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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 under boom foot (Figure 1). It is also stamped on a product identification plate (Figure 2 or Figure 3) on near the base of the boom.

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

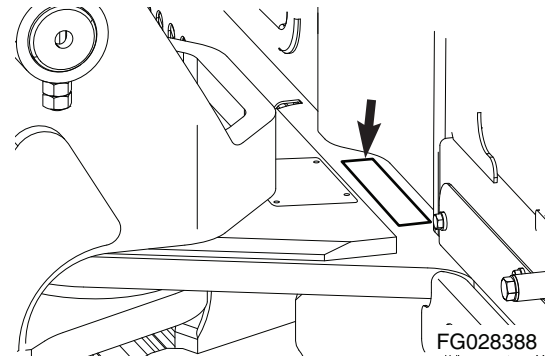
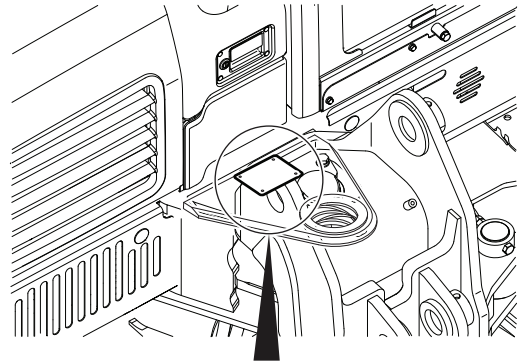
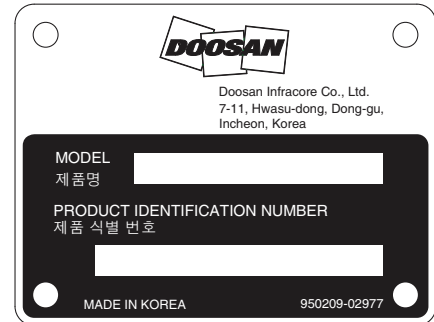
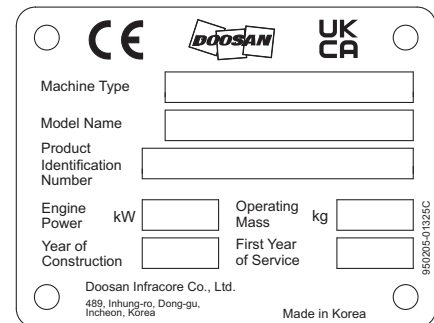


Figure 1



FG028361

Figure 2



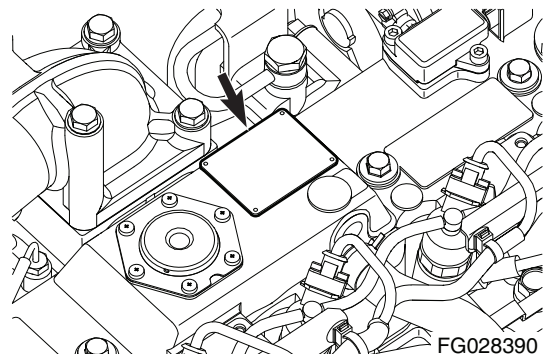
DS2103269

Figure 3

Component Model and Serial Numbers

There are model and serial numbers on each traceable component of machine. For example, the engine serial number is stamped on rear left side of the engine block, above the starter. Additional engine information is described on a label (Figure 4) on head cover.

Record these numbers and their locations. These will be required whenever warranty or service work is requested.



FG028390

Figure 4

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 Infracore Europe s.r.o., Pobřežní 620/3, Karlín, 186 00 Prague 8, Czech Republic
as authorized representative in the European Community of Doosan Infracore Co., Ltd.,
certifies that the construction equipment machinery;

Type of Machine : Hydraulic Crawler Excavator
Manufacturer : Doosan Infracore Co Ltd, 489 Injung-Ro, Dong-gu, Incheon, 22502 Korea
Technical file : Doosan Infracore Europe s.r.o., Pobřežní 620/3, Karlín, 186 00 Prague 8, Czech Republic
Brand : Doosan
Model Name : DX62R-3/DX63-3
Serial Number :
Year of Manufacturing :
Engine Manufacturer :
Engine Type :
Rated Net Power : kW / rpm
Net Installed Power : kW / rpm
Pertinent EC noise emission requirement;
Has been manufactured in conformity with the provisions of the Directive 2000/14/EC amended by 2005/88/EC,
as stated below;
Certificate No. :
Date :
Conformity Assessment Procedure :
Notified Body Involved :
Measured Sound Power Level : dB(A)
Guaranteed Sound Power Level : dB(A)

Has been manufactured in conformity with the provision of:

2006/42/EC (Machinery), EU 2016/1628 (Exhaust Gas Emission), 2014/30/EU (EMC)

Designed and Manufactured in accordance to the sound engineering practice as valid for Class I

Chapter 1, Article 1, paragraph 2 c) items of 2014/68/EU.

186 00 Prague 8

date

Signature

Sales Director

NOTE: *The above declaration of conformity is generic copy, and may be subject to change,
please refer to the individual declaration of conformity issued with the machine for exact details.*

EC DECLARATION OF CONFORMITY

Doosan Infracore Europe (UK Branch), Doosan House, Unit 6,
CF157QU, Nantgarw Park, Nantgarw, Cardiff, (United Kingdom)
as authorized representative in the Great Britain of Doosan Infracore Co., Ltd.,
certifies that the construction equipment machinery;

Type of Machine : Hydraulic Crawler Excavator
Manufacturer : Doosan Infracore Co., Ltd, 489 Injung-Ro, Dong-Gu, Incheon, 22502 Korea
Technical file : Doosan Infracore Europe (UK Branch), Doosan House, Unit 6,
CF157QU, Nantgarw Park, Nantgarw, Cardiff, (United Kingdom)
Brand : Doosan
Model Name : DX62R-3/DX63-3
Serial Number :
Year of Manufacturing :
Engine Manufacturer :
Engine Type :
Rated Net Power : kW / rpm
Net Installed Power : kW / rpm

Pertinent UK noise emission requirement;
Has been manufactured in conformity with the provisions of the Noise Emission in the environment
by Equipment for use Outdoors Regulations 2001, as stated below;

Certificate No. :

Date :

Conformity Assessment Procedure : Annex VIII Full Quality Assurance

Notified Body Involved :

Measured Sound Power Level : dB(A)

Guaranteed Sound Power Level : dB(A)

Has been manufactured in conformity with the provisions of:

Supply of Machinery (Safety) Regulations 2008, Electromagnetic Compatibility regulations 2016

The Non-Road Mobile Machinery (Emission of Gaseous and Particulate Pollutants) Regulations 2018

Designed and manufactured in accordance to the sound engineering practice as valid for Class I

Chapter 1, Article 1, paragraph 2 c) items of Pressure Equipment (Safety) Regulations 2016.

CF157QU, Cardiff

date

Signature

Sales Director

NOTE: *The above declaration of conformity is generic copy, and may be subject to change,
please refer to the individual declaration of conformity issued with the machine for exact details.*

REGULATION (EU) 2017/654

ANNEX XV

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

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

- The engine, including the emissions control system, shall be operated, used and maintained in accordance with the instructions provided to the end-users in order to maintain the emissions performance of the engine.
- No deliberate tampering with or misuse of the engine emissions control system should take place.
- This machine is equipped with an engine exhaust emission control system. The operator is responsible for proper operation and maintenance of the emission controls system. For details, see "Engine Exhaust Emission Control System" in the Operation and Maintenance Manual.
- It is essential to take prompt action to rectify any incorrect operation, use or maintenance of the emissions control system in accordance with the rectification measures indicated by the warnings referred to "Malfunctions & Inducement"
- A fuel with sulfur content not greater than 10 mg/kg (15 mg/kg at point of final distribution) cetane number not less than 45 and an FAME content not greater than 7% V/V shall be used within the Union.
- Use the correct lubrication oil to maintain the performance of the emissions control system. For details, see "Table of recommended lubricants" in the Operation and Maintenance Manual.
- Maintain in accordance with the scheduled emission-related maintenance requirements. For details, see "Maintenance Intervals" in the Operation and Maintenance Manual.

Malfunctions & Inducement

The operator will be informed by the operator warning system when the emission control system does not function correctly. Ignoring the operator warning signals will lead to the activation of the operator inducement system, resulting in an effective disablement of machine operation.

Operator Warning System & Inducement

Diagnosis		Warning Symbols	Action	
Functions	Detection Targets		Low Level Inducement	Severe Inducement
NOx Diagnosis (NCD; NOx Control Diagnosis)	EGR valve malfunctions		36hr after warning Torque limit: 75%	64hr after low level inducement Torque limit: 50% Engine speed limit: 60%
	Electrical malfunction of EGR control sensors			
	Tampering with EGR control sensors			
DPF Diagnosis (PCD; Particulate Control Diagnosis)	Removing DPF including case and sensors		Incident counter/timer	
	Removing all DPF substrate		It is necessary that recording the number of events and duration of the incidents that the operator neglects malfunctions detected by DPF Diagnosis for more than 20hrs on non volatile memory in the engine ECU. Authority must have capability to confirm. (Can be through service tool.)	
	Electrical malfunctions and tampering in PCD			

Malfunction Table

Device	Trigger Action	NCD or PCD Error	Failsafe (•: Selectable)												Fault Code					
			Predicted Operation				Actual Operation								DTC	Failure Type	J1939			
			Rotation Limit	Max. Injection Amount Limit	Transition Time to Actual Operation		Engine Stop			Rotation Limit			Max. Injection Amount Limit				SPN	FMI		
			Limit 1: Maximum Torque Speed+200 min-1	Limit A: 85%	After 2 hours	After 15 minutes	Without delay	With delay time for 2 hours	With delay time for 15 minutes	Limit 1: Maximum Torque Speed+200 min-1	Limit 2: 1,800 min-1	Limit 3: 1,500 min-1	Limit A: 85%	Limit B: 75%					Limit C: 50%	
EGR Differential Pressure Sensor	1. Wiring Bypass	N	•	•		•					•					•	P0238	00	102	3
	1. Wiring Disconnection	N	•	•		•					•					•	P0237	00	102	4
	2. Sensor Removal																			
	1. Pressure Hose Removal 2. Sensor Leave in Atmosphere 3. Dummy Resistance	N															P1673	00	102	10
Coolant Temperature Sensor	1. Wiring Disconnection 2. Sensor Removal	N		•	•											•	P0117	00	110	4
DPF Differential Pressure Sensor	1. Wiring Bypass	P	•	•		•					•					•	P2455	00	3251	3
	1. Wiring Disconnection	P	•	•		•					•					•	P2454	00	3251	4
	2. Sensor Removal																			
	1. Pressure Hose Removal 2. SF Removal 3. Sensor Leave in Atmosphere 4. Dummy Resistance	P															P226D	00	4795	31
DPF Inlet Temperature Sensor	1. Wiring Bypass	P	•	•		•					•					•	P1428	00	3242	3
	1. Wiring Disconnection	P	•	•		•					•					•	P1427	00	3242	4
	2. Sensor Removal																			
DPF Intermediate Temperature Sensor	1. Wiring Bypass	P	•	•		•					•					•	P1434	00	3250	3
	1. Wiring Disconnection 2. Sensor Removal	P	•	•		•					•					•	P1435	00	3250	4
EGR Gas Temperature Sensor	1. Wiring Bypass	N		•	•											•	P041D	00	412	3
	1. Wiring Disconnection 2. Sensor Removal	N		•	•											•	P041C	00	412	4

Device	Trigger Action	Failsafe (•: Selectable)													Fault Code				
		NCD or PCD Error	Predicted Operation				Actual Operation									DTC	Failure Type	J1939	
			Rotation Limit	Max. Injection Amount Limit	Transition Time to Actual Operation		Engine Stop			Rotation Limit			Max. Injection Amount Limit					SPN	FMI
					Limit 1: Maximum Torque Speed+200 min-1	Limit A: 85%	After 2 hours	After 15 minutes	Without delay	With delay time for 2 hours	With delay time for 15 minutes	Limit 1: Maximum Torque Speed+200 min-1	Limit 2: 1,800 min-1	Limit 3: 1,500 min-1	Limit A: 85%				
Intake Manifold Temperature Sensor	1. Wiring Bypass	N	•	•		•					•				•	P040D	00	105	3
	1. Wiring Disconnection	N	•	•		•					•				•	P040C	00	105	4
	2. Sensor Removal																		
Exhaust Manifold Temperature Sensor	1. Wiring Bypass	N		•	•										•	P0546	00	173	3
	1. Wiring Disconnection	N		•	•										•	P0545	00	173	4
	2. Sensor Removal																		
EGR Valve	1. Wiring Disconnection	N		•	•										•	P0403	00	2791	12

The Value of the Carbon Dioxide (CO₂) Emissions

This CO₂ measurement results from testing over a fixed test cycle under laboratory conditions a(n) (parent) engine representative of the engine type (engine family) and shall not imply or express any guarantee of the performance of a particular engine.

Engine Family Name	YD332DNCDV4A
Parent Engine Model	4TNV98C-DM
CO ₂ Value (g/kWh)	794

DoosanConnect System General Information and Privacy Notice

1. Doosan Infracore Co. Ltd. with registered office at 489, Injung-ro, Dong-Gu, Incheon, Republic of Korea and registered under number 120111-0234469 ("Doosan", "we", "our") is providing you this statement because you operate a Doosan® machine that is equipped with a DoosanConnect system. The DoosanConnect system collects information about the equipment, including its condition and operational data and transmits these data to Doosan, to our affiliates and to our official dealers.
2. The information collected and transmitted by the telematics system ("telematics data") includes, but is not limited to:
 - Model name,
 - Model Number,
 - Real-time GPS position and location history,
 - Fault code history,
 - Engine hours,
 - Performance and utilization data,
 - Machine technical data,
 - Machine Parameters,
 - Machine maintenance,
 - All sensors machine data and data on CAN-BUS line.
3. Doosan Connect data can reveal personal data, such as your location. Although we have no intention to identify any natural person, we would like to inform you about our processing activities and about your rights as a data subject.
4. The controller processing personal data is Doosan Infracore Co. Ltd. with registered office at 489, Injung-ro, Dong-Gu, Incheon, Republic of Korea and registered under number 120111-0234469. In case the machine that you operate was distributed by one of our dealers, this dealer might also process your personal data for his own purposes. If so, such dealer is an independent controller of your personal data. It is possible that the owner of the machine (e.g. your employer) also receives telematics information reports concerning the machine that you operate from the dealer for other purposes than our purposes as listed below. In that case, the owner of the machine acts as an independent controller. Both the dealer and the owner should inform you about these processing activities that relate to your personal data.
5. In case we process your personal data, we only do this in a fair and lawful manner. We only collect and retain your personal data for the specific purposes as set out below, and we will not process them in any way incompatible with those purposes. We will de-identify your personal data collected through this Doosan® machine no later than ten (10) years after the last use of this machine, whether this was a use by you or not, unless one of the purposes below justifies a longer retention period.

6. We use telematics data for the following purposes:
- To fulfill customer support agreements, perform maintenance and repairs, and deliver rental equipment or parts (telematics data may be required for these services),
 - To monitor and manage equipment health and efficiency,
 - To continuously improve the user-experience and efficient use of the machine that you operate and to improve the performance of our telematics services,
 - To conduct market research,
 - To inform machine owners of specific promotions and special offers, and
 - To safeguard our legal interests
7. We process your personal data (i) on the basis of our legitimate interest for the purposes set out in Article 6, (ii) to comply with our legal obligations, or (iii) to comply with any reasonable request from competent law enforcement agents or representatives, judicial authorities, governmental agencies or bodies, including competent data protection authorities.
8. You have the right to request information about the personal data we process about you and to access such personal data. In particular, you can request information about the purposes of the processing, the categories of the personal data, the categories of recipients to whom your data are disclosed, the planned storage period, the existence of a right to rectification, deletion, restriction or revocation of processing, the existence of a right to lodge a complaint, the origin of your data, in so far as not collected by us, and also about the existence of automated decision-making including profiling and where appropriate meaningful information about to details thereof. You have the right to ask that any personal data pertaining to you that are inaccurate, are corrected free of charge. You have the right to object to the processing of your personal data when they are processed on the basis of legitimate interest and in so far as there are grounds arising from your particular situation or when you object to direct marketing. Further, you have the right to request that the processing of your personal data be restricted or that your personal data be deleted if this data is no longer required in the light of the purposes outlined above. You also have the right to lodge a complaint to the competent data protection authority.

For more information on how Doosan processes personal data, please check out our general data protection notice, which is available here <https://eu.doosanequipment.com/en/privacy-policy>.

You can contact us via e-mail at communications.emea@doosan.com or sending us a letter via registered post at the address Doosan Bobcat EMEA s.r.o., Legal department, U Kodetky 1810, 263 12 Dobris, Czech Republic.

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.

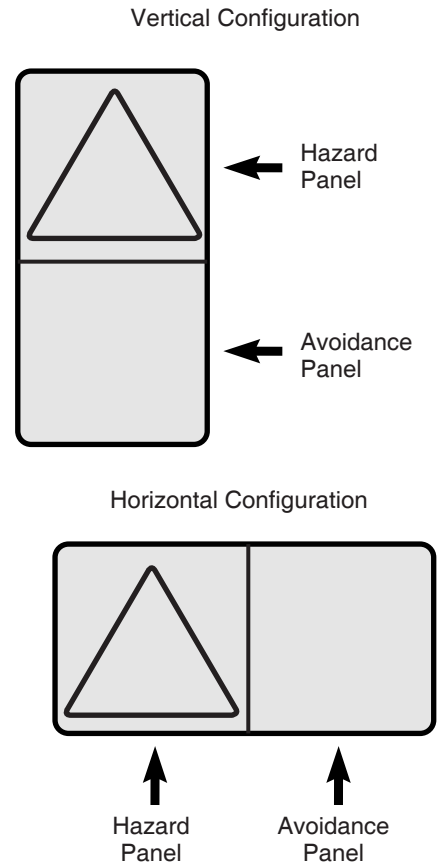
This machine uses safety decals with and without text. The type and number of safety decals can vary depending upon geographical regions and machine models.

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 safety sign and safety information panel. The safety sign panel is located at the top or left side and the safety information panel is located at the bottom or right side of the decal depending on its configuration. The safety sign panel uses a black triangular band and a pictorial to identify the hazard and the potential consequences of the failure to follow instructions. The safety information panel uses pictorials and/or prohibition signs to identify the actions necessary to avoid the hazard.



FG018723

Figure 1

Information and Location for Safety Decals

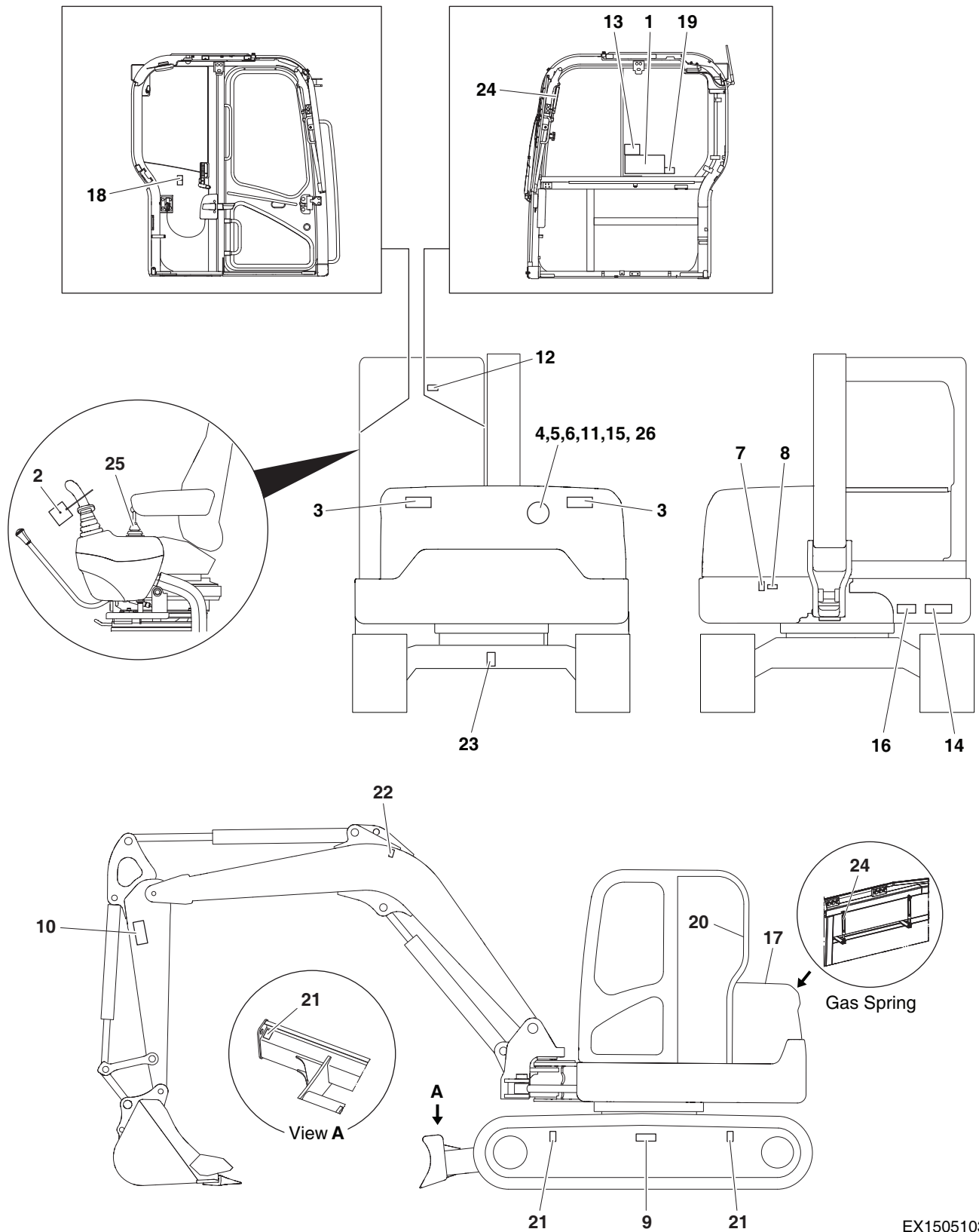


Figure 2

1. General Hazard (950205-03793)



EX1402205



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.

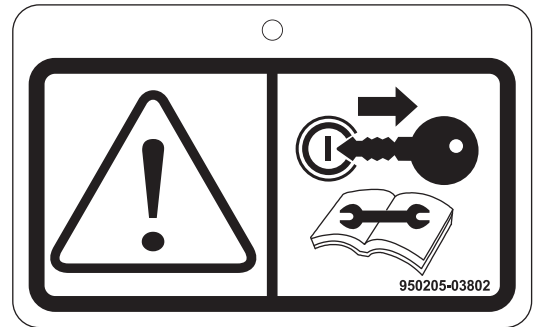
2. Warning Tag - "Do Not Operate" (950205-03802)



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

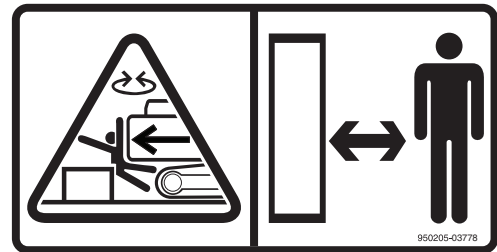
3. Keep Bystanders Away (950205-03778)



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

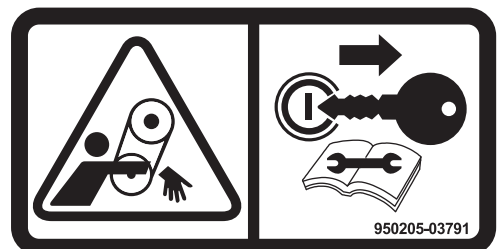
5. Entanglement in Rotating Parts (950205-03791)



WARNING

ROTATING PARTS CAN CAUSE DEATH OR
SERIOUS INJURY

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



EX1301181

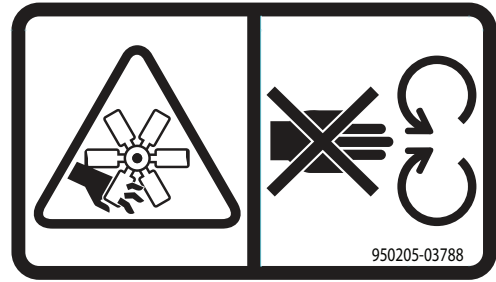
6. Rotating Fan (950205-03788)



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

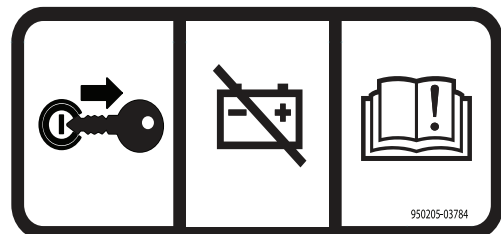
8. Battery Disconnection (950205-03784)

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. Flying Debris or Objects (950205-03866)



WARNING

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

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



EX1301185

10. Crush Hazard (950205-03787)



WARNING

AVOID DEATH OR SERIOUS INJURY

Stay clear of the boom, arm, and attachment.



EX1402207

11. Hot Surface (950205-03777)



WARNING

HOT SURFACE CAN CAUSE SERIOUS BURNS

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

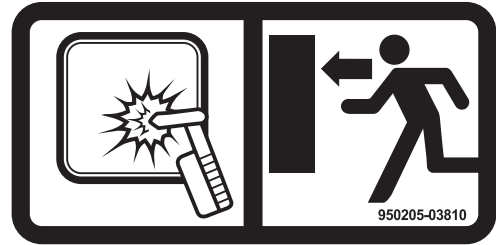


EX1301189

12. Emergency Exit (950205-03810)

IMPORTANT

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



EX1301190

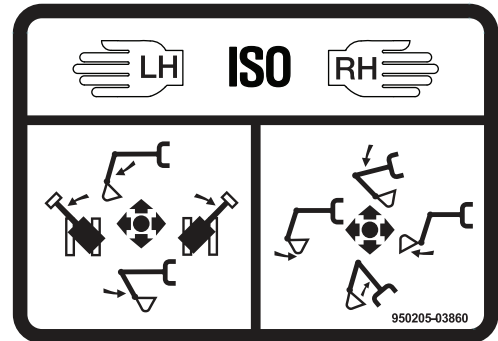
13. ISO Control Pattern (950205-03860)

WARNING

AVOID INJURY OR DEATH

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

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



EX1301191

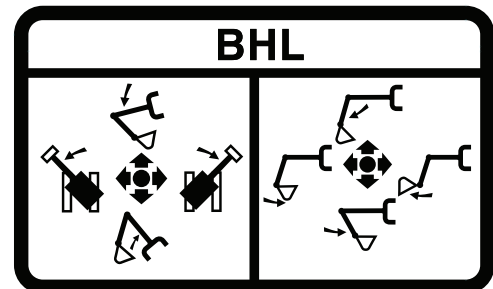
BHL Control Pattern (US Only) (950205-03868)

WARNING

AVOID INJURY OR DEATH

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

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



EX1301192

14. 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.



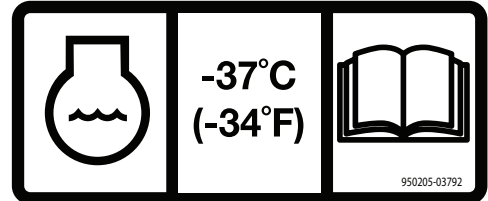
EX1402208

15. 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

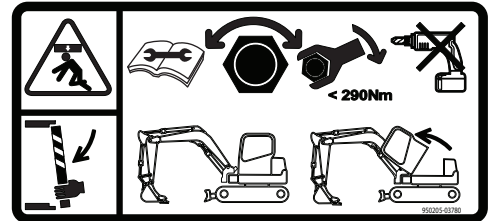
16. Raising The Cab (950205-03780)



WARNING

AVOID DEATH OR SERIOUS INJURY

- Never work under the excavator cab unless supported by an approved cab support device.

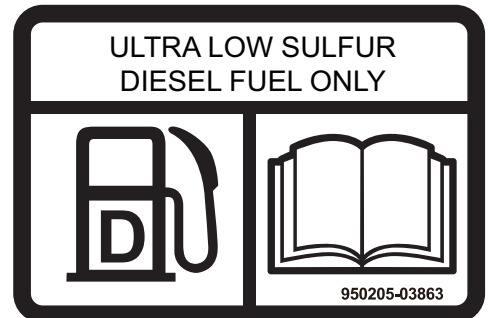


EX1402210

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

IMPORTANT

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



EX1301196



EX1301194

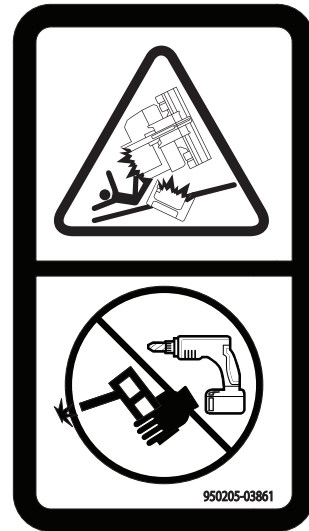
18. ROPS Warning (Optional) (950205-03861)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



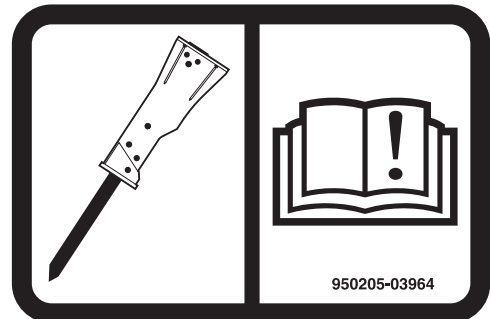
EX1301197

19. Hydraulic Breaker (Optional) (950205-03964)

IMPORTANT

AVOID HYDRAULIC SYSTEM DAMAGE

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



EX1301200

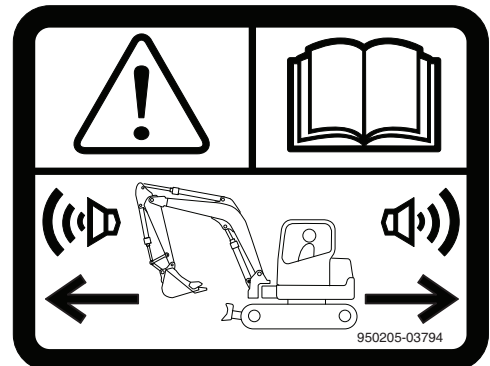
20. Motion Alarm (Optional) (950205-03794)



WARNING

AVOID DEATH OR SERIOUS INJURY

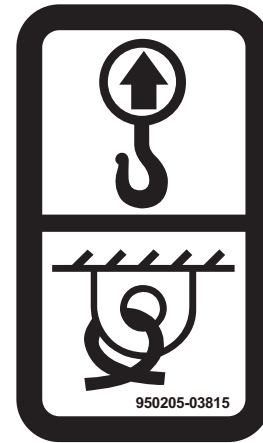
- This machine is equipped with a motion alarm.
ALARM MUST SOUND!
when operating forward or backward.
- Failure to maintain a clear view in the direction of travel could result in death or serious injury.
- The operator is responsible for the safe operation of this machine.



EX1402211

21. Lift/Tie down (Optional) (950205-03815)

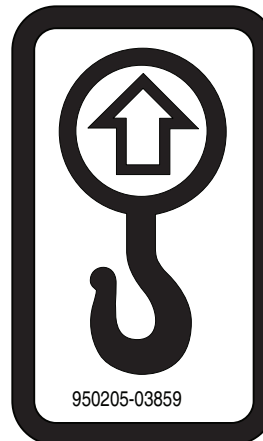
Identifies lift point and tie down point location.



EX1301201

22. Lift (Optional) (950205-03859)

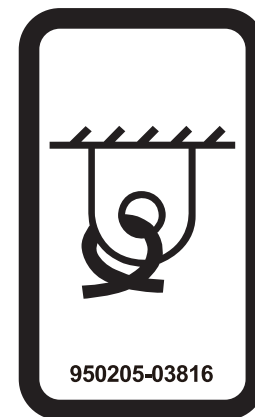
Identifies lift point and tie down point location.



EX1402212

23. Tie down (Optional) (950205-03816)

Identifies tie down point location.



EX1301203

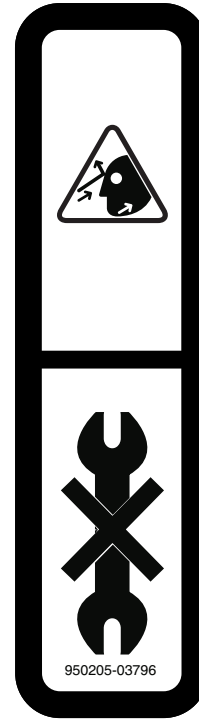
24. Thrown or Flying Objects (950205-03796)



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

25. Dozer (950205-03811)



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.



EX1402214

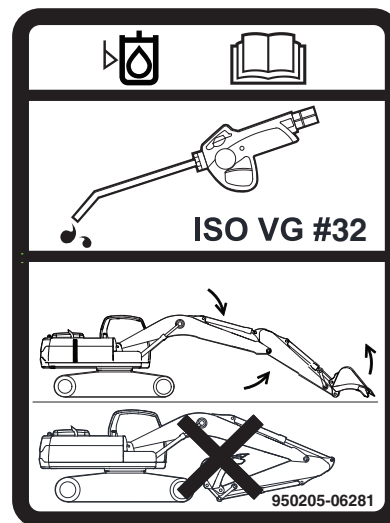
26. Hydraulic Oil Check (Optional)
(950205-06281, 950205-03965, 950205-06282)

IMPORTANT

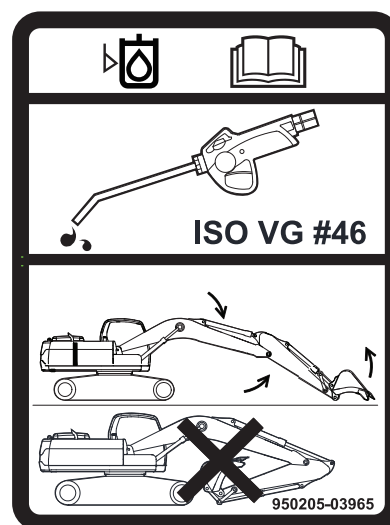
**INCORRECT OIL LEVEL OR INCORRECT FLUID CAN
CAUSE HYDRAULIC SYSTEM DAMAGE**

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

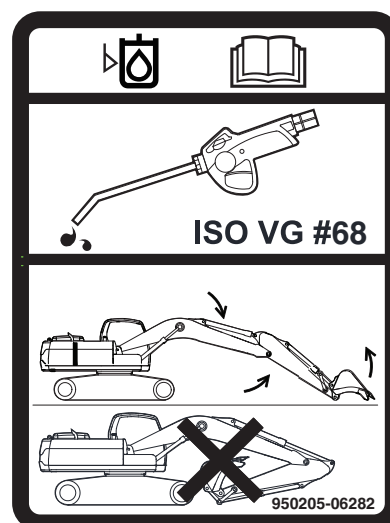
Use hydraulic oil which is suitable for machine.



EX1505097



EX1505098

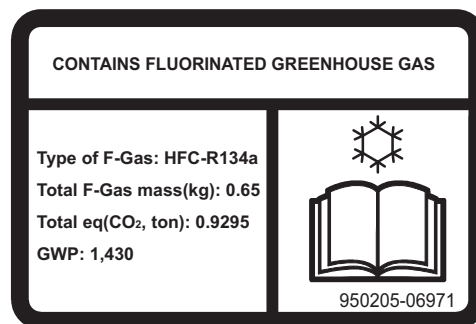


EX1505099

27. Fluorinated Greenhouse Gas (EU Only)
(950205-06971, 950205-07796)

IMPORTANT

- This machine contains 0.65 kg of HFC-R134a, of which the CO₂ equivalent value is 0.9295 tons. The GWP of HFC-R134a is 1,430.
- Every Machine of DOOSAN is clearly attached with an information label.
- EU regulation 2015/2067 of 17 November 2015 imposes to all undertaking (natural persons or companies) performing the repair, maintenance or servicing of air-conditioning system to be certified at national level.
Please pass certification or subcontract the task to an approved company.



DS2101995

Съдържа Флуорсъдържащи парникови газове
Obsahuje fluorované skleníkové plyny
Indeholder fluorholdige drivhusgasser
Enthält fluorierter Treibhausgase
Sisaldab fluuritud kasvuhoonegaase
Περιέχει φθοριούχα αέρια θερμοκηπίου
Contains Fluorinated Greenhouse Gases
Contiene gases de efecto invernadero fluorados
Sisältää fluorattuja kasvihuonekaasuja
Contient des gaz à effet de serre fluorés
Sadržava fluorirane stakleničke plinove
Fluortartalmú üvegházhatású gázokat tartalmaz
Contiene gas fluorurati a effetto serra
Sudėtyje yra fluorintų šiltnamio efektą sukeliančių dujų
Satur fluorētas siltumnīcefekta gāzes
Fih gassijiet fluworurati b'effett ta' serra
Bevat gefluoreerde broeikasgassen
Zawiera fluorowane gazy cieplarniane
Contém gases fluorados com efeito de estufa
Conține gaze fluorurate cu efect de seră
Vsebuje fluorirane toplogredne pline
Obsahuje fluórované skleníkové plyny
Innehåller fluorerade växthusgaser

950205-07796

DS1900515

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.

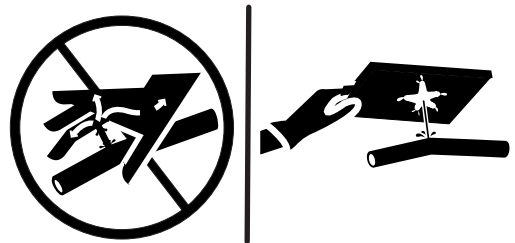
Pressurized Fluids

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.

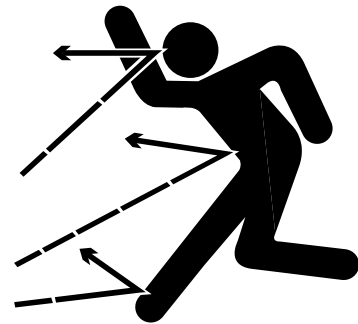
To prevent hot coolant from spraying out, stop engine and wait for coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

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.



HDO1015I

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 3-8, 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.

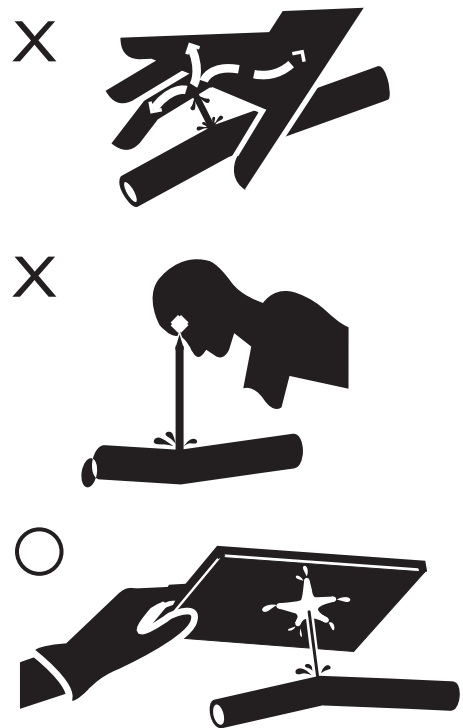
Hydraulic System

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.



HDO10451

Figure 12

Fueling

Use caution when you are refueling a machine.

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

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

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

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

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

Always place plastic fuel containers on the ground before filling.



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.*



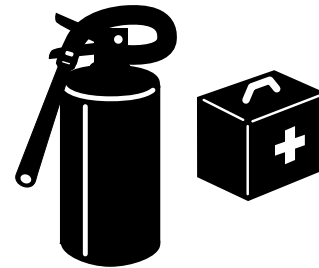
FG018459

Figure 15

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

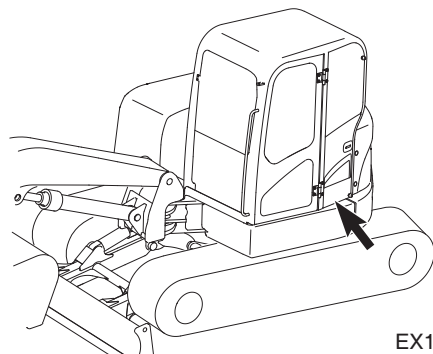
To be prepared in the event of a fire:

- 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



EX1300291

Figure 17

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.

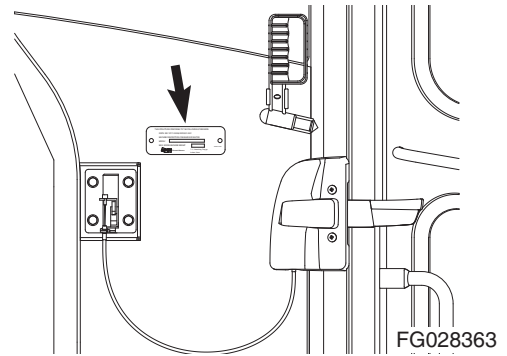


Figure 18



WARNING

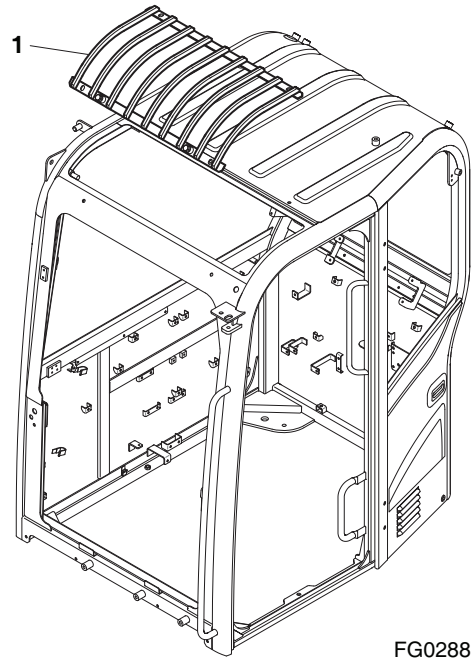
AVOID DEATH OR SERIOUS INJURY

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.).



FG028814

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.

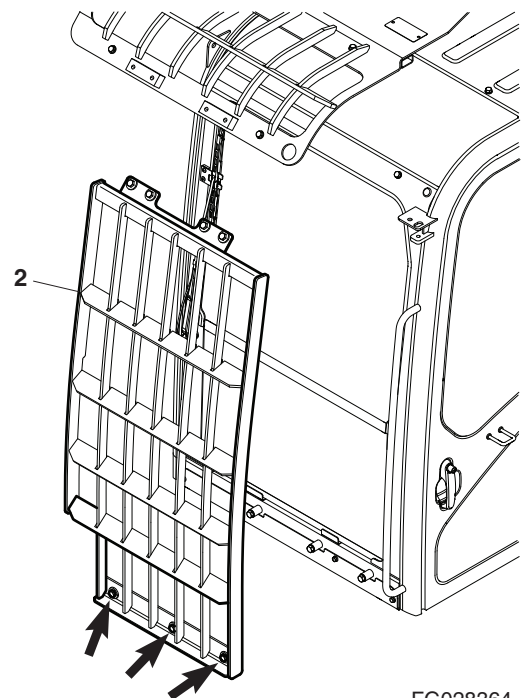
When OPG is installed, and front window needs to be cleaned, loosen bolts marked with arrows (Figure 20). Be sure to tighten bolts when done.

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.*



FG028364

Figure 20

Emergency Exit from Operator's Station

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

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

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

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

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

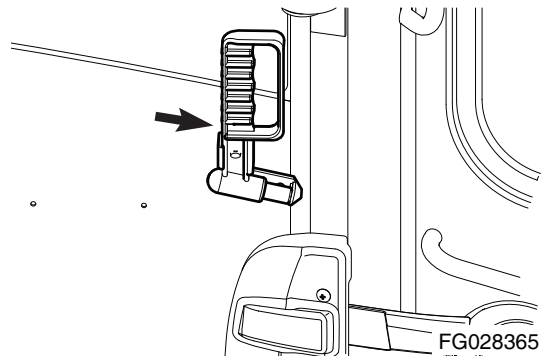


Figure 21

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 tracks and undercarriage. On a rainy day, be careful since ramp surfaces can be slippery.
- Turn auto idle switch "OFF".
- Run engine at low speed and travel slowly.
- When on ramps, do not operate any control lever except for travel lever.
- Never correct your steering on ramps. If necessary, drive off ramps, correct machine direction, then drive back onto ramps.

- When driving up or down ramps, the center of gravity of machine will change suddenly causing the tracks to drop down to the ramps or trailer. This will occur at the joint between the ramps and trailer. Travel slowly over this point.
- For machines equipped with a cabin, always lock door after loading machine to prevent door from suddenly opening during transportation.

Transporting Machine

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

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

OPERATION

Always make sure that the machine is properly maintained.

Before Engine Starting

Machine Condition

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

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

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

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

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

Know maximum operating dimensions of your machine.

Work Site

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

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

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

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

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

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

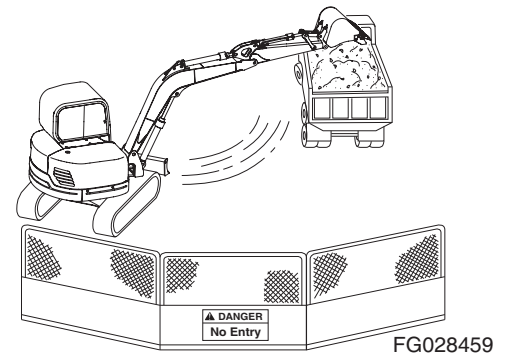


Figure 22

Mounting/Dismounting

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

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

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

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

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

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

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

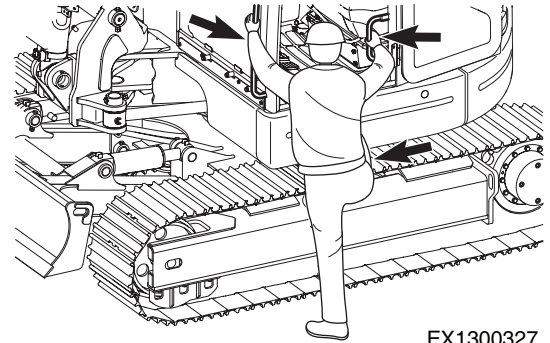


Figure 23

Cleaning

Remove all straw, wood chips, leaves, grass, paper and other flammable debris accumulated in engine compartment, Diesel Particulate Filter (DPF), 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.

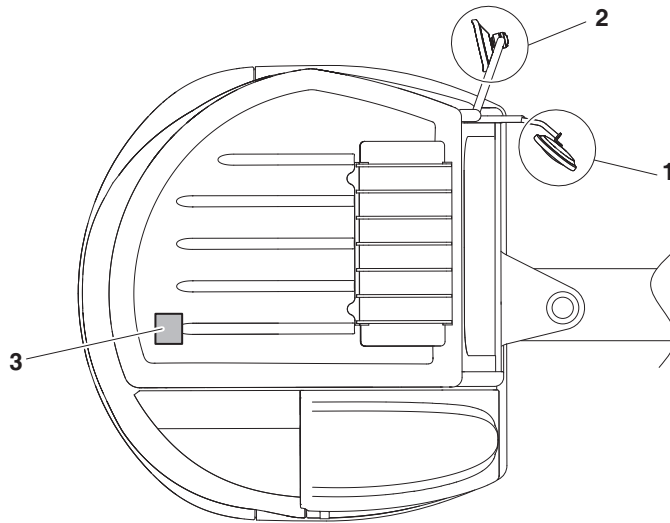
Always wear seat belt when operating machine.

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.*

NOTE: *Your machine may be equipped with additional visual aids other than the Figure 24 shown.*



- 1. Front Mirror on the Cabin (1)
- 2. Front Mirror on the Cabin (2)
- 3. Rear View Camera

DS1801537

Figure 24



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Adjust visual aids for best visibility around machine.

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

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.

Restricted Visibility

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

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

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

Figure 25 ~ Figure 26 provide an approximate visual indication of the areas at ground level inside a radius of 12 m (39' 4") from the operator of significant restricted visibility for various machine configurations.

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

- Visible areas without visual aids at the ground level

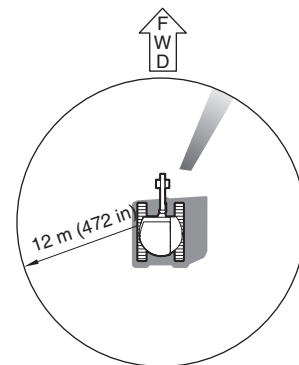


Figure 25

DS1801534

- Visible areas with rear CCTV and mirrors

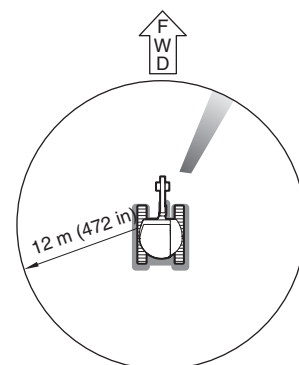


Figure 26

DS1801535

- Machine travel position
 - A is 2.5 m (8' 2") from swing center to bucket pin
 - B is 3.8 m (12' 6") from ground to arm pin

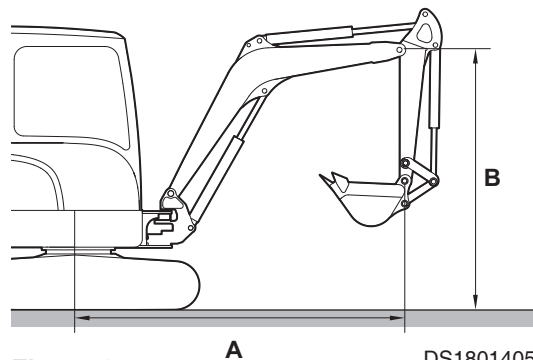


Figure 27

DS1801405

Mirror Adjustment

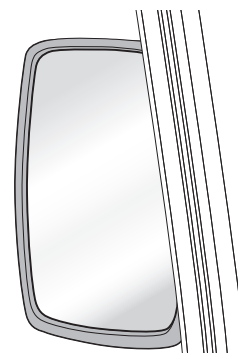
Frequently ensure the mirrors are directed properly.

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

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

1. Front mirror on the cabin (1)

If equipped, adjust the front mirror on the cabin (1, Figure 24) so the front of the right track can be seen from the operator seat.

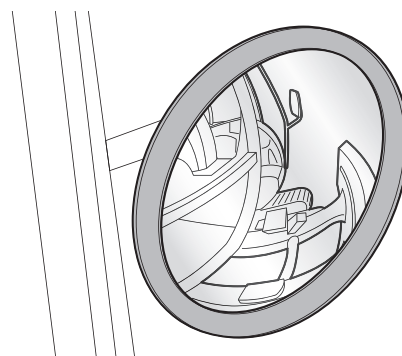


DS1801333

Figure 28

2. Front mirror on the cabin (2)

If equipped, adjust the front mirror on the cabin (2, Figure 24) so the left side cover of machine can be seen from the operator seat.



DS1801222

Figure 29

3. Additional mirrors other than Figure 24

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

Work Site Rules

- If visibility cannot be sufficiently assured, use a flagman. The operator should pay careful attention to signals and follow instructions from flagman.
- Signals should only be given by one flagman.
- When working in dark places, turn "ON" work lights and front lights on the machine. Set up additional lighting in area.
- Stop operations if there is poor visibility, such as fog, snow, rain, or sandstorms.
- Check mirrors and rear view camera (if equipped) on machine before starting operations. Clean off any dirt and adjust view for good visibility.

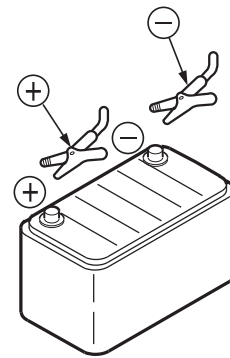
When operating or traveling during poor visibility conditions, follow the preceding work site rules.

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

Boost Starting or Charging 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 3-8, 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 30

Swinging or Traveling

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

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

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

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

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

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

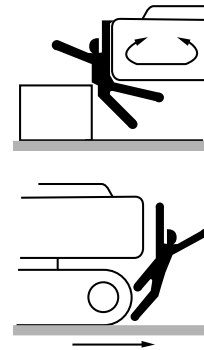


Figure 32

HAOA190

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

Do not operate attachments while traveling.

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

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

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

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

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

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

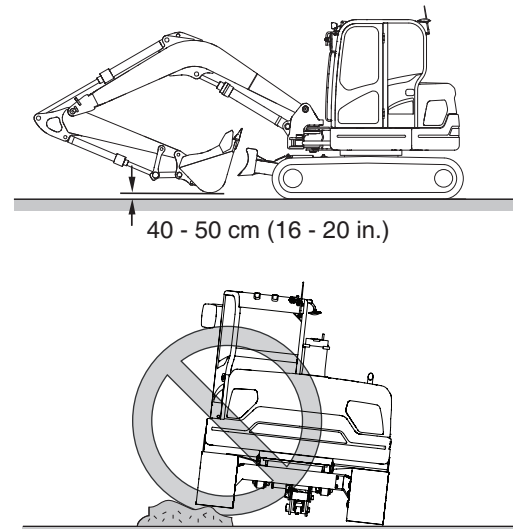
Never exceed maximum permitted load for bridges.

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

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

Keep height and length of attachment in mind.

Travel Position



FG028460

Figure 33

Lifting and Digging

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

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

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

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

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

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

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

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

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

Operation on Slopes

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

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

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

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

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

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

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

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

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

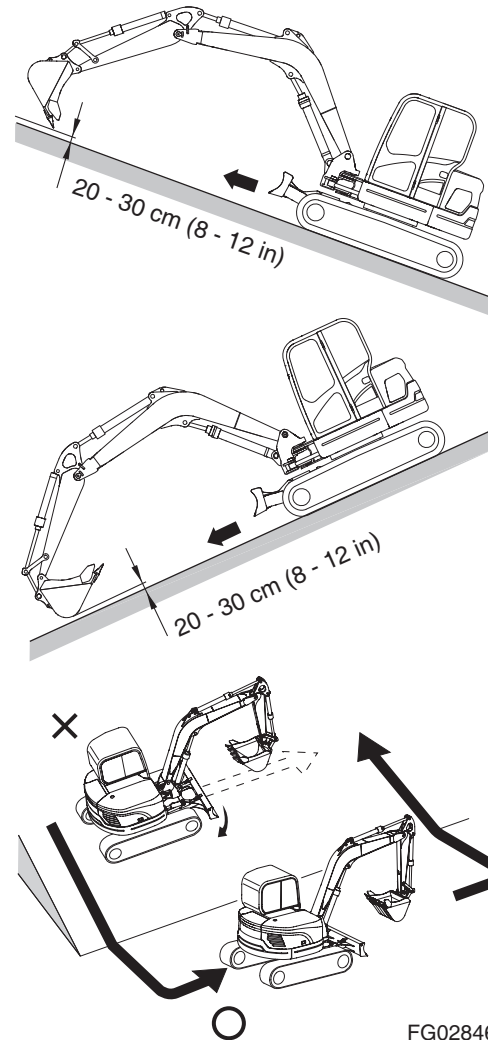


Figure 34

FG028461

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

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

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

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

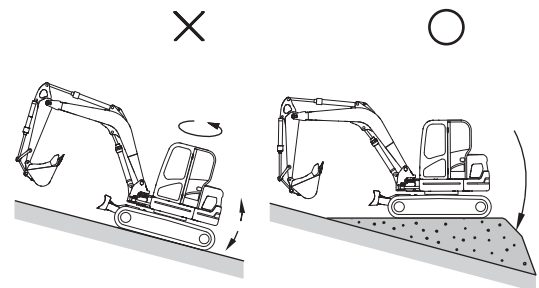


Figure 35

FG028462

Towing

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

- Follow the instruction given in this manual.
- When performing preparation work for towing with two or more personnel, determine signals to use and correctly follow these signals.
- Always attach wire rope onto left and right hooks and secure in position.
- If engine on machine with problem 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. 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.

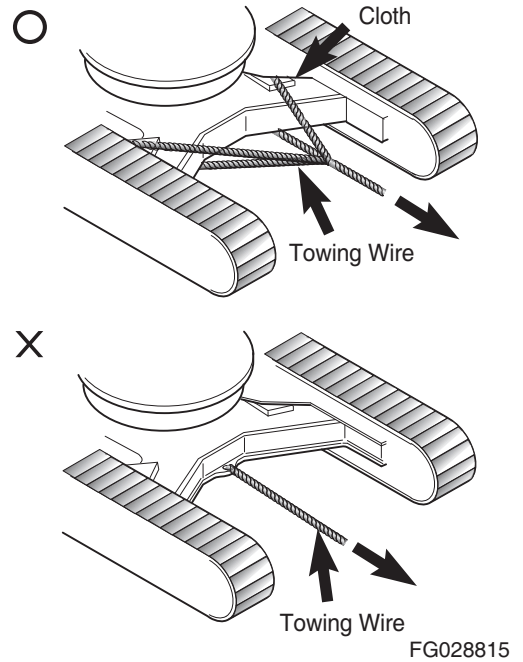


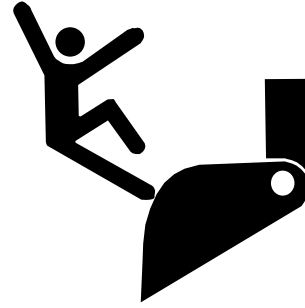
Figure 36

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.



ARO1310L

Figure 37

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.

Wear appropriate personal protective equipment and follow the established procedure in the Operation & Maintenance Manual "Equipment Lowering with Engine Stopped" on page 3-64 in the Operation Section of the manual.

Engine Stop

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

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

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

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

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

Parking Machine

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

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

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

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

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

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

Always move hydraulic lockout control to "LOCK" position before stopping the engine or immediately after engine stops running.

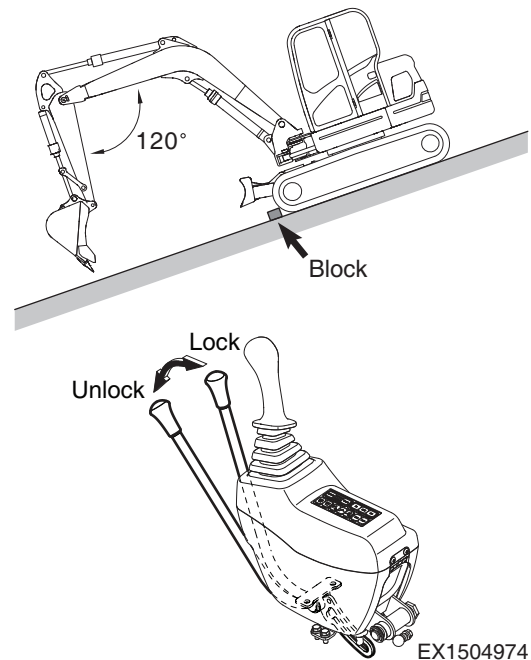


Figure 38

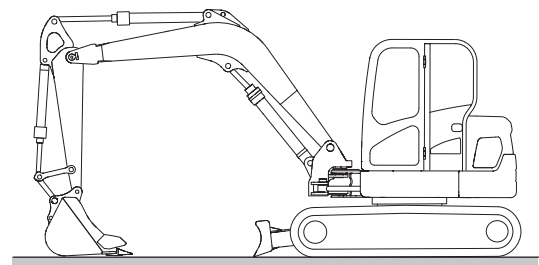


Figure 39

Preservation/Storing Machine

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

Conditions	Maintenance Required
Cleaning	Pressure wash undercarriage and track assemblies. Inspect for damage or loose or missing parts.
Lubrication	Perform all daily lubrication procedures.
	Apply a coating of light oil to exposed plated metal surfaces, such as hydraulic cylinder rods, etc.
	Apply a coating of light oil to all control linkages and control cylinders (control valve spools, etc.)
Battery	Turn "OFF" the battery disconnect switch.
Cooling System	Inspect coolant recovery tank to make sure that antifreeze level in system is at correct level.
	Every 90 days, use a hydrometer to measure protection level of coolant. Refer to "Antifreeze Concentration Tables" on page 4-73, 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 3-10, 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 3-66, 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.)

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 lock lever in "UNLOCK" position. Cycle work levers (joysticks) back and forth, left and right at full stroke 2 to 3 times to eliminate remaining internal pressure in hydraulic circuit. Then move safety lock lever to "LOCK" position.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine starter switch key and press horn switch. If horn does not sound, the main power is shut off.)
- Put blocks under track to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
 - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
 - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.
- Do not touch any control levers or control pedals. If any control levers or control pedals must be operated, always give a signal to other workers and instruct them to move away.

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

Warning Tag

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

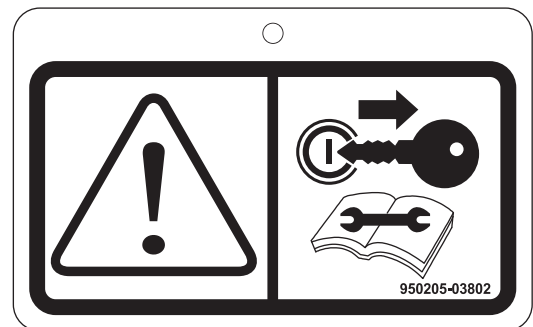
"DO NOT OPERATE" warning tags, are available from your DOOSAN distributor.

- 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 (Special Instruction, SEHS7332) are available from your DOOSAN distributor.



EX1301177

Figure 40

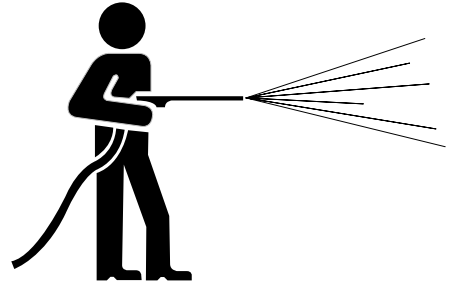
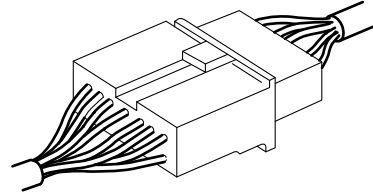
Cleaning

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 41

Proper Tools and Clothing

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



HDO1037L

Figure 42

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.



Figure 43

HDO1040L

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.



Figure 44

HDO1015I

Burn Prevention

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

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

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

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

Allow cooling system components to cool before draining cooling system.

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

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

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

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

Do not smoke while you are checking battery electrolyte level.

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

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

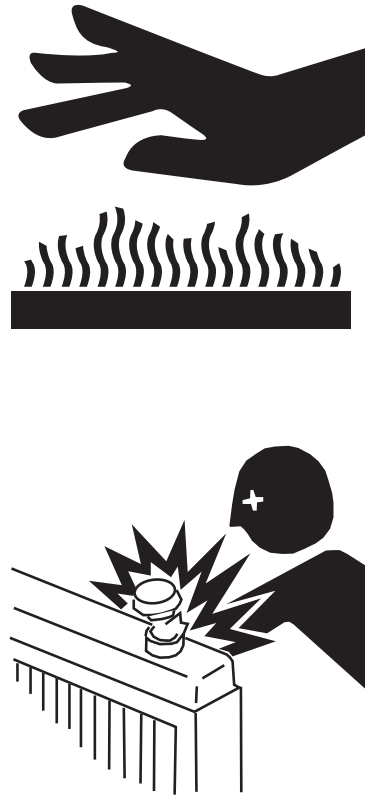


Figure 45

haae2090

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.
- 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 the disconnect switch to the OFF position, disconnect the negative battery (-) terminal completely, and cover the disconnected cable with insulator to keep it out of the machine.
2. Disconnect the connector between ECU and machine, and the connector between ECU and engine.
3. Proceed with welding.
4. After welding, connect the connector between ECU and machine, and the connector between ECU and engine.
5. Clean battery compartment.
6. Connect the negative battery (-) terminal and turn the disconnect switch to the ON position.
7. Close battery compartment door.

NOTE: When connecting the negative battery (-) terminal to the frame ground, keep the following tightening order: frame earth seat → battery cable → main harness → (washer) → bolt.

NOTE: Remove any foreign material and rubber tube from the installation surface so that the ring terminal of the main harness can be installed to the battery terminal firmly.

NOTE: Remove any rust and foreign material from the installation surface of the battery terminal and frame earth seat before installation.

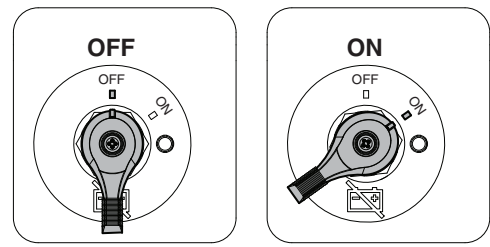


Figure 46

EX1500481

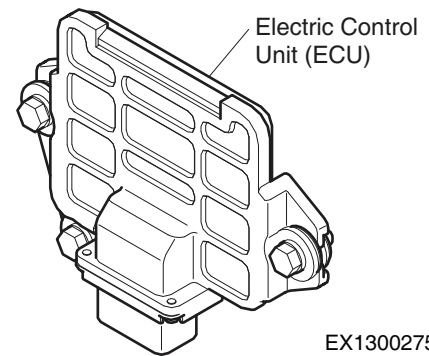


Figure 47

EX1300275

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.

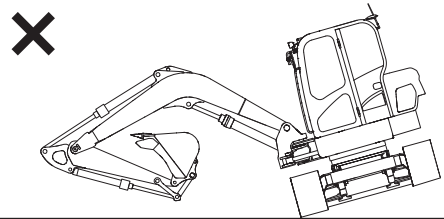
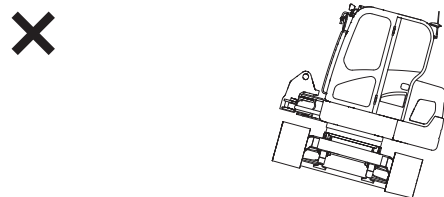


Figure 48

FG028465

Lock Inspection Covers

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

Working on Machine

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

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



ARO1380L

Figure 49

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 4-76.

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.



FG018458

Figure 50

Compressed Air

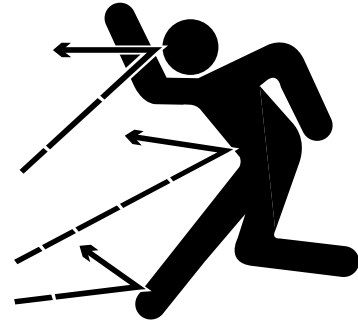
- When cleaning filters, radiator or other components with compressed air, there is a hazard of flying particles that can result in serious injury.
- Always wear safety goggles, dust mask, leather gloves, and other protective devices.

Track Tension Adjustments

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

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

Keep your face and body away from grease valve. Refer to "Track Tension" on page 4-77, for proper procedure in this manual or Shop Manual.



HAOA110L

Figure 51

Supports and Blocking for Work Equipment

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

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

Do not use hollow, cracked or unsteady wobbling supports.

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



HDO1042L

Figure 52

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 4-76.

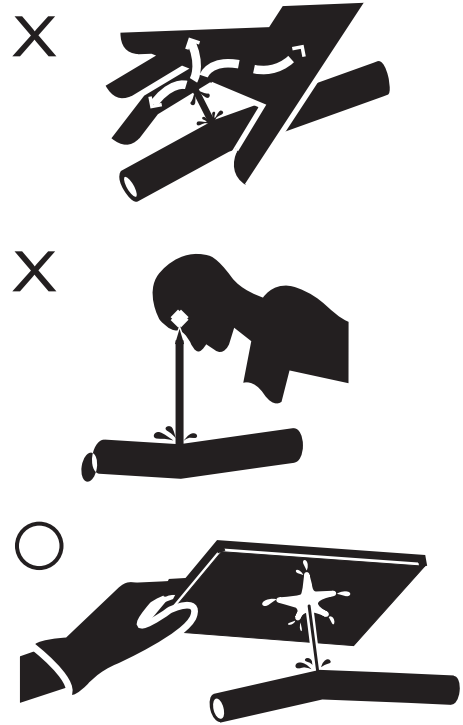
Always do the following:

- 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 4-60, 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.



HDO10451

Figure 53

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.

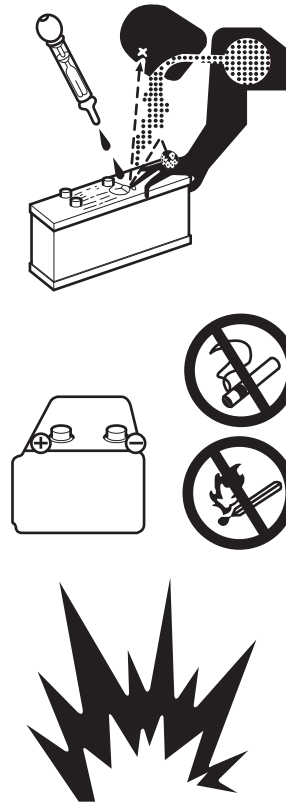


Figure 54

FG018464

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.

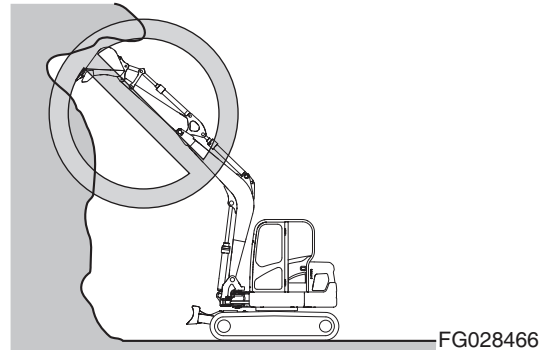


Figure 55

Deep Digging

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

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

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

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

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

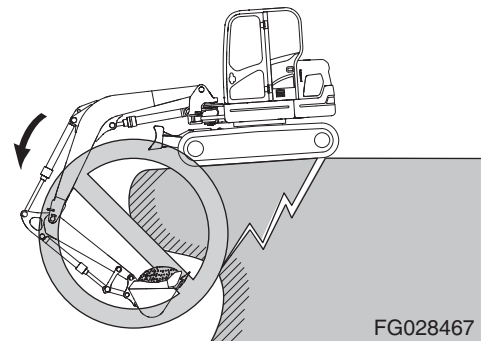


Figure 56

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.

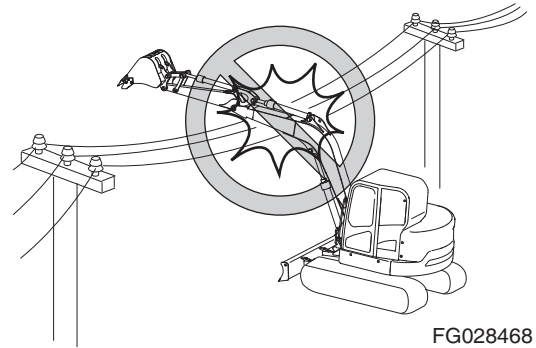


Figure 57

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.

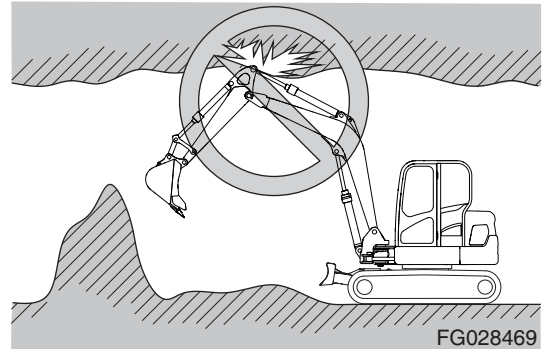


Figure 58

Working in Water

IMPORTANT

Do not exceed maximum permissible water depth. The water level must not reach higher than centerline of upper track roller(s) (1, Figure 59).

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.

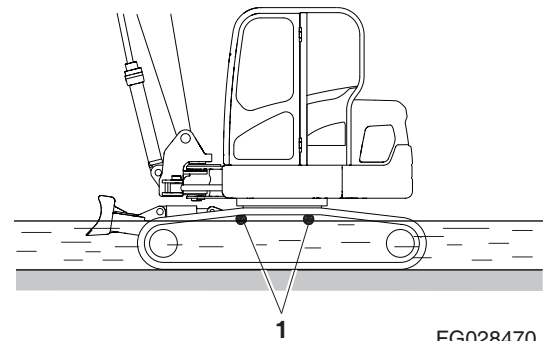


Figure 59

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. Check cooling system for correct mixture of antifreeze solution for lowest expected temperature. Carefully inspect cooling system and repair as necessary.
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.
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 4-7, in this manual or Shop Manual for details.
5. Always keep fuel tank full. Drain condensation from tank before and after operation. Drain and service fuel filter. To eliminate clogging of fuel filters because of wax crystal formation in fuel, be sure that fuel used has a cloud point specification below lowest expected temperature.
6. Lubricate entire machine according to "Description of Lubrication and Service Chart" on page 4-14, 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 4-20 and "Check for Leaks in Fuel System" on page 4-21, 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 "Description of Lubrication and Service Chart" on page 4-14, in this manual or Lubrication Decal on machine.
5. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from sun, dirt and dust.
 - A. Cover machine if no suitable shelter is available. Protect engine compartment and hydraulics from dirt and debris.

- B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season. Rust and paint blisters will appear on metal surfaces and fungus growth on other surfaces.
- C. Protect all unfinished, exposed surfaces with a film of preservative oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation In Dusty and Sandy Areas

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

2. Use care when servicing fuel system to prevent dust and sand from entering tank.
3. Service air cleaner at frequent intervals, check air restriction indicator daily and keep dust cup and dust valve clean. Prevent dust and sand from entering engine parts and compartments as much as possible.
4. Lubricate and perform services outlined on current lubrication chart on machine and "Description of Lubrication and Service Chart" on page 4-14. Clean all lubrication fittings before applying lubricant. Sand mixed with lubricant becomes very abrasive and accelerates wear on parts.
5. Protect machine from dust and sand as much as possible. Park machine under cover to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

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

1. Keep all exposed surfaces coated with preservative oil. Pay particular attention to damaged or unpainted surfaces. Cover all paint cracks and chip marks as soon as possible to prevent corrosive effects.

Operation in Saltwater Areas

Saltwater and saltwater spray is very corrosive. When operating in saltwater areas, or in or around snow, observe the following precautions:

1. When exposed to saltwater, dry machine thoroughly and rinse with freshwater, as soon as possible.
2. Keep all exposed surfaces coated with preservative oil. Pay attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or "Description of Lubrication and Service Chart" on page 4-14, in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

Operation at High Altitudes

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

1. Check engine operating temperature for evidence of overheating. The 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.

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.



ARO1770L

Figure 60



ARO1770L

Figure 61

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.

Sound

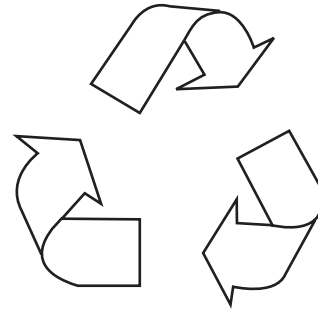
Sound Level Information: Hearing protection may be needed when machine is operated with an open operator station for extended periods or in a noisy environment.

Sound pressure level (LpA) at operator position (Measurement according to ISO 6396)	73 dB(A)
Sound power level (LwA) around the machine (Measurement according to 2000/14/EC with applicable appendices and measuring method according to ISO 6395)	97 dB(A)



ARO1770L

Figure 62



FG009156

Figure 63

Vibration Information

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

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

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

Hand/Arm Vibration Level

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

Whole Body Vibration Level

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

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

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

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

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

Operating Controls

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

1. "Component Locations" on page 2-2
2. "Operator's Area" on page 2-4
3. "Operational Controls and Panels" on page 2-6
4. "Display Monitor" on page 2-21
5. "User Menu" on page 2-38
6. "Heater and Air Conditioner Control Panel" on page 2-47
7. "Stereo" on page 2-51
8. "Miscellaneous Electrical Devices" on page 2-52
9. "Seat Adjustment" on page 2-55
10. "Front Windows" on page 2-59
11. "Door Side Latch" on page 2-61
12. "Cabin Storage Compartments" on page 2-61
13. "Sun Visor (Optional)" on page 2-62
14. "Hanger" on page 2-62
15. "Emergency Exit Glass Breaking Tool" on page 2-62

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

Indicator lights work besides the gauges on the instrument panel. The operator should monitor machine pressure on the instrument panel with indicator lights. These lights will only show there is a problem.

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

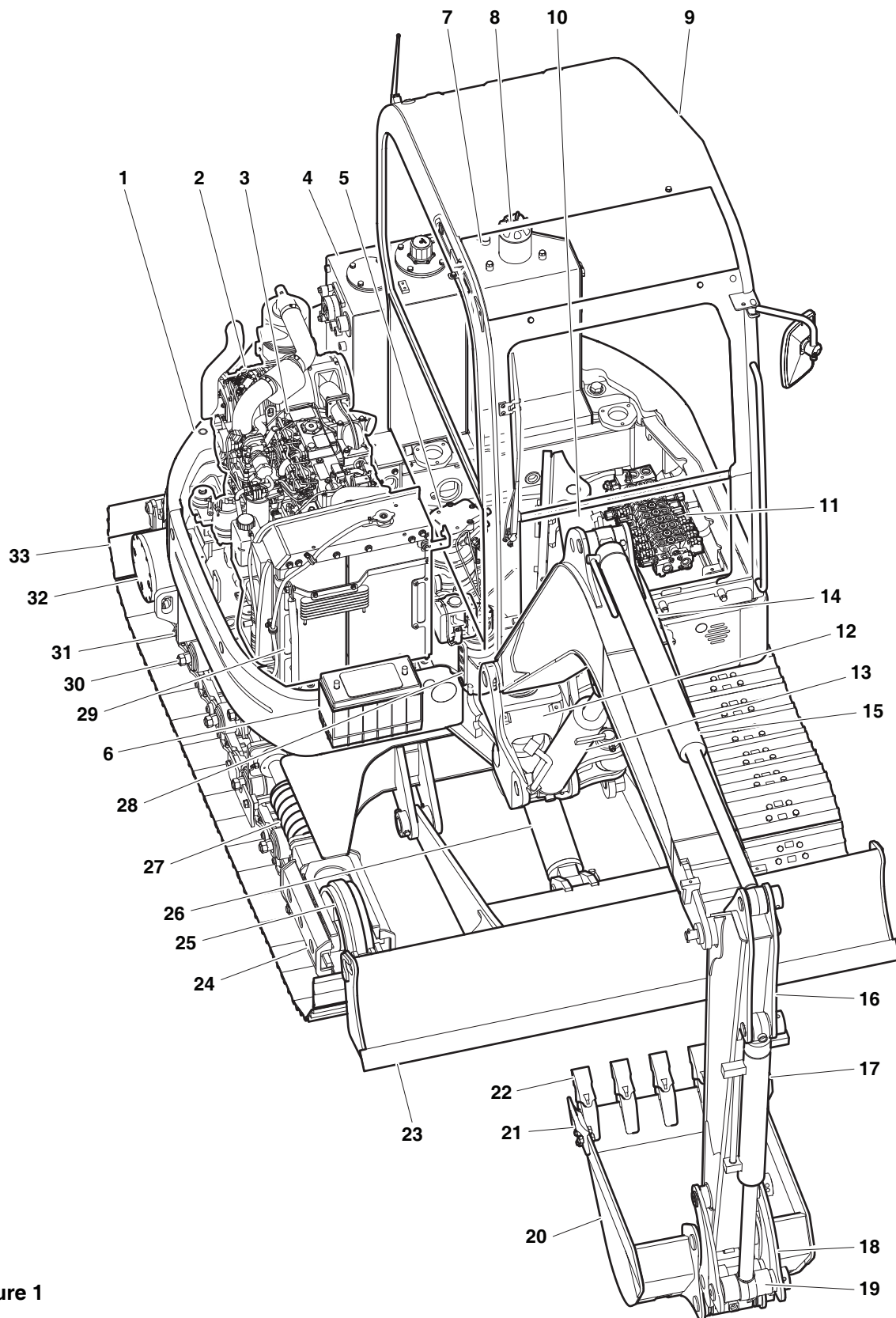


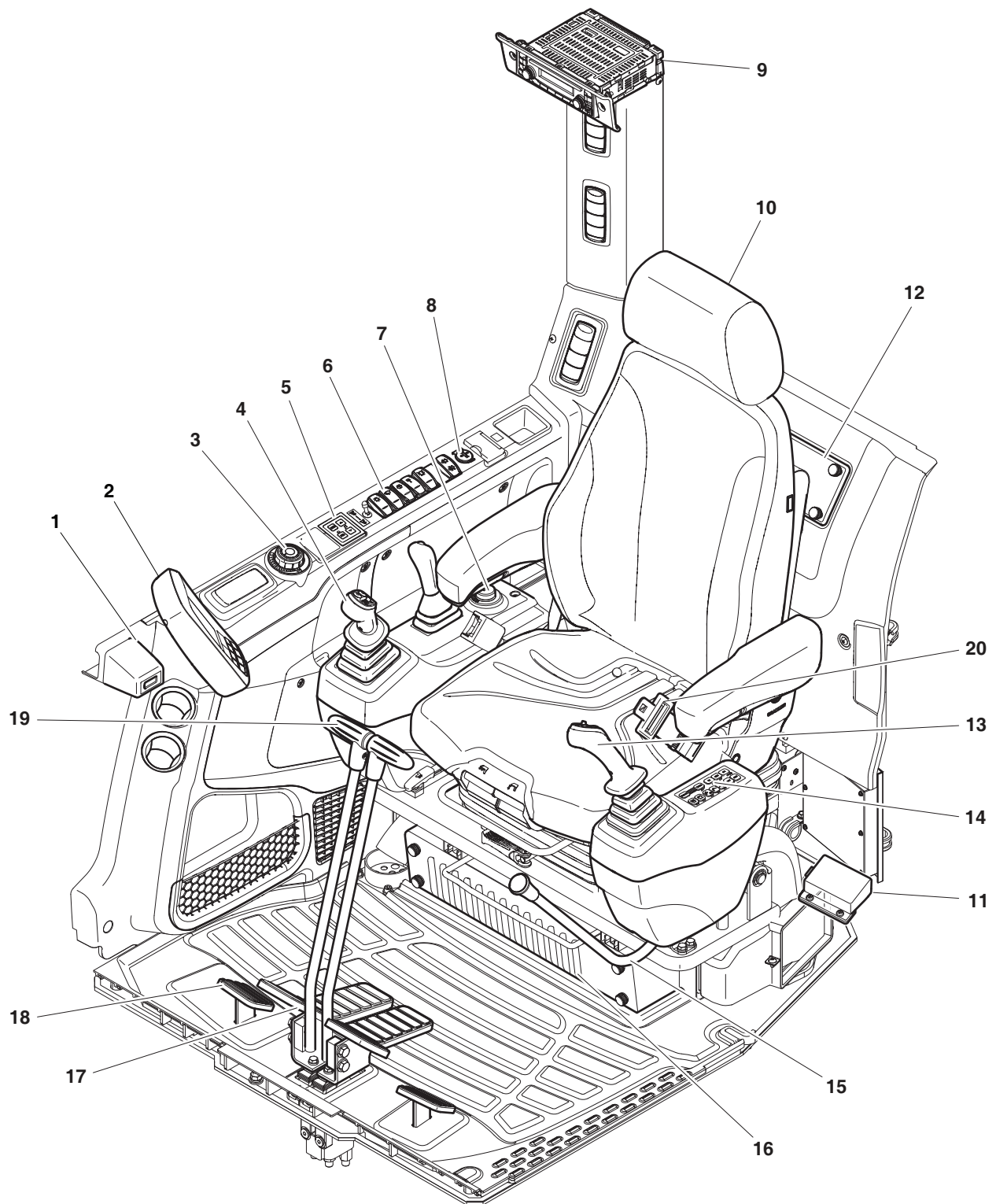
Figure 1

EX1300326

Reference Number	Description
1	Counterweight
2	DPF
3	Engine
4	Hydraulic Oil Tank
5	Swing Motor
6	Battery
7	Fuel Tank
8	Fuel Tank Fill Cap
9	Cabin
10	Boom Swing Cylinder
11	Control Valves
12	Swing Bracket
13	Boom Cylinder
14	Boom
15	Arm Cylinder
16	Arm
17	Bucket Cylinder

Reference Number	Description
18	Guide Link
19	Push Link
20	Bucket
21	Side Cutter
22	Tooth Point
23	Blade
24	Track Guide
25	Idler
26	Blade Cylinder
27	Track Adjuster
28	Center Joint
29	Radiator and Oil Cooler
30	Upper Roller
31	Lower Roller
32	Travel Motor
33	Track Link and Shoe

OPERATOR'S AREA



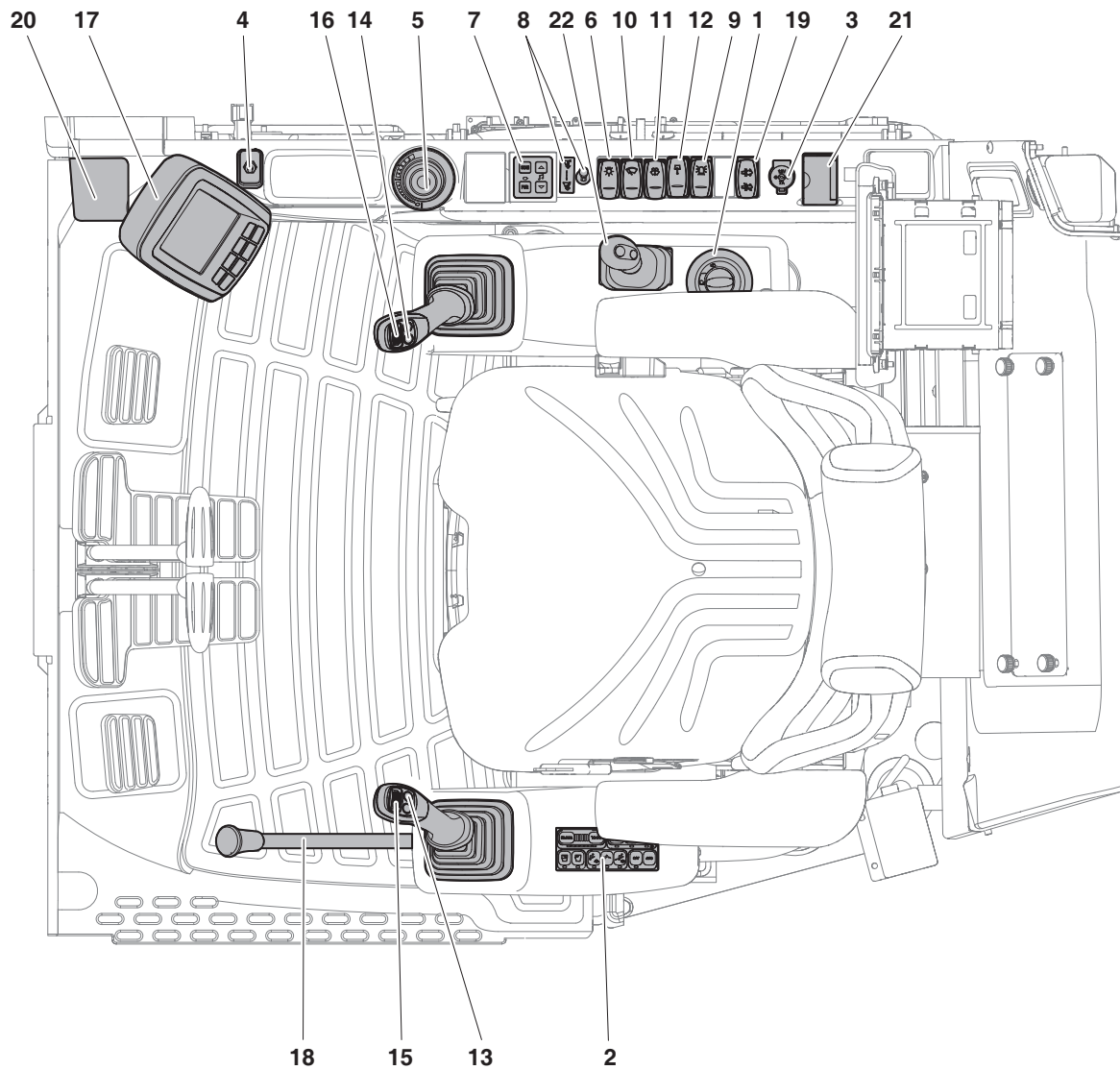
DS1801845

Figure 2

Reference Number	Description
1	Hour Meter
2	Display Monitor
3	Engine Speed Control Dial
4	Right-hand Work Lever (Joystick)
5	Audio Control Panel
6	Switch Panel
7	Starter Switch
8	Power Socket for 12 Volt
9	Audio
10	Seat
11	Fuse Box

Reference Number	Description
12	Electronic Box
13	Left-hand Work Lever (Joystick)
14	Heater and Air Conditioner Control Panel
15	Safety Lever
16	Air Conditioner Unit
17	Travel Pedal
18	Footrest
19	Travel Levers
20	Seat Belt

OPERATIONAL CONTROLS AND PANELS



DS1801846

Figure 3

Reference Number	Description
1	Starter Switch
2	Heater and Air Conditioner Control Panel
3	Power Socket for 12 Volt
4	Engine Emergency Stop Switch
5	Engine Speed Control Dial
6	Light Switch
7	Audio Control Panel
8	Quick Coupler Switch (Optional)
9	Warning Light Switch (Optional)
10	Wiper Switch
11	Windshield Washer Switch
12	Boom Swing Switch (Optional)

Reference Number	Description
13	Horn Button (Left-hand Work Lever)
14	Breaker Button (Right-hand Work Lever)
15	Rotating/Boom Swing Switch
16	Shear Switch
17	Display Monitor
18	Safety Lever
19	Diesel Particulate Filter (DPF) Switch
20	Hour Meter
21	Jack Assembly
22	2-speed Button

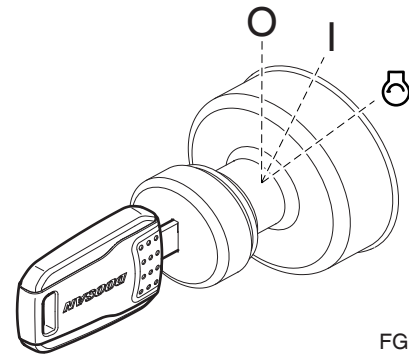
1. Starter Switch

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

- O. Turning the switch to this position turns the engine "OFF" with its electrical system. In this position the engine is "OFF" but the interior cabin light and fuel tank transfer pump (if equipped) are functional.
- I. Turning the switch to this position turns the engine electrical system "ON". The battery warning light and the oil pressure indicator light must be "ON".

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



FG018093

Figure 4



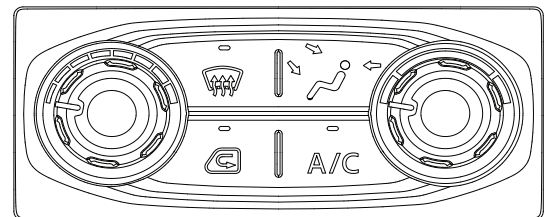
WARNING

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 2-47, for more information.



DS2100281

Figure 5

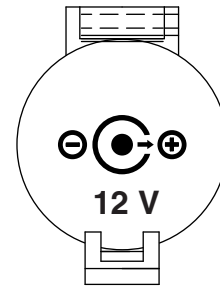
3. Power Socket for 12 Volt

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.*



ARO0090L

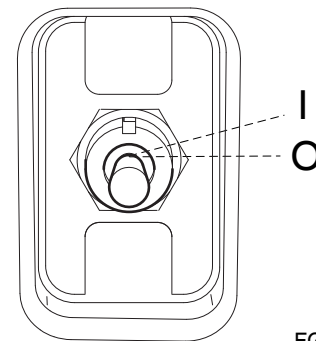
Figure 6

4. Engine Emergency Stop Switch

If the engine does not 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.

NOTE: *When released, the switch will return to its original position "O" (OFF) position.*



FG017886

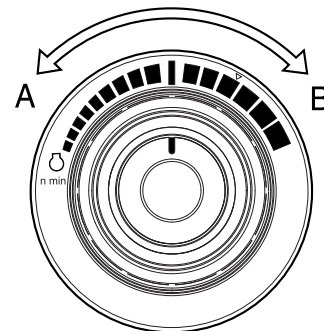
Figure 7

5. Engine Speed Control Dial

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

- A Low Idle (Lowest engine speed).
- B High Idle (Highest engine speed).

NOTE: *The auto idle system will automatically reduce engine speed to "LOW IDLE" approximately four seconds after all the control levers are in the "NEUTRAL" position. This system is designed to reduce fuel consumption and noise. See "1. Auto Idle Selector Button" on page 2-34.*



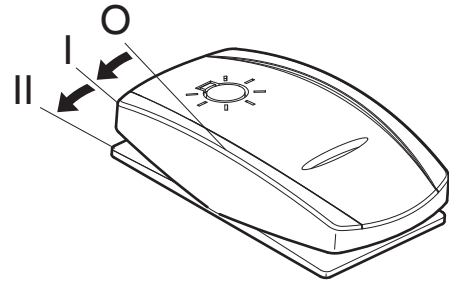
FG017853

Figure 8

6. 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

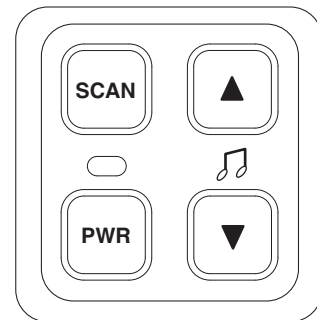
Figure 9

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 battery.

7. Audio Control Panel

The audio system can be remotely controlled using this panel.



FG028164

Figure 10

Power Button

If the audio system is turned off: The audio system will be turned on when the power button is pressed, and the indicator light will be turned on.

If the audio system is turned on: The audio system will be turned off if the power button is pressed for approximately two seconds, and the indicator light will also be turned off. If the power button is pressed shortly, the audio will be in the "Mute" mode, and the indicator light will not be turned off.

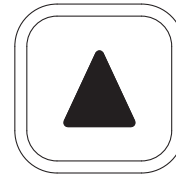


FG000019

Figure 11

Increase Volume

Press the up button, to "INCREASE" volume.

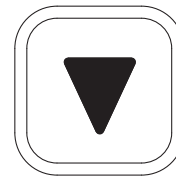


FG000020

Figure 12

Decrease Volume

Press the down button, to "DECREASE" volume.



FG000021

Figure 13

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 14

8. Quick Coupler Switch (Optional)

This switch is used for engaging or releasing the attachment.

See "Quick Coupler Operation" for further information.

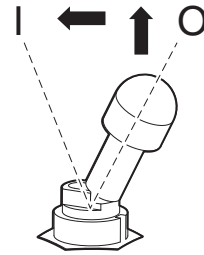


WARNING

AVOID DEATH OR SERIOUS INJURY

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

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



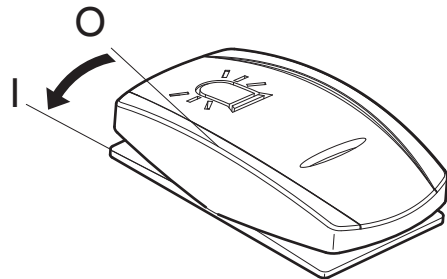
DS1903332

Figure 15

9. Warning Light Switch (Optional)

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

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



FG016020

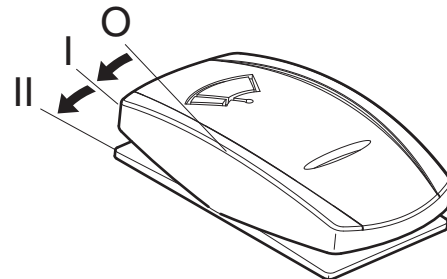
Figure 16

10. Wiper Switch

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

- O. In this position, windshield wiper is "OFF".
- I. In this position, windshield wiper runs on approximately five seconds intermittent cycle.
- II. In this position, windshield wiper runs at a constant speed.

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



FG028662

Figure 17

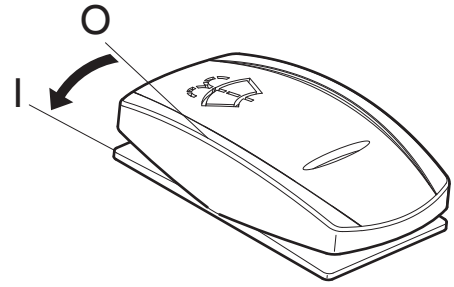
11. Windshield Washer Switch

While the windshield wiper is running, depress the washer switch to spray windshield washer fluid onto the windshield. Use only the proper windshield washer fluid in the system.

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

NOTE: Do not operate the windshield washer without any fluid. If you operate it despite running out of 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. Use standard window cleaning fluid: SSK703



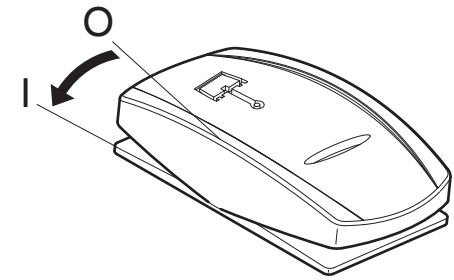
FG017855

Figure 18

12. Boom Swing Switch (Optional)

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

- O. In this position, boom swing will be deactivated. If the thumb wheel switch on the top of the left-hand work lever (joystick) is manipulated, attachment will be rotated.
- I. In this position, boom swing will be activated. If the thumb wheel switch on the top of the left-hand work lever (joystick) is manipulated, boom swing will be activated.



FG017963

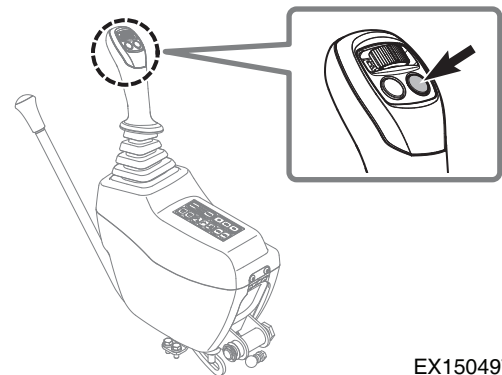
Figure 19

13. Horn Button (Left-hand Work Lever)

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

NOTE: The starter switch must be "ON".

NOTE: Pulling the thumb wheel switch backward enables you to rotate the switch up to 90 degree left or right.



EX1504975

Figure 20

14. Breaker Button (Right-hand Work Lever)

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

NOTE: *Pulling the thumb wheel switch backward enables you to rotate the switch up to 90 degree left or right.*

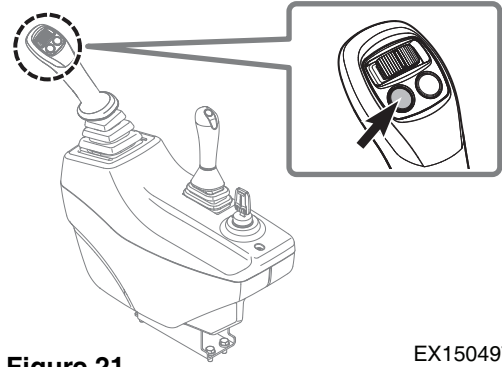


Figure 21

EX1504976

15. Rotating/Boom Swing Switch

To use the attachment rotation function, place the boom swing switch in the "O" (OFF) position (Figure 19).

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".

To use the boom swing function, place the boom swing switch in the "I" (ON) position (Figure 19).

Rotating switch "RIGHT" swings the boom clockwise.
Rotating switch "LEFT" swings the boom counterclockwise.

NOTE: *Pulling the thumb wheel switch backward enables you to rotate the switch up to 90 degree left or right.*

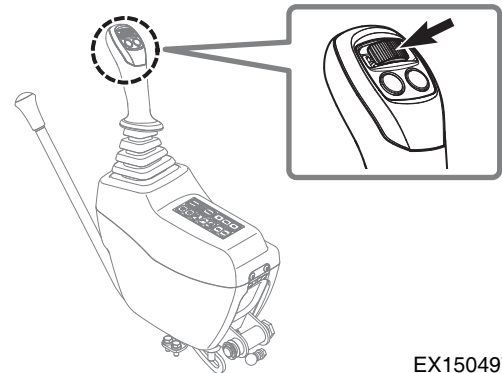


Figure 22

EX1504977



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.

16. 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. Rotating switch "UP" is for "OPENING (DUMP)" and rotating switch "DOWN" is for "CLOSING (CROWD)".

NOTE: *Pulling the thumb wheel switch backward enables you to rotate the switch up to 90 degree left or right.*



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.

17. Display Monitor

See "Display Monitor" on page 2-21.

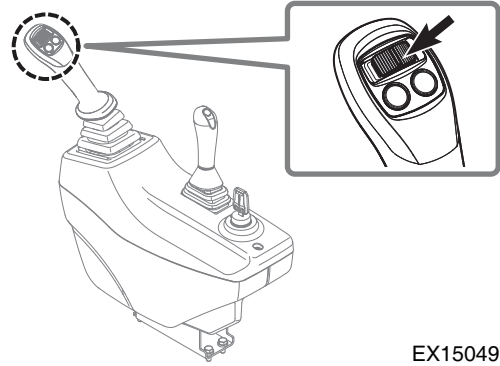


Figure 23

EX1504978

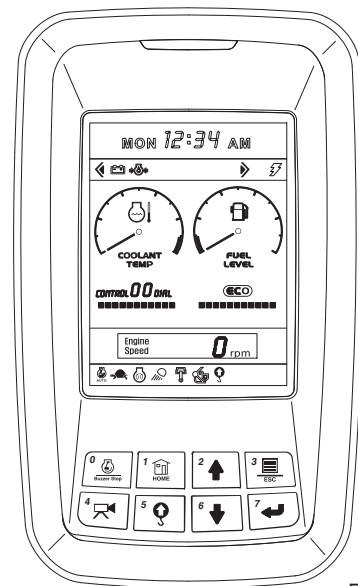
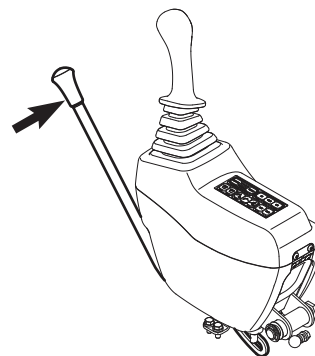


Figure 24

FG028076

18. Safety Lever

See "Safety Lever" on page 3-15.



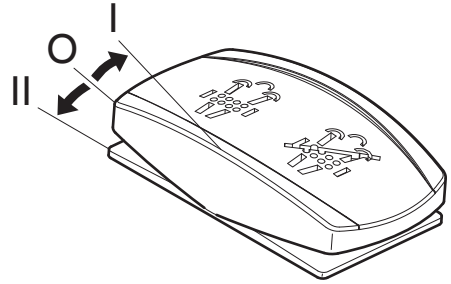
EX1504980

Figure 25

19. Diesel Particulate Filter (DPF) Switch

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

NOTE: Run machine at "LOW IDLE" and do not stop engine until regeneration cycle is completed. See "Diesel Particulate Filter (DPF) Regeneration Light and Switch" on page 3-23, for more information.



FG018280

Figure 26



WARNING

AVOID DEATH OR SERIOUS INJURY

Exhaust gas temperature and exhaust system components are very hot during manual (forced) regeneration.

FOLLOW THESE INSTRUCTIONS DURING MANUAL (FORCED) REGENERATION:

- Keep flammable material and explosive gases away from exhaust system during manual (forced) regeneration.
- Park machine in open area that is well ventilated.
- Lower boom and position arm in vertical position as shown in Figure 27.
- Move safety lever to "LOCK" position.
- Engage parking brake (wheel excavators only).
- Operator must be in operator's position during the regeneration process. Keep bystanders away.

NOTE: *Slight movement of the bucket (work tool) hydraulic cylinder can occur during the manual (forced) regeneration process.*

- O. The switch is automatically returned to this position, when it is released.
- I. In this position, used for inhibited (non-regeneration) operation of DPF regeneration.

The inhibited (non-regeneration) symbol on the display monitor will turn "ON".
- II. In this position, used for manual (forced) regeneration for DPF system.

When the DPF Regeneration Warning Symbol on the Display Monitor Turns "ON"

Manual (Forced) Regeneration

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

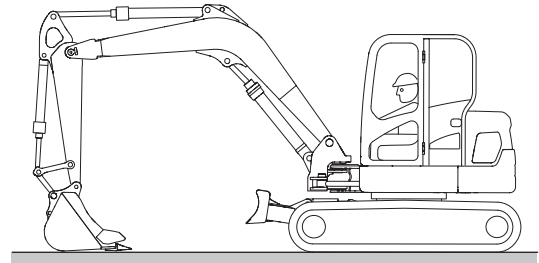
Procedures for manual (forced) regeneration by the operator.

1. Park machine in a well ventilated area and away from flammable materials. Position machine and lower boom as shown in Figure 27.
2. Set up machine in the following manner:
 - A. Operate machine until engine coolant and oil temperatures are above 70°C (158°F).
 - B. DOC inlet temperature must be over 250°C (482°F).
 - C. Set engine speed to "LOW IDLE".
 - D. Put transmission lever in "NEUTRAL" and engage parking brake (Wheel excavator only).
3. Move safety lever to "LOCK" position.
4. Activate regeneration switch (Figure 28) to start regeneration process.

NOTE: Slight movement of the bucket (work tool) hydraulic cylinder can occur during the manual (forced) regeneration process.

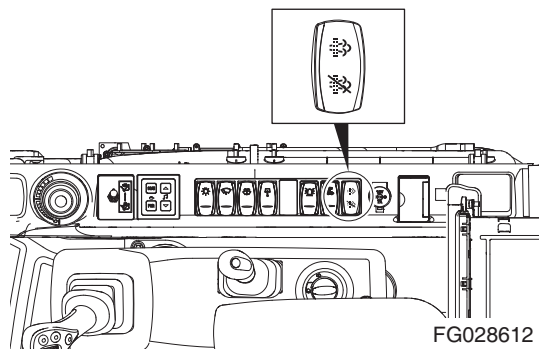
NOTE: Regeneration light on monitor (Figure 29) will be "ON".

Engine speed will gradually increase from "LOW IDLE" to 2,000 rpm and regeneration process will then start. Manual (forced) regeneration can last up to 30 minutes or more depending on amount of soot build-up.



FG028471

Figure 27



FG028612

Figure 28

During regeneration, high temperature warning light will be "ON". When regeneration stops, regeneration and high temperature warning lights will turn "OFF".

NOTE: *Operator can stop manual (forced) regeneration by raising safety lever to "UNLOCK" position. If manual regeneration is not completed for two consecutive times, the engine check warning symbol on the display monitor will turn "ON" and engine output power will be reduced.*

When the DPF Regeneration Warning Symbol on the Display Monitor is "OFF"

Manual (Forced) Regeneration

Procedures for manual (forced) regeneration by the operator.

1. Park machine in a well ventilated area and away from flammable materials. Position machine and lower boom as shown in Figure 27.
2. Set up machine in the following manner:
 - A. Operate machine until engine coolant and oil temperatures are above 70°C (158°F).
 - B. DOC inlet temperature must be over 250°C (482°F).
 - C. Set engine speed to "LOW IDLE".
 - D. Put transmission lever in "NEUTRAL" and engage parking brake (wheel excavator only).
3. Move safety lever to "LOCK" position.
4. Set DPF switch in position "I". The inhibited symbol on the display monitor will turn "ON".
5. Press and hold DPF switch in position "II" for 3 or more seconds. The DPF high temperature warning symbol (amber color) on display monitor will "BLINK".
6. Return DPF switch to position "O".
7. Press once more DPF switch in position "II". If the manual (forced) regeneration starts, the DPF high temperature warning symbol (amber color) on display monitor will turn "ON".

NOTE: *Even if the DPF switch is pressed, manual (forced) regeneration does not start until operation time or amount of PM accumulation reaches an effective range.*

Automatic regeneration is performed every 100 hr to reset soot level.

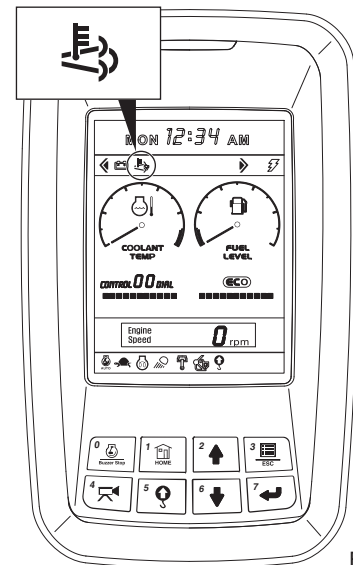
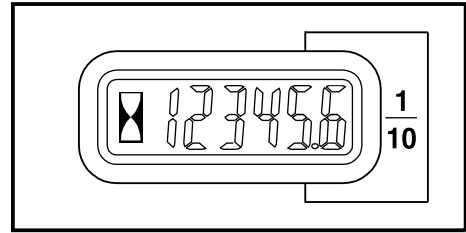


Figure 29

FG028180

20. 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.

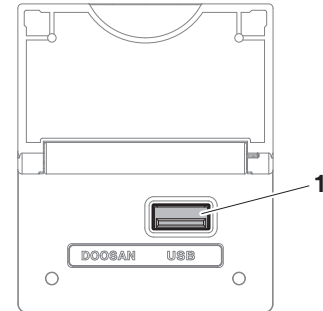


HAOA601L

Figure 30

21. Jack Assembly

1. USB Connection
Used for updating on the display monitor.



DS1800291

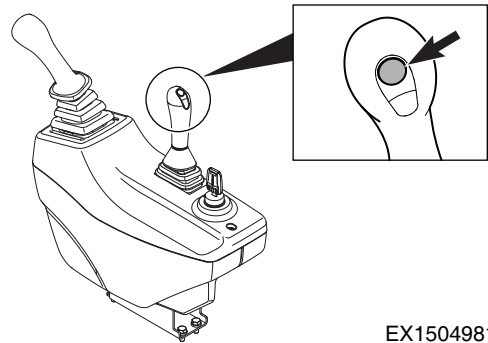
Figure 31

22. 2-speed Button

This button selects "LOW SPEED" or "HIGH SPEED" for leveling blade hydraulics. The button on top of leveling blade lever, changes speeds when pressed.

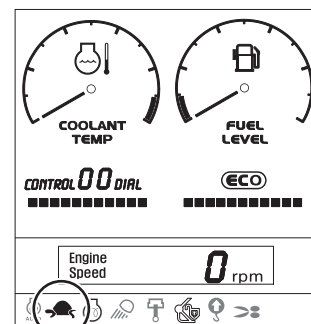
- Low-speed: 
- High-speed: 

NOTE: The "LOW" and "HIGH" speeds are only available, when the safety lever is in the "UNLOCKED" position.



EX1504981

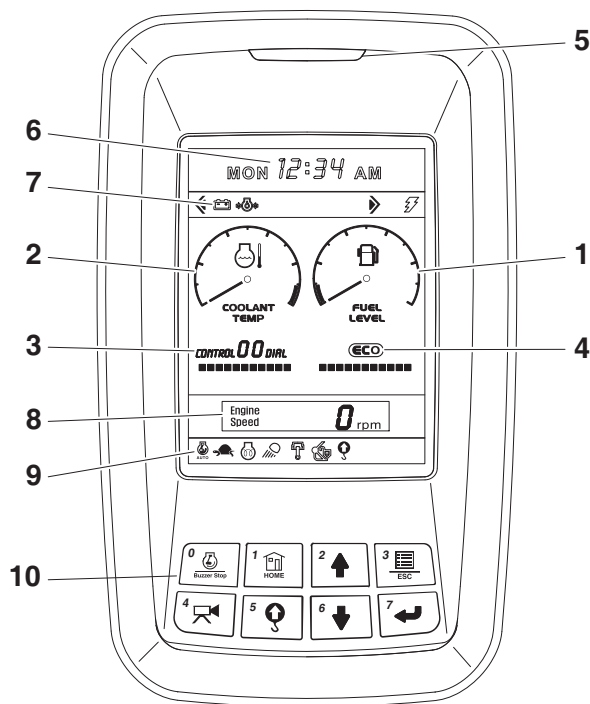
Figure 32



EX1300492

Figure 33

DISPLAY MONITOR



FG028165

Figure 34

Reference Number	Description
1	Fuel Gauge
2	Engine Coolant Temperature Gauge
3	Engine Speed Control Dial Gauge
4	ECO Gauge

Reference Number	Description
5	Warning Light
6	Digital Clock
7	Display Warning Symbols
8	Engine Speed
9	Selector Function Display
10	Function Buttons

Functional Check

When the engine starter switch is turned to "I" (ON) position, charge warning light and engine oil pressure warning light 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.

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 2-45, 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.

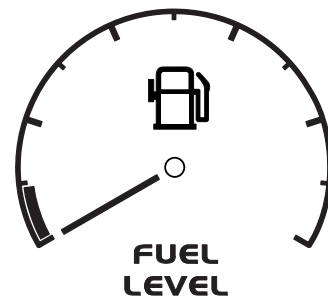
RED ZONE (■) - Indicates that fuel level is low.

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 "7. Display Warning Symbols" on page 2-25, 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.



FG017859

Figure 35

2. Engine Coolant Temperature Gauge

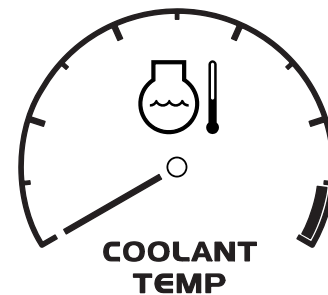
The colored bands indicate the temperature of the engine coolant.

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



FG017858

Figure 36

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. Engine Speed Control Dial Gauge

Indicates the location of the engine speed control dial.

It will displayed from 1 - 11, depending on the location.



Figure 37

FG017860

4. 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.
- Yellow color: the yellow 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 indicates that engine is not running, but the starter key is turned "ON".



Figure 38

FG018119

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 economy mode.
- Amber color gauge: fuel efficiency is in standard-power mode.
- Red color gauge: fuel efficiency is in power mode.



Figure 39

DS1602611

5. 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 2-37.

6. Digital Clock

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

Display	Description
WWW	Day
HH	Hour
mm	Minute
AM (PM)	AM (PM)

Refer to the "User Menu" on page 2-38 for time setting.

Integrating Indicator

Selecting the Home key in the home screen changes the digital clock to an Integrating Indicator.

The Integrating Indicator displays the integrated operating hours of the engine. To reset the Indicator to zero (0), press the Enter key for three seconds.

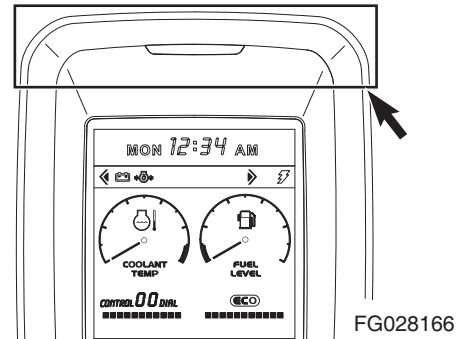


Figure 40

www HH:mm AM(PM)

FG028186

Figure 41

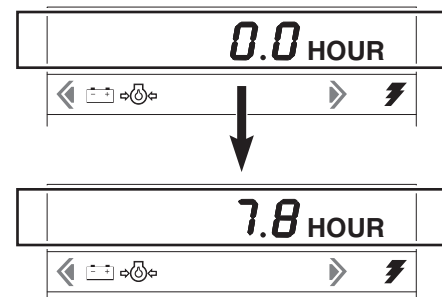
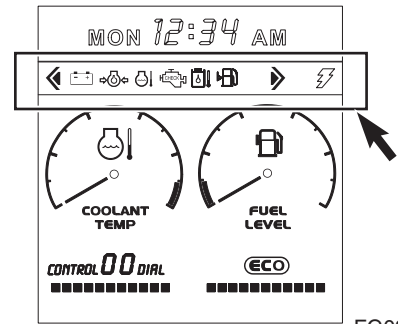


Figure 42

7. Display Warning Symbols

Reference Number	Description
1	Charge Warning Symbol
2	Engine Oil Pressure Warning Symbol
3	Engine Coolant Temperature Warning Symbol
4	Engine Check Warning Symbol
5	Hydraulic Oil Overheat Warning Symbol
6	Fuel Shortage Warning Symbol
7	Air Cleaner Clogged Warning Symbol
8	Water in Fuel Warning Symbol
9	Diesel Particulate Filter (DPF) Regeneration Warning Symbol
10	Overload Warning Symbol (Optional)
11	Diesel Particulate Filter (DPF) High Temperature Warning Symbol
12	Machine Check Warning Symbol



FG028167

Figure 43

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.

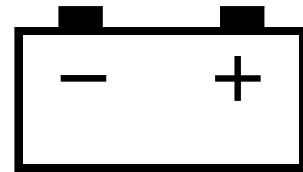


Figure 44

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.

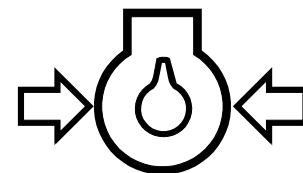


Figure 45

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.

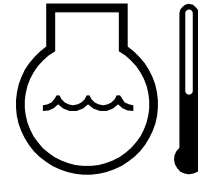


Figure 46

HAOD350L

4. Engine Check Warning Symbol

This symbol indicates when the engine needs to be check.

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

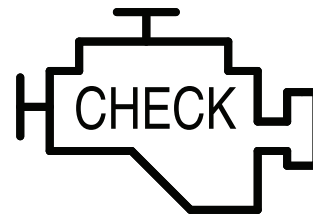


Figure 47

FG000045

5. Hydraulic Oil Overheat Warning Symbol

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

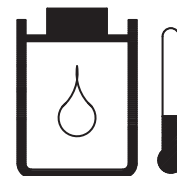


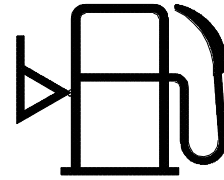
Figure 48

FG000056

6. Fuel Shortage Warning Symbol

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

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



FG000057

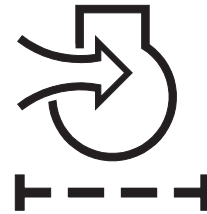
Figure 49

7. 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.



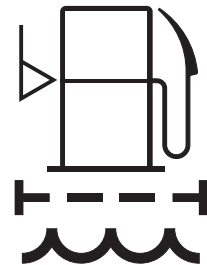
FG000053

Figure 50

8. 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.



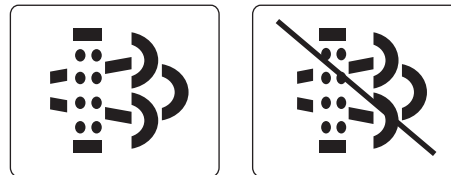
FG013744

Figure 51

9. Diesel Particulate Filter (DPF) Regeneration Warning Symbol

The left-hand regeneration symbol (Figure 52) turns "ON" when forced regeneration is required, or during the manual (forced) regeneration ready. When the operator inhibits the regeneration, the symbol will be displayed as shown in the right-hand view (Figure 52).

NOTE: *Run machine at "LOW IDLE" and do not stop engine until regeneration cycle is completed. See "Engine Exhaust Emission Control System" on page 3-21 for more information.*



FG018399

Figure 52

IMPORTANT

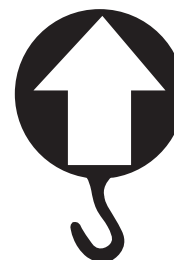
Move safety lever to "LOCK" position for manual (forced) regeneration.

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

NOTE: *If manual regeneration is not completed for two consecutive times, the engine check warning symbol on the display monitor will turn "ON" and engine rpm will be limited to 1,700 rpm.*

10. 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.



FG000253

Figure 53



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.

11. Diesel Particulate Filter (DPF) High Temperature Warning Symbol



WARNING

AVOID DEATH OR SERIOUS INJURY

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

This DPF high temperature warning symbol is shown when regeneration is in process.

Forced Regeneration - The symbol is amber color.

Active Regeneration - The symbol is green color.

NOTE: Run machine at "LOW IDLE" and do not stop engine until regeneration cycle is completed. See "Engine Exhaust Emission Control System" on page 3-21, for more information.



FG018398

Figure 54

12. Machine Check Warning Symbol

This symbol indicates when the electrical system needs to be checked.



FG028168

Figure 55

Communication Indicator

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

1. Normal Condition:

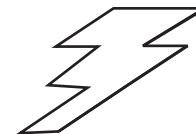
The symbol will sequentially move like lightening.

NOTE: See Figure 56.

2. Abnormal Condition:

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

NOTE: See Figure 57.



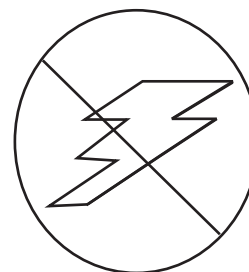
FG000047

Figure 56

Communication Error Warning

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

When this symbol is displayed, contact a DOOSAN distributor.



FG000048

Figure 57

8. Engine Speed

The engine speed is numerically displayed.

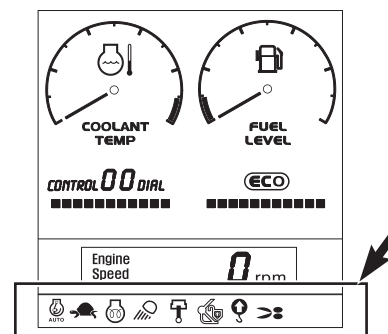


FG017861

Figure 58

9. Selector Function Display

Reference Number	Description
1	Auto Idle Indicator Light
2	Low Travel Speed Indicator Light
3	High Travel Speed Indicator Light
4	Preheating Indicator Light
5	Work Light Indicator Light
6	Boom Swing Indicator Light
7	Quick Coupler Release System Activated Indicator Light (Optional)
8	Overload Indicator Light
9	Breaker Mode Indicator Light
10	Shear Mode Indicator Light
11	Rotating Mode Indicator Light



FG028535

Figure 59

1. Auto Idle Indicator Light

The indicator light indicates that Auto Idle Selector Button is selected.

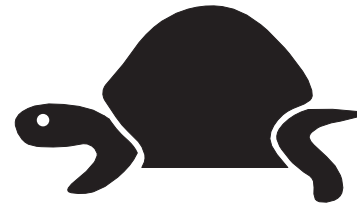


FG017862

Figure 60

2. Low Travel Speed Indicator Light

The indicator light indicates that Low Travel Speed is selected.

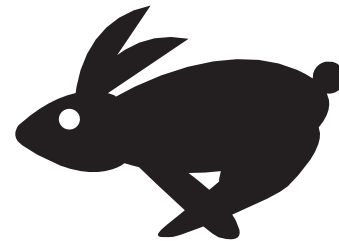


FG017863

Figure 61

3. High Travel Speed Indicator Light

The indicator light indicates that High Travel Speed is selected.



FG017864

Figure 62

4. Preheating Indicator Light

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.



HAAE2000

Figure 63

5. Work Light Indicator Light

The indicator light indicates that work lights are turned "ON."



Figure 64

HB4O2003

6. Boom Swing Indicator Light

The indicator light indicates that Boom Swing Switch is turned "ON."

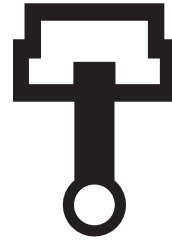


Figure 65

FG028169

7. Quick Coupler Release System Activated Indicator Light (Optional)

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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



Figure 66

FG002195

8. Overload Indicator Light

The indicator light indicates that Overload Warning Button is selected.

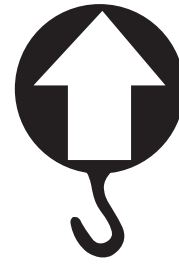


Figure 67

FG000253

9. Breaker Mode Indicator Light

The indicator light indicates that Breaker mode is selected.

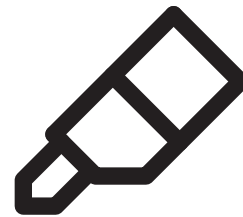


Figure 68

FG028171

10. Shear Mode Indicator Light

The indicator light indicates that Shear Mode is selected.



Figure 69

FG028172

11. Rotating Mode Indicator Light

The indicator light indicates that Rotating Mode is selected.



Figure 70

FG028173

10. Function Buttons

1. Auto Idle Selector Button

The driver can use this button to stop work temporarily, or reduce engine rpm to wait for dumping.

The engine rpm will be automatically decelerated to reduce noise and save fuel, if any handle lever is in a neutral position more than 4 seconds.

If the handle lever is manipulated again, or the button is pressed again to release, the slow-down function will be deactivated, and the original dial setting speed will be restored.

If a machine problem occurs and the warning buzzer is activated, the buzzer can be deactivated by pressing the button.

Operated as the number "0" button, when entering or changing the password.

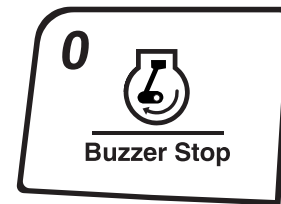


Figure 71

FG017865

2. Home Button

Use this button to return to the initial screen in the menu mode or rear camera mode.

An integrating indicator will be displayed on the time bar area, when the button is pressed once on the main screen.

Operated as the number "1" button, when entering or changing the password.



Figure 72

FG017866

3. Up Arrow Button

Use this button to move the cursor up, when entering the menu.

Operated as the number "2" button, when entering or changing the password.

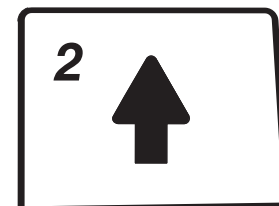


Figure 73

FG017867

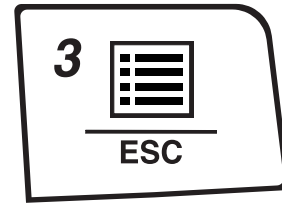
4. Access Button (ESC - Escape)

Use this button to enter the menu.

Also use this button to move up the menu item, after entering the menu.

Also use this button to close a pop-up window.

Operated as the number "3" button, when entering or changing the password.



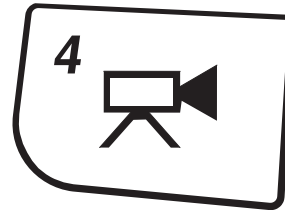
FG017868

Figure 74

5. Camera Mode Selector Button

Use this button to activate the rear camera.

Operated as the number "4" button, when entering or changing the password.



FG017869

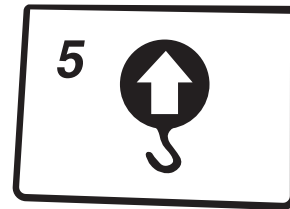
Figure 75

6. Overload Warning Button

Used to activate a warning device in equipment equipped with an overload warning device.

Icons will be displayed on the display monitor, when the button is pressed. If lifted load exceeds the specified value, a warning light will flash on the upper side of the display monitor, and a warning buzzer will sound.

Operated as the number "5" button, when entering or changing the password.



FG028170

Figure 76



WARNING

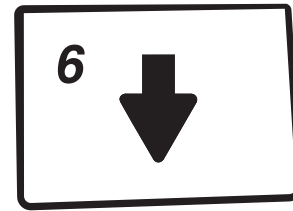
AVOID DEATH OR SERIOUS INJURY

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.

7. Down Arrow Button

Use this button to move down the menu item, after entering the menu.

Operated as the number "6" button, when entering or changing the password.



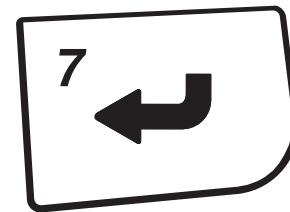
FG017871

Figure 77

8. Selector Button

Use this button to enter the selected menu.

Operated as the number "7" button, when entering or changing the password.



FG017872

Figure 78

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.

In the event of multiple warning symbols in occurrence sequence will be displayed in the warning window.

Warning Pop-up Windows List

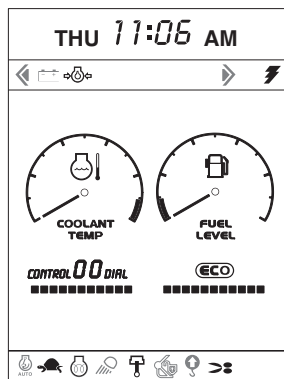
	Warning	Description
1	Check Battery	Check the battery charging system.
2	Check E/G Oil Pressure	Check the engine oil system.
3	Check Coolant Temperature	Coolant is overheated. Service/repair the cooling system after fully cooled down.
4	Check Engine	
5	Check Water in Fuel Sensor	Drain the water in the fuel filter.
6	Check Air Cleaner	Air cleaner is clogged. Check the air cleaner.
7	Check Engine	
8	Stop Engine and Check Vehicle	
9	Start Forced Regeneration	Start Forced Regeneration
10	Stop Engine and Check Vehicle	
11	Regeneration is ready	Regeneration is ready
12	Forceful Regeneration Status	Forceful Regeneration Status
13	DPF Active Regeneration Inhibited Status	DPF Active Regeneration Inhibited Status
14	Check Hydraulic	Hydraulic oil is overheated. Service/repair the oil system after fully cooled down.
15	Communication Error!	

USER MENU

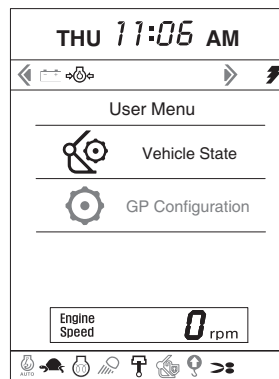
User Menu - Access and Escape Methods

Access Method

On the normal display screen, push the access button to access the user menu screen.



<Normal Indication Monitor>



<Main Menu Monitor>

FG028532

Figure 79

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

The menu selection can be changed by pressing the "UP" () or "DOWN" (▼) buttons. The selected menu item will be highlighted, and a cursor will appear by the menu item.

When the selected menu item is highlighted, press the "SELECT" (◀) button to enter the next submenu.

Vehicle State ↔ GP Configuration

Press the ESC button to return to the previous screen.

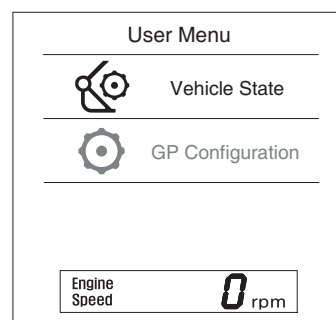


Figure 80

FG028533



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not use vehicle state menu when traveling or operating.

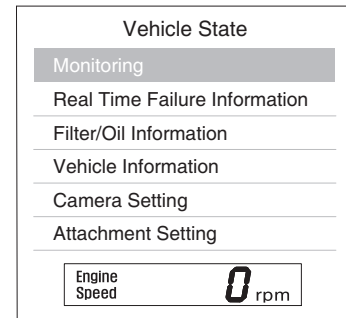
1. Vehicle State

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

Using the "UP" (▲) or "DOWN" (▼) buttons and move the cursor to see a reversed display on the desired menu. Then, press the "SELECT" (↵) button to select the menu.

Monitoring ↔ Real Time Failure Information ↔ Filter/Oil Information ↔ Vehicle Information ↔ Camera Setting ↔ Attachment Setting

Press the ESC button to return to the previous screen.



FG028541

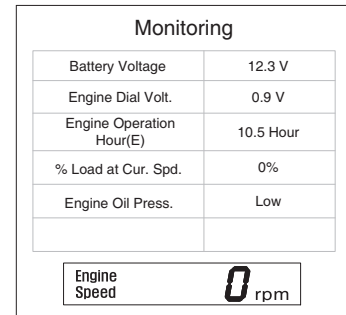
Figure 81

A. Monitoring

The monitoring screen displays the information on vehicle battery voltage, engine dial voltage, etc.

At the vehicle state, if the cursor is placed on Monitoring, press the "SELECT" (↵) button to display the Monitoring screen.

Press the ESC button to return to the previous screen.



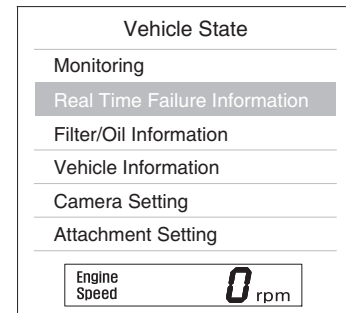
FG028542

Figure 82

B. Real Time Failure Information

Displays the overall current breakdown state of equipment.

At the vehicle state, if the cursor is placed on the Real Time Failure Information, press the "SELECT" (↵) button to display the Real Time Failure Information screen.



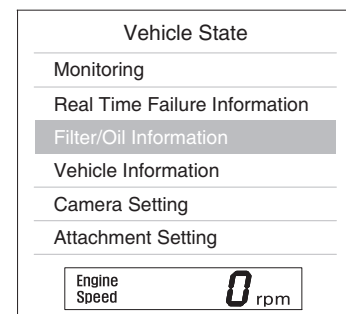
FG028543

Figure 83

C. Filter/Oil Information

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

At the vehicle state, if the cursor is placed on Filter/Oil Information, press the "SELECT" (↵) button to display the Filter/Oil Information screen.



FG028544

Figure 84

Reset Method/Replacement Period Change Method

You can adjust a replacement interval and initialization, using the up/down button.

Various items can be checked, such as engine oil, engine oil filter, coolant, fuel filter, air cleaner, hydraulic oil, pilot filter, return filter, suction filter, and air conditioner filter.

Move to the filter/oil information to change and press the "Enter" key. Then, the replacement interval can be changed using the up/down button.

NOTE: The value bigger than the initial table cannot be set.

For initialization after replacing oil/filter, press the "Enter" key on "CLEAR" of the changed item, and press "OK" when the confirmation window appears to initialize.

To activate a popup window, use the up/down button and press the "Enter" key on "Enable".

If successfully activated and the next filter/oil replacement schedule is due within 10 hours, a popup window will appear each time the key is on.

In the Disable mode, a popup window will appear once when the next filter/oil replacement schedule is due within 10 hours, and appear again when 0 hour is left.

Filter/Oil Information			
Maintenance Notification Setting : ☐ Enable ☒ Disable			
Item	TIME	CHANGE	CLEAR
Engine Oil	00	000	Execute
Engine Oil Filter	00	000	Execute
Coolant	00	0000	Execute
Fuel Filter	00	000	Execute

Engine Speed 0 rpm

FG028545

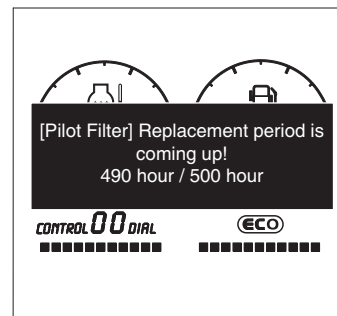
Figure 85

Filter/Oil Period Setup Table

Unit: time (hr)

Kind	Replacement Period		
	Basic Setup Value	Minimum Available Setup Value	Change Value By Step
Engine Oil	250	50	50
Engine Oil Filter	250	50	50
Coolant	2,000	50	50
Fuel Filter	500	50	50
Air Cleaner	500	50	50
Hydraulic Oil	2,000	50	50
Pilot Filter	1,000	50	50
Return Filter	500	50	50
Suction Filter	1,000	50	50
Air-con Filter	1,000	50	50

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



FG028569

Figure 86

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



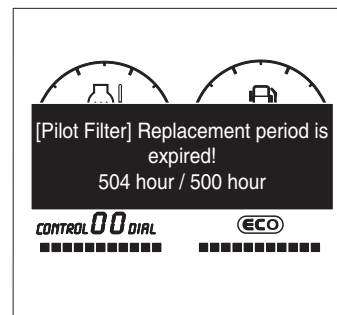
Figure 87

D. Vehicle Information

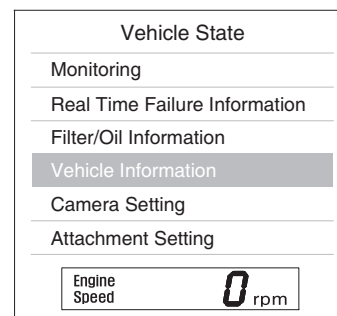
This is used to check the vehicle name, HW and SW P/N of the VCU and GP.

At the vehicle state, if the cursor is placed on the Vehicle Information, press the "SELECT" (←) button to display the Vehicle Information screen.

Click the ESC button to return to the previous screen.

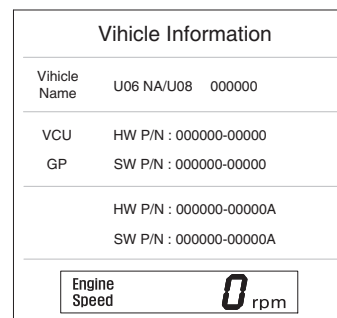


FG028570



FG028547

Figure 88



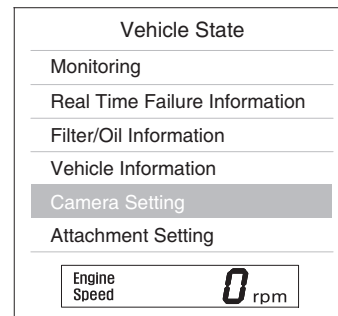
FG028548

Figure 89

E. Camera Setting

The camera setting screen is designed to set up camera brightness and normal/mirror.

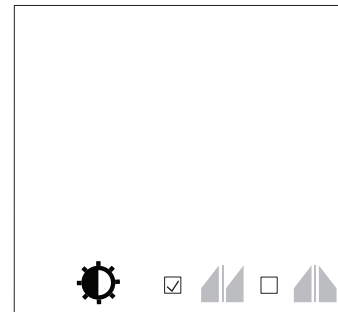
At the vehicle state, if the cursor is placed on the Camera Setting, press the "SELECT" (↵) button to display the Camera Setting screen.



FG028549

Figure 90

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



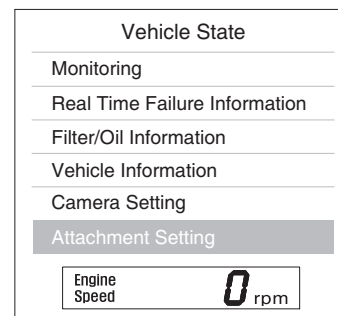
FG028550

Figure 91

F. Attachment Setting

The attachment setting screen is used to set up the use or non-use of Continuous Flow.

At the vehicle state, if the cursor is placed on the Attachment Setting, press the "SELECT" (↵) button to display the Attachment Setting screen.



FG028551

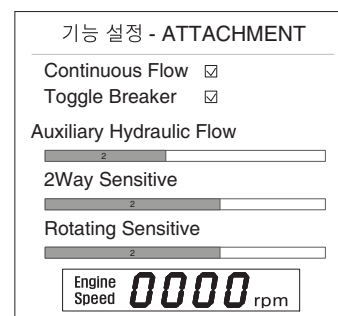
Figure 92

Continuous Flow

If you want to use continuous Flow (like for a breaker), check blank. The hydraulic flow of "Continuous Flow" is according to Auxiliary Hydraulic Flow setting. When Pilot Cut Off Switch is off or Auxiliary Hydraulic Flow is 0, "Continuous Flow" is always disabled.

Toggle Breaker

This item sets the applicability of the toggle of the breaker button when the breaker button is pressed once, and reset when pressed again. If toggle is not selected, the breaker is only actuated while the breaker button is being pressed and held.



DS1602612

Figure 93

Auxiliary Hydraulic Flow

Use the up/down button to adjust continuous flow, auxiliary hydraulic flow. Press the "ENTER" key on the step of Auxiliary Hydraulic Flow. Use the up/down button to change the oil quantity.

Auxiliary Hydraulic Flow can be changed 0 - 5 (6 step).

2Way Sensitive

Sensitivity of 2way thumb wheel can be set.

Sensitivity can be changed 1 - 3 (3 step).

Rotating Sensitive

Sensitivity of rotating thumb wheel can be set.

Sensitivity can be changed 1 - 3 (3 step).

NOTE: *With the Continuous Flow button unchecked, if you press the button for breaker operation of the joystick on the home screen, a screen will move to the attachment's setting screen.
If you don't press any key on this screen for 5 seconds, home screen will be displayed.*

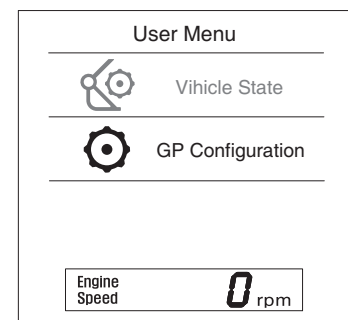
2. GP Configuration

This menu is used to set up Brightness, Time, Unit, Language, Password.

Using the "UP" (▲) or "DOWN" (▼) buttons and move the cursor to see a reversed display on the desired menu. Then, press the "SELECT" (↵) button to select the menu.

**Brightness Setting ↔ Time Setting ↔ Unit Setting ↔
Language Setting ↔ Password Setting**

Press the ESC button to return to previous screen.

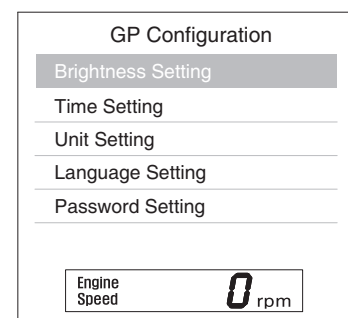


FG028553

Figure 94

A. Brightness Setting

On the GP configuration screen, when cursor is placed on brightness setting, press the "SELECT" (↵) button to display the brightness setting screen.



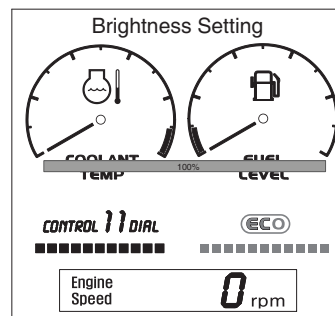
FG028554

Figure 95

Using the "UP" (▲) or "DOWN"(▼) buttons and adjust the brightness of 0 - 100% at an interval of 10%.

The screen brightness when manufactured is set to 60%.

Press the ESC button to return to the previous screen.



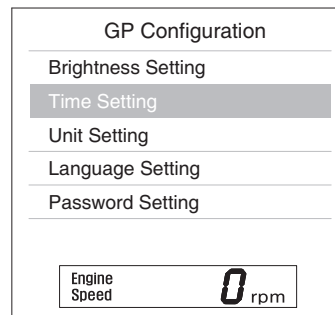
FG028555

Figure 96

B. Time Setting

On the GP configuration screen, when cursor is placed on time setting, press the "SELECT" (↵) button to access the time setting.

Using the "UP" (▲) or "DOWN"(▼) buttons and locate the cursor at a target of change. Then, press the "SELECT" (↵) button to change the target.



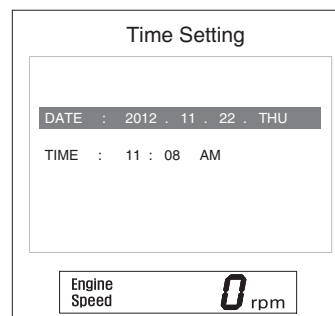
FG028556

Figure 97

Using the "UP" (▲) or "DOWN"(▼) buttons to change numbers of each item.

If the setup is completed, press the "SELECT" (↵) button to store the setup details.

Press the ESC button to return to the previous screen.

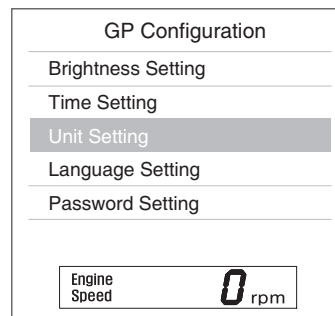


FG028557

Figure 98

C. Unit Setting

On the GP configuration screen, when cursor is placed on unit setting, press the "SELECT" (↵) button to access the unit setting.



FG028558

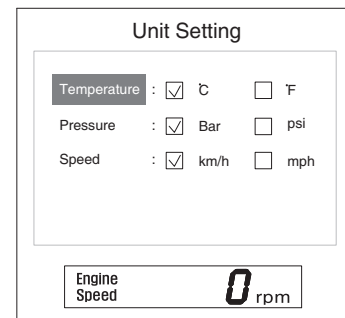
Figure 99

On the unit setting screen, change the units of temperature, pressure, and speed. These figures at the vehicle release time are set as below:

Temperature: °C

Pressure: bar

Speed: km/h

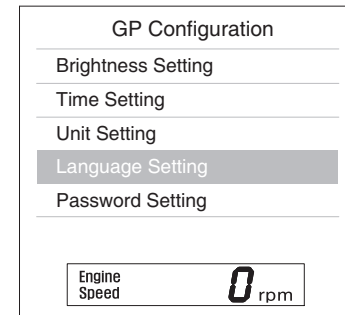


FG028559

Figure 100

D. Language Setting

On the GP configuration screen, when cursor is placed on language setting, press the "SELECT" (↵) button to access the language setting.

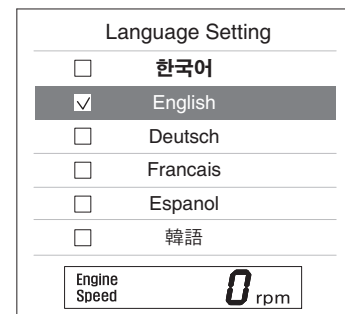


FG028560

Figure 101

On the language selection screen, using the "UP" (▲) or "DOWN" (▼) buttons and move the cursor to select a language. Then, press the "SELECT" (↵) button to adopt the selected language.

Press the ESC button to return to the previous screen.



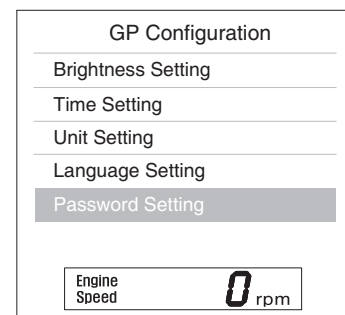
FG028561

Figure 102

E. Password Setting

This function is used to set up a user password.

If the password setting function is used, the password must be correctly entered to operate the vehicle normally.



FG028562

Figure 103

User Password Setting

Not Use/Always/1 min/5 min can be set.

Not Use - Ignition can be started without entering the password.

Always - The password must be entered when the key is turned on.

1 min - Input is required if restarted 1 minute after turning the engine off.

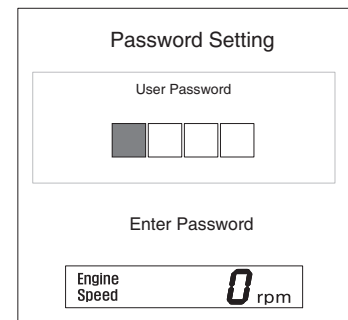
5 min - Input is required if restarted 5 minute after turning the engine off.

Changing the Password

The default password is "0000" and can be changed with the number 0 - 7, using the numeric buttons on the gauge.

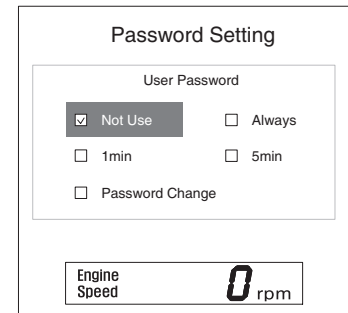
IMPORTANT

If password input errors have been made three times in a row, the screen will move to the default screen. After that, starting will be locked for 10 minutes.



FG028563

Figure 104

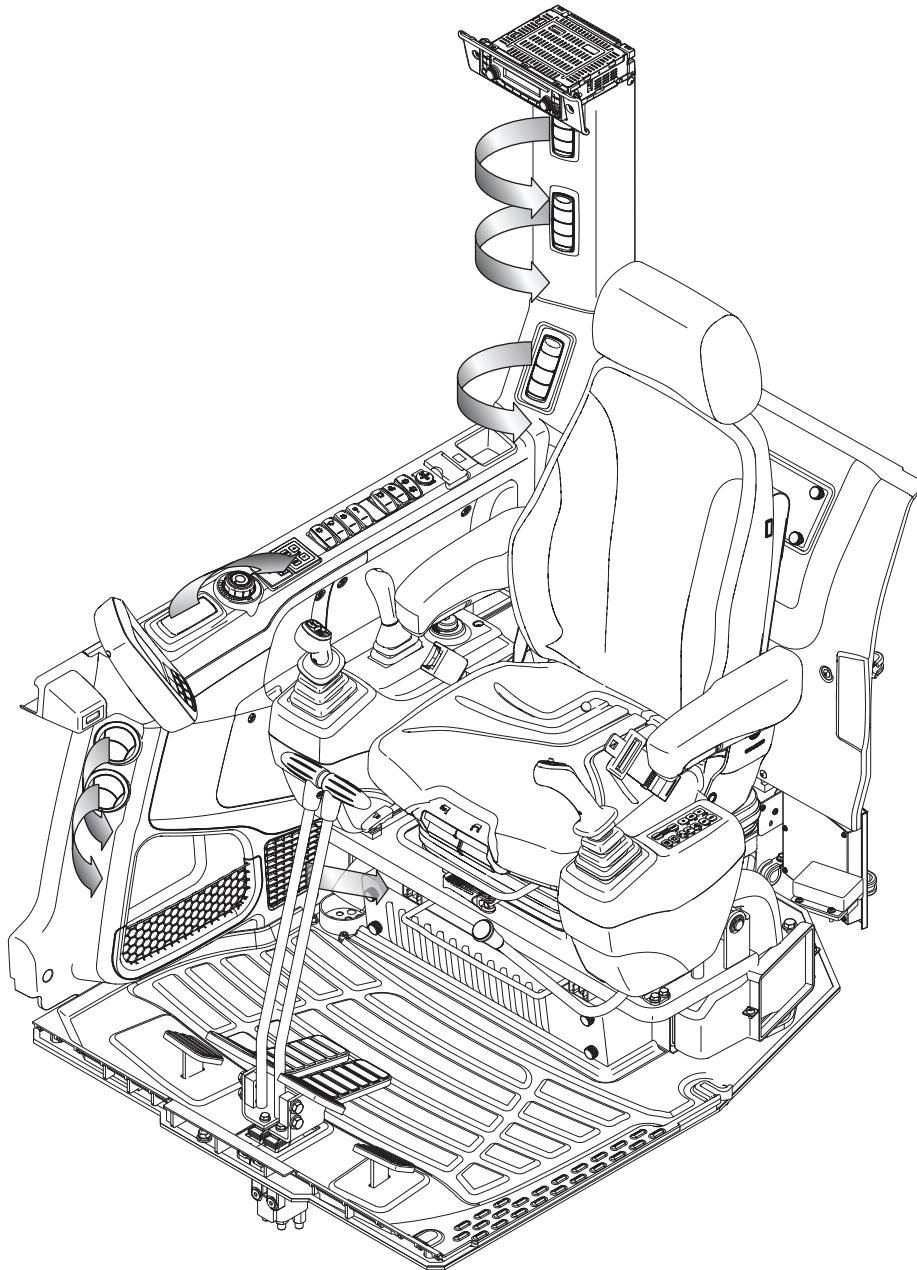


FG028564

Figure 105

HEATER AND AIR CONDITIONER CONTROL PANEL

Location of Controls and Vents



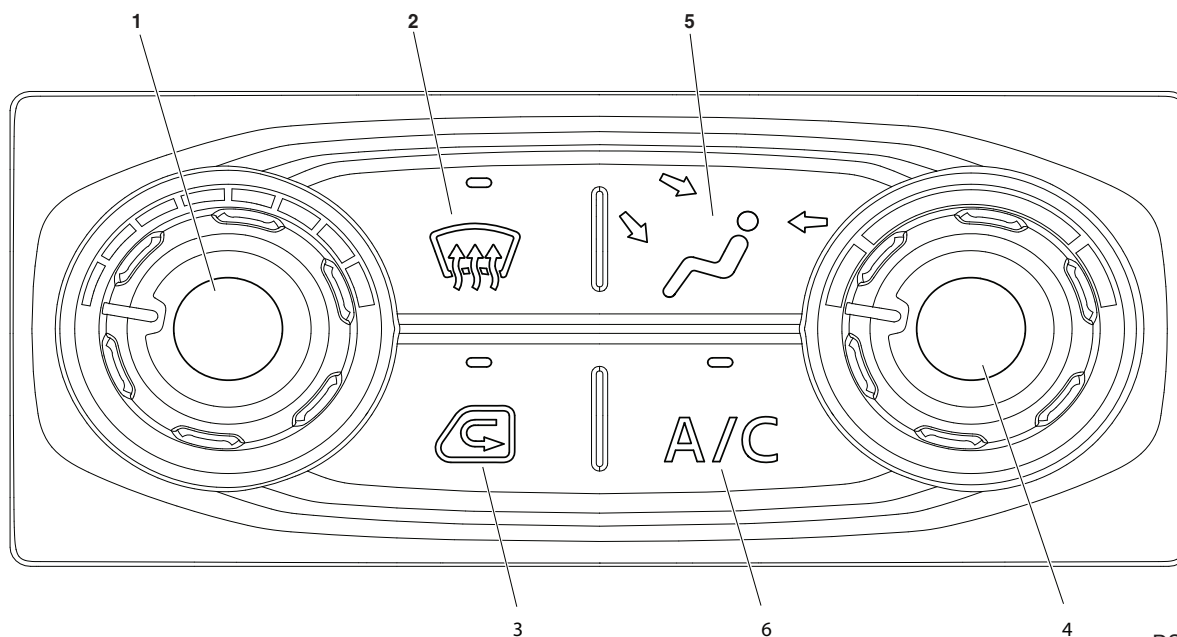
FG028369

Figure 106

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



DS2002944

Figure 107

Reference Number	Description
1	Fan Speed Adjust Dial
2	Defroster Button
3	Air Inlet/Outlet Selector Button

Reference Number	Description
4	Temperature Control Dial
5	Mode Selector Button
6	Air Conditioner Button

When a button is pressed, the LED indicator for the switch will turn "ON" to indicate that button is functioning and give an activation sound.

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

1. Fan Speed Adjust Dial

This dial is used to control the speed of the blower fan.

Turn counterclockwise - Decreases the speed of the blower fan

Turn clockwise - Increases the speed of the blower fan

2. Defroster Button

This button is used to direct airflow to front window.

Press the button once (first time):

The LED on the button is turned on and the window frost is removed.

Press the button again (second time):

The LED on the button is turned off and defroster function is deactivated.

3. Air Inlet/Outlet Selector Button

Press the button once (first time):
Exchanges air within the operator's cabin with fresh air.

Used to remove condensation or ice on the window.

Press the button again (second time):
Recirculates air within the operator's cabin. Used to quickly warm or cool the operator's cabin.

4. Temperature Control Dial

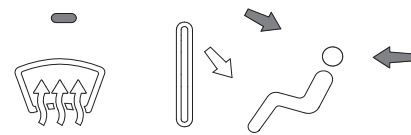
The temperature control dial consists of 9 steps.

Turn counterclockwise - Lowers the temperature

Turn clockwise - Raise the temperature.

5. Mode Selector Button

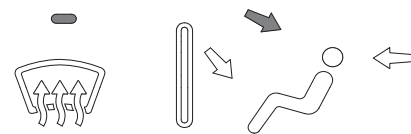
Press the button once (first time):
Used to direct airflow to the upper portion of the operator's cabin from both the front and rear.



DS2100146

Figure 108

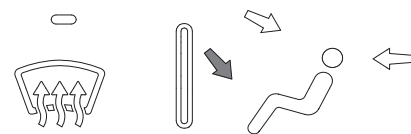
Press the button again (second time):
Used to direct airflow to lower portion of the operator's cabin and feet and front window.



DS2100147

Figure 109

Press the button again (third time):
Used to direct airflow to lower portion of the operator's cabin and feet.



DS2100148

Figure 110

6. Air Conditioner Button

Press the button once (first time):
The LED on the button is turned on and the air conditioner is activated.

Press the button again (second time):
The LED on the button is turned off and the air conditioner is deactivated.

Memory Function

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

Additional Operating Instructions

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

Operate the air conditioner from 20 - 30 minutes a week to circulate the refrigerant in the system.

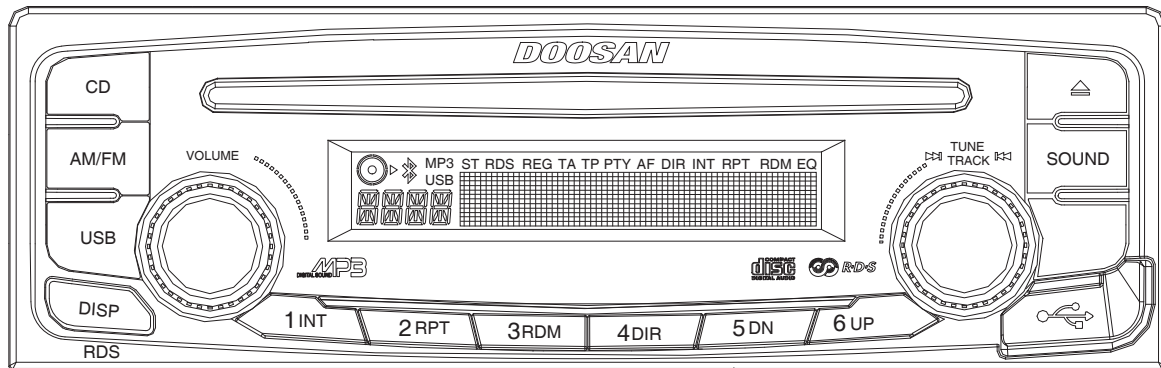
NOTE: *The blower switch must be on "LO" speed.*

2. Replace filter every 6 month or when required because of operating conditions. Replace filter when required.
3. If operating the air conditioner or heater for a long time, operate the ventilation switch. When smoking, vent the air to the outside to prevent irritation to eyes.

STEREO

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

CD Player (Optional)



FG017017

Figure 111

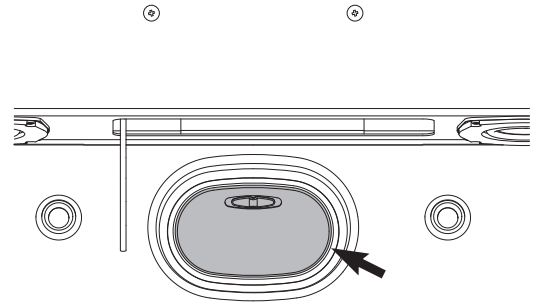
MISCELLANEOUS ELECTRICAL DEVICES

Cabin Light

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

The light will work regardless of starter switch position.

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



FG028071

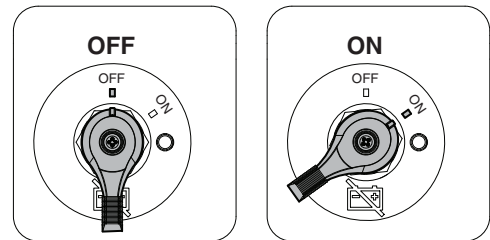
Figure 112

Battery Disconnect Switch

A battery disconnect switch is located in the battery cover beside hood.

When the battery disconnect switch is turned "OFF", it can be locked to help prevent machine theft.

Turn battery disconnect switch to "ON" position (Figure 113) before starting engine.

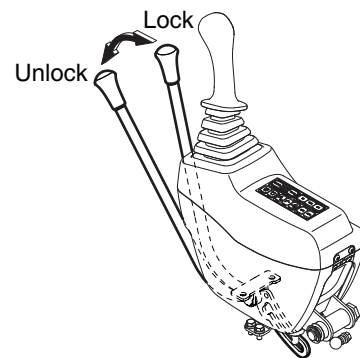


EX1500481

Figure 113

Pilot Cutoff Switch

When the safety lever is put 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.



EX1504982

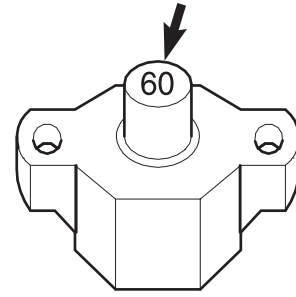
Figure 114

Circuit Breaker

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.

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



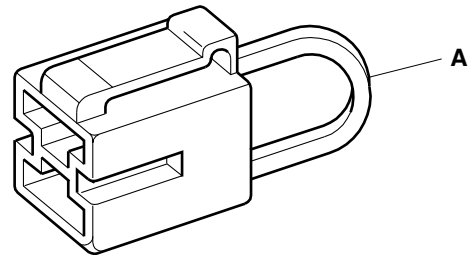
FG028000

Figure 115

Fusible Link

A fusible link is in the battery box.

If the engine does not crank, first check that starter switch is turned "ON" and that no power is available (No indicator lights will light.). Check that "A" portion (Figure 116) of the fusible link is not broken or burned through. Replace the fusible link if damaged and investigate cause.



HAAE2120

Figure 116



WARNING

AVOID DEATH OR SERIOUS INJURY

When changing the fusible link, replace the fusible link with the same capacity part. Otherwise, a fire could break out in the wiring harness and/or other components of the circuit. Always use original DOOSAN parts.

Fuse Box

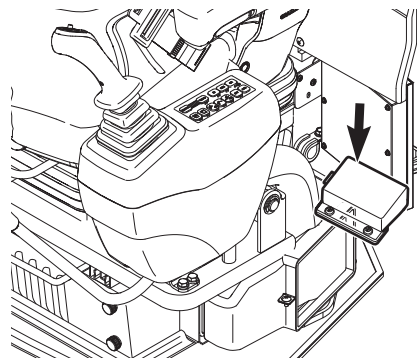
There is a fuse box on the left side of the back of the seat. The fuses prevent electrical devices from overloading or shorting.

A decal attached to the fuse box's cover indicates the function and amperage of each fuse.

NOTE: For a further explanation see "Fuse Box" on page 4-68.

Spare fuses are mounted on the inside of fuse box's cover. (One each of a 10A, 15A, 20A and 30A.)

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



FG028374

Figure 117



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



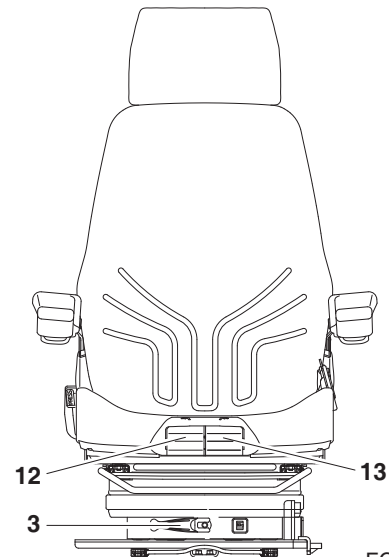
WARNING

AVOID DEATH OR SERIOUS INJURY

Adjust the seat position before starting operations or after changing the operator.

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 back against the backrest.



FG010765

Figure 118

1. Forward/Backward Adjustment

Holding lever (1, Figure 119), raise it up, move the seat to the desired position. Release lever to lock the seat in the selected position. Adjustment range is 160 mm (6.3 in).

2. Seat Height Adjustment

With no load on the seat (getting up from the seat slightly), you can adjust the seat height by pulling up the lever (2, Figure 119) by stages.

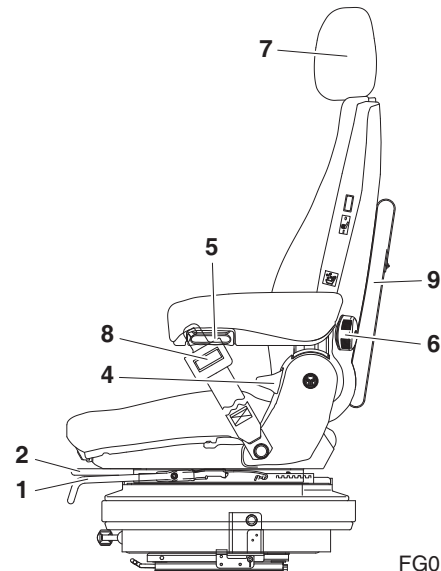
To lower the seat, raise the seat fully until it automatically moves to the lowest point.

3. Suspension Adjustment

Turning lever (3, Figure 119) to right makes the suspension harder. Turning lever to left 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 - 120 kg (110 - 265 lb).

4. Backrest Adjustment

Lifting the adjustment lever (4, Figure 119) under the front of the seat adjusts the seat back to obtain the desired backrest angle.



FG010766

Figure 119

5. Armrest Angle Adjustment

The angle of each armrest can be adjusted by turning a dial (5, Figure 119) on bottom of armrest. When adjusting the angle, manually raise the armrest before turning the dial.

6. Lumbar Support Adjustment

A lumbar support is located in the seat back.

Turn the dial (6, Figure 119) counterclockwise to increase the force of the lumbar support

7. Headrest

The headrest (7, Figure 119) can be adjusted forward/backward and up/down. Move it by holding both sides.

8. Seat Belt



WARNING

AVOID DEATH OR SERIOUS INJURY

The seat belt is for the operator's safety and should always be worn. Before driving the machine, adjust the seat to the desired position for maximum comfort and machine control, then fasten the seat belt. Seat belts must be worn across the pelvic region and adjusted snugly to lessen the chance and severity of injury in case of an accident. Never fasten a seat belt across the abdomen.

Under no circumstances should the operator be standing in the cabin when operating the excavator.

Do not adjust the seat position while the vehicle is moving because a loss of control can result. 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 it with twists in it. Replace belt or bracket if damaged or worn.

Seat Belt Locking and Unlocking

Insert belt end (1, Figure 120) into the buckle (2). Pull the belt to check that belt end is locked into buckle.

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

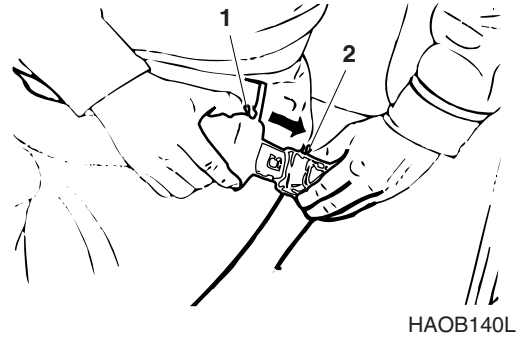


Figure 120

Press the button (3, Figure 121) in the center of buckle (2) and pull out belt (1) to unlock.

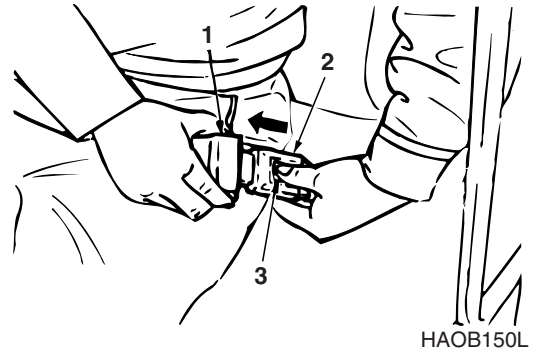


Figure 121

9. Seat Back-pocket

The seat has a seat back pocket. It is used for storing the Operation & Maintenance Manual.

10. Heating the Operator's Seat (Optional)

The operator's seat can be heated. The switch on the left side of the seat back is used to warm the seat. When heating is not needed or seat is warmed, turn the switch to "OFF" position.

11. Two-grade Forward/Backward Adjustment

For operator's convenience, the right and left control stands and seat can slide together, within a 120 mm (4.7 in) forward or backward travel distance.

Holding lever (11, Figure 122), raise it up, set the seat to desired position. Release lever to lock the seat in the selected position.

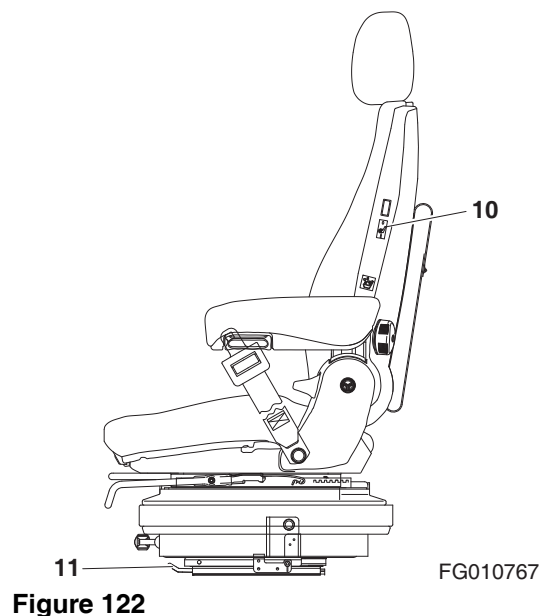
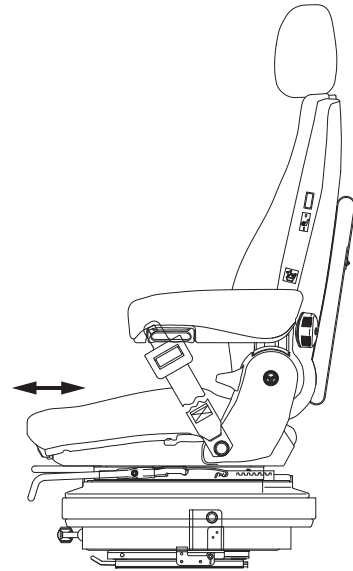


Figure 122

12. Seat Forward/Backward Adjustment

The seat cushion can be shifted forward and backward by pulling the lever (12, Figure 118).

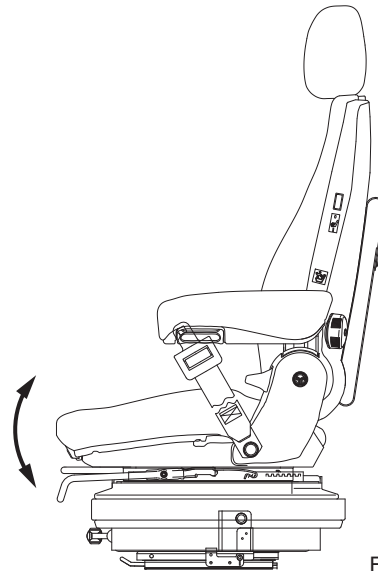


FG010768

Figure 123

13. Seat Angle Adjustment

The seat cushion can be shifted tilted up and down by pulling the lever (13, Figure 118).



FG010769

Figure 124

FRONT WINDOWS



WARNING

AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, move safety lever to "LOCK" position (Figure 126) and stop engine to prevent accidental activation of the work levers and controls.

Front Upper Window

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

Opening the Window



WARNING

AVOID DEATH OR SERIOUS INJURY

When stowing front window in the cabin roof, make sure both release levers (1, Figure 125) are latched. A falling window can cause bodily injury.

1. Lower bucket or work tool to ground.
2. Set safety lever (Figure 126) on "LOCK".
3. Set engine speed control dial to "LOW IDLE" Allow engine to idle for 3 - 5 minutes.
4. Stop engine by turning key to "O" (OFF) position.
5. Hold the window handles (2, Figure 125), then turn the lock levers (1) to release the lock. The top of the front window will come out.
6. Pull window up, and push it against lock latch at the top of the cabin. Make sure that it is securely latched.
7. Check that lock levers are securely latched in the lock position.



WARNING

AVOID DEATH OR SERIOUS INJURY

When operating, keep entire body inside the cabin at all times.

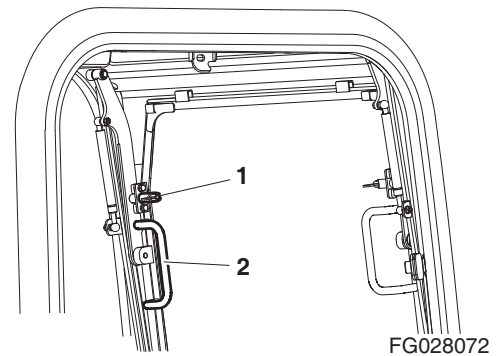


Figure 125

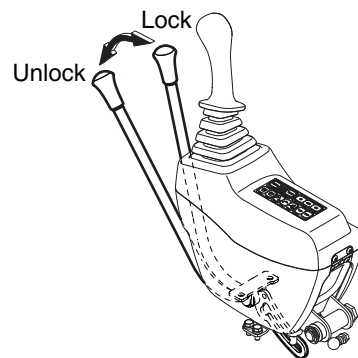


Figure 126

Closing the Window



WARNING

AVOID DEATH OR SERIOUS INJURY

Be careful that your hands are not caught in window frame.

1. Lower bucket or work tool to ground.
2. Set safety lever (Figure 126) on "LOCK" and stop engine.
3. Holding upper handles (1, Figure 127) of front window with left and right-hand, turn lock levers (2, Figure 127) to release the lock.
4. Push window forward, and lower it slowly.
5. When the bottom of the window, reaches the top of the front bottom window, push the front window to engage the lock (2, Figure 125).
6. Check that lock levers are securely latched in the lock position.

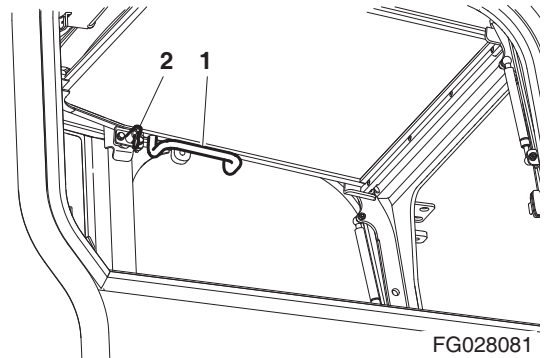


Figure 127

Front Bottom Window

The front bottom window can be removed.

1. After stowing the front upper window in the cabin ceiling, remove bottom window (1, Figure 128) from cabin in direction of the arrow.



WARNING

AVOID DEATH OR SERIOUS INJURY

Never have wet hands when handling a window. Never drop window or let it come into contact with other parts of the machine.

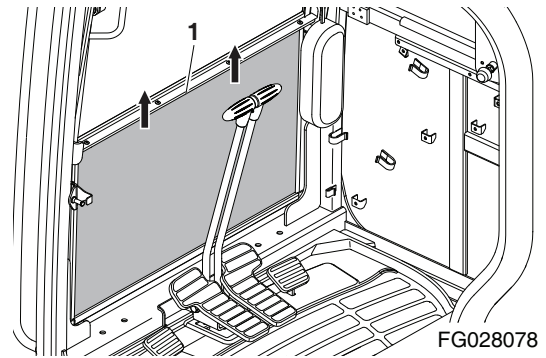
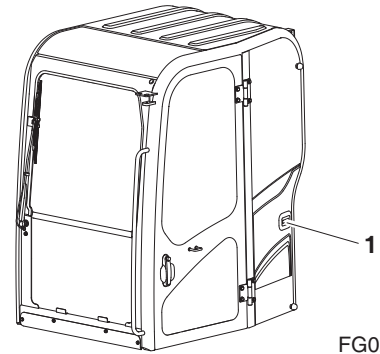


Figure 128

DOOR SIDE LATCH

1. The door side latch (1, Figure 129) is used to secure the door to the side of the cabin when it is opened.

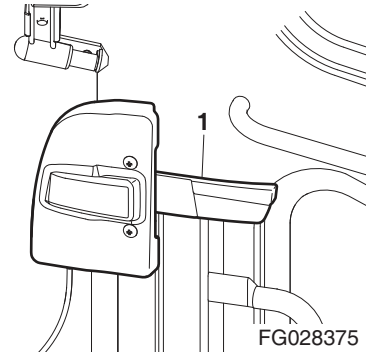
NOTE: *Keep the door closed and locked when machine is not in use.*



FG028080

Figure 129

2. To release door from side of cabin, push the latch lever (1, Figure 130) down. The latch lever is to the left of the operator's seat.



FG028375

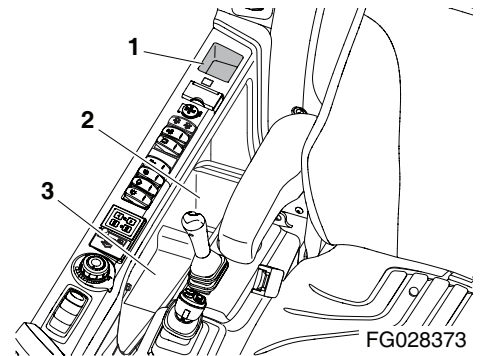
Figure 130

CABIN STORAGE COMPARTMENTS

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

There is a separated small tray (1, Figure 131) on the right side of operator's seat.

Two storage (2, 3, Figure 131) compartments are located below the tray area.



FG028373

Figure 131

SUN VISOR (OPTIONAL)

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 132) down, and hook it on each brackets (2, Figure 132).

To retract sun visor, unhook it from brackets (2, Figure 132) 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.*

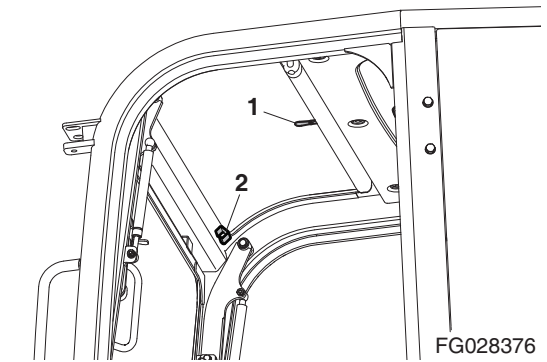


Figure 132

HANGER

A hanger (1, Figure 133) is behind in the left corner of the cabin.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

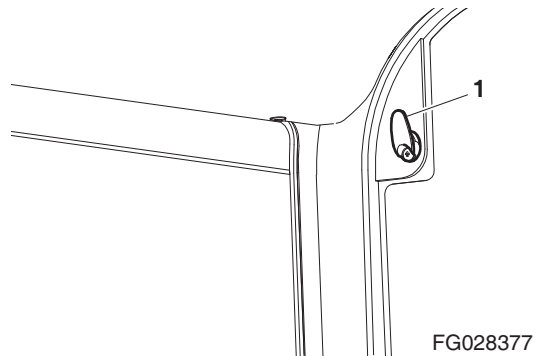


Figure 133

EMERGENCY EXIT GLASS BREAKING TOOL

This machine is equipped with a glass breaking tool. It is at the left middle side of the operator's seat. This tool can be used in case of an emergency which requires the breaking of glass to exit from the cabin. Grip the handle firmly and use the sharp point to break the glass.



WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

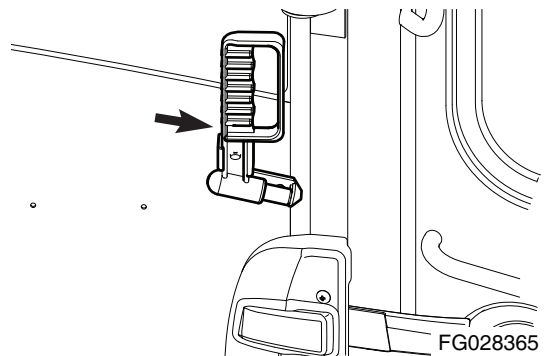


Figure 134

Operation

TO OPERATE A NEW EXCAVATOR

All DOOSAN excavators are inspected and adjusted 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 of the machine. This could lead to problems later.

- NOTE:**
1. *Check daily for leakage of coolant, fuel, engine oil and hydraulic oil.*
 2. *Inspect all lubricants daily, 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 oil filter after first 50 hours of operation.
2. Change swing reduction device oil after first 250 hours of operation.
3. Change hydraulic oil return filter after first 250 hours of operation.
4. Replace travel and reduction gear oil after first 250 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



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 operation.

Before starting engine, inspect the following items:

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

Operational Checks Before Starting Engine



WARNING

AVOID DEATH OR SERIOUS INJURY

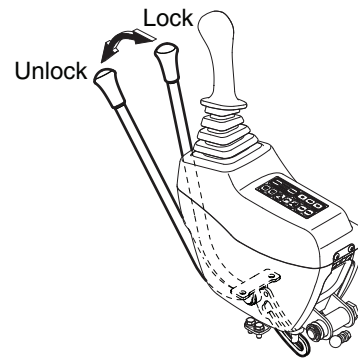
When leaving operator's seat, move the safety lever to "LOCK" (Figure 1) position, and stop engine to prevent accidental activation of the work levers (joysticks) and controls.

1. Move safety lever to "LOCK" position (Figure 1).
2. Fasten seat belt. Check for proper operation and condition.
3. Move all operation levers to "NEUTRAL".

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

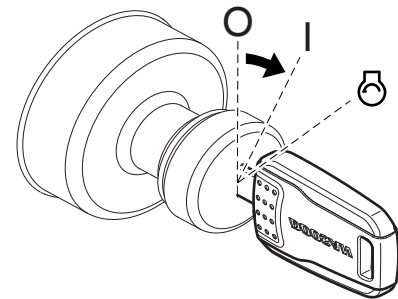
4. Rotate the starter switch to "I" (ON) position (Figure 2). Check all indicator lights. A warning buzzer will sound for about two seconds. After two seconds, the following light will turn "ON".
 - Charging warning light
 - Engine oil pressure warning light

NOTE: *If all the indicator lights do not come "ON" when the key is first turned, there is a problem.*



EX1504982

Figure 1



FG018147

Figure 2

Engine Start

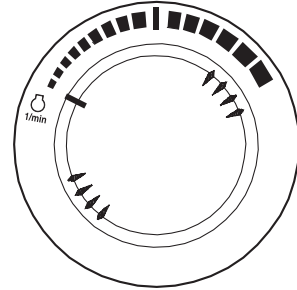


WARNING

AVOID DEATH OR SERIOUS INJURY

Start the engine after sounding horn and make sure there are no people or obstacles in the area.

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



HAOB290L

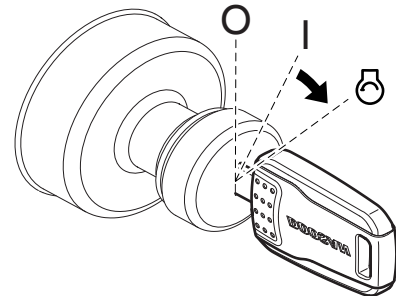
Figure 3

4. Turn starter switch to "O" (START) position (Figure 4). Engine should start in approximately five 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 step.

5. After engine has started, release key. Key will return to "I" (ON) position (Figure 4).
6. Follow procedures in "Hydraulic System Warm-up" on page 3-10.
7. After warming unit, check all operating indicators to make sure that all engine systems (oil pressure, coolant, etc.) are in the normal operating range. If any problems are noticed, stop engine.



FG018149

Figure 4

Normal indicators are:

No.	Instrument Panel Light or Gauge	Indicator Reading
1	Engine Coolant Temperature Gauge	White Range
2	Fuel Gauge	White Range
3	Engine Oil Pressure Warning Light	OFF
4	Charging Warning Light	OFF
5	Engine Coolant Temperature Warning Light	OFF
6	Engine Check Warning Light	OFF

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

NOTE: *If engine coolant temperature gauge pointer moves into the red zone, the engine coolant temperature warning light will turn "ON". 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 minutes before shutting down 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.*

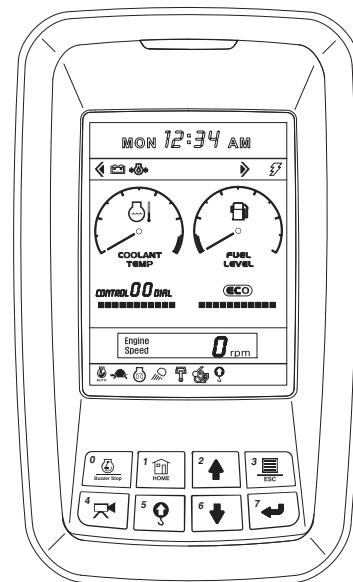


Figure 5

FG028076

Cold Weather Starting

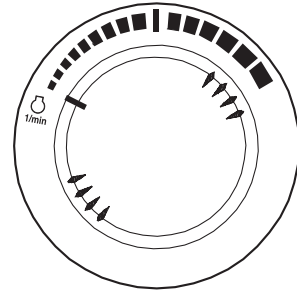


WARNING

AVOID DEATH OR SERIOUS INJURY

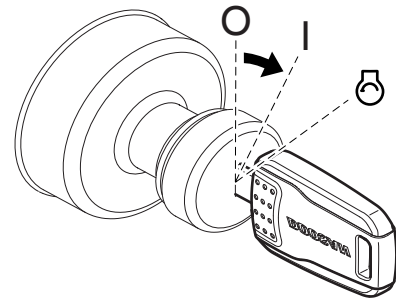
DO NOT USE STARTING FLUIDS. The preheat system could cause the starting fluid to explode.

1. Perform all steps in "Operational Checks Before Starting Engine."
2. Set engine speed control dial slightly above "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.
4. Turn starter switch to "I" (ON) position (Figure 7). When preheat cycle is completed, the preheat indicator light (1, Figure 8) will turn "OFF".



HAOB290L

Figure 6



FG018147

Figure 7

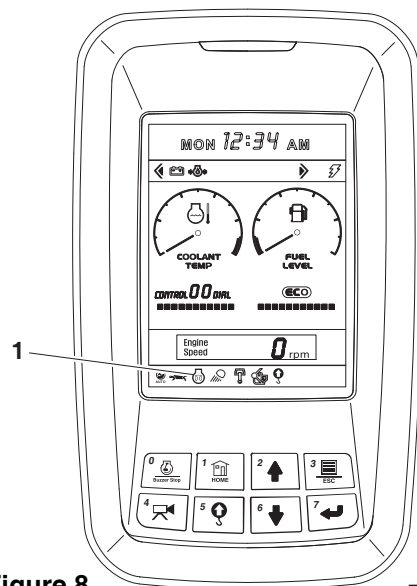


Figure 8

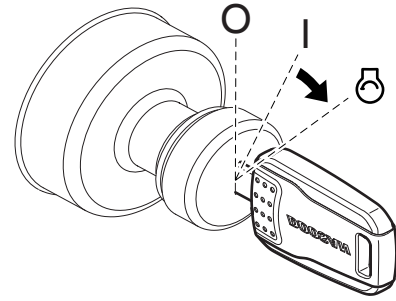
FG028077

5. After the preheat completion, immediately turn starter switch to "O" (START) position (Figure 9). Engine should start in approximately five 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.

6. After engine has started, release key. Key will return to "I" (ON) position (Figure 9).
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 3-10)



FG018149

Figure 9

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 person 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 depleted battery positive (+) terminal first. Connect auxiliary battery negative (-) terminal to the frame of the depleted battery machine second.
 8. Connect positive cable first when installing cables and disconnect the negative cable first when removing.
-



HAOA440L

Figure 10

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 11).
2. Connect one end of red cable (1, Figure 11) to the positive (+) terminal of the machine battery, and the other end to the positive (+) terminal of the booster battery (4, Figure 11).
3. Connect one end of black cable (2, Figure 11) to the negative (-) terminal of the booster battery, and then make ground connection to the upper frame of the machine (5, Figure 11) to be started with the other end of black negative (-) cable (2, Figure 11). 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.

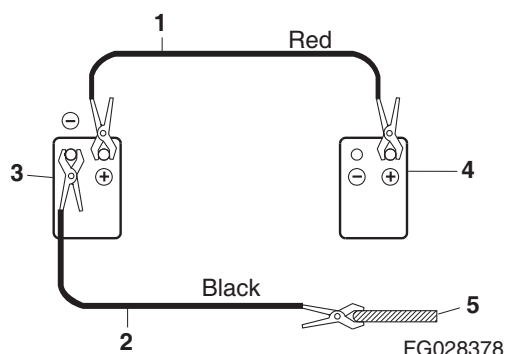


Figure 11

Disconnecting the Booster Battery

1. Disconnect black negative (-) cable (2, Figure 11) from the machine frame first.
2. Disconnect the other end of black negative (-) cable (2, Figure 11) from the booster battery.
3. Disconnect red positive (+) cable (1, Figure 11) from the booster battery.
4. Disconnect red positive (+) cable (1, Figure 11) from the machine battery.

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 minutes set at the middle of the speed range, without a load.

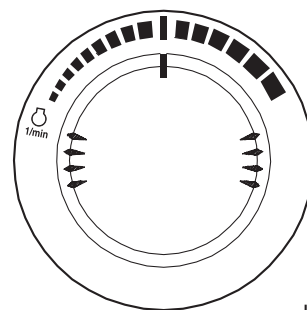


Figure 12

2. Move safety lever (1, Figure 13) to "UNLOCK" position.

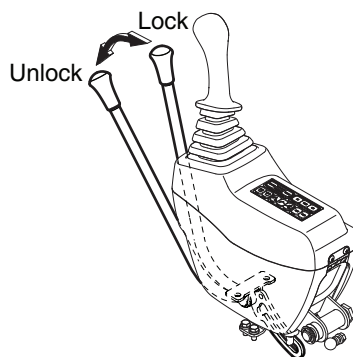


Figure 13

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 minutes.
4. Check for clearance and fully raise the front attachment. Swing clockwise 3 revolutions. Swing counterclockwise 3 revolutions.
5. Travel forward and reverse at low speed for two revolutions of the drive sprocket.

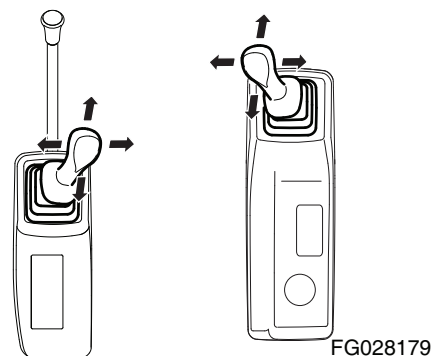
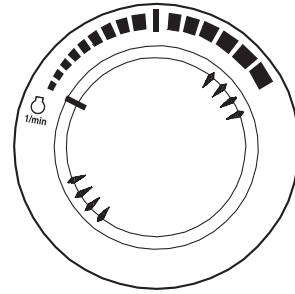


Figure 14

Hydraulic System Warm-up – Cold Weather

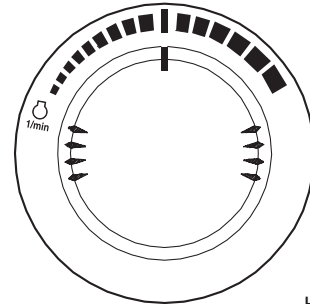
1. Run engine at "LOW IDLE" (no load) for five minutes (Figure 15).



HA0B290L

Figure 15

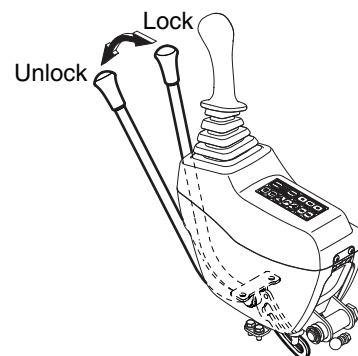
2. Run engine for approximately five minutes set at the middle of the speed range, without a load (Figure 16).



HA0B410L

Figure 16

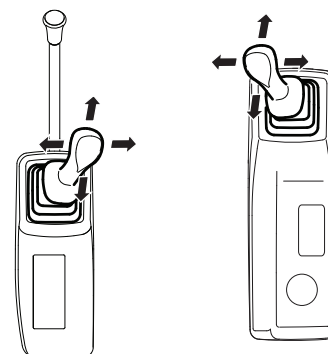
3. Move safety lever (1, Figure 17) to "UNLOCK" position.



EX1504982

Figure 17

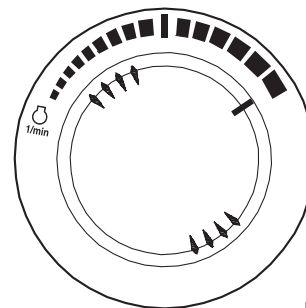
4. Slowly cycle boom, arm and bucket cylinders about five times without a load to circulate the oil through the system. Do this for five minutes.



FG028179

Figure 18

5. Set engine speed control dial to "HIGH IDLE" (Figure 19).
6. Repeat Step 4 for five minutes. If working speeds continue to be slow, continue to operate, but use extreme caution because the machine function may be erratic.
7. Check for clearance and fully raise the front attachment. Slowly swing clockwise 3 revolutions. Slowly swing counterclockwise 3 revolutions.
8. Travel forward and reverse at low speed for two revolutions of the drive sprocket.



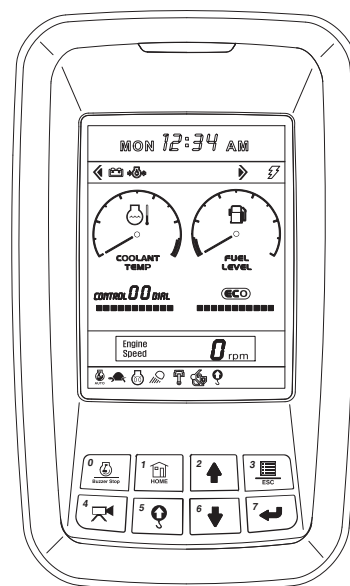
HAOB550L

Figure 19

Check and Confirmation After Engine Start

1. Instrument and Warning Light Confirmation

Engine Coolant Temperature Gauge	White Zone
Fuel Gauge	White Zone
Engine Oil Pressure Warning Light	OFF
Charging Warning Light	OFF
Air Cleaner Clogged Warning Light	OFF
Engine Coolant Temperature Warning Light	OFF
Fuel Level Warning Light	OFF
Communication Indicator	ON
Auto Idle Indicator Light	ON



FG028076

Figure 20

2. Engine Operating Condition Confirmation - Exhaust Color

No color or light blue - Engine is running in good condition.

Black - Incomplete combustion. Check cause.

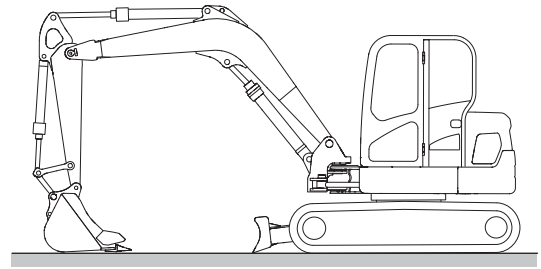
White or dark blue - Engine is burning engine oil.

NOTE: If engine coolant temperature gauge pointer moves into the red zone, the engine coolant temperature warning light will turn "ON". 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 minutes before shutting down 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.

Stopping Engine

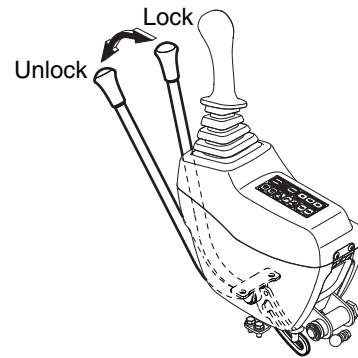
NOTE: Allow engine to idle for three - five minutes before shutting down the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allowing the engine to idle will dissipate heat.

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 22).
4. Set engine speed control dial to "LOW IDLE" (Figure 23). Allow engine to idle for three - five minutes.
5. Stop engine by turning key to "O" (OFF) position (Figure 24).
6. Remove key from starter switch.



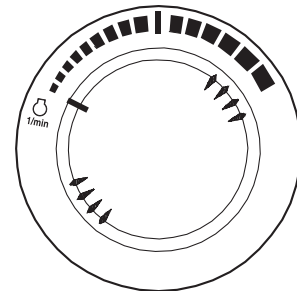
FG028464

Figure 21



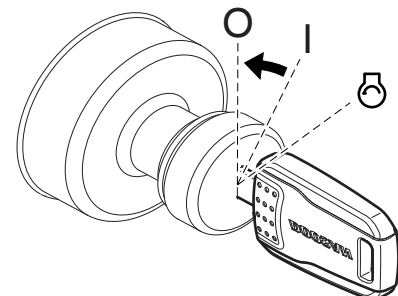
EX1504982

Figure 22



HAOB290L

Figure 23



FG018156

Figure 24

Check and Confirmation After Stopping Engine

1. Repair excavator, if there are any coolant or oil leaks.
2. Inspect front attachment and undercarriage for abnormal appearances. Correct any problems.
3. Fill fuel tank.
4. Get rid of any accumulated flammable materials such as leaves and paper etc. in engine compartment.
5. Clean all mud, etc. from undercarriage and tracks. Make sure that all steps and handholds are clean, and that operator's cabin is clean.

SAFETY LEVER



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Be careful not to move the work (joystick) lever when raising up or pushing down the safety lever.

The safety lever is designed to lock the working control levers so even if the working control levers are moved unintentionally, they will not work. However, the safety lever does not control the travel levers and boom swing pedal.

1. Pull safety lever up to allow left-hand control console to raise into "LOCKED" position. Make sure that safety lever is "LOCKED" into the raised (up) position. When safety lever is in the "LOCKED" position, front attachment movement will be disabled even though a lever is moved.

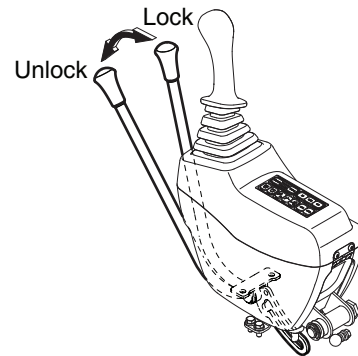
NOTE: Lower bucket (front attachment) and blade to ground. Place all control levers in "NEUTRAL" and stop engine.

2. Move safety lever to "UNLOCK" position, by pushing it down before starting work.

NOTE: When the engine is not running, but the safety lever is "UNLOCKED" and the starter key is turned "ON", moving the joysticks can result in movement. The charged accumulator in the system will provide pilot pressure for control valve spool movement.

NOTE: If the front attachment moves when the safety lever is moved to "UNLOCK" position and all levers and pedals are in "NEUTRAL", return the safety lever to "LOCK" position, stop engine and contact your nearest DOOSAN dealer. There is a malfunction with the system.

NOTE: If the pilot cutoff switch mounted on switch panel is not pressed to "I" position when the safety lever is in "UNLOCK" position, the operator cannot operate the work levers (Joysticks). (See page 2-52)



EX1504982

Figure 25

TRAVEL



WARNING

AVOID DEATH OR SERIOUS INJURY

1. 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.
 2. 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.
 3. Always make sure the path is clear during travel.
 4. Use extreme caution when reversing travel. Be sure there is a clear path behind the machine.
 5. Operate the travel control levers smoothly to avoid sudden starts or stops.
 6. Before leaving the operator's seat, make sure to lock out all control systems and stop engine to avoid accidental activation of the controls.
-

Travel Speed Control



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not change the travel mode while traveling. Always use "Low Travel Speed Mode" when traveling down a slope. Do not change to speed mode indicated "High Travel Speed Mode" while going down a slope. Only change travel mode after coming to a complete stop.

Two travel speed ranges can be selected by using the travel speed selector button on the dozer lever.

Press button on the top of the dozer lever to change travel speed.

Setting the travel mode at the "HIGH SPEED" enables the machine to change to a different speed range automatically. This change happens automatically depending on the hydraulic oil pressure in the travel circuit. When hydraulic oil pressure rises, the travel speed is automatically set to low. An example is if the machine is traveling on a flat, solid surface, the higher speed range would be used. When a slope is encountered, the speed drops and the travel circuit hydraulic pressure rises, causing the control circuit to shift to the higher torque, lower speed range.

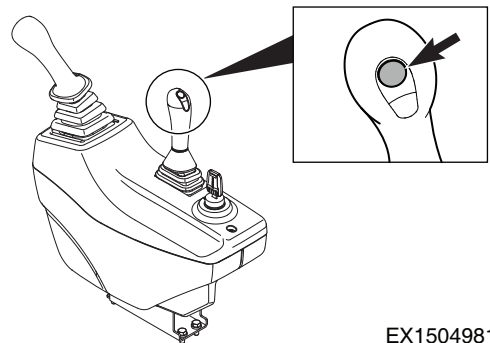


Figure 26

EX1504981

NOTE: *Engine rpm dial must be set to the highest level when using top speed of 2-speed gear. If travel lever is operated with the 2-speed button pressed, engine rpm increases to reach the top speed of 2-speed gear.*

Travel Control Lever Operation

1. To travel straight (Figure 27), push both travel control levers/pedals fully forward or backwards. The farther the levers/pedals are pressed, the faster the travel speed.

NOTE: "X" is the sprocket end of the track.

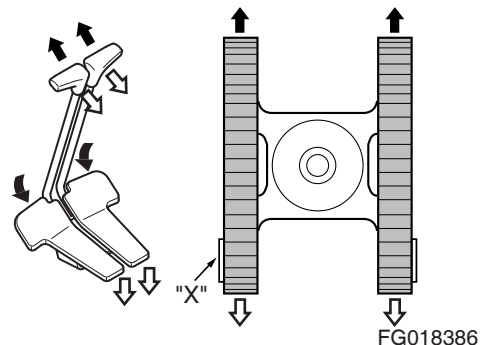


Figure 27

2. Pivot turns (Figure 28) are made by rotating only one track forward or backward. The machine will pivot on the nonmoving track.

NOTE: "X" is the sprocket end of the track.

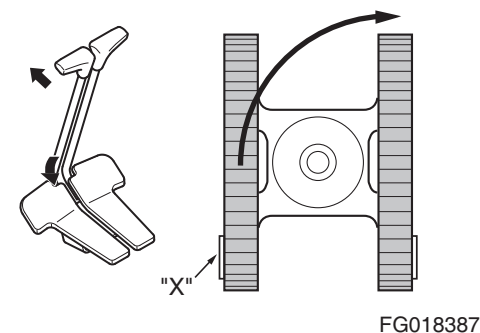


Figure 28

3. Spin turns (Figure 29) are made by rotating one track forward and one track backward. The machine will spin around its center point, thus counterrotating.

NOTE: "X" is the sprocket end of the track.

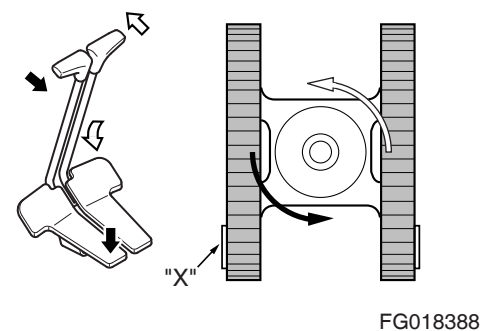
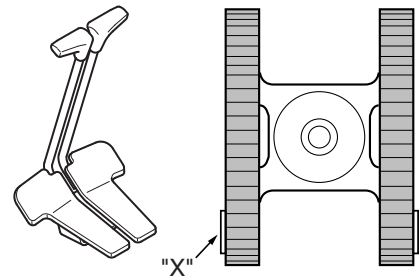


Figure 29

- Stopping travel (Figure 30) - Returning travel levers to "NEUTRAL" position will automatically apply brakes and stop excavator.

NOTE: "X" is the sprocket end of the track.

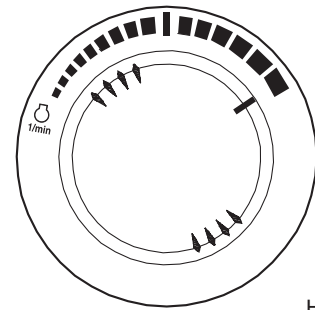


FG018389

Figure 30

General Travel Instructions

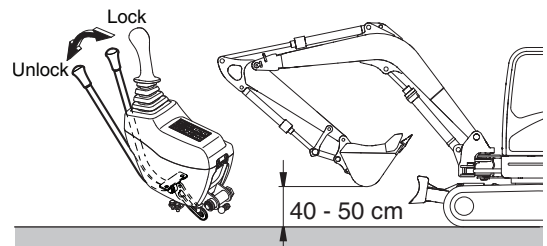
- Move engine speed control dial (Figure 31) to desired speed.



HAOB550L

Figure 31

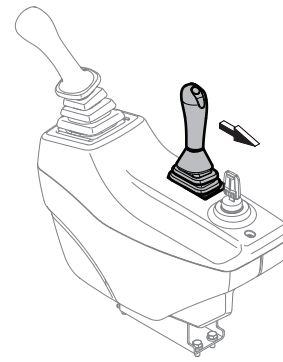
- Move safety lever to "UNLOCK" position, and folding the front, raise it 40 - 50 cm (16 - 20 in) above ground. See Figure 32.



EX1504983

Figure 32

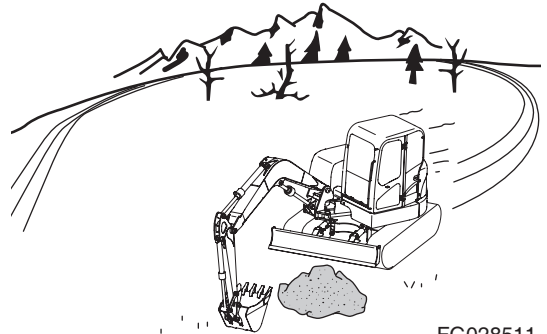
3. Raise dozer blade all the way up.



EX1504984

Figure 33

4. When possible, travel on firm and level ground. Avoid sudden movements and sharp turns.
5. When traveling on rough ground, travel at a slow speed [1.0 - 1.5 km/h (0.62 - 0.93 MPH)]. Reduce engine speed, to avoid shock loading the equipment. Be careful that an excessive force is not added to equipment by climbing on rocks.



FG028511

Figure 34

6. On rough, frozen, or uneven terrain, travel slowly.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Never turn or travel across a slope. Travel straight up or down the slope.

Choose a safe alternate route before climbing a slope.

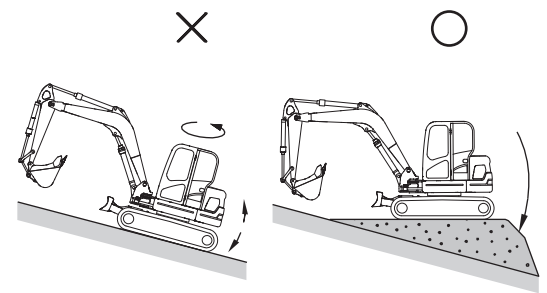
If excavator starts to slip or becomes unstable, lower the bucket immediately into the ground, using it as a brake.

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

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

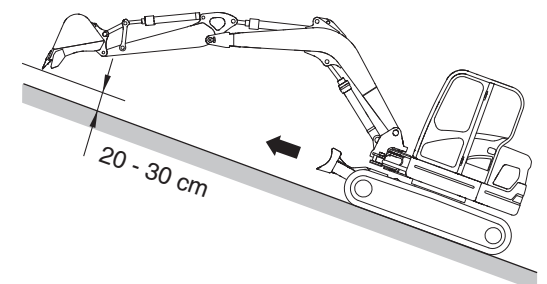
In unavoidable cases, level the slope with fill soil to make the machine as level as possible. See Figure 35.

Do not travel on slopes more than 30° because of risk of roll-over.



FG028462

Figure 35



FG028473

Figure 36

7. Travel straight up or down slopes, never diagonally across the slope. See Figure 36 and Figure 37. Extend the arm and lower the boom to keep the bucket about 20 - 30 cm (8 - 12 in) off the ground. If the machine starts to slide or becomes unstable, lower the bucket to regain control. If the engine stalls, lower the bucket, make sure that all controls are in the "NEUTRAL" position and restart the engine.

NOTE: *Even though engine stops on a slope, do not operate swing control. The hydraulic accumulators can cause the unit to swing.*

NOTE: *Do not open or close operator's door on a slope. Make sure door is latched.*

8. If dirt or mud builds up in the track frame, raise each track to rotate and clean that track.

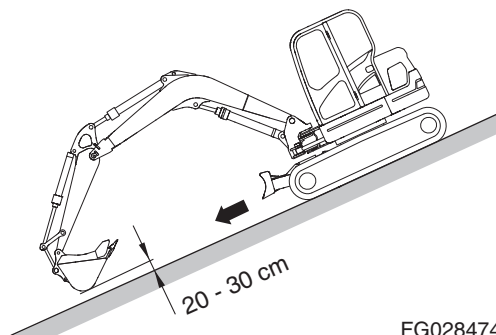
IMPORTANT

When using the boom and arm to lift any portion of the machine, roll the bucket until round base is against the ground. The angle of the arm to the boom must be at 90°.

Make sure that material buildup has been cleared. See Figure 38 and Figure 39.

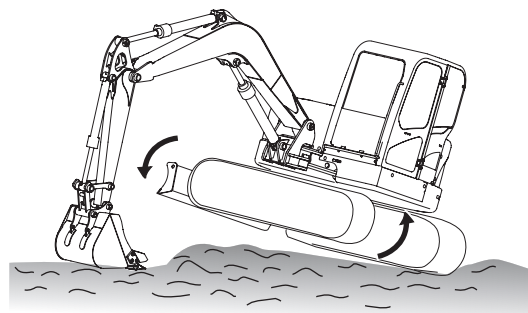
9. The excavator can travel in water that comes up to center of upper carriage rollers. Make sure that footing is solid so the machine will not sink.

NOTE: *If the machine is submerged to the point that water or mud gets into the swing bearing or center joint, stop machine operation. Remove machine from the submerged location to firm, dry ground. Do not operate until proper inspection and maintenance have been completed. Refer to the Shop Manual or contact your DOOSAN distributor.*



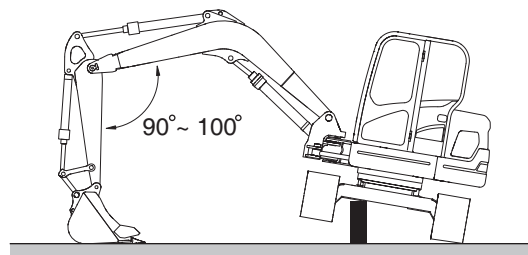
FG028474

Figure 37



FG028527

Figure 38



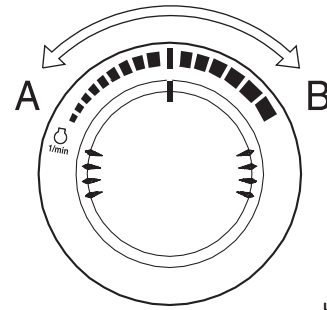
FG028476

Figure 39

OPERATING INSTRUCTIONS

Engine Speed Control

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



HAOA690L

Figure 40

IMPORTANT

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

Engine Exhaust Emission Control System

This machine is equipped with an engine exhaust emission control system that meets applicable engine EPA/EU exhaust emission regulations. The owner/operator is responsible for proper operation and maintenance of the emission controls system as provided in this manual and the emissions-related warranty provisions.

The engine exhaust system is equipped with a diesel particulate filter (DPF). The DPF is an emissions reduction device that removes diesel particulate matter or "soot" from the exhaust gases of the diesel engine. The DPF will trap and collect the particulate matter until it is burned off. The process of burning off the collected particulate matter is called "regeneration". After the regeneration process is completed, ash residue will remain and will need to be periodically removed from the DPF. Ultra Low Sulfur Diesel fuel and API CJ-4/ACEA E9 grade engine oil must be used with this engine for the emission control system to function properly.

If you have any questions about the operation or maintenance of your emission control system, contact your DOOSAN distributor.



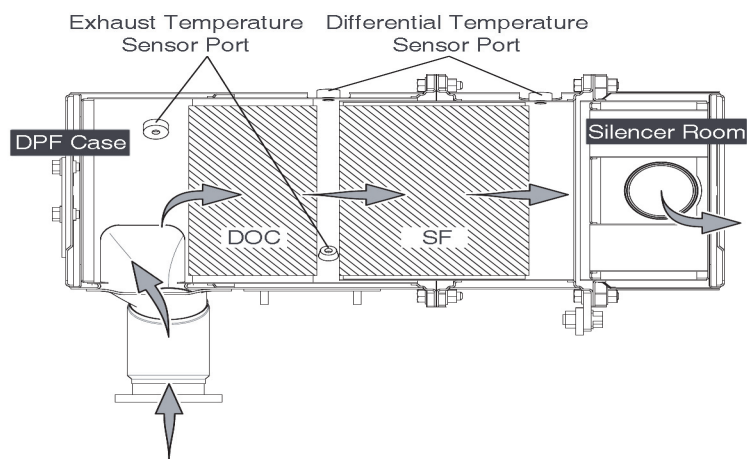
WARNING

AVOID DEATH OR SERIOUS INJURY

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

Regeneration of Diesel Particulate Filter (DPF)

This is an internal illustration of the DPF and shows how particles (soot) are filtered in arrows' flow direction. (Figure 41)



FG028538

Figure 41

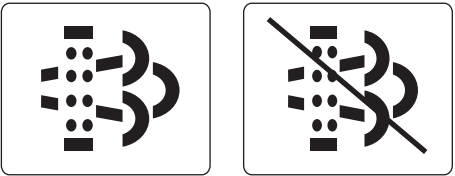


WARNING

AVOID DEATH OR SERIOUS INJURY

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

- Regeneration light: light turns "ON" when regeneration is required, or during the regeneration. When the operator inhibits regeneration, the symbol will be displayed as shown in the right-hand view of Figure 42.



FG018399

Figure 42

- The high temperature warning light turns "ON" as shown in Figure 43 to alert the operator of hot engine exhaust gases.

Condition	Automatic Regeneration	Selective Manual Regeneration
Color	Green	Amber

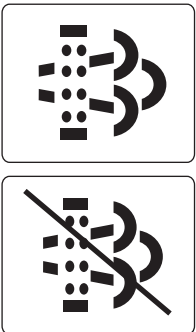


FG018398

Figure 43

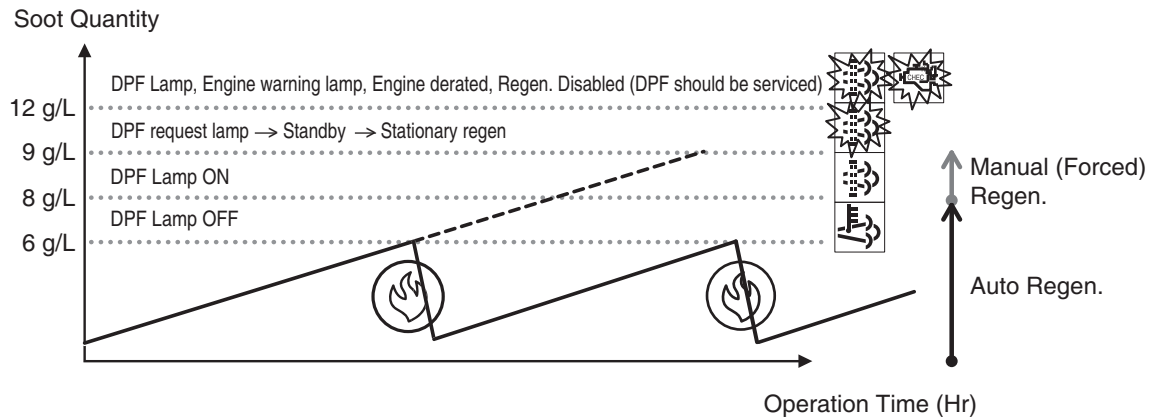
- Manual (forced) regeneration and inhibit switch: the upper symbol in Figure 44 is shown when the operator selects manual (forced) regeneration with the switch. When the operator inhibits regeneration, the lower symbol will be displayed as shown in Figure 44.

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



FG018400

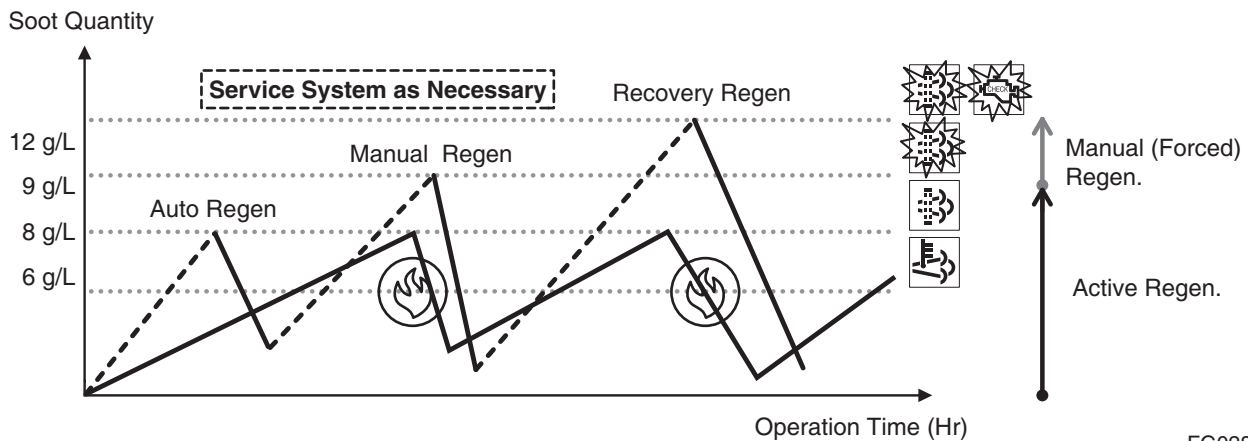
Figure 44



FG028082

Figure 45 DPF Regeneration Light

- Regeneration light turns "ON" when soot quantity in DPF is 8 g/L or more.
- Regeneration light "FLASHES" when soot quantity in DPF is 10 g/L.
- Regeneration light "FLASHES" + engine output power reduction (50%) occur when soot quantity in DPF exceeds 12 g/L.



FG028083

Figure 46 DPF Regeneration Method

- Soot quantity in DPF is from 8 g/L to 10 g/L: Auto regeneration.
- Soot quantity in DPF is 10 g/L to 12 g/L: Manual (Forced) regeneration.
- Soot quantity in DPF is 12 g/L or more: regeneration is impossible, service the emission control system. Contact your DOOSAN distributor for more information.

Diesel Particulate Filter - Service Chart		
Level/Light Status	Filter Status	Requested Action
	Soot in DPF is under 8 g/L	No Need
"ON" (GREEN)	Soot in DPF is above 8 g/L	No Need (Auto Regeneration)
"FLASHING" (RED)	Soot in DPF is above 9 g/L	Manual (Forced) Regeneration Immediately (Service Regeneration)
"FLASHING" (RED) + Engine Output Power Reduction	Soot in DPF is above 12 g/L	Service the Emission Control System Immediately

Passive Regeneration

The engine provides adequate exhaust gas temperature for regeneration.

Active Regeneration

No action by the operator is required to start active regeneration. Regeneration of the DPF is automatically activated by the engine control unit (ECU) when particulate matter or "soot" has reached certain levels in the DPF. When the soot quantity in the DPF is near 8 g/L, active regeneration will start. If the soot quantity exceeds 10 g/L, the operator should activate manual (forced) regeneration. When the soot quantity exceeds 12 g/L, the engine warning light turns on and the engine's output power is reduced to 50%.

If this occurs, service the emission control system. Contact your DOOSAN distributor for more information.

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

The regeneration process can last for 30 minutes or longer. When completed, the regeneration lights on the monitor will turn "OFF".

IMPORTANT

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

Manual (Forced) Regeneration

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



WARNING

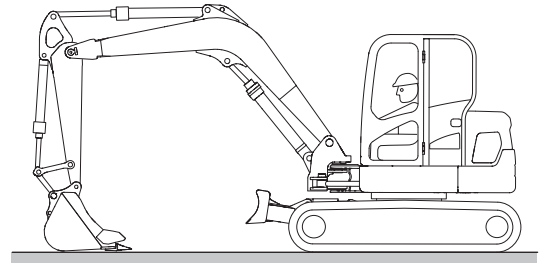
**AVOID DEATH OR SERIOUS INJURY
OR PROPERTY DAMAGE**

Exhaust gas temperature and exhaust system components are very hot during manual (forced) regeneration.

FOLLOW THESE INSTRUCTIONS DURING MANUAL (FORCED) REGENERATION:

- **Keep flammable material and explosive gases away from exhaust system during manual (forced) regeneration.**
- **Park machine in open area that is well ventilated.**
- **Lower boom and position arm in vertical position as shown in Figure 47.**
- **Move safety lever to "LOCK" position.**
- **Engage parking brake (Wheel excavators only).**
- **Operator must be in operator's position during the regeneration process. Keep bystanders away.**

NOTE: *Slight movement of the bucket (work tool) hydraulic cylinder can occur during the manual (forced) regeneration process.*



FG028471

Figure 47

Procedures for manual (forced) regeneration by the operator.

1. Park machine in a well ventilated area and away from flammable materials. Position machine and lower boom as shown in Figure 47.
2. Set up machine in the following manner:
 - A. Operate machine until engine coolant and oil temperatures are above 60°C (140°F).
 - B. Set engine speed to "LOW IDLE".
 - C. Move safety lever to "LOCK" position.
 - D. If regeneration mode is "inhibited", push regeneration inhibit switch.

3. Activate regeneration switch to start regeneration process.

NOTE: *Slight movement of the bucket (work tool) hydraulic cylinder can occur during the manual (forced) regeneration process.*

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

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

Manual (forced) regeneration can last up to 30 minutes or more depending on amount of soot build-up.

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

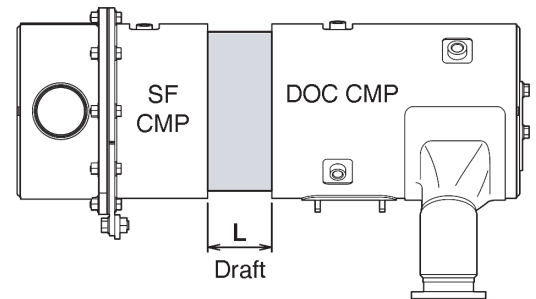
When regeneration stops, regeneration and high temperature warning lights will turn "OFF".

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

DPF Cleaning (Removing Ash in DPF)

Regeneration of soot collected in the DPF leads to the accumulation of ash in the DPF, which in turn results in reduced engine performance and reduced fuel efficiency because of the increase of back pressure. Periodic ash cleaning is necessary to prevent this. The DPF assembly must be removed for cleaning. The frequency of ash cleaning depends upon the operating conditions, environment, and engine oil used. The cleaning is recommended to be done after every 3,000 hours of operation.

Contact your DOOSAN distributor for DPF cleaning.



FG028540

Figure 48

Removal and Installation of the DPF Assembly

The following instructions must be followed when handling the DPF assembly:

1. The weight is approximately 65 kg (143 lb) and DPF assembly can be easily damaged. Remove and handle assembly carefully.
2. When replacing the differential pressure sensor, check that sensor pipe is free of foreign materials. Foreign materials can trigger a fault signal because of incorrect differential pressure sensing.
3. When removing from the machine, protect the inlet/outlet of the DPF assembly from foreign materials. Foreign materials can damage the DOC/DPF assembly.
4. Do not damage the differential pressure sensor and temperature sensor on the outside of the DPF assembly during disassembly/assembly work.
5. Replace the DPF gasket when reassembling the DPF. Otherwise, an exhaust leak can result.
6. Observe specified tightening torque of the exhaust system fasteners. Leakage in the exhaust system can result in failure to meet emission control regulations.

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 as 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.

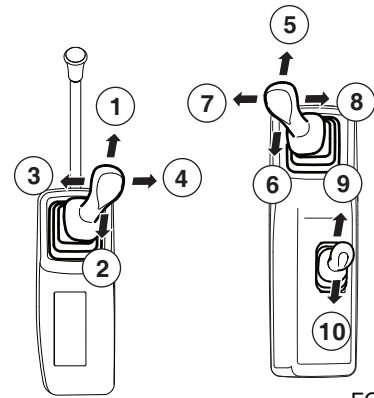
This equipment is manufactured using the lever configuration described in ISO standards. Do not change valving, hoses, etc., that would change this standard. The boom, arm and bucket movements and swing direction of work levers (joysticks) are as follows:

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

1. Arm dump
2. Arm crowd
3. Left swing
4. Right swing

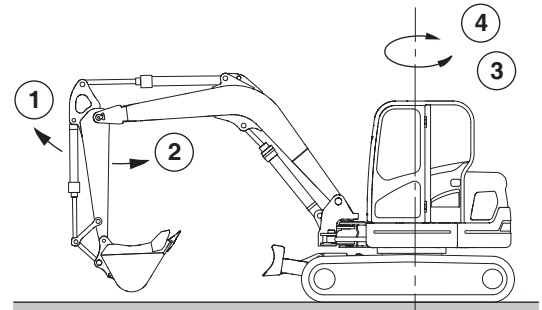
NOTE: The swing brake is spring applied and hydraulically released. It is always engaged when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.

NOTE: When operating the arm, it may stop momentarily because of characteristics of the hydraulic system. When the arm is operated, the weight of the arm can cause it to move faster than the amount of oil being supplied.



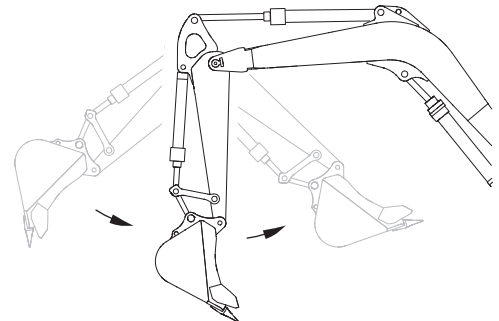
FG028379

Figure 49



FG028477

Figure 50



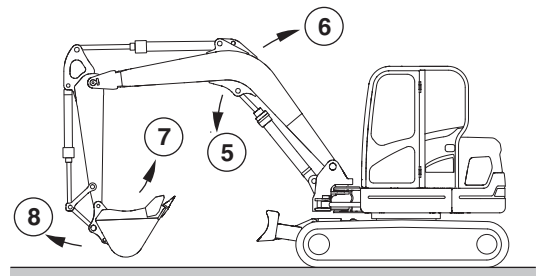
FG028478

Figure 51

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 boom, arm and dozer can be lowered to the ground by operating work lever (joystick), after moving safety lever to "UNLOCK" position and turning starter switch "ON."

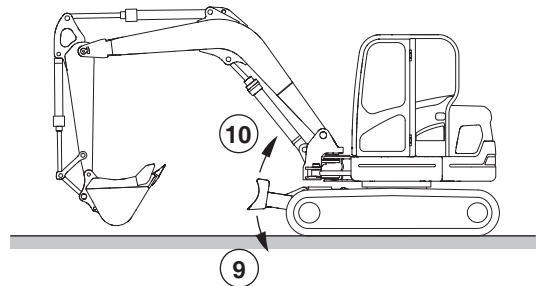


FG028479

Figure 52

Right-hand Dozer Lever

- 9. Dozer down
- 10. Dozer up



FG028480

Figure 53

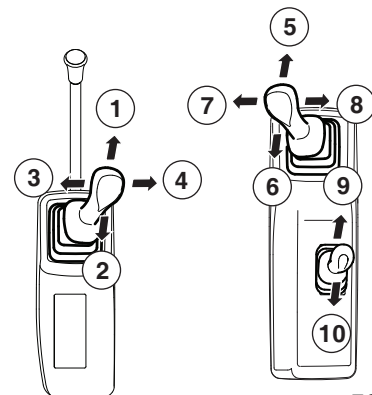
Change Machine Control Pattern by Selector Valve (If Equipped)



WARNING

AVOID DEATH OR SERIOUS INJURY

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



FG028379

Figure 54

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

The machine control pattern can easily be changed to the ISO standard pattern or to the standard backhoe loader pattern (BHL) by changing the position of the selector valve (if equipped). Use the following procedure to change the position of the selector valve.

The selector valve is located under the cabin.

1. Remove rubber cover from the hole of side cover.
2. Rotate spool to the ISO position or to the BHL position. (Figure 55)

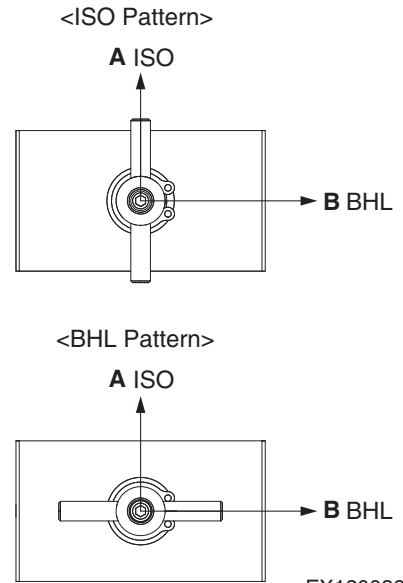


Figure 55

EX1300267

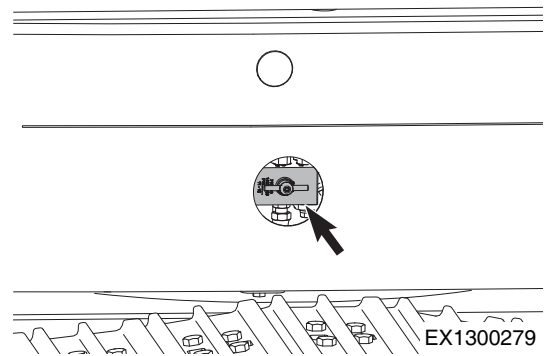


Figure 56

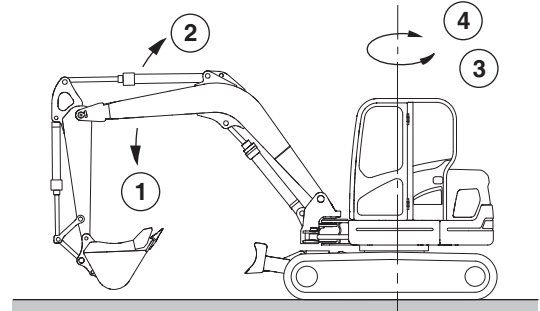
EX1300279

Work Levers (Joysticks) (BHL Pattern)

Left-hand Work Lever (Joystick) (Figure 54 and Figure 57)

1. Boom down
2. Boom up
3. Left swing
4. Right swing

NOTE: The swing brake is spring applied and hydraulically released. It is always engaged when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.



FG028481

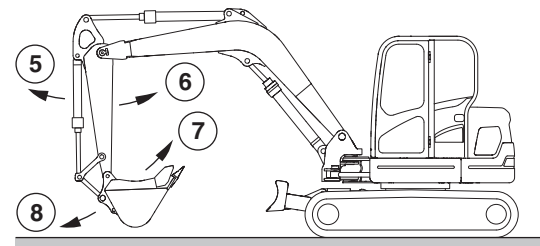
Figure 57

Right-hand Work Lever (Joystick) (Figure 54 and Figure 58)

5. Arm dump
6. Arm crowd
7. Bucket crowd
8. Bucket dump

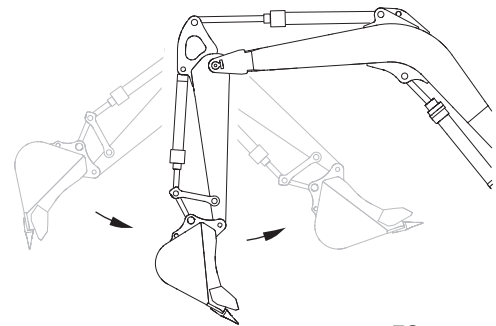
NOTE: When operating the arm, it may stop momentarily because of characteristics of the hydraulic system. When the arm is operated, the weight of the arm can cause it to move faster than the amount of oil being supplied.

NOTE: Even after stopping the engine, the boom, arm and dozer can be lowered to the ground by operating work lever (joystick), after moving safety lever to "UNLOCK" position and turning starter switch "ON."



FG028482

Figure 58



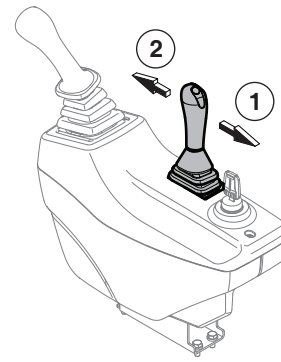
FG028478

Figure 59

Blade Control Lever

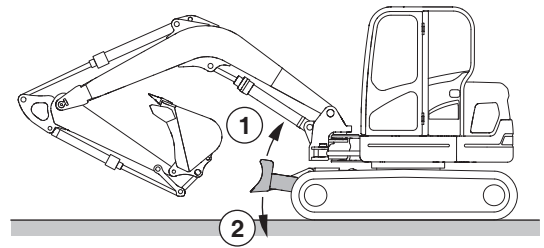
The blade control lever, located on the right-hand side of the driver's seat, controls the operation of the blade. When the lever is released, it goes to the NEUTRAL position and the blade stops immediately.

1. Pulling lever back "RAISES" dozer blade.
2. Pushing lever forward "LOWERS" dozer blade.
3. Pushing lever all the way forward will put the lever into the detent position and the dozer blade will be in the "float" position.



EX1504985

Figure 60



FG028504

Figure 61

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 track system.
2. Do not apply a large or unbalanced, off-center load to the blade. This can damage the blade or the track system.
3. Do not strike anything with the blade while traveling. This can damage the blade or track 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

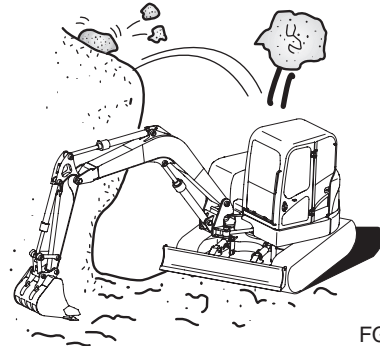


WARNING

AVOID DEATH OR SERIOUS INJURY

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

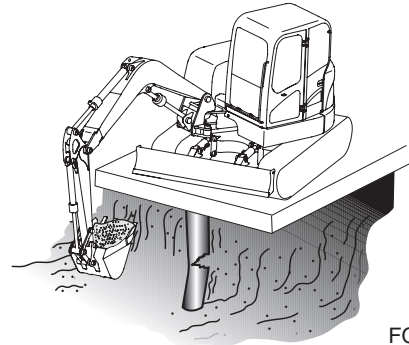
1. Before starting work, inspect terrain and soil condition. Level ground and drain area if necessary.
2. Install window guards for additional operator protection where there is a possibility of falling rocks or other objects. See Figure 62.



FG028483

Figure 62

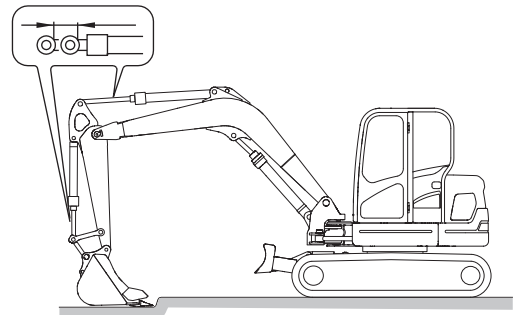
3. Check strength of supported structures before working to avoid collapse of the structure caused by the weight of the excavator. If insufficient, reinforce it. See Figure 63.



FG028484

Figure 63

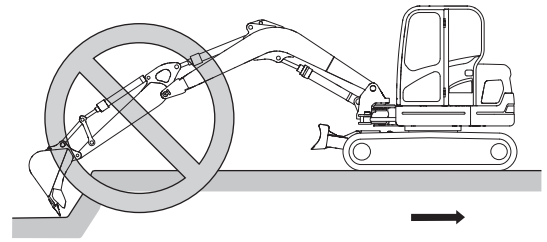
4. Do not continually "bottom out" the hydraulic cylinders. Machine damage can occur if the cylinders are fully extended or retracted. For example: arm cylinder fully retracted and the bucket cylinder is extended to rotate the bucket into the ground. See Figure 64.



FG028485

Figure 64

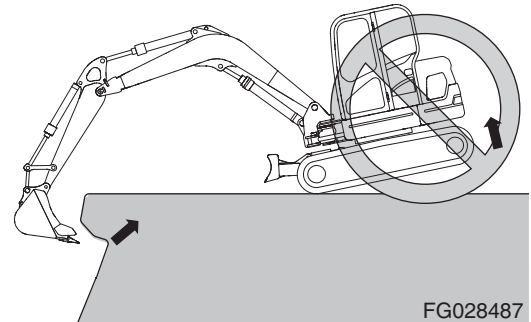
5. Do not use machine travel or swing when the bucket is in the ground to provide additional breakout force. See Figure 65.



FG028486

Figure 65

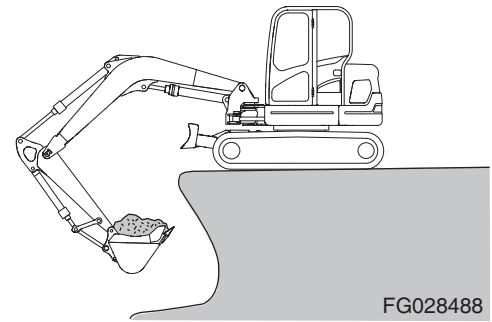
6. Do not use machine weight to provide additional breakout force. See Figure 66.
7. When working on soft or muddy ground, make sure that the machine is not sinking.



FG028487

Figure 66

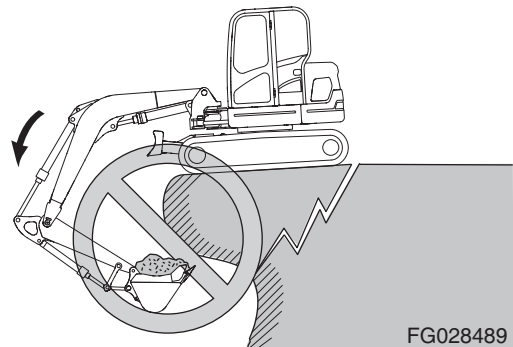
8. When working close to the excavated edge, make sure that ground the machine is sitting on is solid. Keep the travel motors to the rear. See Figure 67.



FG028488

Figure 67

9. Do not excavate underneath the machine. The ground under the machine can collapse and cause the machine to fall and rollover. See Figure 68.



FG028489

Figure 68

10. Make sure there is adequate clearance from overhead electrical supply lines. Check for underground utility lines before excavating. Call before you dig. See Figure 69.

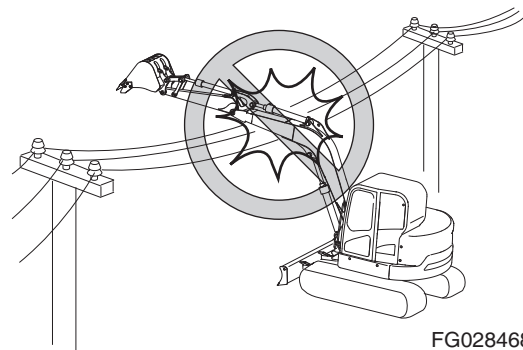


Figure 69

11. 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 70.

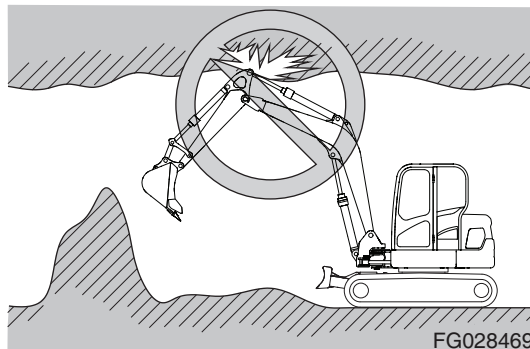


Figure 70

12. Do not use the bucket as a hammer or ramming device. This can cause damage to the front attachment. See Figure 71.

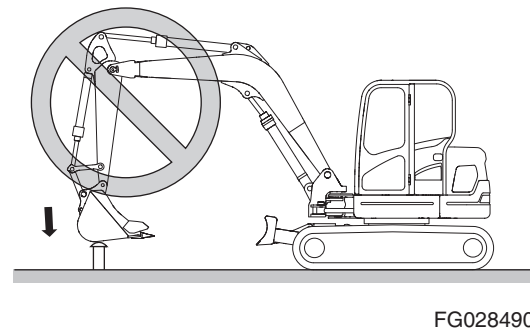


Figure 71

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

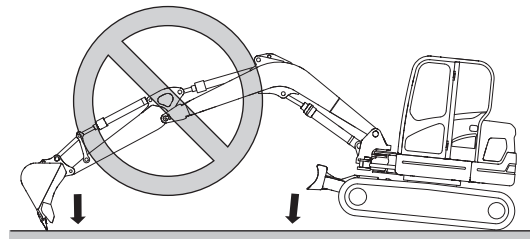
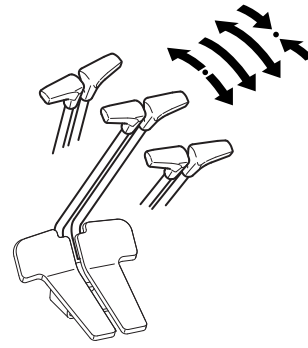


Figure 72

14. Do not operate travel levers quickly or jerk them 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 with levers.
 - Avoid sudden stops. Return levers to neutral by hand. Do not let them snap back to neutral on their own.
15. If the optional long fronts or attachments or heavy-duty front end attachments are used, the machine balance will be altered. Follow these additional operating precautions.



FG018422

Figure 73



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 slope.

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

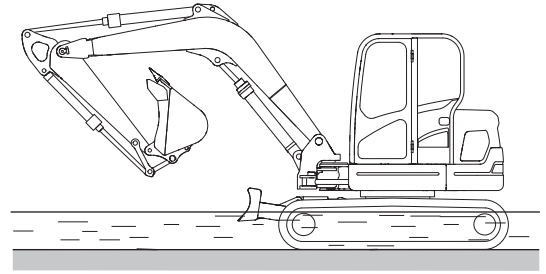
Allow extra swing stopping room. The additional momentum generated by the longer or heavier front end equipment will increase the amount of time needed to stop the swing motion.

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

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

Operation Under Water or On Weak Ground

1. If a riverbed is uneven or the current is swift, be especially careful. Do not travel in water deeper than the upperpart of the shoes on the idler end of tracks. Be careful not to submerge the center joint, swivel bearing or pinion gear in water, mud or sand.
2. On weak, unstable surfaces, the machine may sink: keep watching the tracks and checking the riverbed surface.



FG028492

Figure 74

IMPORTANT

If the center joint, swivel bearing or pinion gear are submerged in water, mud or sand, they need to be serviced, either lubricated or in some cases rebuilt. In addition, any other component that is submerged, such as a bucket pin, must be lubricated.

PARKING EXCAVATOR



WARNING

AVOID DEATH OR SERIOUS INJURY

Park machine on firm and level ground. Avoid parking on slopes. If excavator must be parked on a slope, block tracks and place bucket teeth in ground. See Figure 75.

1. Park machine on firm and level ground. Lower blade and bucket or work tool to ground as shown in Figure 76.

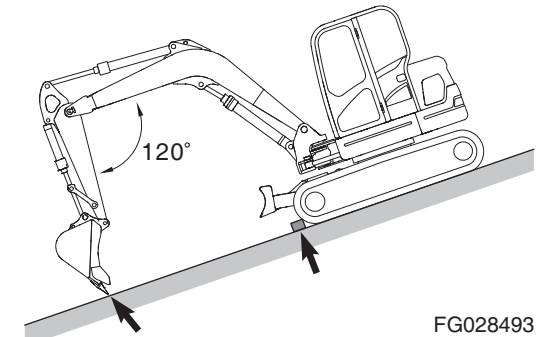


Figure 75

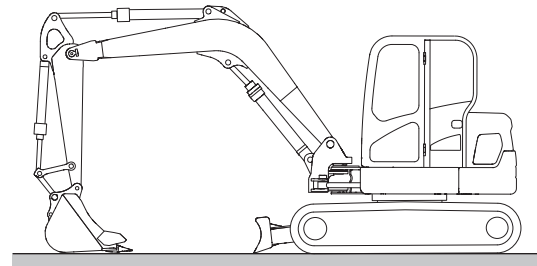


Figure 76

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

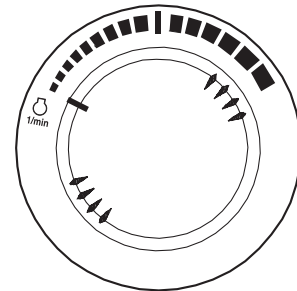


Figure 77

3. If you move the operation lever unintentionally, it can cause accidental movement of the work group or attachment. Before leaving operator's seat, move safety lever to "LOCK" position. Stop engine.

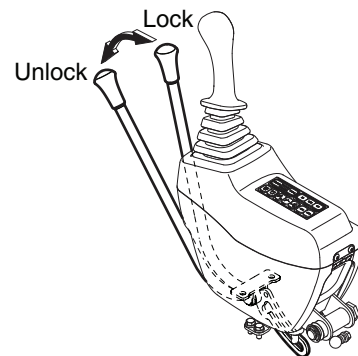


Figure 78

TOWING PROCEDURE



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Always wear gloves when handling a chain or wire rope.

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

Attach chain or wire rope to track frame as shown in Figure 79.

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



WARNING

AVOID DEATH OR SERIOUS INJURY

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

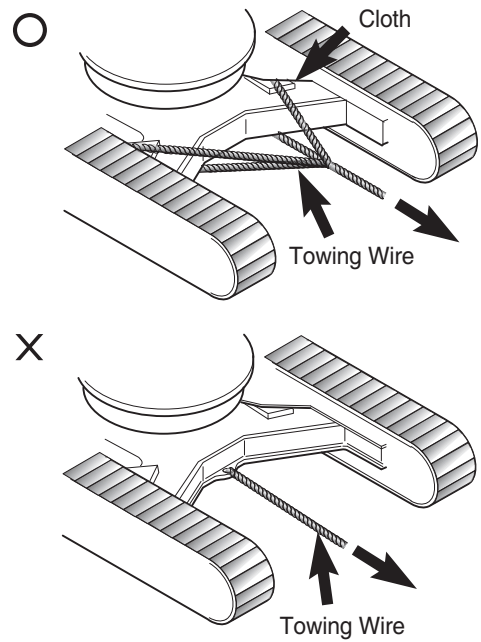


Figure 79

FG028815

HYDRAULIC BREAKER

IMPORTANT

If a hydraulic breaker and piping is installed without DOOSAN's authorization, it may create a serious malfunction which 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 drawings 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.

Hydraulic Breaker Operation

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 80.
Do not drop breaker from extreme heights. This can damage breaker or the excavator.

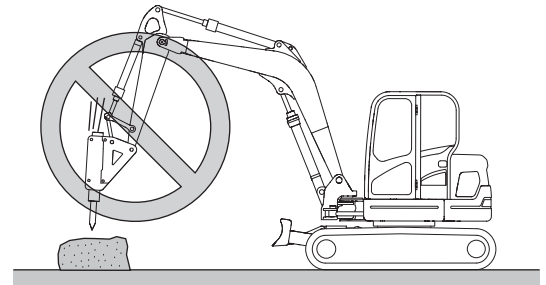


Figure 80

FG028495

4. Do not operate the breaker with the boom or arm cylinders fully extended (bottomed out). See Figure 81.
Leave over 100 mm (4 in) of clearance between rod end of cylinder and cylinder head. This will help prevent damage to cylinders during breaker operation.

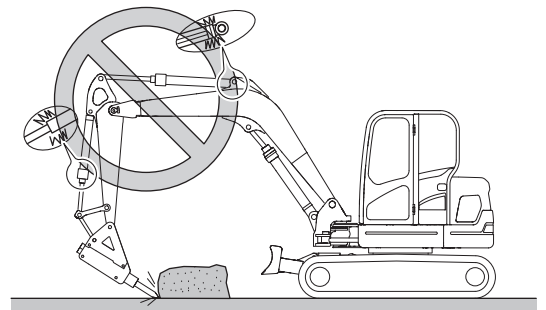


Figure 81

FG028496

5. Do not use the breaker if the hydraulic hoses vibrate excessively. See Figure 82. Check the breaker's hydraulic accumulator (1) for damage and repair as required. If excavator is operated under this condition, structural and hydraulic components can be damaged.

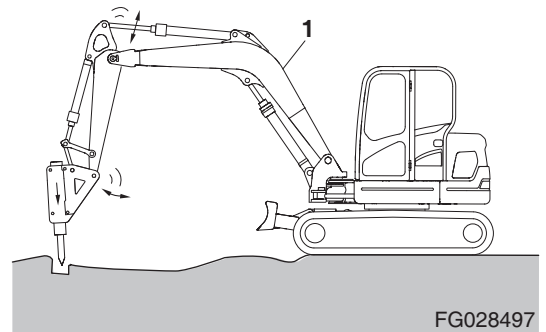


Figure 82

FG028497

6. Do not allow the breaker body to go into water if not equipped for underwater operation. The breaker seal can be damaged and allow rust, foreign material or water to enter the hydraulic system and cause damage. Only insert the breaker tool into water. See Figure 83.

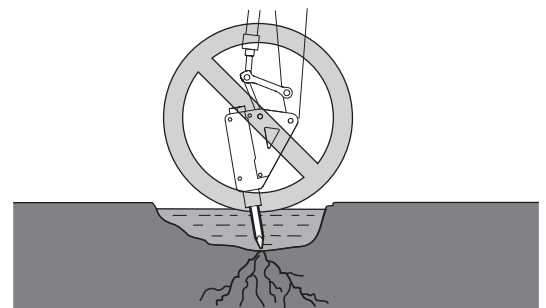


Figure 83

FG028498

7. Do not lift or tow with a breaker. See Figure 84.

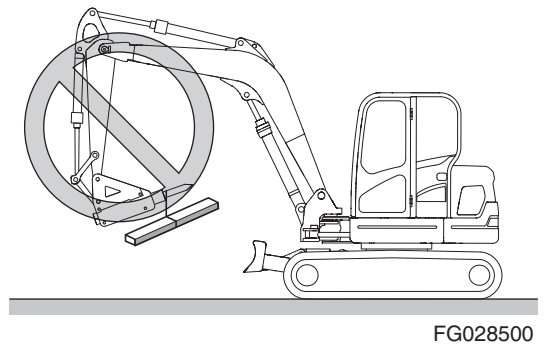


Figure 84

8. Operate the breaker only to the front and rear of the excavator. Do not use the breaker on either side of the excavator. Do not swing the breaker from side to side when operating it. See Figure 85.



WARNING

AVOID DEATH OR SERIOUS INJURY

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

9. Do not curl the breaker tool tip into the arm or boom when traveling or parking the excavator. See Figure 86.

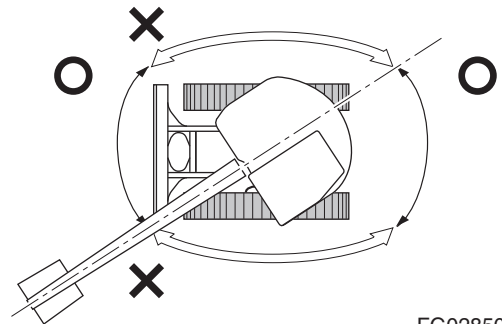


Figure 85

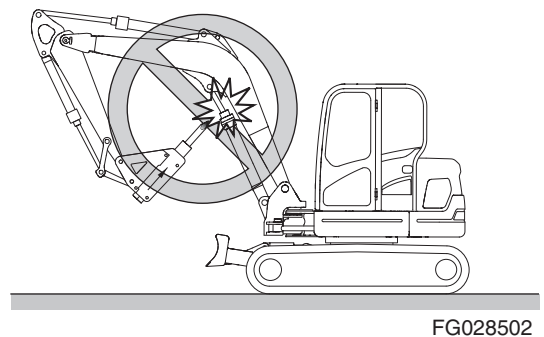


Figure 86

10. Do not operate the breaker as shown.

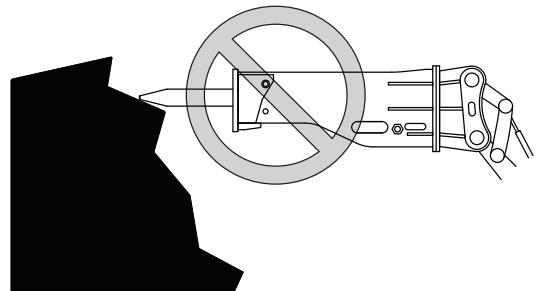


Figure 87

To Activate Breaker

When using a breaker, make sure the direct to tank valve is in the proper position for breaker operation. The direct to tank valve is located under the left side of floor mat.

To access the direct to tank valve, raise the left side of floor mat and remove the rubber cap. Replace the rubber cap once the valve has been adjusted.

1. Rotate the direct to tank valve clockwise until fully against the stop (Figure 89).

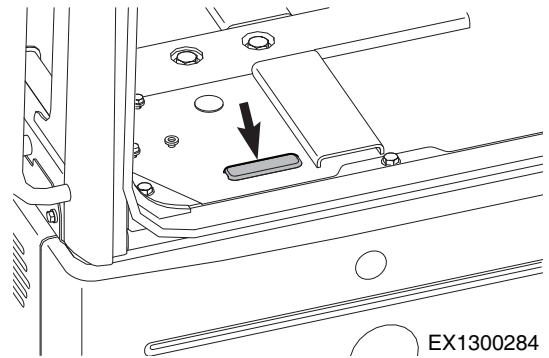


Figure 88

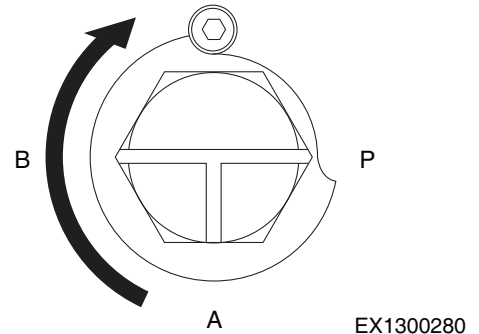


Figure 89

2. Press lower button on top of right-hand work lever (joystick) to activate hydraulic breaker.
3. Press lower button one more on top of right-hand work lever (joystick) to deactivate hydraulic breaker.

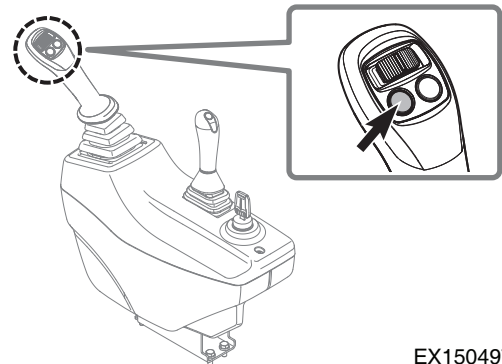
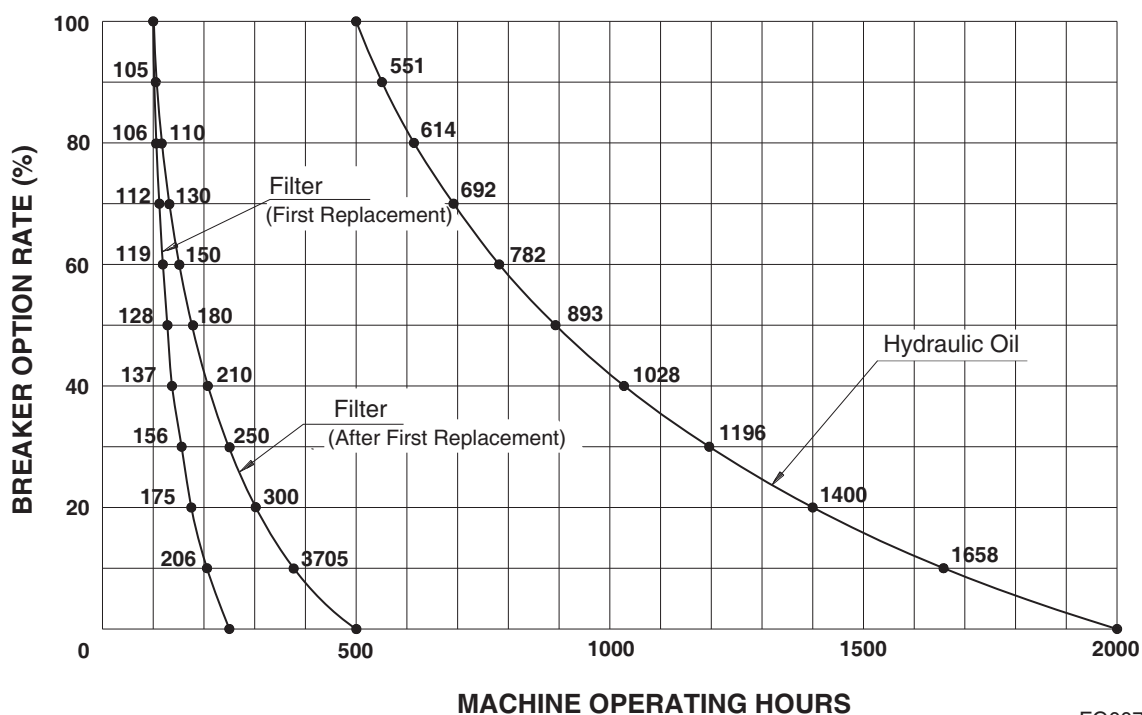


Figure 90

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) 500 Hours (After First Replacement)
Hydraulic Breaker Work	100%	500 Hours	100 Hours
* These service intervals only apply, when genuine DOOSAN oil and filter are used. If any other brands are used, the guaranteed change interval must be reduced in half.			



FG007618

Figure 91

NOTE: The replacement intervals of hydraulic oil and filter depend upon the amount of time the hydraulic breaker is being used. These intervals must be followed as opposed to regularly scheduled maintenance.

Boom Swing Operation (Optional)

This switch is used with thumb wheel switch on top of left-hand work lever (joystick) to swing the boom.

It is used to dig along the side of a ditch or a retaining wall.

To Activate Boom Swing

Set boom swing switch to "I" position.

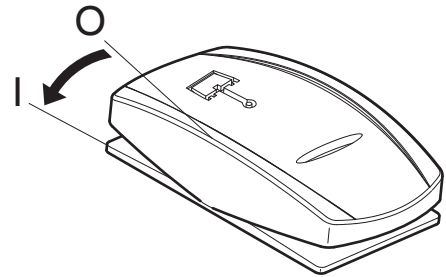
and then move the thumb wheel switch on top of the left-hand work lever (joystick) (Figure 93).

- O. In this position, boom swing will be deactivated.
If the thumb wheel switch on the top of the left-hand work lever (joystick) is moved, attachment will be rotated.
- I. In this position, boom swing will be activated.
If the thumb wheel switch on the top of the left-hand work lever (joystick) is moved, boom swing will be activated.

Thumb wheel switch "UP" is for "CLOCKWISE" boom swing.

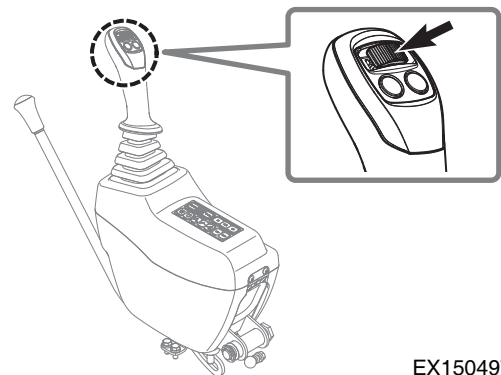
Thumb wheel switch "DOWN" is for "COUNTERCLOCKWISE" boom swing.

Release the thumb wheel switch to stop boom swing movement.



FG017963

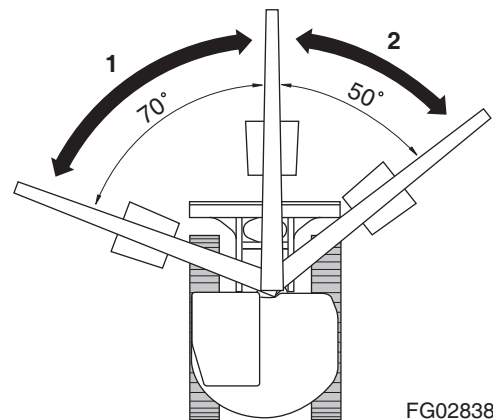
Figure 92



EX1504977

Figure 93

1. Left swing: 70°
2. Right swing: 50°



FG028386

Figure 94

Shear Operation

The switch located on top of right-hand work lever (joystick) is used to function the shear or other two-way flow attachments.

When using a shear or other two-way flow attachment, make sure the direct to tank valve is in the proper position for attachment operation. The direct to tank valve is located under the left side of floor mat.

To access the direct to tank valve, raise the left side of floor mat and remove the rubber cap. Replace the rubber cap once the valve has been adjusted.

Rotate the direct to tank valve counter clockwise until fully against the stop (Figure 96).

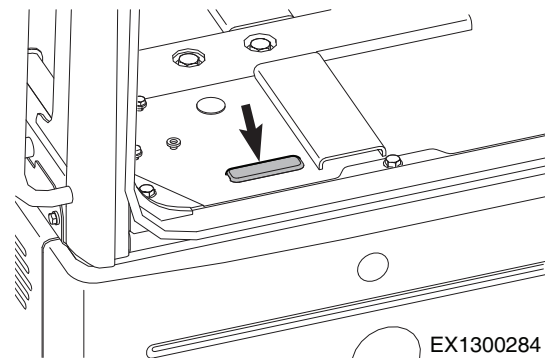


Figure 95

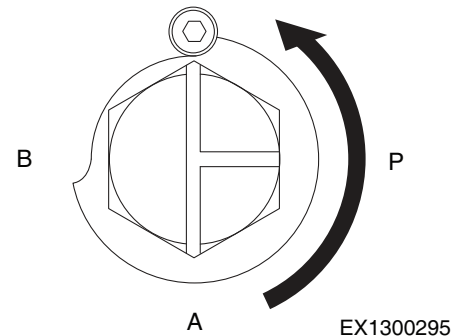


Figure 96

To Activate Shear

Pushing thumb wheel switch "UP" pressurizes the hydraulic piping on the left side of the excavator arm.

Pushing thumb wheel switch "DOWN" pressurizes the hydraulic piping on the right side of the excavator arm.

Release the thumb wheel switch to stop action.

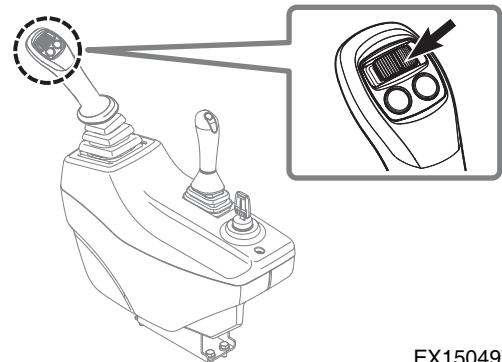


Figure 97

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. After checking the safe environment conditions for installing/removing the quick coupler, perform the below process.
3. To unlock the quick coupler switch, grab the switch and pull it up.

Pull the switch into the "I" (release) position; then, hold the switch in place until the quick coupler is released.

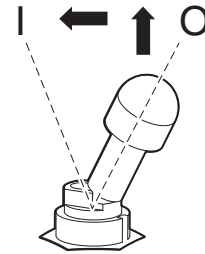
NOTE: If the switch held by the driver is released, the switch will automatically return to the "O" (locked) position.

NOTE: If the switch returns to the locked position before the pop-up notifying the operator that the quick coupler has been released appears on the gauge panel, the quick coupler switch must be pulled again.

4. Quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer (Internal & External) will sound.

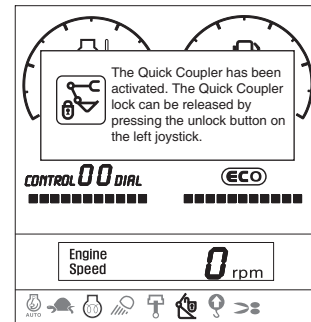
NOTE: When the quick coupler switch is kept in the "I" (release) position, a warning pop-up appears and a warning buzzer sounds.

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



DS1903332

Figure 98



DS1903351

Figure 99

5. With the quick coupler switch held in the "I" (release) position check the activation pop-up message and press the left hand button of the left joystick.

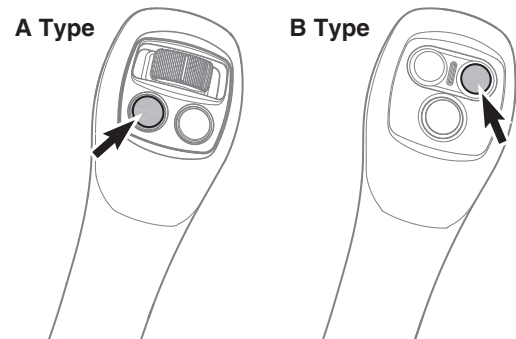
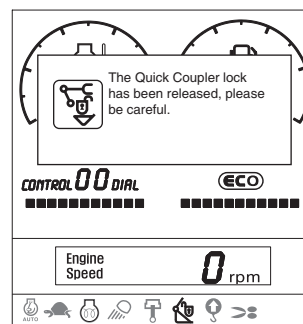


Figure 100

DS2000041

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

NOTE: *After changing warning message, the quick coupler unlock will work even if the user releases the quick coupler switch and the left button of the left joystick.*



DS1903352

Figure 101

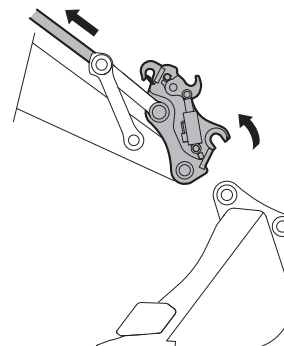
7. Retract the bucket cylinder. Align the quick coupler with attachment mounting pins or interface.



WARNING

AVOID DEATH OR SERIOUS INJURY

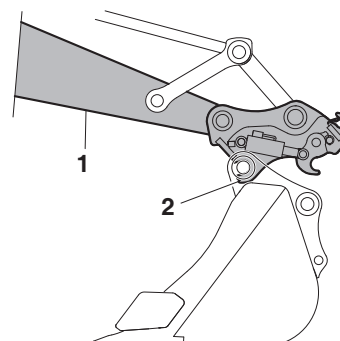
Keep attachment close to ground during engaging or releasing attachment. Attachment can fall off without warning if not "FULLY ENGAGED AND LOCKED" causing death or serious injury.



EX1300731

Figure 102

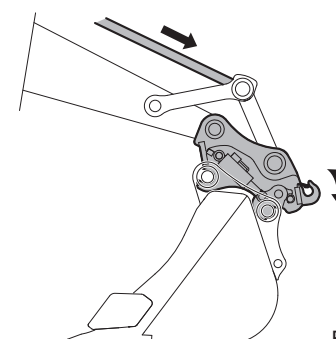
8. Move the arm (1) and raise it until hook (2) engages the upper pin or interface of attachment.



DS1903425

Figure 103

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



EX1400299

Figure 104

10. To lock the quick-coupler, press the left hand button of the right joystick.

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

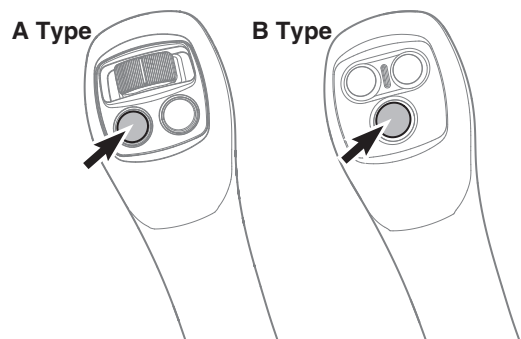


Figure 105

DS1903335

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

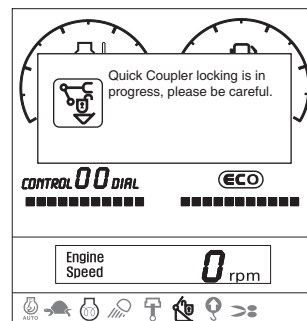


Figure 106

DS1903353

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

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

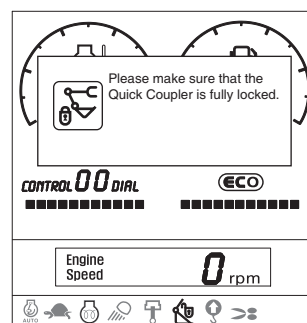


Figure 107

DS1903354

13. Shake the attachment vigorously and lower the boom to the ground and apply down pressure to the quick coupler and attachment to check that attachment is fully engaged and locked to the quick coupler.

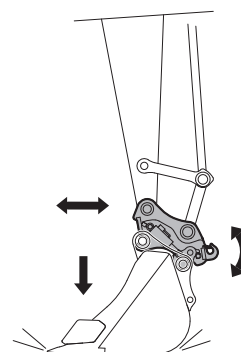


Figure 108

DS1903339

14. Visually check that quick coupler is fully engaged and locked before operating the machine and attachment.



WARNING

AVOID DEATH OR SERIOUS INJURY

Failure to visually check that quick coupler is "FULLY ENGAGED AND LOCKED" before operating can allow the attachment to fall off causing death or serious injury.



WARNING

AVOID DEATH OR SERIOUS INJURY

The attachment swing radius is increased when the quick coupler is installed.

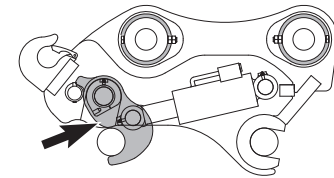
Operate quick coupler and attachment through its full range of motion to check for interference between attachment and machine that could damage the cabin, boom, coupler or attachment.



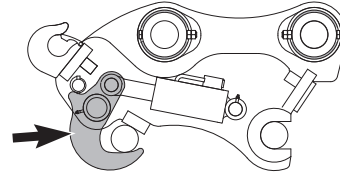
WARNING

AVOID DEATH OR SERIOUS INJURY

Never use quick coupler or attachment to transport or lift persons. Always use quick coupler and attachment according to the instructions provided by the manufacturer.



Push Type



Pull Type

DS1903533

Figure 109

To Release Attachment

1. Park the excavator and attachment on firm and level ground.
2. After checking the safe environment conditions for installing/removing the quick coupler, perform the below process.
3. To unlock the quick coupler switch, grab the switch and pull it up.

Pull the switch into the "I" (release) position; then, hold the switch in place until the quick coupler is released.

NOTE: If the switch held by the driver is released, the switch will automatically return to the "O" (locked) position.

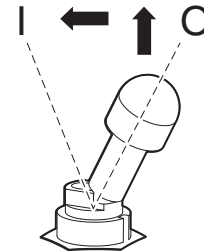
NOTE: If the switch returns to the locked position before the pop-up notifying the operator that the quick coupler has been released appears on the gauge panel, the quick coupler switch must be pulled again.

4. Quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer (Internal & External) will sound.

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

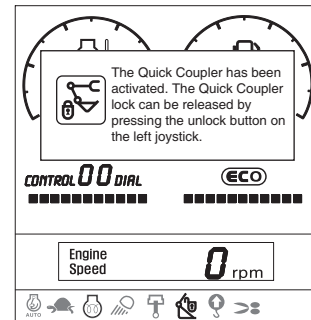
NOTE: The warning buzzer continues to sound until the quick coupler is locked again after being released.

5. With the quick coupler switch held in the "I" (release) position check the activation pop-up message and press the left hand button of the left joystick.



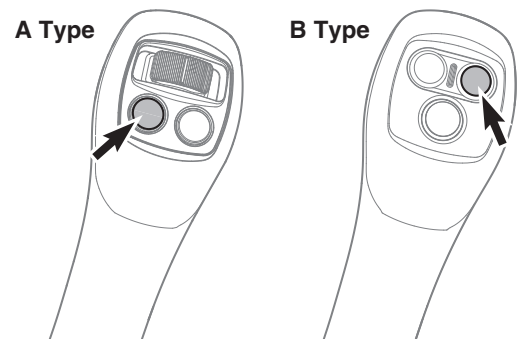
DS1903332

Figure 110



DS1903351

Figure 111

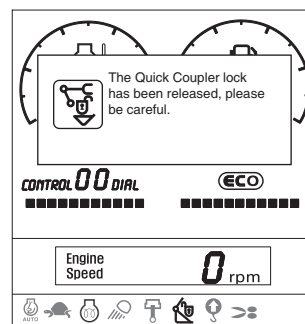


DS2000041

Figure 112

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

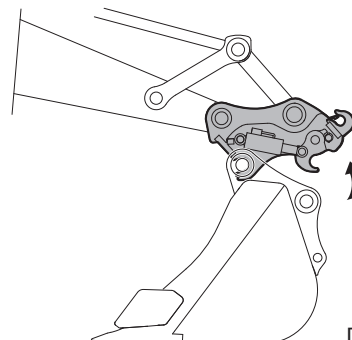
NOTE: *After changing warning message, the quick coupler unlock will work even if the user releases the quick coupler switch and the left button of the left joystick.*



DS1903352

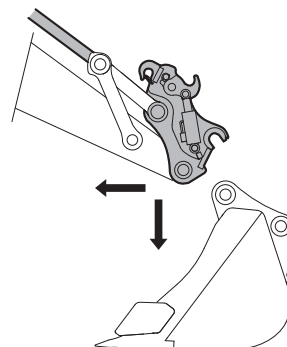
Figure 113

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



DS1903427

Figure 114

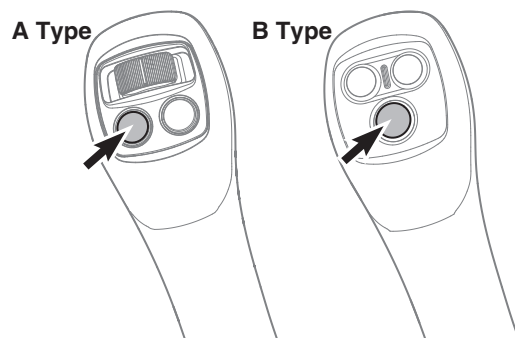


DS1903340

Figure 115

8. To lock the quick-coupler, press the left hand button of the right joystick.

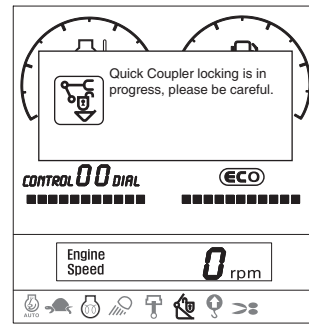
NOTE: *The driver does not need to keep the button pressed.*



DS1903335

Figure 116

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

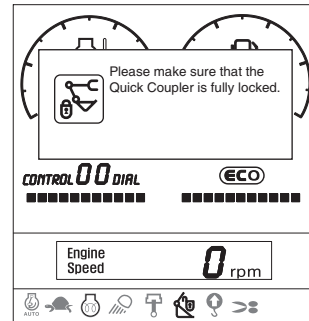


DS1903353

Figure 117

10. When the quick coupler is locked, the warning pop-up changes and the internal/external warning buzzer stops.

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



DS1903354

Figure 118

LIFTING OBJECTS

IMPORTANT

There may be local or government regulations, about the use of excavators for the lifting of heavy loads. Always contact your local and government agencies and follow all applicable laws and regulations.

To prevent injury, do not exceed the rated load capacity of the machine. If the machine is not on firm and 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 119) 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 120).

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.

Lifting Unknown Weight

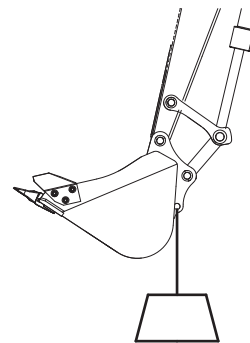
When the weight of the load is unknown, the person responsible for the job shall ascertain that weight of the load does not exceed the machine **RATED LIFTING CAPACITY** at the radius at which it is to be lifted.



WARNING

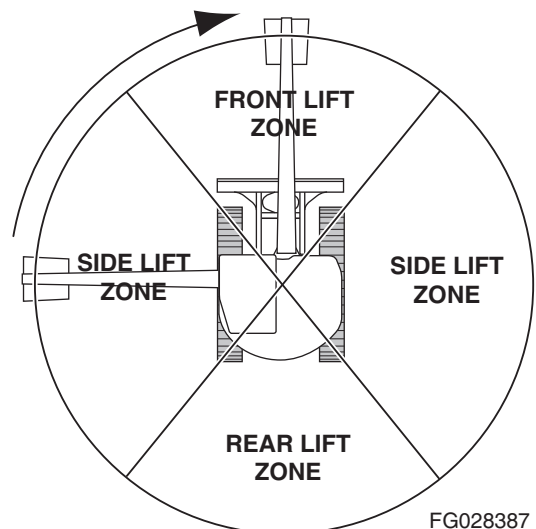
AVOID DEATH OR SERIOUS INJURY

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.



FG012789

Figure 119



FG028387

Figure 120

Lifting Known Weight

The load chart is the governing factor when lifting known weights. Refer to the "Excavator Rated Lift Capacity Tables" on page 7-8. It is recommended that you feel your way into any lift as a precaution against tip over. Whenever possible, lift and swing payloads between the front idler area.

Pick and Carry

The machine can pick and carry loads. It is recommended that when traveling with a suspended payload, 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 and 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.

LIFTING OBJECTS WITH QUICK COUPLER

The lifting point capacity (1, Figure 121) 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 121) 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.**

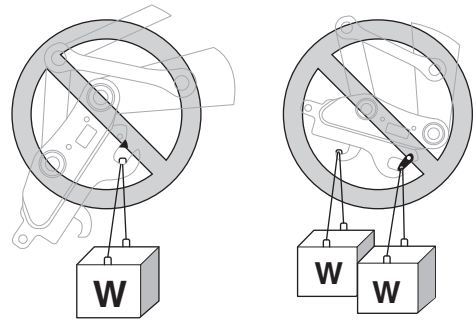
Ensure all personnel and unnecessary equipment is moved clear of the operation site and cordon off the area using barricades or other methods to prevent bystanders from entering the work area.

		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 121

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 122).



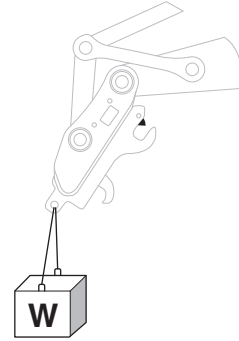
EX1300292

Figure 122 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 123). 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.



EX1300293

Figure 123 Correct Lifting Procedure

OPERATION UNDER ABNORMAL CONDITIONS

NOTE: See "Maintenance in Special Conditions" on page 4-82 for other recommendations.

Operation In Extreme Cold

If machine is to be operated in extreme cold weather temperatures, certain precautions must be taken to assure continued normal operation. The following paragraphs detail checks to be made to be certain the machine is capable of operating at these temperatures.

1. Check cooling system for correct antifreeze solution for lowest temperature expected. Carefully inspect cooling system and repair as necessary.
2. Keep batteries fully charged to prevent freezing. If water is added to batteries, run engine at least one hour to mix electrolyte solution.
3. Keep engine in best possible mechanical condition to assure easy starting and good performance during adverse weather.
4. Use engine oil of the proper specifications for expected temperatures. Refer to "Lubrication Specifications" in this manual for details.
5. Keep fuel tank full always. Drain condensation from tank before and after operation. Drain and service fuel filter. To eliminate clogging of fuel filters because of wax crystal formation in the fuel, be sure that fuel used has a cloud point specification below the lowest expected temperature.
6. Lubricate entire machine according to "Periodic Service Table and Chart" Section 4, in this manual or lubrication chart on machine.
7. Start engine and allow it to reach normal operating temperature before operating.
 - A. 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.
 - B. Operate hydraulic units with care until they have reached a temperature to enable them to operate normally.
 - C. Check all machine controls and/or functions to be sure they are operating correctly.
8. An extra outer air filter must be kept in the operator's cabin to replace element that could become iced and cause restricted airflow to engine.
9. If cold weather starting aid must be used, see "Engine Starting" COLD WEATHER START portion of this manual.

10. 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 transmission hydraulic systems temperatures and stop machine for a cooling-off period whenever necessary.

1. Make frequent inspections and services of the fan and radiator. Check coolant level in radiator. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block the cooling passages.
 - A. 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.
 - B. 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. Dilute 1.28 specific gravity electrolyte as issued to 1.20 - 1.24 specific gravity readings at full charge. Recharge batteries whenever they reach a 1.16 specific gravity reading. 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; the acid fumes have a harmful affect on rubber.

3. Service fuel system as directed in "Engine Fuel System" Section 5, 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 "Periodic Service Chart and Table" Section 4, in this manual or Lubrication Decal on the 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, transmission and hydraulics from entrance of dust.

- B. In hot, damp, climates corrosion will occur on all parts of the machine and will be accelerated during the rainy season. Rust and paint blisters will appear on metal surfaces and fungus growth on other surfaces.
- C. Protect all unfinished, exposed surfaces with a film of preservative oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation in Dusty or Sandy Areas

Operation of the 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 the 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 Chart and Table" Section 4. 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 or protect with a tarp to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

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

1. Keep all exposed surfaces coated with preservative oil. Pay particular attention to damaged or unpainted surfaces. Cover all paint cracks and chip marks as soon as possible to prevent corrosive effects.

Operation in Salt Water Areas

The corrosive effect of salt water and salt water spray is very extensive. When operating in salt water areas, observe the following precautions.

1. When exposed to salt water, dry machine thoroughly and rinse with fresh water as soon as possible.
2. Keep all exposed surfaces coated with preservative oil. Pay particular attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or "Periodic Service Table and Chart" Section 4, in this manual. Shorten lubricating intervals for parts subject to exposure to salt water, if found necessary.

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.

Equipment Lowering with Engine Stopped

To lower the boom, place the hydraulic lockout lever in the "UNLOCKED" position and turn starter switch to "I" (ON) position. Move the joystick to "BOOM LOWER" position. If the accumulator is still charged, the boom will lower. Turn key to "O" (OFF) position and remove from starter switch.

If the boom does not lower, the accumulator is empty. If there is a boom lowering valve, use the following method to lower the boom.

Machine with a Boom Lowering Control Valve



WARNING

AVOID DEATH OR SERIOUS INJURY

Boom weight can cause cylinder oil pressure to reach relief pressure of the boom lowering control device when the boom is supported by one cylinder. Boom can lower suddenly, causing death or serious injury.

To avoid death or serious injury, be sure no one is under or near the work tool before manually lowering the boom.

Keep all personnel and bystanders away from the boom area when lowering the boom with the engine stopped.

The machine may be equipped with a boom lowering control valve to be used to lower the boom if the engine has stopped and cannot be started or if the hydraulic system is disabled. Use the following procedure to lower the boom when equipped with a boom lowering control valve.

1. Relieve the pressure in the hydraulic system before manually lowering the boom.
 - A. Turn starter switch to "I" (ON) position.
 - B. Move the hydraulic lockout lever to "UNLOCKED" position.
 - C. Move the joysticks and travel levers/pedals forward and backward to relieve accumulator pressure.
 - D. Turn key to "O" (OFF) position and remove from starter switch.
2. Remove cap (1, Figure 125) of the lock valve.
3. Mark the current screw (3, Figure 125) position.
4. Loosen locknut (2, Figure 125) of the lock valve.
5. Slowly turn screw (3, Figure 125) clockwise. The boom will lower to the ground.
6. Make sure that work tool has been completely lowered onto the ground. Tighten screw (3, Figure 125) to marked position.

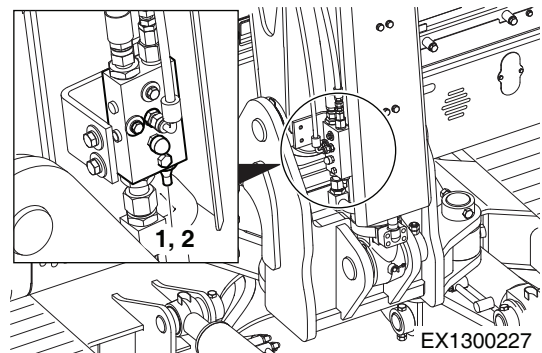


Figure 124

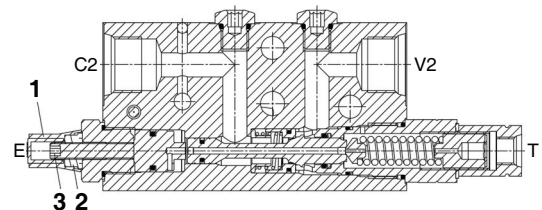


Figure 125

7. Tighten locknut (2, Figure 125) to a torque of $0.23 \pm 0.03 \text{ kg}\cdot\text{m}$ ($2.25 \pm 0.25 \text{ Nm}$, $1.66 \pm 0.18 \text{ lb ft}$)

After completion of the manual boom lowering, make necessary repairs before you operate the machine again.

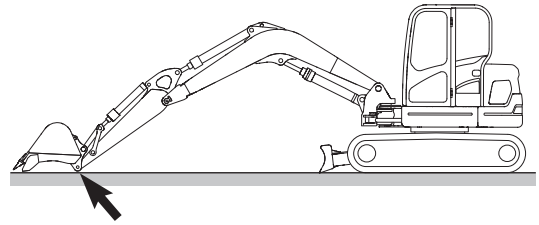
NOTE: *For additional information, contact your DOOSAN dealer.*

LONG TERM STORAGE

IMPORTANT

When storing machine, position as shown in illustration to protect the cylinder rod. Protect the cylinder against rust.

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



FG028507

Figure 126

Conditions	Maintenance Required
Cleaning	1. Pressure wash the undercarriage and wheel drive assemblies. Inspect for damage or loose or missing parts.
Lubrication	1. Perform all daily lubrication procedures. 2. Apply a coating of light oil to the exposed plated metal surfaces, such as hydraulic cylinder rods, etc. 3. Apply a coating of light oil to all the control linkages and control cylinders (control valve spools, etc.).
Battery	1. Remove battery from the excavator and store in a warm place. Fully charge battery before storing.
Cooling System	1. Inspect the coolant reserve tank to make sure that antifreeze level in the system is at the correct level. 2. Every 90 days or 750 hours on the hour meter, use a hydrometer to measure the protection level of the coolant. Refer to the antifreeze/coolant protection chart to determine the amount of protection the cooling system requires. Add coolant as required.
Hydraulic System	1. Once a month, start the engine and follow the "Hydraulic Oil Warm-up" procedures listed in this manual.

After Storage

1. Check fluid levels and check for missing parts, then start engine.

IMPORTANT

Sudden operation can damage seals and gaskets.

2. When operating cylinders, run engine at idle and operate each control 3 or 4 times to lubricate hydraulic components.

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.



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not perform any inspection and maintenance operation that is not found in this manual.

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 4-80.

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



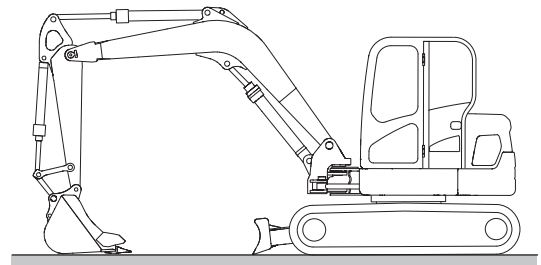
WARNING

AVOID DEATH OR SERIOUS INJURY

If work has to be done on the machine before it has cooled down, be careful with hot liquids and hot parts of the machine to avoid burns.

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

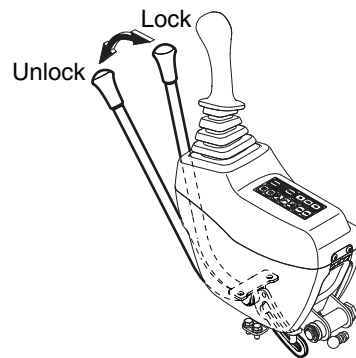
1. Park machine on firm and level ground. Lower bucket or attachment to ground.
2. "LOWER" dozer blade to ground, if equipped.



FG028464

Figure 1

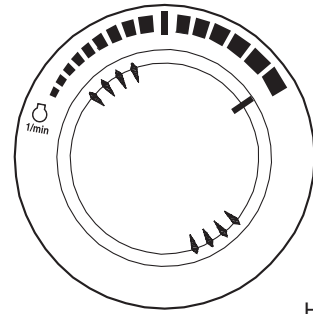
3. Move safety lever to "LOCK" position.



EX1504982

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.



HAOB550L

Figure 3

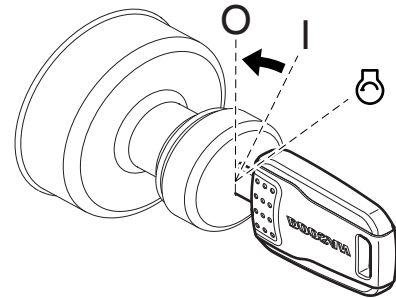
5. Stop engine by turning key to "O" (OFF) position. Remove key from starter switch.



WARNING

AVOID DEATH OR SERIOUS INJURY

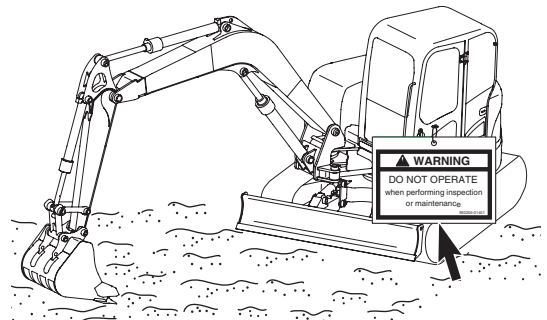
If engine must be run while performing maintenance, use extreme care. Always have one person in the cabin at all times. Never leave the cabin with the engine running.



FG018156

Figure 4

6. Before starting maintenance work, hang up a tag, "Do Not Touch When Performing Inspection or Maintenance" on cabin door or work lever.



FG028506

Figure 5

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 "Description of Lubrication and Service Chart" on page 4-14 for locations.

Reservoir	Kind of Fluid	Ambient Temperature											
		-58	-40	-22	-4	14	32	50	68	86	104	122 °F	
		-50	-40	-30	-20	-10	0	10	20	30	40	50 °C	
Engine Oil Pan	5) Engine Oil												
Swing Drive Case	Gear Oil												
Final Drive Case													
Hydraulic Oil Tank	6) Hydraulic Oil												

Fuel Tank	Diesel Fuel						1) ASTM D975 No. 2					
							ASTM D975 No. 1					
Grease Fitting	Grease						DIN 51502 KP-1K-30 / NLGI No.1					
							DIN 51502 KP-2K-10 / NLGI No.2					
							DIN 51502 KP-3K-10 / NLGI No.3					
Cooling System	Coolant	Add Antifreeze 1) (50% antifreeze - 50% distilled water) (Note that mixing ratio is for reference purpose only, and is not an absolute standard.) Make sure to use Doosan's genuine antifreeze. If Doosan's genuine antifreeze is not available, see the "Type of Antifreeze" page.										
1) Installed at factory.												
2) (5W40) - Recommended for use at extremely low temperature below -20°C.												
3) (10W40) - Filled at factory. 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 oil grade is for reference purpose only, and is not an absolute standard.												
API: American Petroleum Institute.												
ACEA: Association des Constructeurs Européens d'Automobiles.												
ASTM: American Society of Testing and Materials.												
ISO: International Organization for Standardization.												
NLGI: National Lubricating Grease Institute.												
SAE: Society of Automotive Engineers.												
DIN: Deutsche Industrie Normen												

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.



NOTICE

We recommend using genuine Doosan products for the grease applied to this equipment.

In areas where the use of genuine products is restricted, greases of at least the following specifications should be used.

- **DIN 51502 Specification**
 - Extreme Cold Area : KP-1K-30 / NLGI No. 1
 - Normal Area : KP-2K-10 / NLGI No. 2
 - Extreme Heat Area : KP-3K-10 / NLGI No. 3
- **EP (Extreme Pressure) Specification**
 - Normal : 250 kgf or more
 - Front Pin-Bush : 315 kgf or more

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 4-69.
- 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 4-69 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 4-73.
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.
- If a Doosan pure antifreeze is not available, the antifreeze specification provided on the "Type of anti-freeze" page must be used.
- The engine must be turned off when draining, replacing, or adding fluid to the machine.

FLUID CAPACITIES

Component		Capacity
Engine	Oil Pan with Filter	11.6 ℓ (3.1 U.S. gal.)
	Cooling System	10 ℓ (2.64 U.S. gal.)
Fuel Tank		78 ℓ (20.6 U.S. gal.)
Hydraulic Oil	Tank Level	65 ℓ (17.2 U.S. gal.)
	System	111 ℓ (29.3 U.S. gal.)
Travel Reduction Gear (Each)		2 ℓ (0.5 U.S. gal.)

NOTE: *If the level is between lower limit line and upper limit line of the gauge, the level is correct.
If the level is low, open the cover on the tank and add hydraulic oil.*

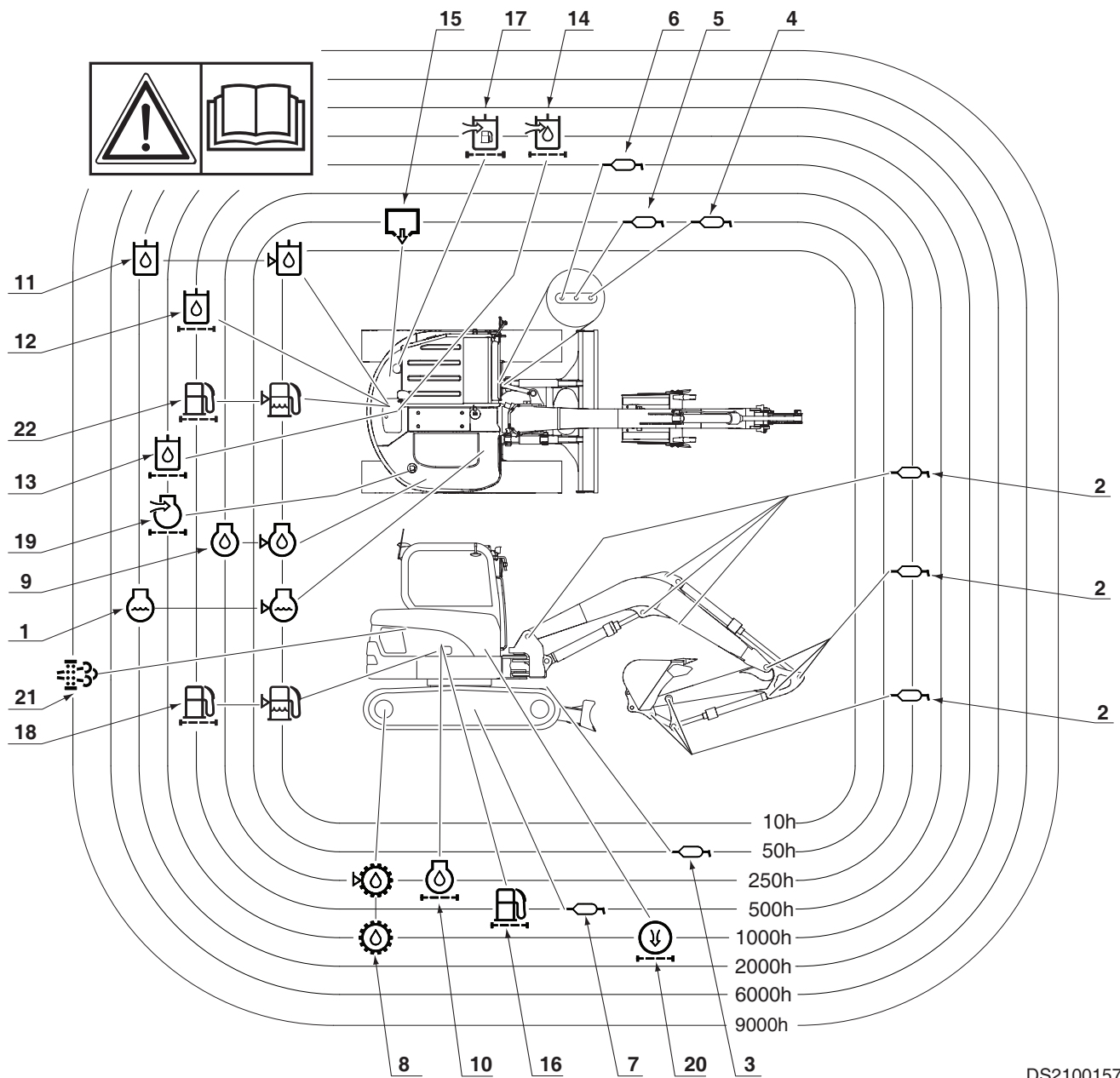
LUBRICATION AND SERVICE CHART

Lubrication and service chart is on the inside of battery box cover. The symbols shown here are used in the lubrication and service chart on the next page.

Symbol	Description
	Lubrication
	Gear Oil (Swing Device, Travel Device)
	Engine Oil
	Engine Oil Filter
	Hydraulic Oil
	Hydraulic Oil Filter
	Hydraulic Oil Tank Breather
	Coolant

Symbol	Description
	Air Cleaner Filter
	Fuel Filter
	Air Conditioner Filter
	Drain Water
	Fuel Cap Filter
	Fuel Filter
	Water Separator

Description of Lubrication and Service Chart



DS2100157

Figure 6

SERVICE DATA											
No.	Items to Check	Service	Qty.	Service Interval							
				10	50	250	500	1000	2000	6000	9000
1	Radiator	Coolant	10 ℓ	V							
2	Front Attachment Pins	Grease	12	F100		W10					
3	Dozer Blade Pin	Grease	4	F100	W10						
4	Boom Swing Cylinder Pin	Grease	4	F100	W10						
5	Swing Bearing	Grease	1		W10						
6	Pinion Gear (Swing)	Grease	1								
7	Track Spring	Grease	2				W10				
8	Travel Reduction Gear	Gear Oil	2 x 1.4 ℓ			F, V					
9	Engine Oil	Engine Oil	10.2 ℓ	V							
10	Engine Oil Filter	Cartridge	1		F						
11	Hydraulic Oil Tank**	Hydraulic Oil	65 ℓ	V							
12	Hydraulic Oil Return Filter	Element	1			F					
13	Hydraulic Oil Suction Strainer	Strainer	1					C			
14	Air Breather Filter*	Element	1								
15	Fuel Tank	Diesel	78 ℓ	V							
16	Main Fuel Filter	Cartridge	1								
17	Fuel Cap Filter	Element	1								
18	Water Separator & Pre Fuel Filter (Fuel Prefilter)	Cartridge	1	D, V							
19	Air Cleaner (Outer)	Element	1			C					
	Air Cleaner (Inner)	Element	1								
20	Air Conditioner Filter (Inner)	Cartridge	1				C				
	Air Conditioner Filter (Outer)	Cartridge	1				C				
21	DPF	DOC	1								
		SF (Soot Filter)	1							C	
22	Additional Water Separator (If Equipped)	Cartridge	1	D, V							
V: Maintenance and Refill.											
C: Cleaning.											
D: Drain Water.											
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 4-69, for further explanation.											
: Replacement On Every Interval.											
NOTE: For additional service items see list of "Maintenance Intervals" on page 4-16.											
*: When the machine is operated under dusty work sites, the air breather filter needs to be cleaned or replaced on a regular basis even before the expected replacement date.											
**: If DOOSAN Genuine Oil used, hydraulic oil change interval is 4,000 hours.											

MAINTENANCE INTERVALS

SERVICE ITEM	PAGE
10 Hour / Daily Service	
Grease Dozer, Boom Swing and Front Attachment Pins (for first 100 hours)	4-18
Check Engine Oil Level	4-18
Check Level of Hydraulic Oil Tank	4-19
Check for Leaks in Hydraulic System	4-20
Check Fuel Level	4-20
Check for Leaks in Fuel System	4-21
Check Water Separator & Pre Fuel Filter (Fuel Prefilter) and Drain Water as Required	4-21
Check Additional Water Separator and Drain Water as Required (If Equipped)	4-22
Check Cooling System and Refill as Required	4-23
Check Level of Window Washer Liquid	4-23
Inspect Bucket Teeth and Side Cutters for Signs of Wear	4-24
Inspect Cooling Fan Blade	4-24
Check Air Intake System	4-25
Inspect Seat Belt for Proper Operation	4-25
Inspect the Structure for Cracks and Faulty Welds	4-25
Check the Operation of All Switches	4-25
Check Operation of All Exterior Lights, Horn and Control Console Indicator and Display Monitor	4-26
Start Engine, Check Starting Ability, and Observe Exhaust Color at Start-up and at Normal Operating Temperature. Listen for Any Abnormal Sounds	4-26
Check Operation of All Controls and Linkages	4-26
50 Hour / Weekly Service	
Perform All Daily Service Checks	4-27
Grease Dozer Pins	4-27
Grease Boom Swing Cylinder and Bracket	4-27
Grease Swing Bearing	4-27
Drain Water and Sediment from Fuel Tank	4-28
Check Engine Fan Belt for Cracks, Wear and Correct Tension (After First 50 Hours)	4-28
Inspect the Track Assemblies for Proper Tension and Loose, Worn or Damaged Parts (Links, Shoes, Rollers, Idlers)	4-28
250 Hour / Monthly Service	
Perform All Daily and 50 Hour Service Checks	4-29
Grease Front Attachment Pins	4-29
Change Engine Oil and Filter	4-32
Check Engine Fan Belt Tension	4-32
Check Engine Fan Belt Wear	4-33
Check Oil Level in Travel Reduction Device (One on Each Side of Unit)	4-34
Clean Outer Filter of Air Cleaner	4-35
Change Oil in Travel Reduction Device (One on Each Side of Unit) (After First 250 Hours)	4-36
Replace Hydraulic Oil Return Filter (After First 250 Hours)	4-36
Inspect Pins and Bushings of the Front End Attachments for Signs of Wear	4-36
Check Fluid Levels in Batteries	4-36
Inspect for Any Loose or Missing Nuts and Bolts	4-36

SERVICE ITEM	PAGE
Inspect Fuel System Hose Clamps	4-36
500 Hour / 3 Month Service	
Perform All Daily, 50 and 250 Hour Service Checks	4-37
Grease Swing Gear and Pinion	4-37
Change Main Fuel Filter	4-38
Change Water Separator & Pre Fuel Filter (Fuel Prefilter)	4-39
Change of Water Separator & Pre Fuel Filter (Fuel Prefilter) (If Equipped)	4-40
Replace Hydraulic Oil Return Filter	4-41
Clean Air-conditioning Inner Filter	4-42
Clean Air-conditioning Outer Filter	4-43
1,000 Hour / 6 Month service	
Perform All Daily, 50, 250 and 500 Hour Service Checks	4-44
Change Oil in Travel Reduction Device (One on Each Side of Unit)	4-44
Change Air-conditioning Inner Filter	4-45
Change Air-conditioning Outer Filter	4-46
Clean Hydraulic Oil Suction Strainer	4-47
Change Air Breather Element	4-48
Change Fuel Cap Filter	4-48
Check Air Conditioner Refrigerant	4-50
Check and Adjust Engine **	4-50
Replace Outer and Inner Air Cleaner Filters	4-51
2,000 Hour / Yearly Service	
Perform All Daily, 50, 250, 500 and 1,000 Hour Service Checks	4-52
Change Radiator Coolant	4-52
Change Hydraulic Oil	4-54
Check Alternator and Starter **	4-56
Check All Rubber Antivibration Shock Mounts	4-56
Perform and Record the Results of the Cycle Time Tests	4-56
Inspect Machine to Check for Cracked or Broken Welds or Other Structural Damage	4-56
Check, Adjust Valve Clearance **	4-56
Check Head Bolt Torques	4-56
4,000 Hour / Biennial Service	
Major Parts - Periodic Replacement	4-57
6,000 Hour / Biennial Service	
Clean Diesel Particulate Filter (DPF)	4-58
9,000 Hour / 4 Year Service	
Change Diesel Oxidation Catalyst (DOC) and Diesel Particulate Filter (DPF)	4-59
12,000 Hour / 6 Year Service	
Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN))	4-60

** These checks need to be completed by an authorized DOOSAN dealer.

10 HOUR / DAILY SERVICE

Grease Dozer, Boom Swing and Front Attachment Pins (for first 100 hours)



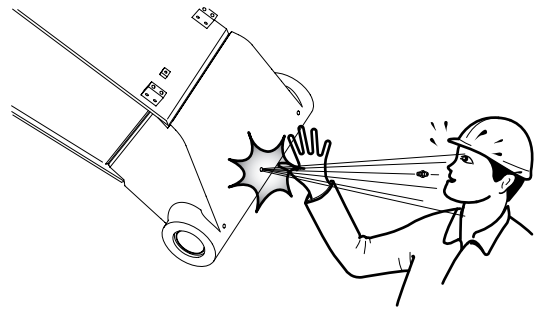
WARNING

AVOID DEATH OR SERIOUS INJURY

Do not remove grease fitting until pressure is entirely bled off by loosening grease fitting slowly.

Grease every 10 hours for first 100 hours and every 50 hours thereafter (See page 4-29).

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



FG000500

Figure 7

Check Engine Oil Level



WARNING

AVOID DEATH OR SERIOUS INJURY

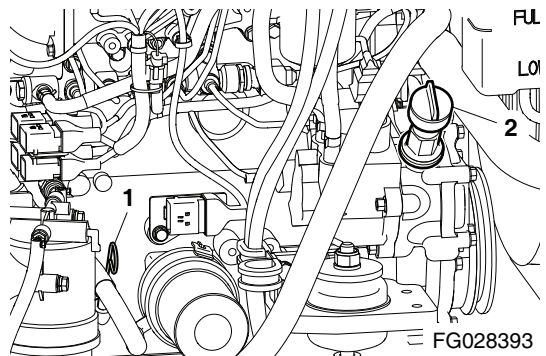
Allow the engine to cool before checking oil level to avoid burn injuries.

NOTE: *When checking level using a dipstick, 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 8) and wipe the oil off with a clean cloth.
3. Insert dipstick fully in the oil gauge tube, then take it out again.
4. Engine oil level must be between "HIGH" and "LOW" marks on dipstick.

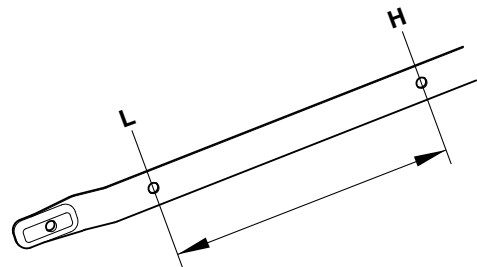
NOTE: *If oil is above "HIGH" mark on dipstick, oil must be drained to return oil to proper level.*

5. Add oil through engine oil fill cap (2, Figure 8), if the oil level is below the "LOW" mark.



FG028393

Figure 8



FG000616

Figure 9

Check Level of Hydraulic Oil Tank



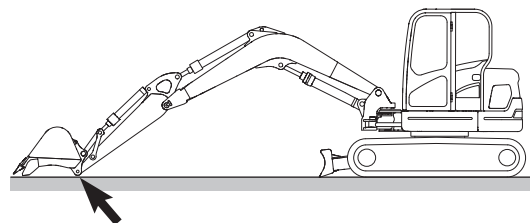
WARNING

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.

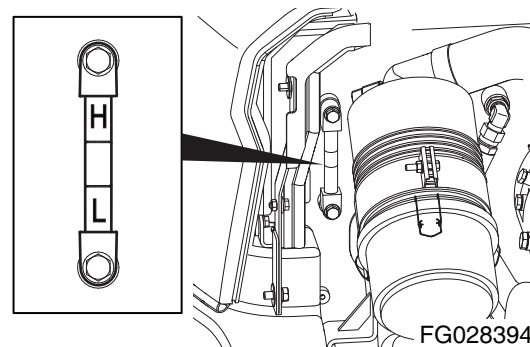
1. Park machine on firm and level ground. Lower blade, boom and position bucket on ground as shown in Figure 10.
2. Move engine speed to "LOW IDLE."



FG028507

Figure 10

3. Move safety lever to "LOCK" position.
4. Check level gauge by opening right access door. Oil level must be between marks on sight gauge.



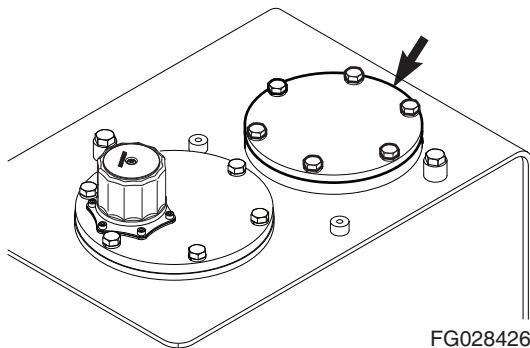
FG028394

Figure 11

5. If the level is below "L" mark add oil.
 - A. Stop engine.
 - B. 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.



FG028426

Figure 12

6. If oil level is above the "H" mark drain oil.
 - A. Swing upper structure parallel to tracks as shown in (Figure 13).
 - B. Stop engine and wait for the hydraulic oil to cool down.
 - C. Remove right bottom cover.
 - D. Drain the excess oil from drain valve at the bottom of the tank into a suitable container.

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

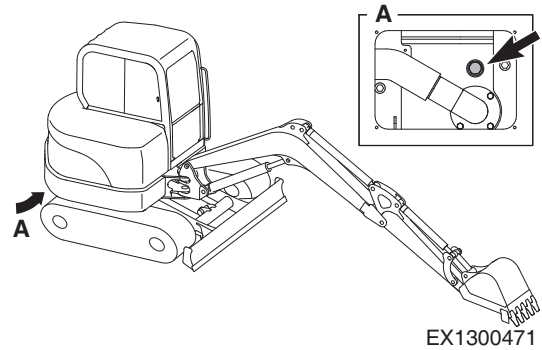


Figure 13

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 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 (2, Figure 14). When working at a temperature of 0°C (32°F) or higher, use ASTM No. 2-D or its equivalent. At temperatures below 0°C (32°F) use ASTM No. 1-D or its equivalent.
2. Make sure that fuel fill hose is grounded to the excavator before fueling begins.
3. Check the amount of fuel in the tank by observing the fuel tank sight gauge (1, Figure 14).

NOTE: *See "Fluid Capacities" on page 4-11. for capacity.*

4. The excavator may be equipped with the optional battery operated fuel fill pump. The pump assembly is in the hydraulic pump compartment. Put the suction hose of the pump into the fuel resupply tank. Turn the switch in the pump compartment "ON," and the fuel will be pumped into the excavator fuel tank.

NOTE: *See "Fuel Transfer Pump (Optional)" on page 4-74, for further information.*

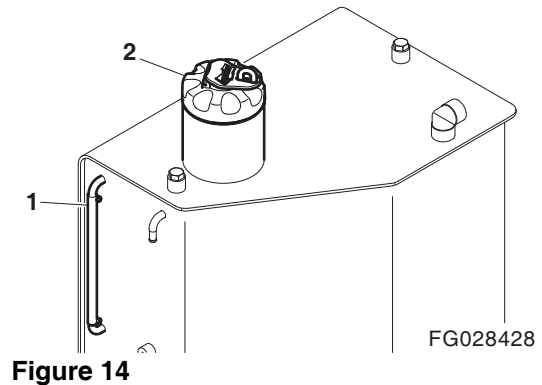
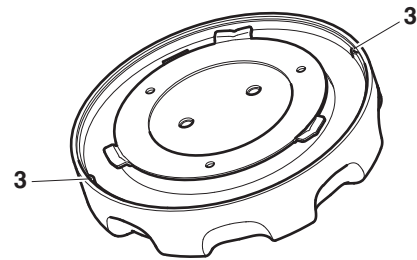


Figure 14

5. Do not overfill the tank.
6. Securely tighten cap after fueling.

NOTE: If breather holes (3, Figure 15) in cap are clogged, a vacuum may form in the tank preventing proper fuel flow to engine. Keep holes in fuel cap clean.



FG028396

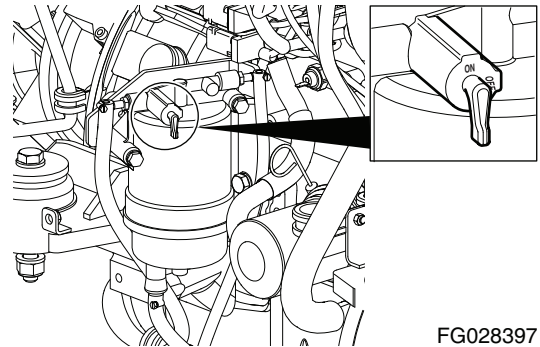
Figure 15

Check for Leaks in Fuel System

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

Check Water Separator & Pre Fuel Filter (Fuel Prefilter) and Drain Water as Required

NOTE: A fuel water separator is inside the hood cover. The cup of the separator is made from semitransparent material. In the cup is a red colored float ring. The float ring will rise to the surface of the water to show how much needs to be drained. The separator is also equipped with a sensor to detect a harmful amount of water and contaminants within it. An indicator light will turn "ON" when immediate attention is required.



FG028397

Figure 16

1. Position a small container under fuel prefilter.
2. Turn fuel lever (3, Figure 17) to "CLOSED" position (2) to shut off fuel supply before draining water.

NOTE: Lever must be pointing horizontally.

3. Drain water or sediment by opening drain valve (4, Figure 17) on bottom of bowl (1).

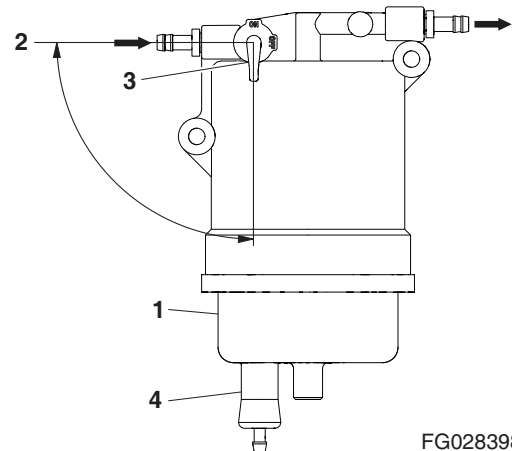
NOTE: Dispose of drained fluids in compliance with all applicable environmental laws and regulations.

4. Close drain valve.
5. Turn fuel lever (3) to "OPEN" position.

NOTE: Lever must be pointing down.

NOTE: The fuel system may need priming. See "Fuel System Priming" on page 4-38.

6. Check for leaks.



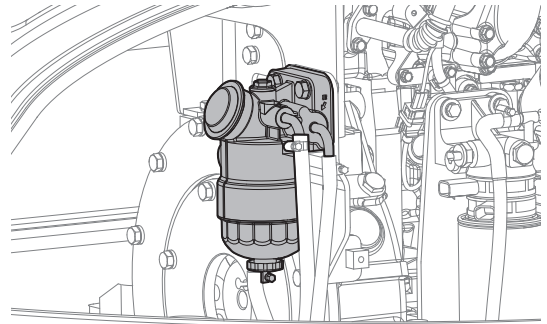
FG028398

Figure 17

Check Additional Water Separator and Drain Water as Required (If Equipped)

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

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.



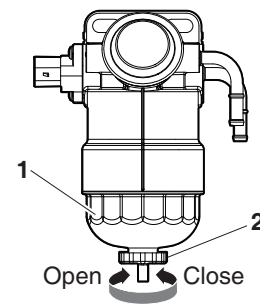
EX1502685

Figure 18

5. Position a small container under fuel prefilter. Drain water or sediment by opening drain valve (2, Figure 19) 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 19

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.

Lock out and tag the controls alerting personnel that service work is being performed.

Do not remove radiator cap unless it is required. Check the coolant level in the coolant recovery tank.

NOTE: Do not mix ethylene glycol and propylene glycol antifreeze together.
See "Engine Cooling System" and "Types of Antifreeze" page for further details.

1. When the engine is cold, remove radiator cap and check the coolant level inside the radiator. Do not rely on the level of coolant in the coolant recovery tank. Refill radiator as required. Refer to coolant concentration table. (See page 4-73)
2. Check to make sure that coolant transfer line from the coolant recovery tank to the radiator is free and clear of obstructions, or not pinched.
3. Observe the level of coolant in the coolant recovery tank. The normal cold engine fluid level must be between "FULL" and "LOW" marks on tank.
4. If the coolant is below the "LOW" mark, add genuine part of 50% concentration coolant to the tank.

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.

Check Level of Window Washer Liquid

1. Open the back hood door and the right door.
2. Check fluid level in windshield washer tank.
3. 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. Use standard window cleaning fluid: SSK703

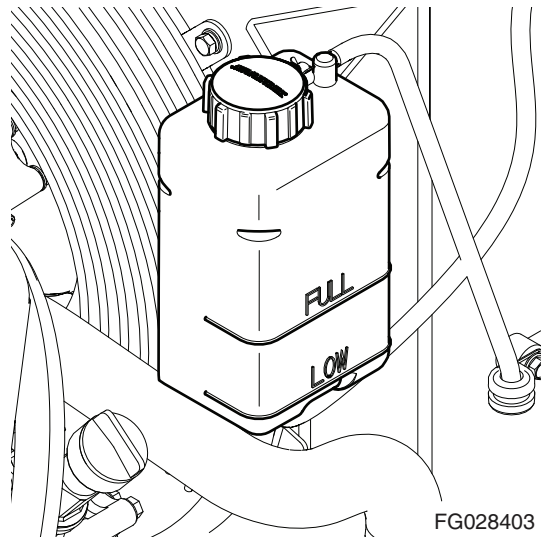


Figure 20

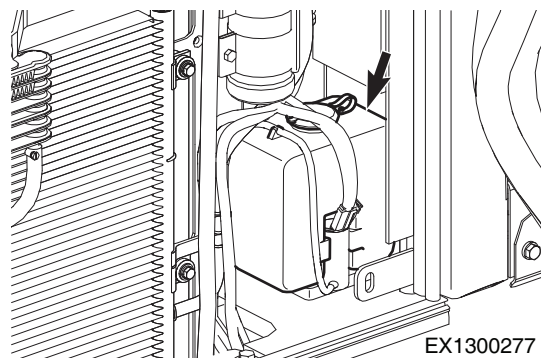


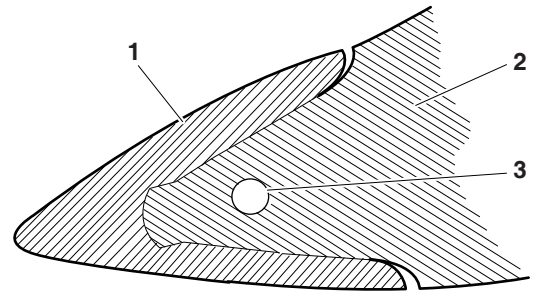
Figure 21

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 22.

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
3	Pin



HAOE870L

Figure 22

Inspect Cooling Fan Blade

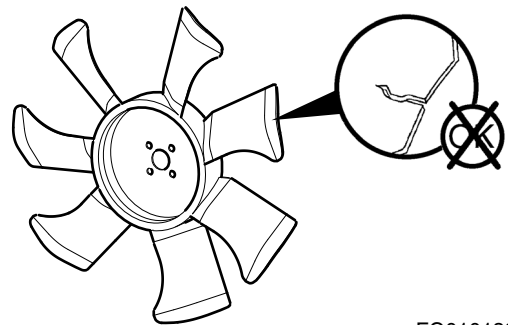


WARNING

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.

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.



FG010132

Figure 23

Check Air Intake System



CAUTION

AVOID INJURY

Hot engine components can cause burns.

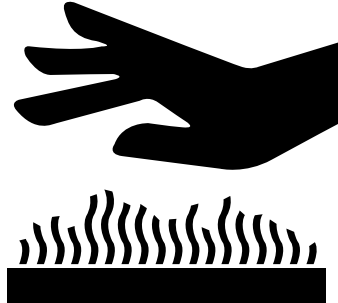
Avoid contact with hot engine components.

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. If damaged, wrinkled, or loose, replace or retighten or contact your nearest DOOSAN dealer.

IMPORTANT

Severe engine damage will result from running with unfiltered air.

Do not operate engine if any leaks or defects are found on air intake system.



HAOA050L

Figure 24

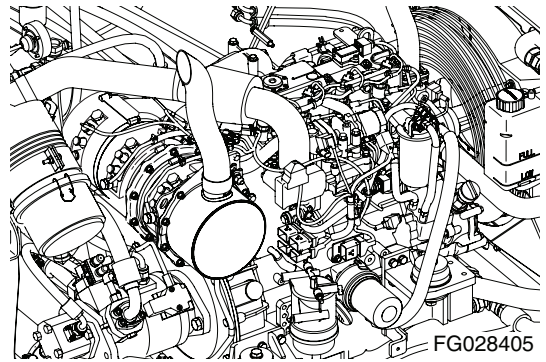


Figure 25

Inspect Seat Belt for Proper Operation

Inspect the 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 the Operation of All Switches

1. Verify the working condition of all switches before starting the engine.

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 the fault before operating.

50 HOUR / WEEKLY SERVICE

Perform All Daily Service Checks

Grease Dozer Pins

- A. Dozer pins (2 points).
- B. Dozer cylinder (2 points).

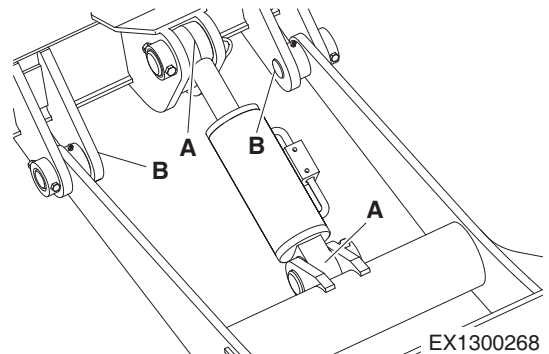


Figure 26

Grease Boom Swing Cylinder and Bracket

There are four grease fittings for the boom swing cylinder and bracket.

Do not over lubricate. When replacing grease, purge the used off.

- 1. Boom swing cylinder head (C, Figure 27).
- 2. Boom swing cylinder rod (E, Figure 28).
- 3. Boom swing bracket (F, Figure 28 - 2 points).

NOTE: Fitting (B, Figure 27) is greased every 500 hours.

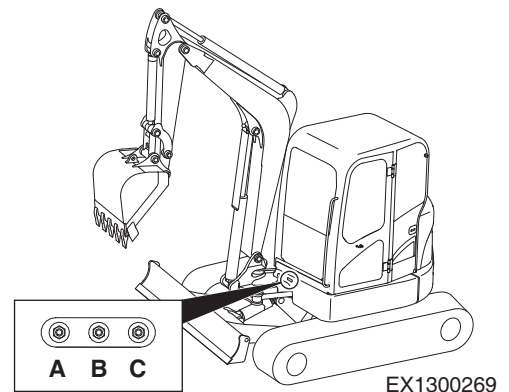


Figure 27

Grease Swing Bearing

- 1. Inject grease through the grease fitting (A, Figure 27) using a grease gun.
- 2. Lift bucket about 20 cm (8 in) from ground. Turn upper body 90° at a time for two full turns, greasing the swing bearing at each stop.

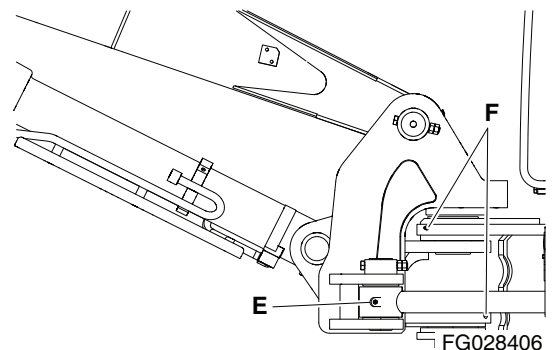


Figure 28

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 a suitable container.

NOTE: *Dispose of drained fluid 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.*

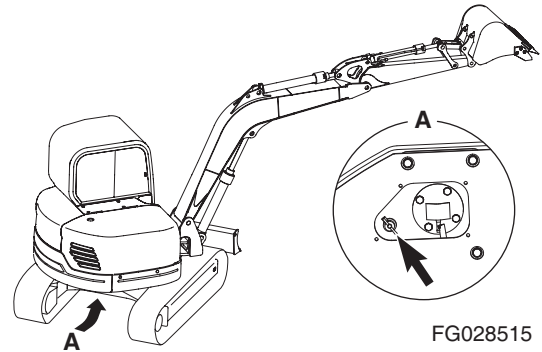


Figure 29

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 Belt Tension" on page 4-32.

Inspect the Track Assemblies for Proper Tension and Loose, Worn or Damaged Parts (Links, Shoes, Rollers, Idlers)

1. Do a daily walk-around inspection of all components including the track assemblies. Look for missing, damaged or excessively worn parts. See "Track Tension" on page 4-77.
2. Jack up each track and perform the two speed travel motor test.

250 HOUR / MONTHLY SERVICE

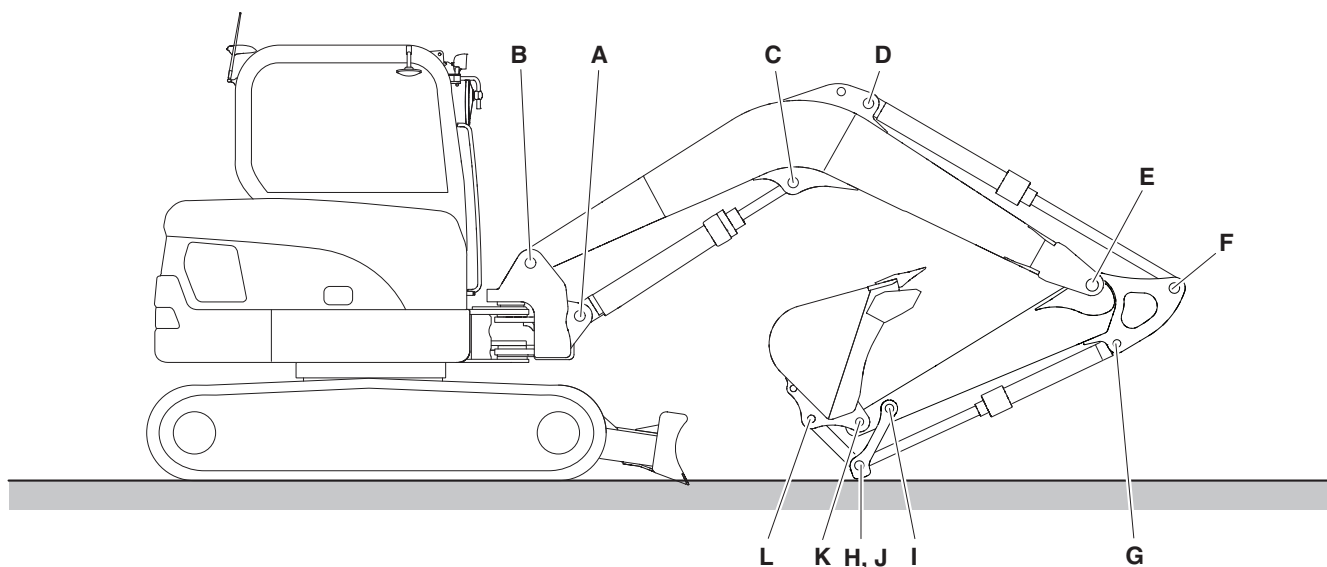
Perform All Daily and 50 Hour Service Checks

Grease Front Attachment 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 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 injection grease, clean off the old grease that has been purged.



FG028410

Figure 30

Reference Number	Description
A	Boom Cylinder Head Pin (1 Point)
B	Boom Foot Pin (1 Point)
C	Boom Cylinder Rod Pin (1 Point)
D	Arm Cylinder Head Pin (1 Point)
E	Boom Arm Joint Pin (1 Point)
F	Arm Cylinder Rod Pin (1 Point)

Reference Number	Description
G	Bucket Cylinder Head Pin (1 Point)
H	Bucket Cylinder Rod Pin (1 Point)
I	Arm Link Pin (1 Point)
J	Push Link Guide Link Pin (1 Point)
K	Arm End Pin (1 Point)
L	Bucket Push Link Pin(1 Point)

A. Boom Cylinder Head Pin (1 Point)

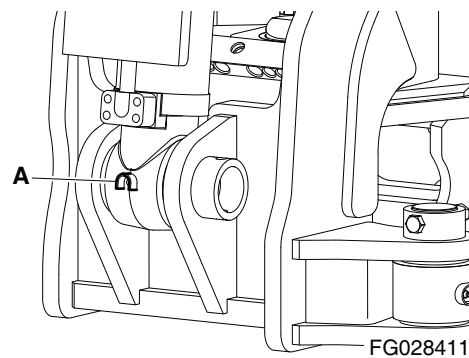


Figure 31

B. Boom Foot Pin (1 Point)

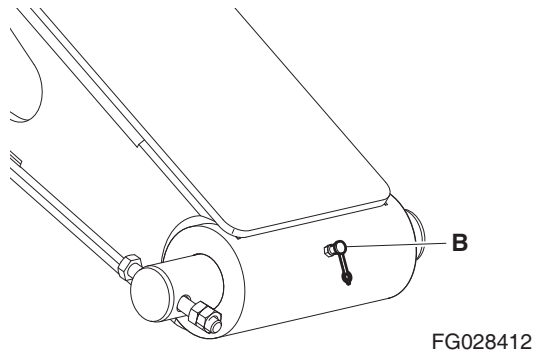


Figure 32

C. Boom Cylinder Rod Pin (1 Point)

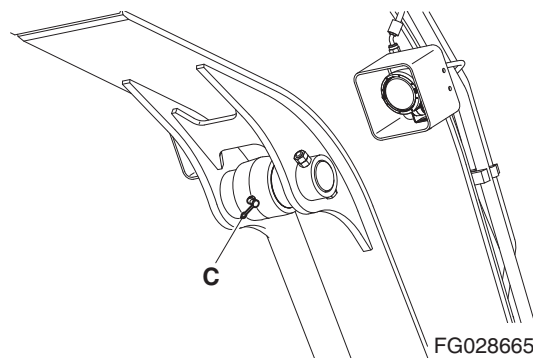


Figure 33

D. Arm Cylinder Head Pin (1 Point)

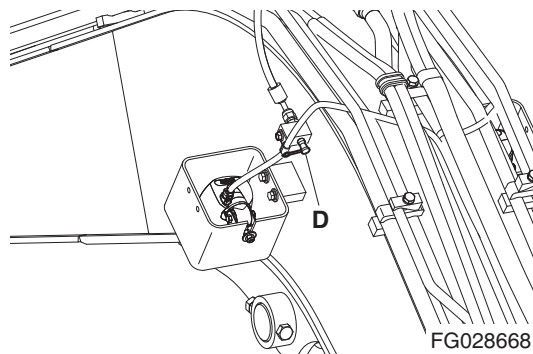
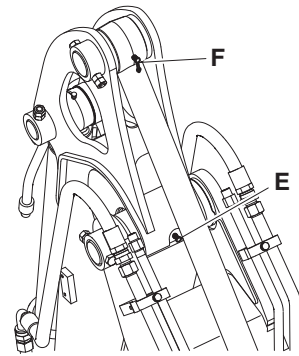


Figure 34

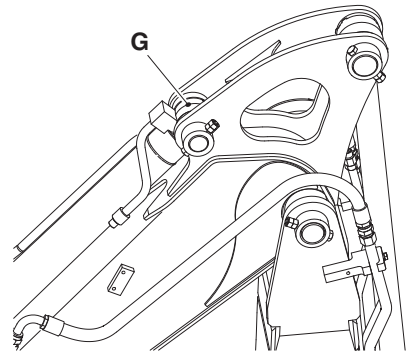
- E. Boom Arm Joint Pin (1 Point)
- F. Arm Cylinder Rod Pin (1 point)



FG028415

Figure 35

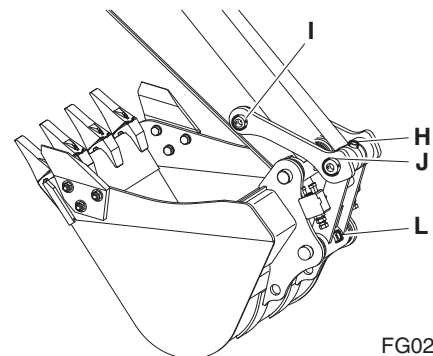
- G. Bucket Cylinder Head Pin (1 Point)



FG028416

Figure 36

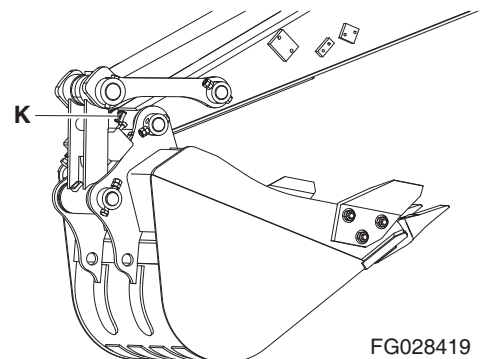
- H. Bucket Cylinder Rod Pin (1Point)
- I. Arm Link Pin (1 Point)
- J. Push Link Guide Link Pin (1 Point)
- L. Bucket Push Link Pin (1 Point)



FG028418

Figure 37

- K. Arm End Pin (1 Point)



FG028419

Figure 38

Change Engine Oil and Filter

NOTE: Change engine oil and filter after first 50 hours of operation or rebuild, then every 250 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 burn injuries.

1. Position a larger container under the engine. Remove cap (Figure 39) and install hose to drain the engine oil. Remove hose and install cap.

NOTE: Dispose of drained fluids according to laws and regulations.

2. Replace engine oil filter by using filter wrench. The engine oil filter is a spin-on type. Figure 40. Remove and discard filter.
3. Install new filter. Apply a small amount of oil around filter gasket. Screw filter on head until gasket contacts head, turn filter 1/2 turn more.
4. Refill the engine with the correct oil through the oil fill port (2, Figure 40). Refer to the Lubrication Table (4-5) of this manual for the recommended oil for the operating conditions.

NOTE: See "Fluid Capacities" on page 4-11. for capacity.

5. Start engine. Run engine for five minutes at "LOW IDLE", and check engine oil pressure light.
6. Stop engine. Look for signs of leaks at filter. Recheck oil level after 15 minutes.

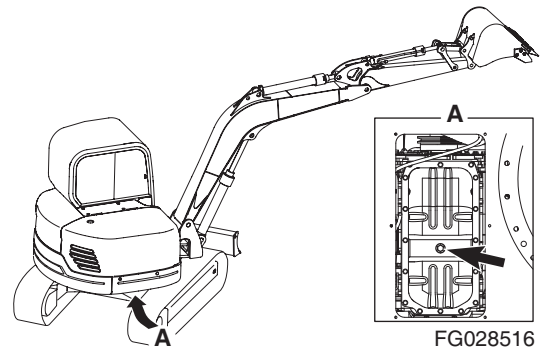


Figure 39

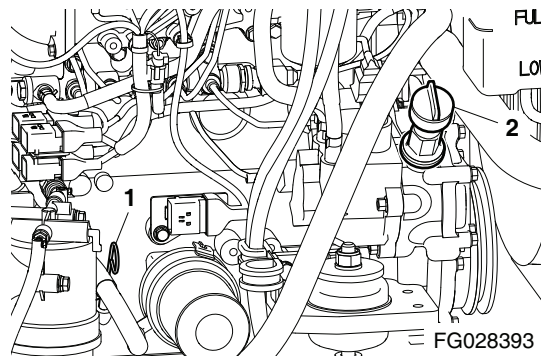


Figure 40

Check Engine Fan Belt 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 approximately 10 mm (0.4 in). See Figure 41. To adjust the

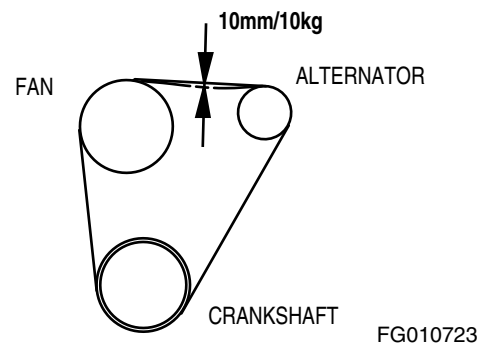


Figure 41

belt, loosen the alternator adjustment plate bolts, adjust the belt tension and retighten the bolts.

Check Engine Fan Belt Wear



WARNING

AVOID DEATH OR SERIOUS INJURY

Keep clear of engine fan and fan drive belts when the engine is running. Contact with rotating belt can cause injury.



WARNING

AVOID DEATH OR SERIOUS INJURY

When checking, adjusting or replacing drive belts, precautions must be taken to prevent accidental cranking of the engine. Be sure the starter switch is in the "OFF" position and the controls are tagged.

1. Replace badly worn, greasy or severely cracked belts immediately. These conditions prevent proper belt function. Visually inspect the belt. Check the belt for intersecting cracks. Replace the belt if it is frayed or has pieces of material missing.
2. Before installing new belts, make sure all pulley grooves are clean and not worn. Replace pulley, if damaged, or if the grooves are worn.
3. All pulley support bearings, shafts, and brackets must be in working order.
4. When replacing belts and pulleys, pulley alignment must be checked with belts tensioned and brackets securely clamped. A misalignment that can be detected by the eye is detrimental to belt performance.
5. Do not force the belts into the pulley grooves by prying with a screwdriver or pry bar. This will damage the belt side cords which will cause the belts to turn and result in complete destruction of the belts in operation.
6. Belts on new machines and replacement belts lose their tension as they seat into the pulley grooves. Check the tension of new belts at 50 hour intervals until tension is stabilized and thereafter, every 250 hours. If the tension falls below the required minimum, the belt slips damaging the belts and pulley grooves.

NOTE: When operating in abrasive conditions, check tension every 100 hours.

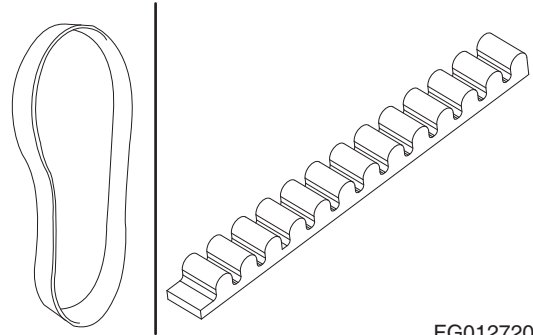


Figure 42

FG012720

Check Oil Level in Travel Reduction Device (One on Each Side of Unit)



WARNING

AVOID DEATH OR SERIOUS INJURY

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

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

Reference Number	Description
1	Oil Level Plug
2	Drain Plug
3	Fill Plug

1. Make sure that the machine is on firm and level ground.
2. Rotate the track until ports (1 thru 3, Figure 43) are in their proper positions as shown.
3. Loosen fill plug (3, Figure 43) slightly to allow pressurized air to escape.
4. Remove oil level plug (1, Figure 43).
5. Check oil level. The oil must be near the bottom of the level plug opening.
6. Add oil through the fill plug (3, Figure 43) opening, if necessary.
7. Clean and install oil level plug (1) and fill plug (3, Figure 43).
8. Repeat this procedure on the other travel reduction device.

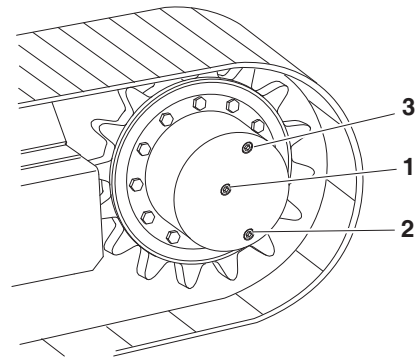


Figure 43

FG028680

Clean Outer Filter of Air Cleaner

NOTE: When working in severely 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.
2. Remove and clean rubber evacuator valve (1, Figure 44) from bottom of air cleaner housing cover (2, Figure 44). Inspect seal lips for wear or damage. Replace valve if necessary.

NOTE: Install evacuator valve with lips parallel to the cover.

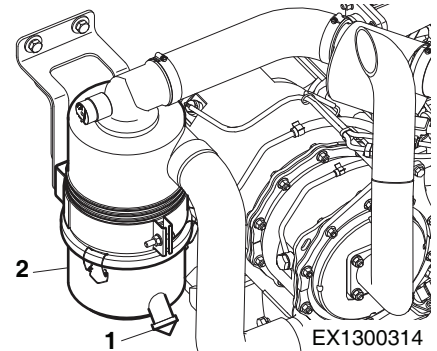


Figure 44

3. Remove access cover (2, Figure 45) by loosening the latches.
4. Remove outer filter (3, Figure 45) from the housing. Do not remove inner filter (4, Figure 45).

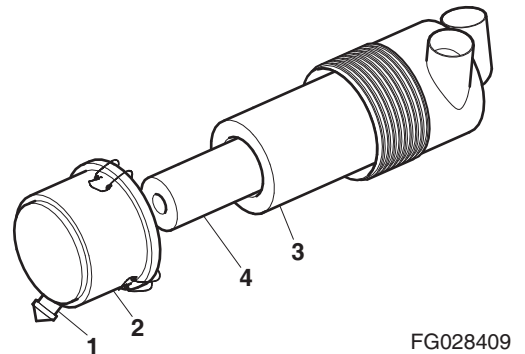


Figure 45

5. Clean the outer filter (3, Figure 45) by blowing compressed air from the inside of the filter towards the outside. Do not use more than 205 kPa (30 psi) air pressure.

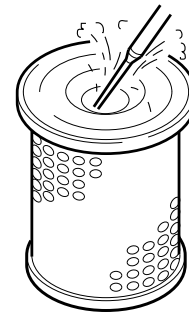


Figure 46

6. Check outer filter by shining light through it. If small holes or thinner parts are found on the element after cleaning, 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".

If after cleaning the outer filter the air cleaner clogged indicator remains "ON", replace the outer and inner filters. Do not clean inner filter.

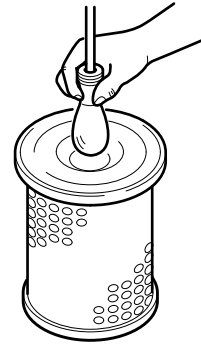


Figure 47

FG000412

Change Oil in Travel Reduction Device (One on Each Side of Unit) (After First 250 Hours)

NOTE: *Drain and refill oil after first 250 hours of operation or rebuild, and every 1,000 hours thereafter (See page 4-44).*

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 500 hours thereafter (See page 4-41).*

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 4-67 for further information.

Inspect for Any Loose or Missing Nuts and Bolts

Inspect Fuel System Hose Clamps

500 HOUR / 3 MONTH SERVICE

Perform All Daily, 50 and 250 Hour Service Checks

Grease Swing Gear and Pinion



WARNING

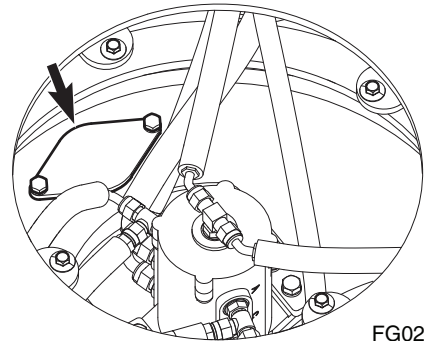
AVOID DEATH OR SERIOUS INJURY

Greasing swing gear and pinion must be serviced by only one person.

1. Remove inspection cover and inspect the condition of the grease. Make sure that water or other contaminants are not noticeable.

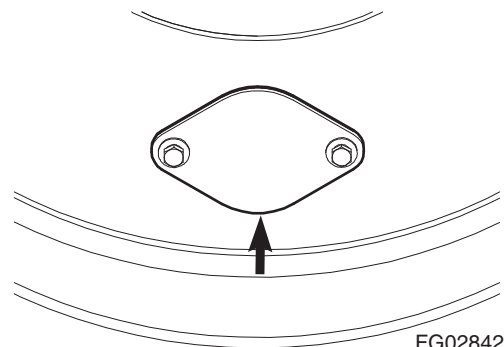
NOTE: *The upper structure must be rotated a little at a time so the entire face of the swing gear can be lubricated. Use extreme caution when performing this operation.*

2. If water or other contaminations are found, remove lower access cover so the gear teeth can be thoroughly cleaned and lubricated.
3. Install access covers after lubricating gear teeth.



FG028420

Figure 48



FG028421

Figure 49

Change Main Fuel Filter



WARNING

AVOID DEATH OR SERIOUS INJURY

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

1. Locate fuel filter inside engine compartment.
2. Position a small container under fuel filter.
3. Unscrew fuel filter from head assembly. Discard fuel filter.

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

4. After cleaning filter head, install new fuel filter. Screw filter on head until gasket contacts head, and turn filter 1/2 turn more with a filter wrench.

NOTE: *Coat fuel filter gasket with fuel.*

NOTE: *Fill fuel filter with clean fuel. This will help reduce fuel system priming.*

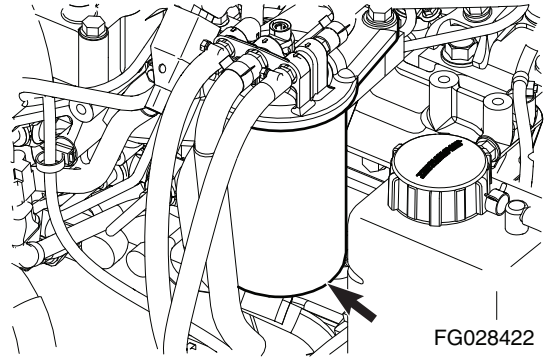


Figure 50

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 the starter switch to "I" (ON) position for 10 - 15 seconds. This will allow the electric fuel pump to prime the fuel system.

NOTE: *NEVER use the starter motor to crank the engine to prime the fuel system. This can cause the starter motor to overheat and damage the coils, pinion and/or ring gear.*

4. Start engine and check fuel system for leaks.

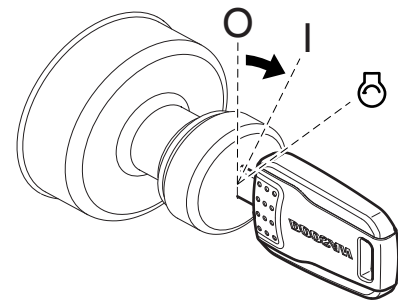


Figure 51

Change Water Separator & Pre Fuel Filter (Fuel Prefilter)

1. Position a small container under fuel prefilter.
2. Turn fuel lever (3) to "CLOSED" position (2) to shut off fuel supply before draining water.

NOTE: Lever must be pointing horizontally.

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

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

4. Turn the retaining ring to the left (8) and remove the cup. If equipped, disconnect the sensor wire from the cup before removing the cup.
5. Carefully hold the cup to prevent fuel from spilling. If you spill any fuel, clean up the spill completely.
6. Remove the float ring (6) from the cup. Pour the contaminants into the container and dispose of it properly.
7. Replace the element (7) into the top of filter.
8. Install the element and O-ring in the cup.
9. Position the float ring in the cup.
10. Check the condition of the cup O-ring. Replace if necessary.
11. Install the cup to the bracket by tightening the retaining ring to the right (5) to a torque of 27 - 33 Nm (2.8 - 3.4 kg•m).
12. Close the drain cock. Reconnect the sensor wire if equipped.

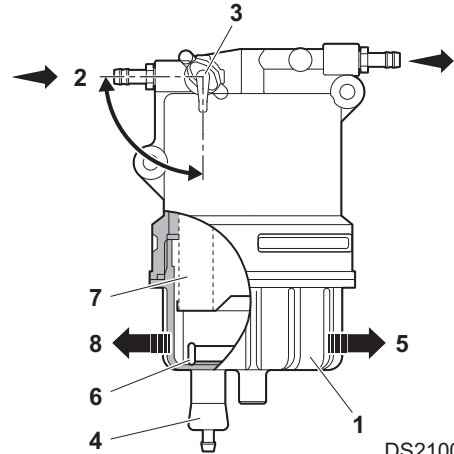
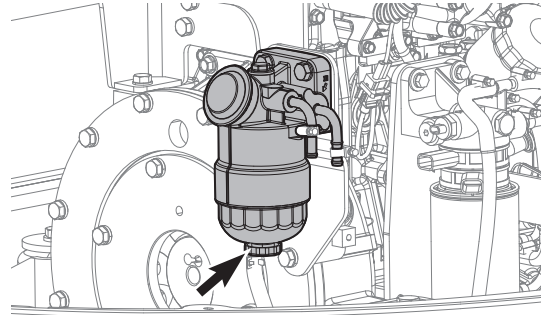


Figure 52

Change of Water Separator & Pre Fuel Filter (Fuel Prefilter) (If Equipped)

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.

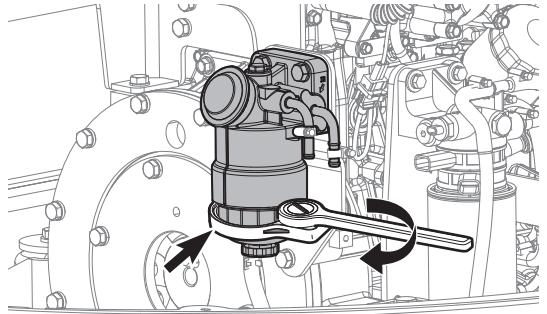
NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*



EX1502721

Figure 53

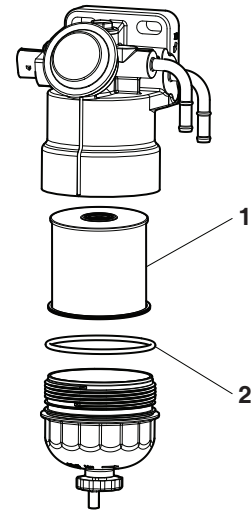
4. Remove bowl using supplied tool.
5. Remove element (1, Figure 55) and replace the new element.



EX1502722

Figure 54

6. Coat surface of O-ring (2, Figure 55) with fuel, and tighten the bowl with tool.
7. Turn the cock valve to "OPEN" position.



EX1502723

Figure 55

Replace Hydraulic Oil Return Filter

NOTE: Replace hydraulic oil return filter after first 250 hours of operation or rebuild, and every 500 hours thereafter.

NOTE: If return filter clogged warning light on instrument panel comes "ON" the return filter must be serviced.



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow the system to cool before attempting to service any of the hydraulic components.

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. Remove bolts (1, Figure 57), washers (2), service cover (3) and O-ring (4).

Remove spring (5), valve (6) and filter (7).

2. Properly discard filter.
3. Install new filter and a new O-ring. Install valve and spring.
4. Run engine for 10 minutes at low idle to purge air from circuit.
5. Stop engine.
6. Check level in hydraulic oil tank. Add oil if necessary.

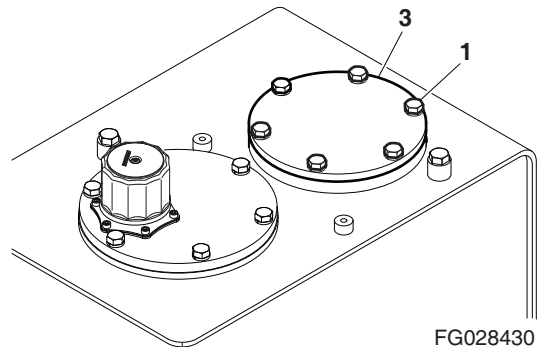


Figure 56

FG028430

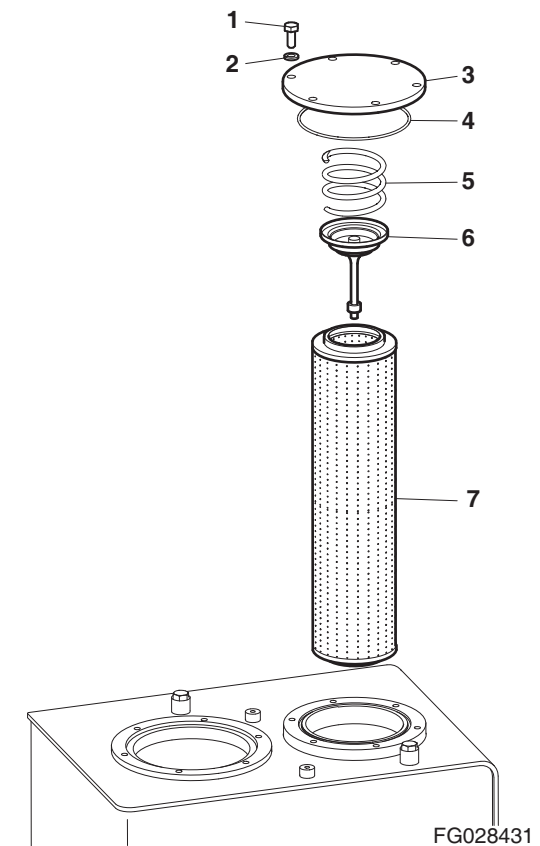


Figure 57

FG028431

Clean Air-conditioning Inner Filter

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

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

NOTE: *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

1. Remove four bolts and filter cover from operator's seat base.
2. Remove filter from seat base. Clean filter using compressed air. If filter is still not clean, replace with a new one.
3. After inserting filter, install cover. Secure cover in place with four screws.

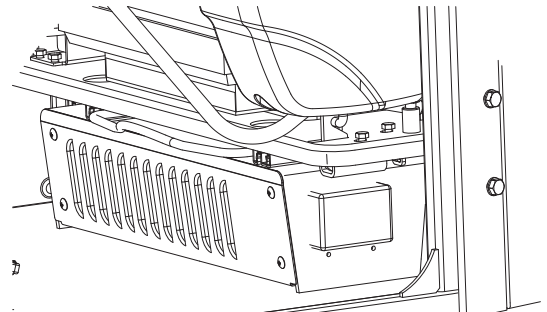
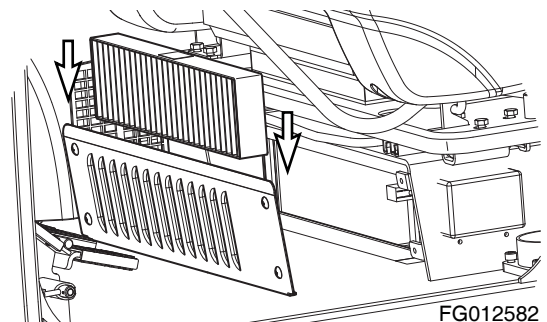


Figure 58

FG012582

Clean Air-conditioning Outer Filter

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

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

NOTE: *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

1. Remove two bolts and open the cover in the inside of the left of the cabin.

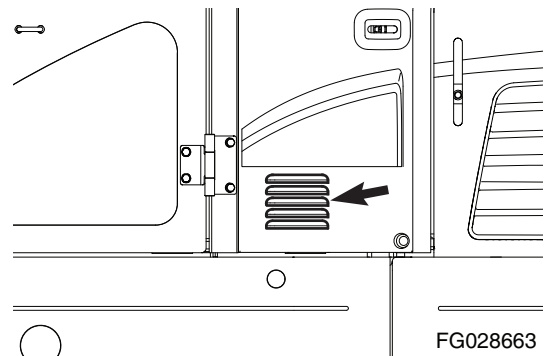


Figure 59

2. Remove filter from cover. Clean filter using compressed air. If filter is still dirty, replace filter.
3. Reassemble in reverse order.

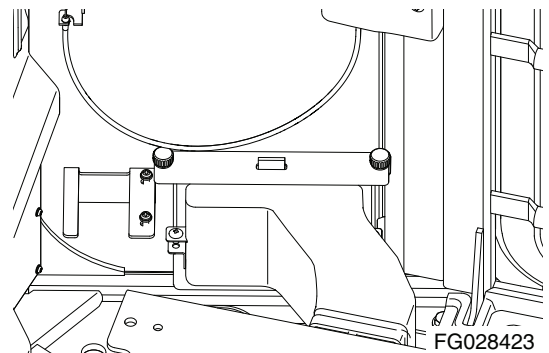


Figure 60

1,000 HOUR / 6 MONTH SERVICE

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

Change Oil in Travel Reduction Device (One on Each Side of Unit)



WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool. Before fully removing any motor case, inspection port plug, etc., loosen the plug slightly to allow pressurized air to escape.

NOTE: Drain oil after first 250 hours of operation or rebuild, and every 1,000 hours thereafter.

1. Make sure that the machine is on firm and level ground.
2. Rotate the track until ports (1 thru 3, Figure 61) are in their proper positions as shown.
3. Place a container under drain plug (2, Figure 61) and remove plugs (1 thru 3) to drain the travel reduction gear oil.

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

4. Install drain plug (2, Figure 61). Refill the travel reduction gear case with fluid through fill port (3) until fluid level is at port (1). Install level plug (1) and fill plug (3).

NOTE: See "Fluid Capacities" on page 4-11. for capacity.

5. Repeat this procedure on the other travel reduction device.

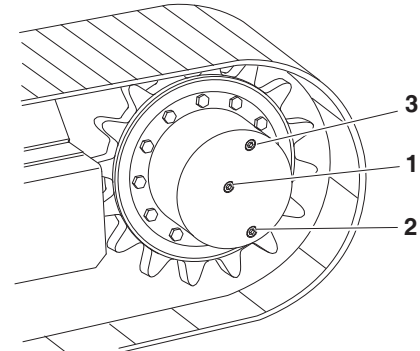


Figure 61

FG028680

Change Air-conditioning Inner Filter

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

1. Remove four bolts and filter cover from operator's seat base.
2. Remove filter and replace it with a new one.
3. After inserting filter, install cover. Secure cover in place with four screws.

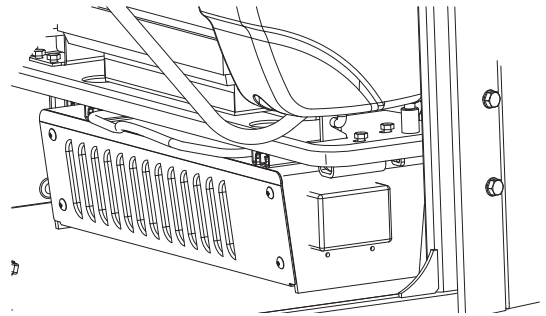
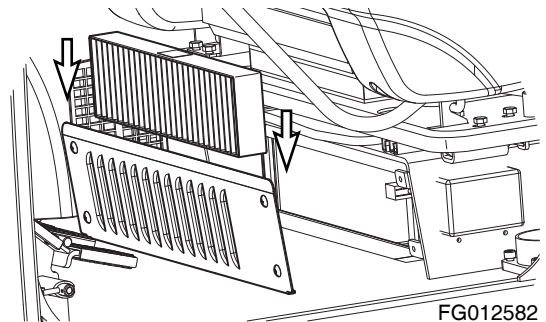


Figure 62

FG012582

Change Air-conditioning Outer Filter

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

NOTE: *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

1. Remove two bolts and open the cover on the inside of the left of the cabin.

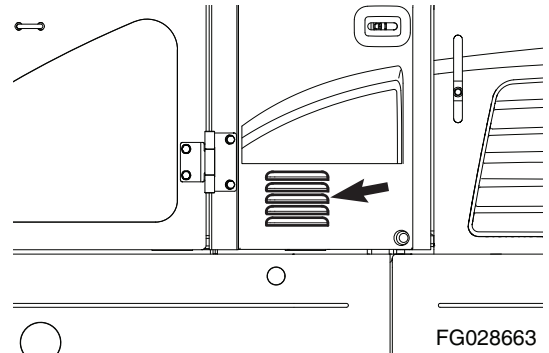


Figure 63

2. Remove filter and replace with new one.
3. Reassemble in reverse order.

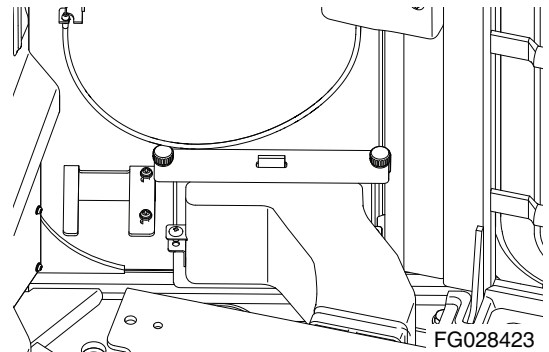


Figure 64

Clean Hydraulic Oil Suction Strainer

NOTE: Replace hydraulic oil suction strainer after first 250 hours of operation or rebuild, then 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.

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.
2. Move safety lever to "LOCK" position.
3. Stop engine.
4. Carefully remove bolts and cover (2, Figure 65) from top of hydraulic oil tank. There is a spring (3) under the cover that will force the cover up.
5. Remove spring (3, Figure 65) and strainer (5), by pulling on rod (4).
6. Clean inside and outside of strainer. Replace strainer if broken.
7. Position strainer (5, Figure 65) on boss portion of suction pipe (6).

NOTE: Measurement "A" is 492 mm (19.4 in).

8. Place spring (3, Figure 65) on rod (4) and assemble cover (2).
9. Check level of hydraulic oil tank.

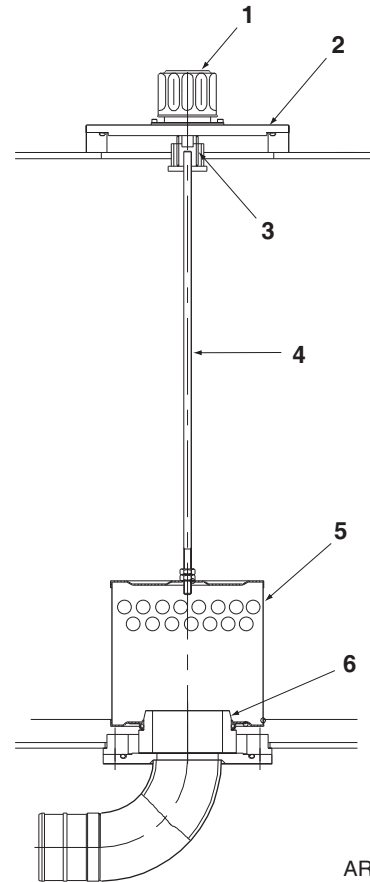


Figure 65

ARO1720L

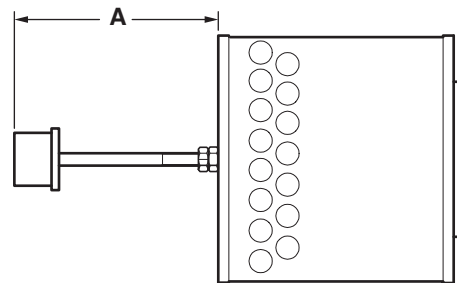


Figure 66

FG028432

Change Air Breather Element

1. Remove bolt (A) from top of breather assembly.
2. Remove housing (C).
3. Replace the element (B).
4. Reassemble in reverse order.

NOTE: When the machine is operated under dusty work sites, the air breather filter needs to be cleaned or replaced on a regular basis even before the expected replacement date.

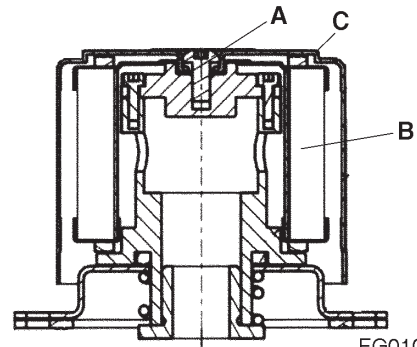


Figure 67

FG010662

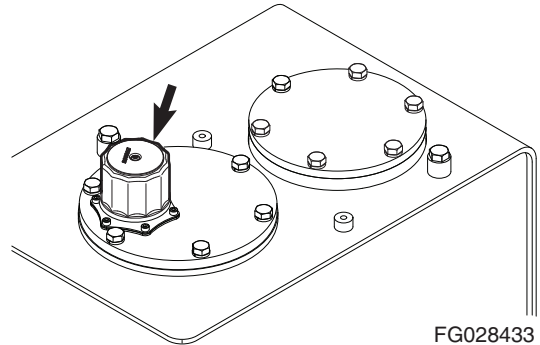


Figure 68

FG028433

Change Fuel Cap Filter

IMPORTANT

External shock or damage to fuel cap may lead to permanent damage to filter.

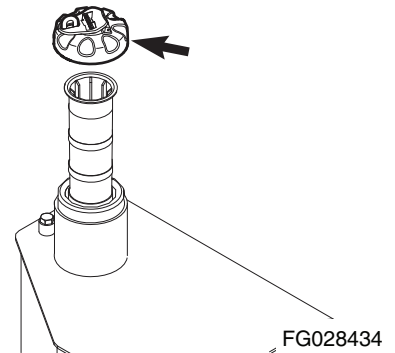


Figure 69

FG028434

1. See under the fuel cap as shown on (Figure 70). Rotate bolt counterclockwise direction to loosen.

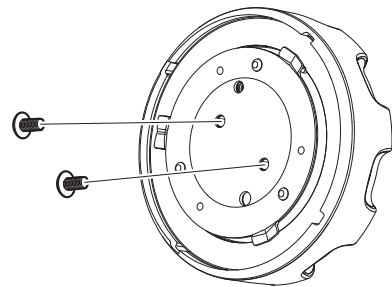
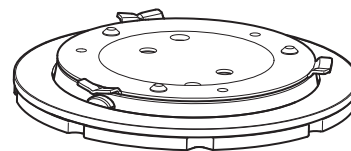


Figure 70

FG015684

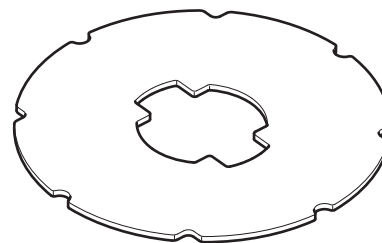
2. After disengaging it as shown on (Figure 71), carefully lay it on floor.



FG015685

Figure 71

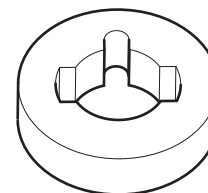
3. After disengaging (Figure 71), disengage rubber as shown on (Figure 72).



FG015686

Figure 72

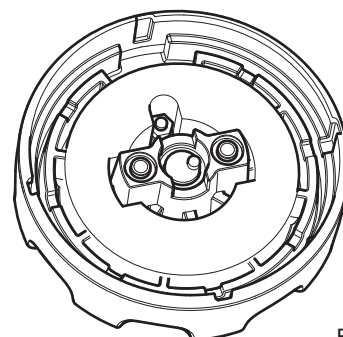
4. After disengaging as shown on (Figure 72), you may now exchange it with a new filter as shown on (Figure 73).



FG015687

Figure 73

5. After exchanging with a new filter, you may now reassemble in reverse order.



FG015688

Figure 74

Check Air Conditioner Refrigerant



WARNING

AVOID DEATH OR SERIOUS INJURY

Mixing of tobacco smoke and freon is deadly.

Do not smoke while servicing or recharging air-conditioning system.

1. Run engine at about 1800 rpm. Operate for a minimum of ten minutes to stabilize the system.
2. Press the "HI" fan speed switch to set maximum airflow.
3. Put the temperature control switch in maximum cooling position.
4. Press the "Internal Air Circulation" switch.
5. Compare the flow of bubbles in the sight glass of receiver dryer with the drawings in the following table.

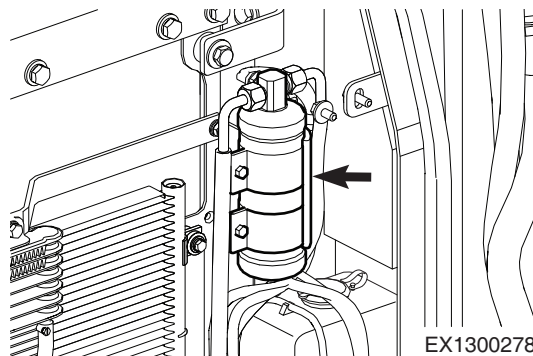
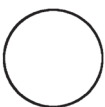


Figure 75

IMPORTANT

Overfilling refrigerant can cause dangerous high-pressure and poor cooling action; and low refrigerant level can cause compressor damage.

Always maintain refrigerant at normal level.

Amount of Refrigerant	Appearance of the Sight Glass	Solutions
Normal	 Almost clear. Any bubbles disappear.	Charge or withdraw the system with the correct amount of HFC-134a refrigerant.
High	 No bubbles are seen.	
Low	 A flow of bubbles is visible.	

Check and Adjust Engine **

Contact your nearest DOOSAN dealer for checking and adjusting the following items:

- Engine Compression Pressure.
- Injection Pressure.
- Injection Timing.

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 10 times or every 500 hours of service.

NOTE: Replace inner element every 1,000 hours of service.

If there is clogged filter signal on the gauge panel, use the following procedure.

1. Open the access door at the hood.
2. Remove evacuator valve (1, Figure 76) and 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. Remove outer filter (3, Figure 77) from the air cleaner housing.
4. Clean the air cleaner cover and the inside of the air cleaner housing.
5. Remove inner filter (4, Figure 77).
6. Clean out inside of air cleaner housing. Do not use compressed air to blow out housing.
7. Install new inner filter. Do not clean and reuse inner element.
8. Install new outer filter.
9. Install air cleaner cover and evacuator valve.

NOTE: Make sure that all gaskets and cover are properly installed and seated.

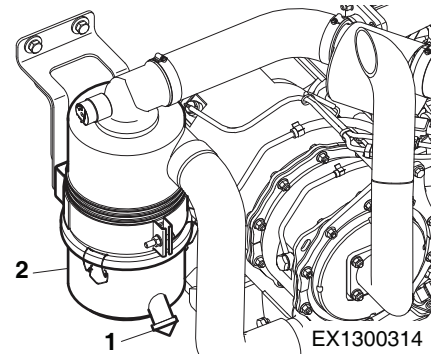


Figure 76

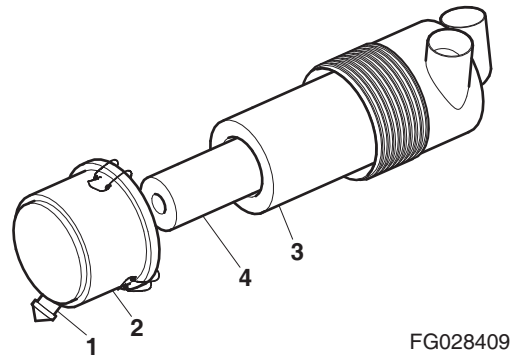


Figure 77

2,000 HOUR / YEARLY SERVICE

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

Change Radiator Coolant

NOTE: Do not mix ethylene glycol and propylene glycol antifreeze together. Refer to "Engine Cooling System" and "Types of Antifreeze" page for further details.



WARNING

AVOID DEATH OR SERIOUS INJURY

Allow the engine to cool before releasing the radiator cap. Make sure to loosen the cap slowly to release any remaining pressure.

Radiator cleaning is performed while the engine is running. Take extreme caution when working on or near a running engine. Make sure to lock out and tag the controls notifying personnel that service work is being performed.

Do not remove radiator cap unless it is required. Check the coolant level in the coolant recovery tank.

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.



Figure 78

ARO1760L

1. Slowly open the radiator cap and the surge tank cap (Figure 79) to allow any pressure to escape.

NOTE: See "Fluid Capacities" on page 4-11. for capacity.

NOTE: Some models may have no surge tank or radiator cap. This instruction is only applicable to those with the cap.

2. Install drain plug, and close drain valve after coolant has completely drained from system.
3. Fill cooling system with a flushing solution.
4. Run engine at low idle until coolant temperature gauge reaches the "BLUE 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 4-73.
9. Run engine with radiator cap and the surge tank cap not installed, so all air will be purged from system. Fill radiator to fill neck.
10. Drain and fill radiator coolant recovery tank.

Refer to "Antifreeze Concentration Tables" on page 4-73.

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.

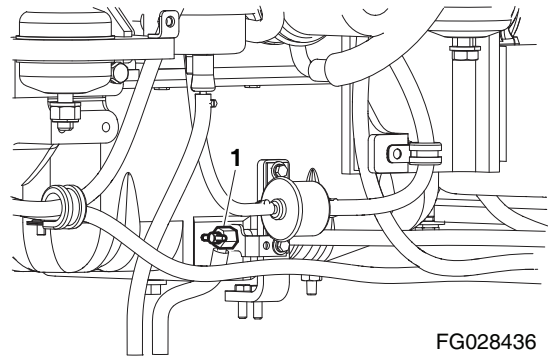


Figure 79

Change Hydraulic Oil



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.

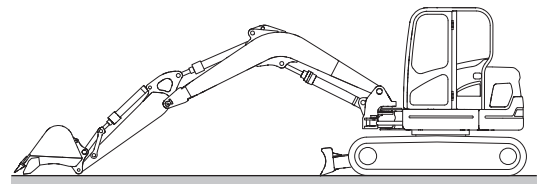
NOTE: *Based on the type of excavating being completed, the working conditions (extremely hot or dusty) and the extra front end attachments being used (hydraulic breaker, etc.), the hydraulic fluid will need to be changed more frequently.*

1. Park machine on firm and level ground. Swing upper structure parallel to tracks. Lower boom and position bucket on ground as shown in Figure 81.
2. Move safety lever to "LOCK" position.
3. Stop engine.



ARO1760L

Figure 80



FG028517

Figure 81

4. Drain hydraulic oil from tank into a container capable of holding 87 liters (23 U.S. gal.). After draining tank, install drain plug.



WARNING

AVOID DEATH OR SERIOUS INJURY

Be careful of spraying oil when removing drain plug.

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

5. Carefully remove bolts and cover (2, Figure 83) from top of hydraulic oil tank. There is a spring (3) under the cover that will force the cover up.
6. Remove spring (3, Figure 83) and strainer (5), by pulling on rod (4).
7. Clean inside and outside of strainer. Replace if it is broken.
8. Position strainer (5, Figure 83) on boss portion of suction pipe (6).

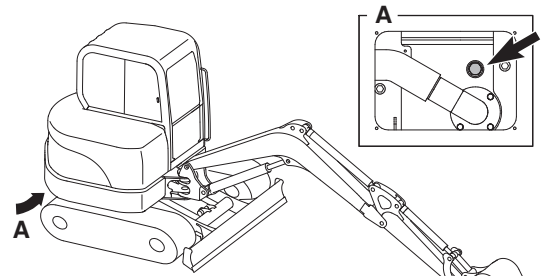
NOTE: *Measurement "A" is 492 mm (19.4 in).*

9. Fill the hydraulic oil tank. Check level using sight gauge on side of tank.
10. Place spring (3, Figure 83) on rod (4) and assemble cover (2).
11. After replacing and cleaning the hydraulic oil, filter and strainer, vent the system.

IMPORTANT

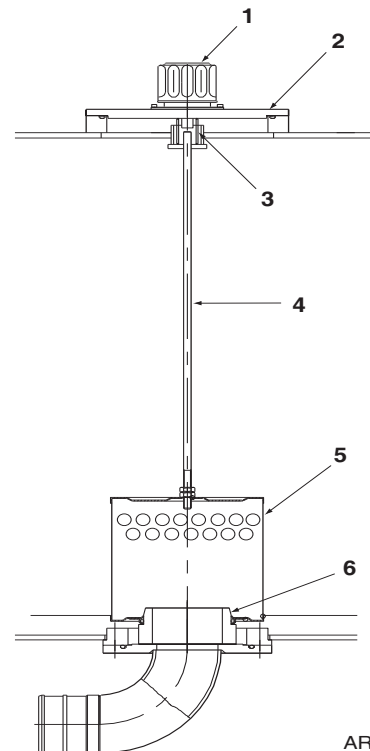
When the hydraulic breaker is being used, because of the higher heat generated by this unit, use replacement intervals recommended under the "Hydraulic Oil and Filter Service Intervals" on page 3-45.

12. Check level of hydraulic oil tank. (See page 4-19)



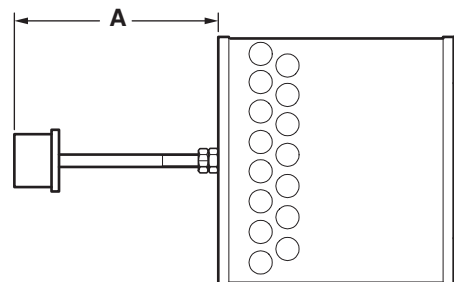
EX1300471

Figure 82



ARO1720L

Figure 83



FG028432

Figure 84

Check Alternator and Starter **

**These checks need to be completed by an authorized DOOSAN dealer.

Check All Rubber Antivibration Shock Mounts

Perform and Record the Results of the Cycle Time Tests

Inspect Machine to Check for Cracked or Broken Welds or Other Structural Damage

Check, Adjust Valve Clearance **

Check Head Bolt Torques

4,000 HOUR / BIENNIAL SERVICE

Major Parts - Periodic Replacement

For proper operation and work, perform periodic inspections. These parts are those most often subjected to abrasion, heat and fatigue. Replace these parts with new ones at the designated time intervals, even if the old parts look satisfactory.

Replace all related parts such as gaskets and O-rings with original equipment manufacturer's parts.

Major Component		Parts Name to be Replaced Periodically	Time to Replace
Engine		Fuel hose (Tank to fuel prefilter)	2 years or 4,000 hours
		Fuel hose (Fuel prefilter to fuel cooler)	
		Fuel hose (Fuel cooler to ECU)	
		Fuel hose (Tank to CP pump)	
		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	

6,000 HOUR / BIENNIAL SERVICE

Clean Diesel Particulate Filter (DPF)

IMPORTANT

Regular ash cleaning is necessary to prevent engine performance and fuel efficiency from deteriorating.

IMPORTANT

When DPF cleaning is needed, contact DOOSAN distributor for more information.

For details, See "Engine Exhaust Emission Control System" on page 3-21.

9,000 HOUR / 4 YEAR SERVICE

Change Diesel Oxidation Catalyst (DOC) and Diesel Particulate Filter (DPF)

IMPORTANT

Regular replacement is necessary to prevent engine performance and fuel efficiency from deteriorating.

IMPORTANT

When DPF replacement is needed, contact DOOSAN distributor for more information.

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 4-57, 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.

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.

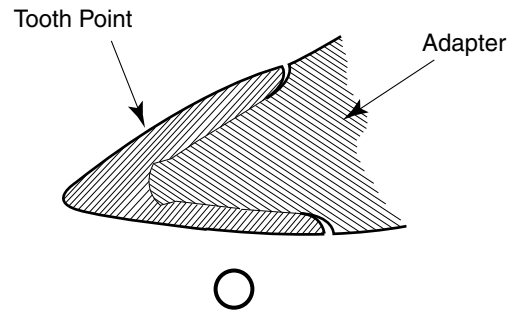
NOTE: *These instructions are only for DOOSAN OEM buckets. If you are using other manufacturers buckets, refer to their specific instructions.*

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.

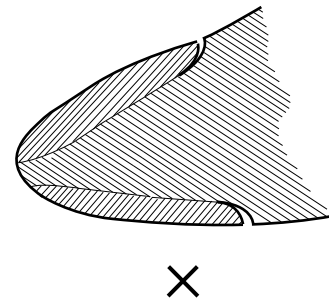
Procedures of Bucket Tooth Replacement

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 85, Figure 86.
2. To replace a tooth, use a hammer (1, Figure 87) and punch (2, Figure 87) to drive locking pin (4, Figure 88) and locking rubber (3, Figure 88) 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.



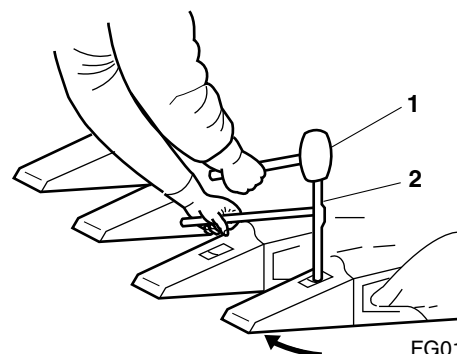
FG010724

Figure 85



FG010083

Figure 86



FG010527

Figure 87

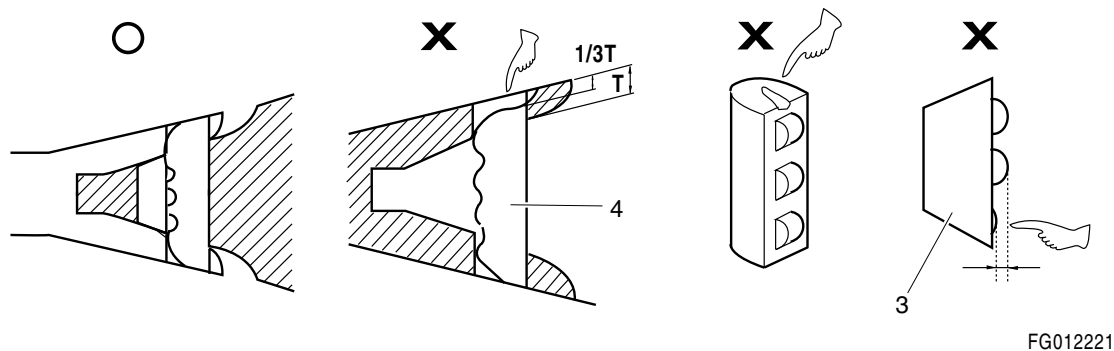


Figure 88

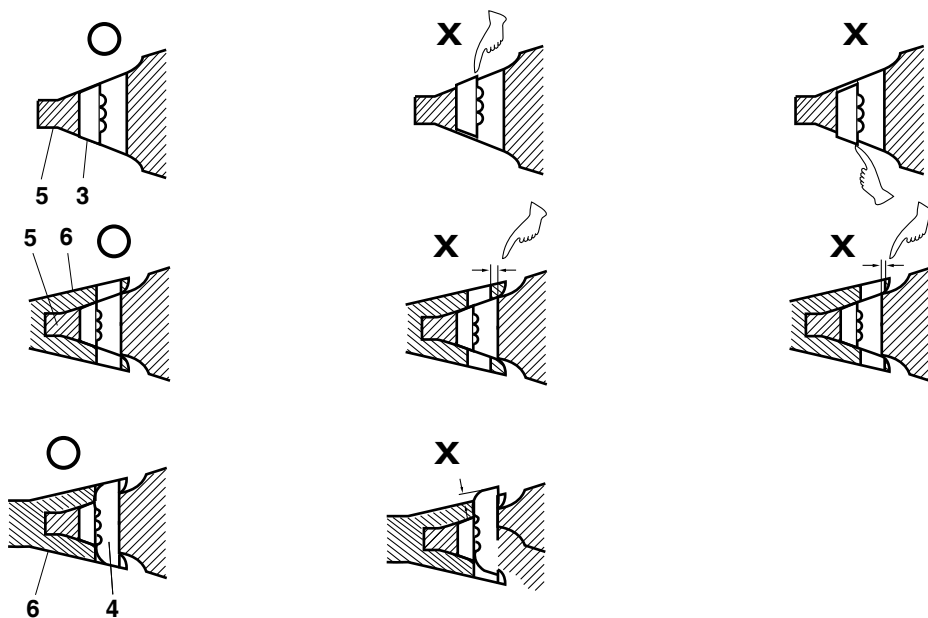


Figure 89

Bucket O-ring Replacement



WARNING

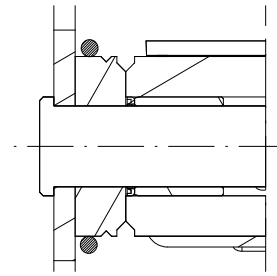
AVOID DEATH OR SERIOUS INJURY

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 91) onto boss (2) around bucket pin (3). Remove bucket pin and move arm or bucket link (4) out of way.

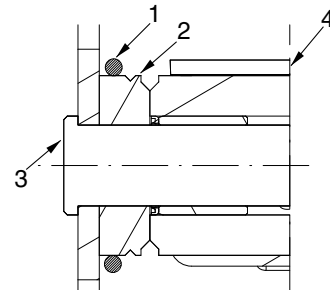
3. Remove old O-ring and temporarily install new O-ring (1, Figure 91) onto bucket boss (2). Make sure that O-ring groove on both bucket link (4) and boss have been cleaned.
4. Realign arm or link with bucket pinhole and insert bucket pin (3, Figure 91).

5. Roll new O-ring (1, Figure 91) into O-ring groove.



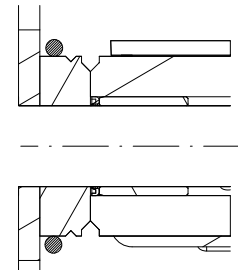
FG010163

Figure 90



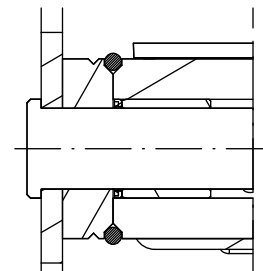
FG011218

Figure 91



FG010164

Figure 92



FG010165

Figure 93

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.



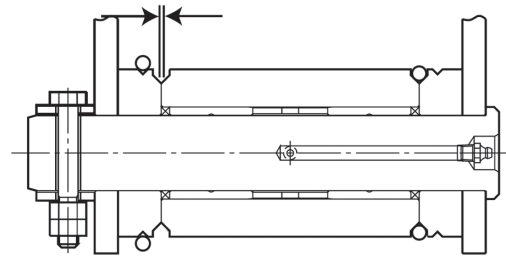
WARNING

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 Nm/4.3 kg•m (31 ft lb).



FG007698

Figure 94

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.

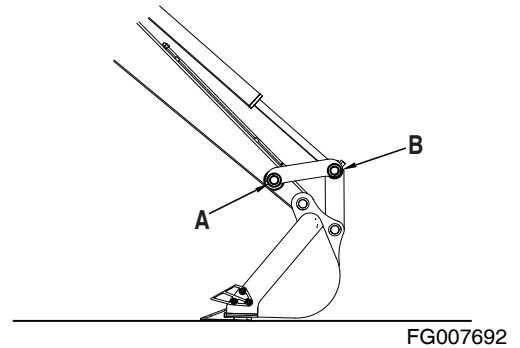


Figure 95

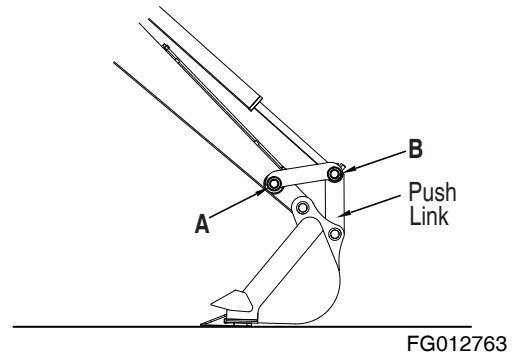


Figure 96

ELECTRICAL SYSTEM

NOTE: *Never disassemble electrical or electronic parts. Consult with a DOOSAN distributor or sales agency 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 drink 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 bring lighted cigarettes near the battery, 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 power 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, it means low electrolyte state because of a leakage or charging system error. Determine the cause of problem and replace the batteries immediately.

Check Charging State

Check charging state through the charging indicator.

- GREEN: Sufficiently charged.
- BLACK: Insufficient charged.
- TRANSPARENT: Replace battery.

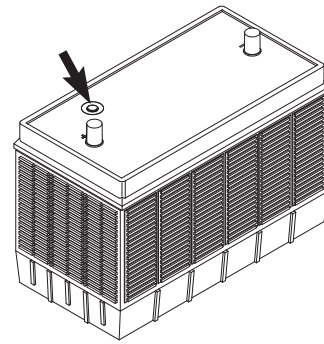
Check Battery Terminals

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.

Battery Replacement

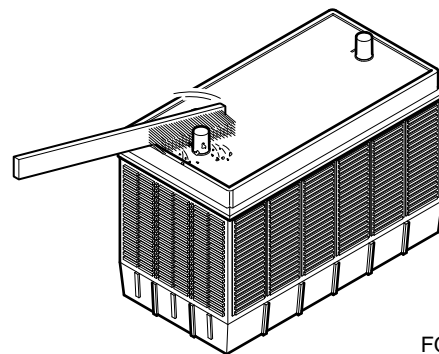
When the charging indicator indicates transparent state, replace the battery. The batteries should always be replaced in pairs.

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



FG028451

Figure 97

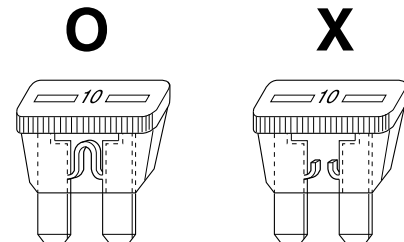


FG010162

Figure 98

Fuses

1. The fuses in the fuse box are used to protect the various electrical circuits and their components from being damaged. See Figure 99. The fuses used are standard automotive type fuses.
2. The section on "Fuse Identification" on page 4-68, lists the circuits and the fuse amperage required for each circuit. If a fuse blows, determine the cause and repair any 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 99

IMPORTANT

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

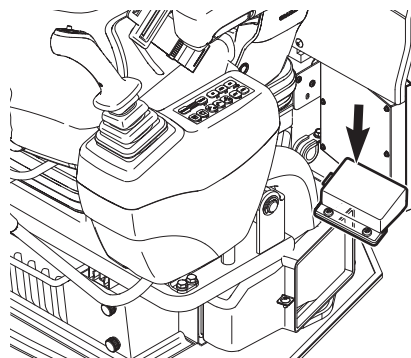
Fuse Box

There is a fuse box on the left side of the back of the seat. The fuses prevent electrical devices from overloading or shorting.

A decal attached to the fuse box's cover indicates the function and amperage of each fuse.

Spare fuses are mounted on the inside of fuse box's cover. (One each of a 10A, 15A, 20A and 30A.)

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



FG028374

Figure 100



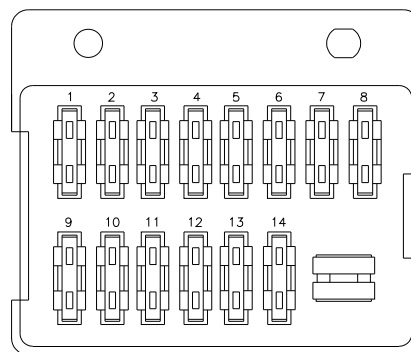
WARNING

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.

Fuse Identification

No.	Fuse Box	
	Name	Capacity
1	Rotating Beacon Light (Optional)	10A
2	Horn, Wiper Motor, Wiper Washer	20A
3	Seat Warmer, A/C Panel	20A
4	Stereo, Quick Coupler, Handsfree	20A
5	12V Socket, A/C Unit	20A
6	Check Connector	10A
7	Working Light	20A
8	Cabin Light	15A
9	Room Light, Fuel Pump	20A
10	Stater Switch	15A
11	Gauge Panel, VCU	20A
12	Condenser Fan, Compressor	30A
13	Pilot Cutoff	30A
14	Spare	10A



FG007491

Figure 101

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 4-73. 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.

Measuring the Concentration of Coolant

The coolant and its additives can be checked by using coolant test strips (No: 60.99901-0038). Use the following procedure to conduct the test:

1. With a coolant temperature of 10° - 55°C (50° - 131°F), drain 1 liter (1 U.S. quart) from the radiator into a clean plastic container.

NOTE: *Do not take the sample from the coolant recovery tank. Recovery tank coolant concentration can differ from the concentration level of coolant in the radiator.*

2. Dip test strip, into coolant sample for 3 - 5 seconds. Remove strip and excessive coolant by giving the strip one shake.
3. Wait for 45 seconds, for the test strip to change color.

NOTE: *Measuring time should not be more than 75 seconds. If it is over this time limit, the color will be changed and an inaccurate reading will result.*

4. Compare the color of the test strip with the color table on the outside of test strip container bottle and determine what numeric value corresponds to the color in the table.

- A. Check antifreeze concentration levels by comparing the color change at the end of test paper, with the green spectrum range, with the green symbol on the upper portion of the container bottle.

NOTE: *A suitable concentration indicator must be between 33% and 50%.*

- B. Check the anticorrosive additives, by comparing brown color in the middle range of the test strip and pink color on the lower part of the test strip, with the brown and pink spectrum range. Where the brown (vertical) color and pink (horizontal) color intersects represents the anticorrosive additive level.

NOTE: *A reading between 0.3 and 0.8, represents an adequate additive level.*

5. Correct the antifreeze concentration and additive levels.
 - A. If anticorrosive additive level is below 0.3, add 100% pure antifreeze to the radiator.
 - B. If anticorrosive additive level is greater than 0.8, add a 50% distilled water and antifreeze mixture to lower the additive reading.

NOTE: *In either case keep the antifreeze concentration level between 33% and 50%.*

6. Run the engine to recirculate the coolant mixture. Be sure that engine reaches operating temperature to ensure a thorough mix. Stop engine and retest antifreeze.

NOTE: *When making adjustment, drain 1 liter (1 U.S. quart) of coolant from the radiator. Add 30 cc (1 fl oz) at a time to the drained fluid. Keep track of how many cc's (fl oz's) were added to the 1 liter (1 U.S. quart) to obtain a proper reading. Then multiply that number times the total system capacity of liters (U.S. quarts). Add that amount to the radiator.*

Example: If 1 liter needs 90 cc to obtain proper reading. Then system capacity of 40 liters x 90 cc = 3,600 cc (3.6 liters) of correction fluid.

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.

When refilling and changing coolant, use Doosan's genuine coolant is the top priority. If Doosan's genuine coolant is not available, the coolant and additives specifications must meet the following table.

Description	Coolant	
	Refill	Change
Coolant Standard	ASTM D6210	ASTM D6210
Coolant Base	Ethylene Glycol Base (Do not use Propylene Glycol)	Ethylene Glycol Base or Propylene Glycol (Both available)
Additive	Only Phosphate type available	Only Phosphate type available (Do not use Silicates type additive)
Remark	Below should not be contained for Scania Engine <ul style="list-style-type: none">2-EHA (mono carboxylate acid)Benzoat (aromatic carboxylate acid)	

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 (OPTIONAL)

IMPORTANT

Please open fuel cap before operate fuel transfer pump to avoid any safety issue/damages due to the pressure building up.

Dry operating fuel pump for more than fifteen seconds can cause wear and/or damage to pump.

- Cooling and lubrication of pump is achieved by fuel passing through pump. If pump is dry operated, heat generated by moving parts will cause damage to pump rotors, vanes and seals.

Do not operate pump for more than fifteen minutes at a time.

- Continuous usage of pump over recommended time interval will cause overheating of motor and will result in motor damage.

Do not use fueling pump for other types of fuel or fluids. (Use only diesel.)

- 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 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, it 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

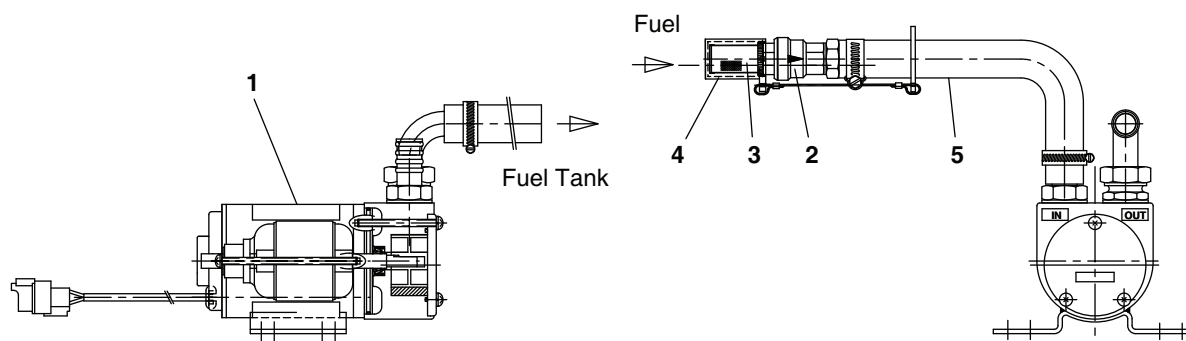
AVOID DEATH OR SERIOUS INJURY

If there are any sign of leakage while operating transfer pump, inspect the following components to prevent any fires or hazardous fuel spills.

- 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 102

Reference Number	Description
1	Body
2	Check Valve
3	Strainer

Reference Number	Description
4	Strainer Cap
5	Inlet Hose

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 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 punch a hole 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 "UNLOCKED" 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.

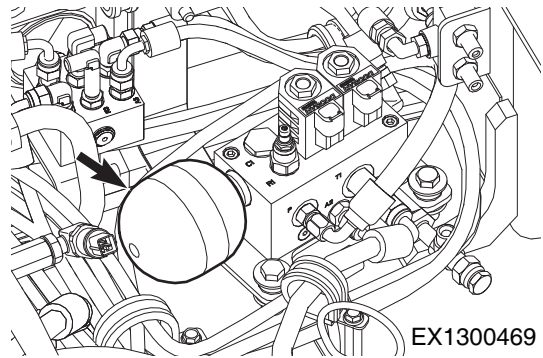


Figure 103

EX1300469

TRACK TENSION



WARNING

AVOID DEATH OR SERIOUS INJURY

Measurement of track tension requires two people. Always follow these instructions:

- One person must be in the operator's seat operating the controls while the other person makes dimensional checks.
- Block frame to make sure the machine won't move or shift position during service.
- Warm up the engine to prevent stalls.
- Park the excavator in an area that provides level, uniform ground support and/or use support blocks when necessary.

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

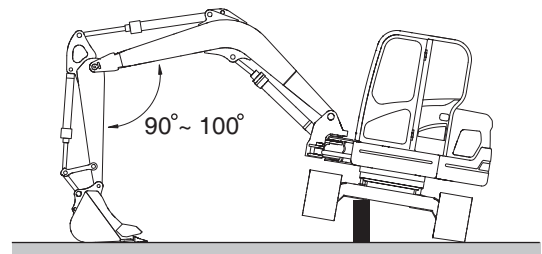
Track shoe link pins and bushings wear with normal usage, reducing track tension. Periodic adjustment is necessary to compensate for wear and it may also be required by working conditions.

Inspection

1. Turn upper body so it is at a 90° angle to tracks.

NOTE: *On rubber tracks, move machine body so seam of track pad is on axle centerline, then turn body.*

2. Use the boom and arm to raise the machine.
3. Place blocking underneath the machine.
4. Raise the boom until the weight of the machine is resting on the blocks.
5. Stop engine.
Turn the track backward 1 - 2 turns.

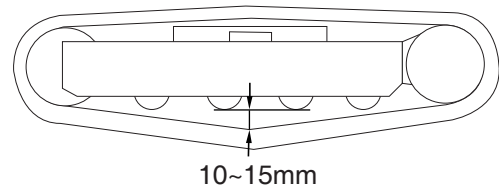


FG028476

Figure 104

6. Measure clearance between track roller and track contact surfaces. Clearance must be approximately 10 - 15 mm (0.39 - 0.59 in)

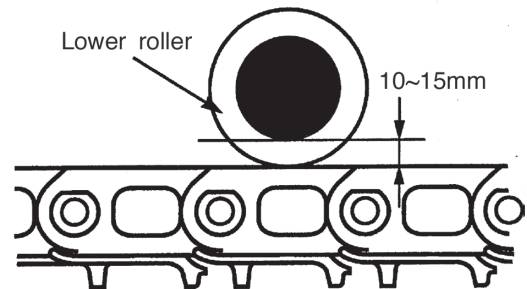
NOTE: *This measurement can be thrown off if there is too much mud or dirt or other material in track assembly. Clean off tracks before checking clearance.*



FG007705

Figure 105

NOTE: *For machines with rubber tracks (optional), checking and adjustment steps and clearance are the same.*



FG007706

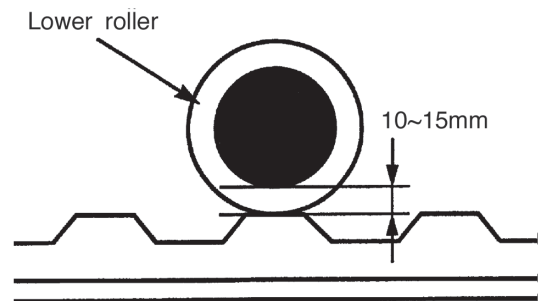
Figure 106



WARNING

AVOID DEATH OR SERIOUS INJURY

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



FG007708

Figure 107

How to Increase Tension

1. Apply grease through grease fitting.
2. Move track forward and backward to distribute grease and readjust tension if necessary.
3. If tension cannot be increased, replace pin and bushing, or, on rubber tracks, replace cylinder seal or tracks.

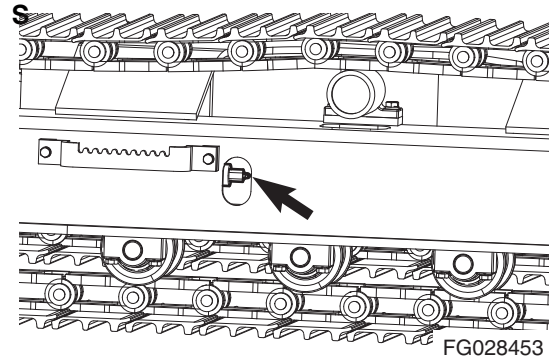


Figure 108

To Reduce Tension

1. Loosening track tension grease valve causes grease to drain out and track tension to decrease. Loosen valve slowly to a maximum of 1 turns.
2. When track tension is correct, tighten track tension grease valve to 59 - 88 Nm/6 - 9 kg•m (43 - 65 ft lb)
3. Recheck tension by moving track forward and backward.
4. Recheck tension and adjust as necessary.

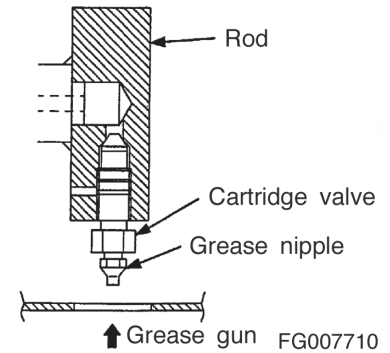


Figure 109

VENTING AND PRIMING HYDRAULIC SYSTEM

Main System Pump

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

1. With the engine stopped, remove drain hose (1, Figure 110) to see if any oil is present.
2. If oil is not present, fill pump with oil through port (2, Figure 110).
3. Install drain hose (1, Figure 110) first.
4. Start engine and run it for several minutes at low idle engine speed. This will pressurize the hydraulic oil tank and system.
5. Slowly loosen drain hose (1, Figure 110) several turns, until hydraulic oil flows out of drain hose. This shows that air has been released.
6. Tighten the drain hose (1, Figure 110).

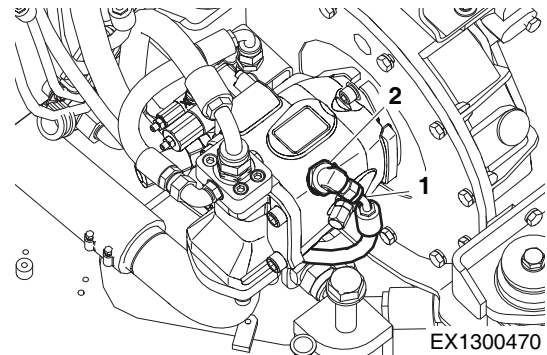


Figure 110

EX1300470

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.

Travel Motor

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

1. Stop engine
2. Disconnect drain hose (Figure 111) and fill motor case with hydraulic oil.
3. Connect drain hose.
4. Start engine and move engine speed control dial to "LOW IDLE". Run the engine for one minute and slowly drive excavator forwards and backwards.

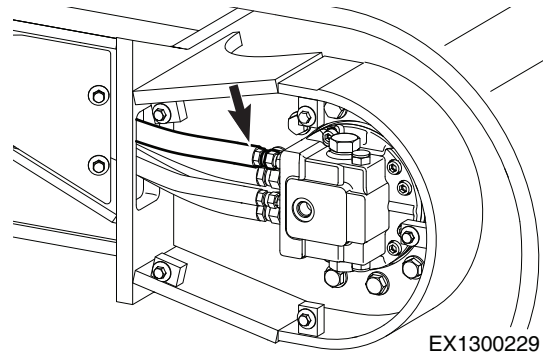


Figure 111

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, 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 3-60 for other recommendations.

Conditions	Maintenance Required
Operating in mud, water or rain.	Perform a walk around inspection to check for any loose fittings, obvious damage to the machine or any fluid leakage.
	After completing operations, clean mud, rocks or debris from the machine. Inspect for damage, cracked welds or loosened parts.
	Perform all daily lubrication and service.
	If the operations were in salt water or other corrosive materials, make sure to flush the affected equipment with fresh water.
Operating in an extremely dusty or hot environment.	Clean the air intake filters on a more frequent basis.
	Clean the radiator and oil cooler fins to remove embedded dirt and dust.
	Clean the fuel system intake strainer and fuel filter more frequently.
	Inspect and clean as required the starter and alternator.
Operating in rocky terrain.	Check the undercarriage and track assemblies for damage or excessive wear.
	Inspect for loose or damaged fittings or bolts.
	Relax track tension.
	On a more frequent basis, inspect the front end attachments for damage or excessive wear.
	Install top and front guard as required for protection against falling rocks.
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 extremely 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.

LOADING AND UNLOADING



WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT remove machine counterweight, front attachment or any other part, if stability is not secured. Removing such parts could cause tipping or rollover resulting in death or serious injury.

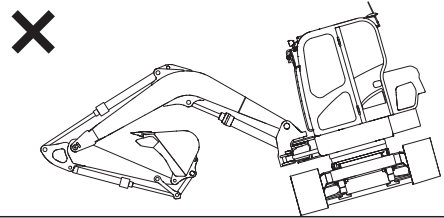
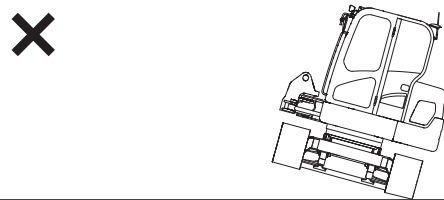
Never remove counterweight or front attachment unless the upper structure is in-line with the lower structure.

Operator Protective Structure's capacity in the event of machine tip-over or roll-over depends on the support of the boom, arm and counterweight.

Avoid any machine operations which could affect machine stability when the machine needs to be operated without the boom, arm or counterweight.

Machine should be operated slowly by a qualified operator.

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



FG028465

Figure 1



WARNING

AVOID DEATH OR SERIOUS INJURY

When transporting the machine, know the width, height, length and weight.

When loading or unloading the machine make sure to run the engine at the lowest speed setting, and travel at the slowest speed possible.

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

Make sure that ramp surface is free of grease, debris or mud that could cause the machine to slip or slide.

Make sure that trailer is parked on firm and level ground before attempting to load/unload the excavator.

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

Make sure to secure the excavator onto the trailer as required by local transportation laws and regulations.

1. Make sure that trailer is parked on firm and level ground. See Figure 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 or not exceeding a 15° angle. Ramps steeper than this can cause a problem when loading or unloading.

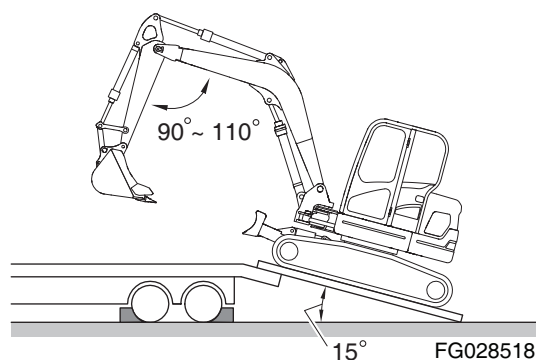


Figure 2

4. Press the travel speed selector button once to change to low speed.
5. Set engine speed to "LOW IDLE."

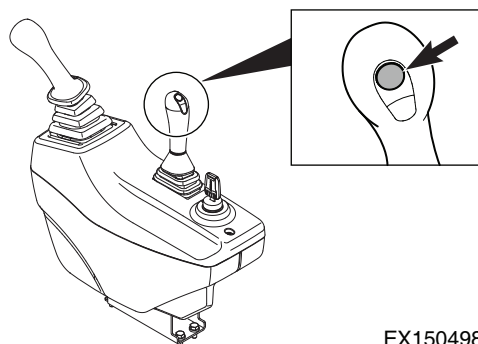


Figure 3

6. If the machine is equipped with work equipment, set the work equipment at the front, and travel forward to load it.

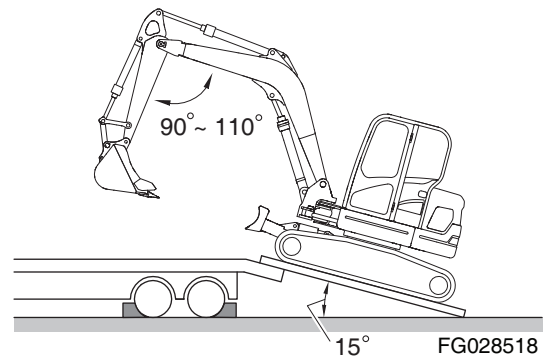


Figure 4

7. 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. See Figure 5.

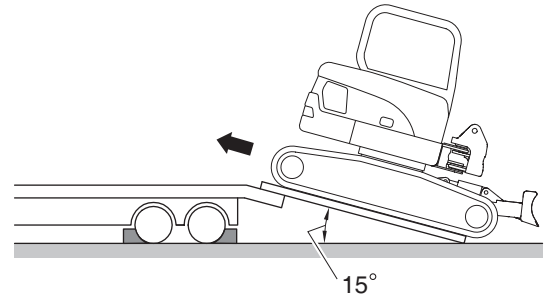


Figure 5

8. Extend bucket and arm cylinders to maximum length and then lower the boom slowly.

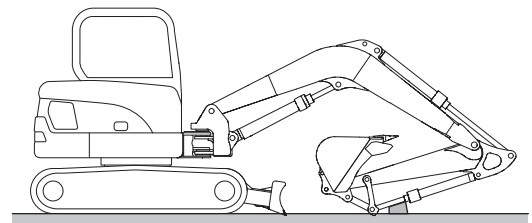


Figure 6

9. Move safety lever to "LOCK" position.

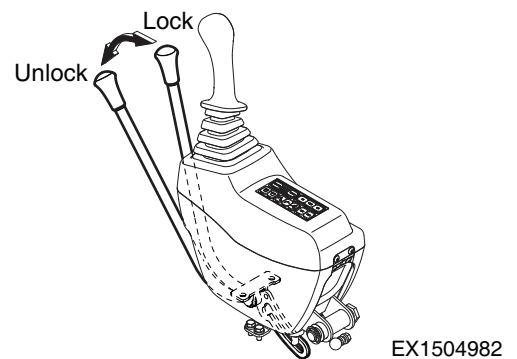
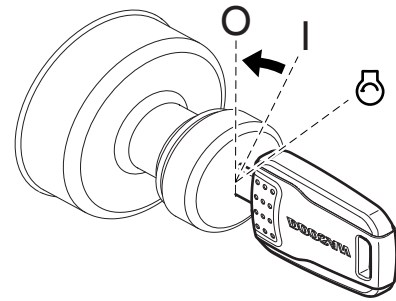


Figure 7

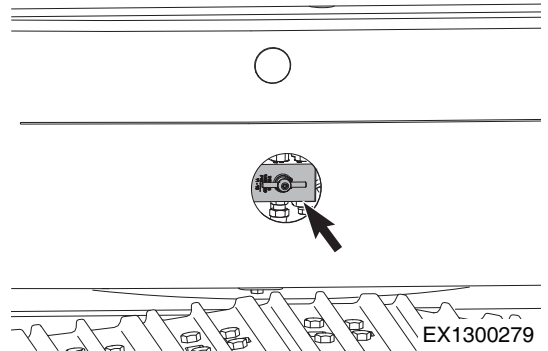
10. Stop engine by turning key to "O" (OFF) position (Figure 8).
11. Remove key from starter switch.



FG018156

Figure 8

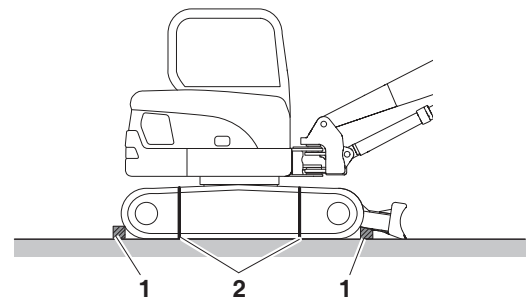
12. Turn battery disconnect switch to "OFF" position (Figure 9).
13. Lock all doors and covers.
14. Adjust direction of rotating beacon and radio antenna.



EX1300279

Figure 9

15. Make sure to secure the excavator onto the trailer before transporting. Place blocking (1, Figure 10) in front of and behind each track. Tie front and rear tie down point (2, Figure 11) on the lower frame with wire cable as required by local transportation laws and regulations.
16. Refer to "Specification" on page 6-1 of this manual for overall machine height and width measurements. Make sure to position the excavator as shown. If not transported in this position, the height measurements may be different.



FG028521

Figure 10

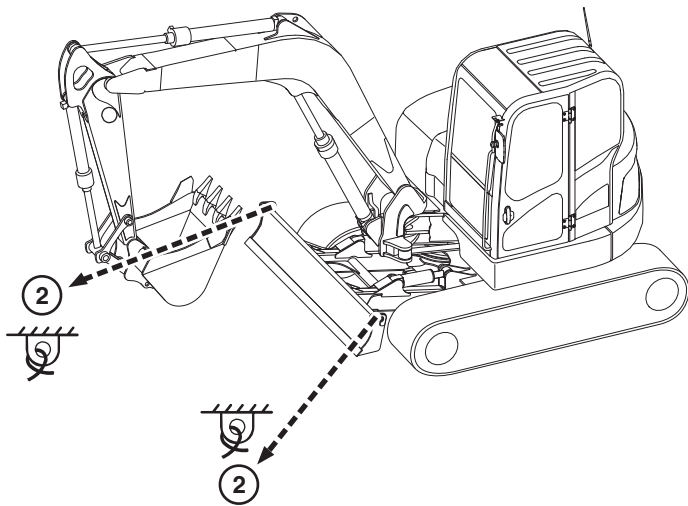
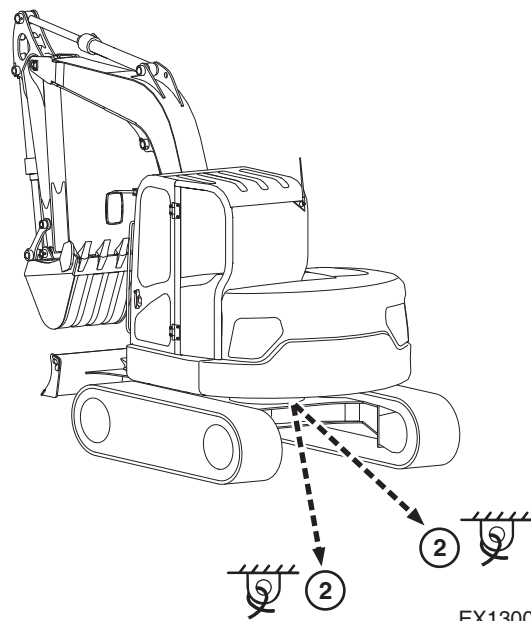


Figure 11



EX1300462

LIFTING MACHINE



WARNING

AVOID DEATH OR SERIOUS INJURY

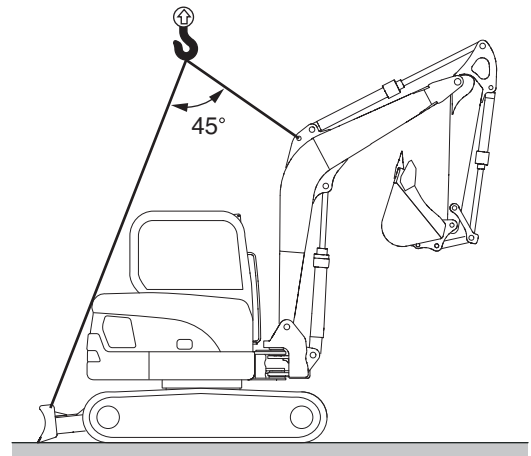
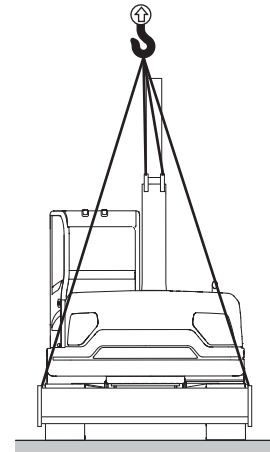
Never lift the machine with a person in the cabin or on the machine.

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.

1. Refer to "Specification" on page 6-1 of this manual for weight and dimensional information. Machine weight may vary with optional equipment.
2. Always lift the machine as shown Figure 12.
3. Use properly rated cables, slings and fixtures. Use lifting cables that are long enough to prevent contact with the machine. Spreader bars may be required.
4. Place protective material between the cables and the cabin and the upper structure to prevent damage.
5. The maximum angle between the cables must not exceed 45°.
6. While machine is lifted, keep the machine horizontal and lift the machine slowly to keep it balanced.



EX1300436

Figure 12

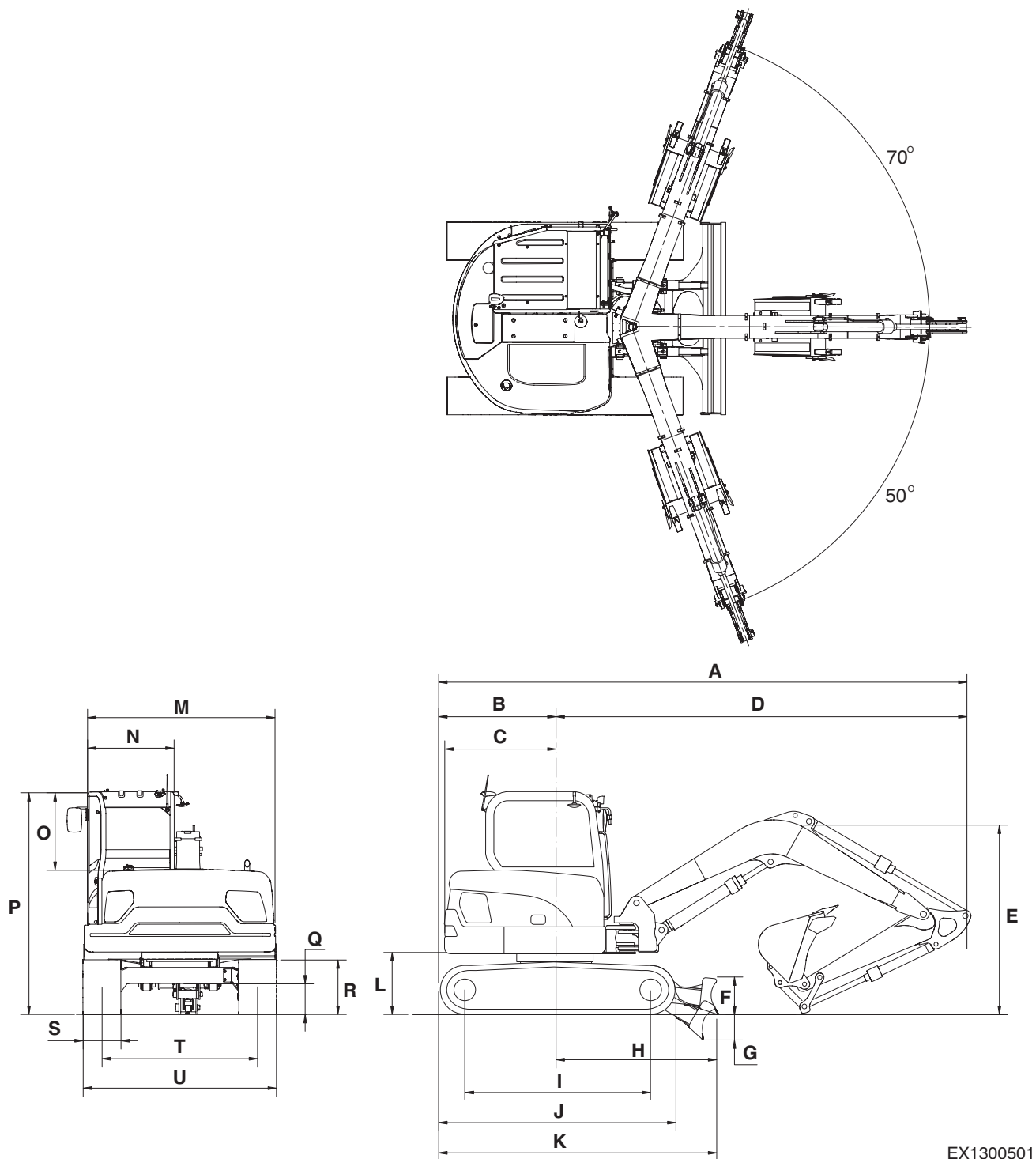
Specification

STANDARD SPECIFICATION

Component			Specification			
			DX62R-3		DX63-3	
			1.6 m (5' 3") Arm	1.9 m (6' 3") STD Arm	1.6 m (5' 3") Arm	1.9 m (6' 3") STD Arm
Bucket Capacity (SAE/CECE)	STD.		0.175 m ³ (0.23 yd ³)/0.151 m ³ (0.20 yd ³)			
	OPT.		0.21 m ³ (0.27 yd ³)/0.18 m ³ (0.23 yd ³)			
	OPT.		-		0.18 m ³ (0.23 yd ³)/ 0.21 m ³ (0.27 yd ³)	
Operating Weight			6.13 metric tons (6.755 tons)	6.25 metric tons (6.887 tons)	6.13 metric tons (6.755 tons)	6.25 metric tons (6.887 tons)
Engine	Model		4TNV98C			
	Type		4 cycle, Inline, Water-cooled Diesel			
	Displacement (Total Displaced Volume)		3,319 cc			
	Rated Output (Gross)		44.3 kW (60.2 PS) @ 2,100 rpm			
	Rated Output (Net)		43.6 kW (59.3 PS) @ 2,100 rpm			
	Maximum Torque		24.58 kg•m (241 Nm) @ 1,365 rpm			
	Fuel Tank Capacity		78 liters (21 U.S. gal.)			
Hydraulic Pump	Type		Variable Displacement Axial Piston Pump			
	LS Relief Set Pressure		235 kg/cm ² (3,342 psi)			
	System Pressure (Working/Traveling)		255 kg/cm ² (3,627 psi)			
	Maximum Discharge Quantity		132 liter/min (34.8 U.S. gpm) (at 2,200 rated rpm)			
	Hydraulic Oil Capacity	Tank Level	65 liters (17.2 U.S. gal.)			
		Full	83 liters (22 U.S. gal.)			
		System	111 liters (29.3 U.S. gal.)			

Component			Specification			
			DX62R-3		DX63-3	
			1.6 m (5' 3") Arm	1.9 m (6' 3") STD Arm	1.6 m (5' 3") Arm	1.9 m (6' 3") STD Arm
Performance	Digging Capability (SAE)	Bucket (STD)	3,950 kg (38.8 kN)	3,950 kg (38.8 kN)	3,950 kg (38.8 kN)	3,950 kg (38.8 kN)
		Arm (STD)	2,840 kg (27.9 kN)	2,550 kg (25.0 kN)	2,840 kg (27.9 kN)	2,550 kg (25.0 kN)
	Digging Capability (ISO)	Bucket (STD)	4,410 kg (43.3 kN)	4,410 kg (43.3 kN)	4,410 kg (43.3 kN)	4,410 kg (43.3 kN)
		Arm (STD)	2,930 kg (28.7 kN)	2,620 kg (25.7 kN)	2,930 kg (28.7 kN)	2,620 kg (25.7 kN)
	Swing Speed		9.4 rpm			
	Travel Speed	High-speed	4.7 km/h (2.92 MPH)			
		Low-speed	2.6 km/h (1.62 MPH)			
	Traction Force	High-speed	5.6 metric tons (6.2 tons)			
		Low-speed	2.1 metric tons (2.3 tons)			
	Gradeability		30° (58% slope)			
	Ground Pressure		0.36 kg/cm²			
Control	Lever Control Type		Hydraulic Control/Electronic Proportional Control for Auxiliary flow			
	Lever Pattern		SAE/BHL			
Ground Clearance			310 mm (1' 0")			
Track Shoe Width			400 mm (1' 4")			
Upper Roller Qty.			1 per side			
Lower Roller Qty.			5 per side			

OVERALL DIMENSIONS

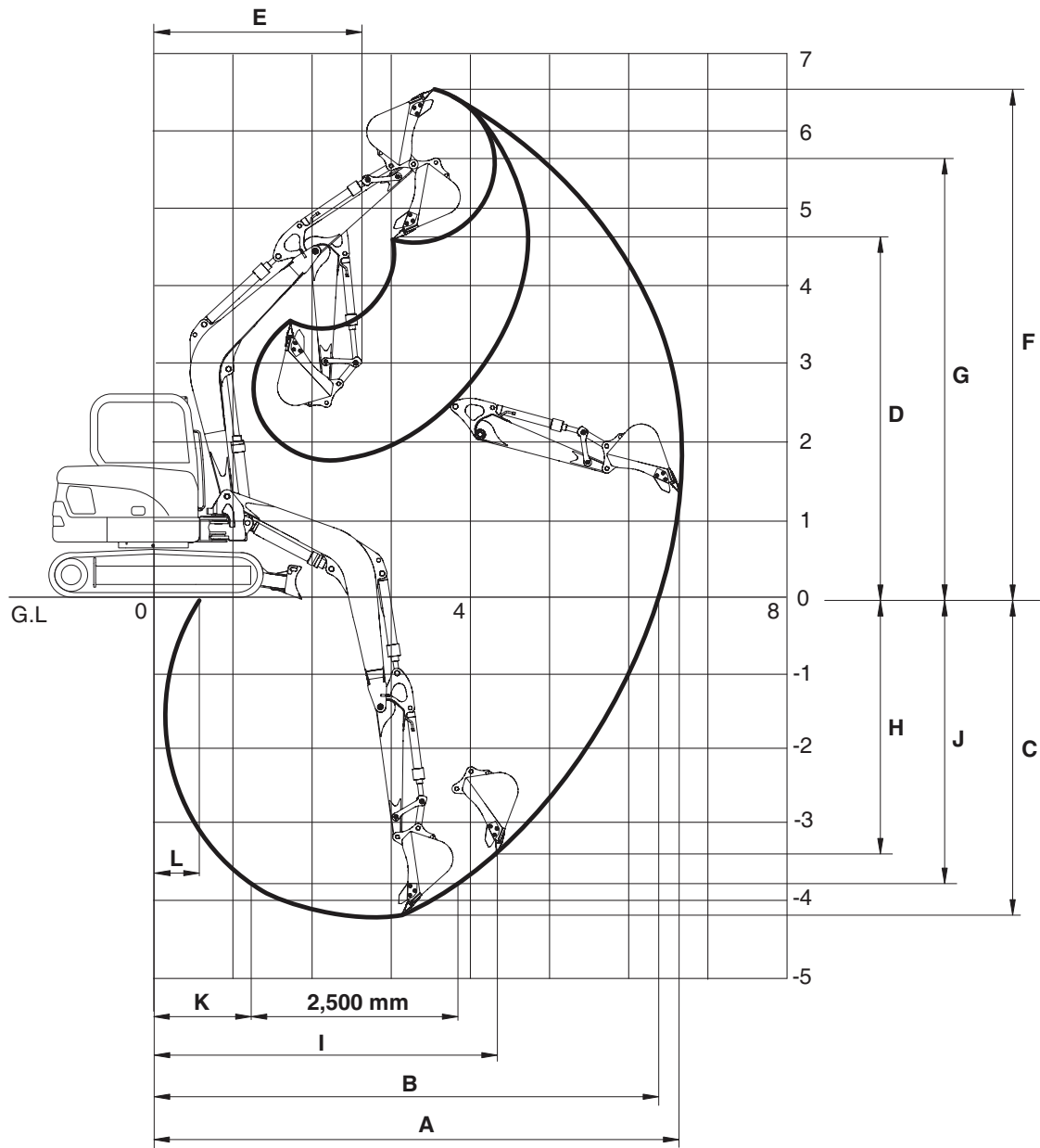


EX1300501

Figure 1

Dimension	DX62R-3		DX63-3	
	2.9 m (9' 6") Boom		2.9 m (9' 6") Boom	
	1.6 m (5' 3") Arm	1.9 m (6' 3") Arm	1.6 m (5' 3") Arm	1.9 m (6' 3") Arm
A	5,670 mm (18' 7")		5,670 mm (18' 7")	5,685 mm (18' 8")
B	1,270 mm (4' 2")		1,270 mm (4' 2")	1,285 mm (4' 3")
C	1,100 mm (3' 7")	1,115 mm (3' 8")	1,270 mm (4' 2")	1,285 mm (4' 3")
D	4,400 mm (14' 5")		4,230 mm (13' 11")	
E (Boom)	2,135 mm (7' 0")	2,350 mm (7' 9")	2,135 mm (7' 0")	2,350 mm (7' 9")
E (Hose)	2,175 mm (7' 2")	2,370 mm (7' 9")	2,175 mm (7' 2")	2,370 mm (7' 9")
F	410 mm (1' 4")			
G	440 mm (1' 5")			
H	1,870 mm (6' 2")			
I	1,990 mm (6' 6")			
J	2,535 mm (8' 4")			
K	3,150 mm (10' 4")			
L	635 mm (2' 1")			
M	1,920 mm (6' 4")			
N	1,030 mm (3' 5")			
O	930 mm (3' 1")			
P	2,550 mm (8' 4")			
Q	310 mm (1' 0")			
R	590 mm (1' 11")			
S	400 mm (1' 4")			
T	1,580 mm (5' 2")			
U	1,980 mm (6' 6")			

WORKING RANGE



EX1402422

Figure 2

		DX62R-3		DX63-3	
DIM.	Boom	2.9 m (9' 6") Boom		2.9 m (9' 6") Boom	
	Arm	1.6 m (5' 3") Arm	1.9 m (6' 3") Arm	1.6 m (5' 3") Arm	1.9 m (6' 3") Arm
	Bucket Type (PCSA)	0.175 m ³ (0.228 yd ³)		0.175 m ³ (0.228 yd ³)	
A	Max. Digging Reach	6,230 mm (20' 5")	6,525 mm (21' 5")	6,060 mm (19' 11")	6,355 mm (20' 10")
B	Max. Digging Reach (Ground)	6,100 mm (20' 0")	6,400 mm (21' 0")	5,930 mm (19' 5")	6,230 mm (20' 5")
C	Max. Digging Depth	3,815 mm (12' 6")	4,115 mm (13' 6")	3,815 mm (12' 6")	4,115 mm (13' 6")
D	Max. Loading Height	4,045 mm (13' 3")	4,260 mm (14' 0")	4,045 mm (13' 3")	4,260 mm (14' 0")
E	Min. Swing Radius	2,530 mm (8' 4")	2,645 mm (8' 8")	2,360 mm (7' 9")	2,475 mm (8' 1")
F	Max. Digging Height	5,785 mm (19' 0")	6,005 mm (19' 8")	5,785 mm (19' 0")	6,005 mm (19' 8")
G	Max. Bucket Pin Height	4,930 mm (16' 2")	5,145 mm (16' 11")	4,930 mm (16' 2")	5,145 mm (16' 11")
H	Max. Vertical Wall Depth	3,125 mm (10' 3")	3,435 mm (11' 3")	3,125 mm (10' 3")	3,435 mm (11' 3")
I	Max. Radius Vertical	3,965 mm (13' 0")	4,020 mm (13' 2")	3,795 mm (12' 5")	3,850 mm (12' 8")
J	Max. Depth to 2,500 mm Line	3,405 mm (11' 2")	3,750 mm (12' 4")	3,405 mm (11' 2")	3,750 mm (12' 4")
K	Min. Radius 2,500 mm Line	1,065 mm (3' 6")	1,050 mm (3' 5")	895 mm (2' 11")	880 mm (2' 11")
L	Min. Digging Reach	340 mm (1' 1")	-20 mm (-1' 11")	170 mm (0' 7")	-190 mm (-1' 5")

EXCAVATOR RATED LIFT CAPACITY TABLES



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.

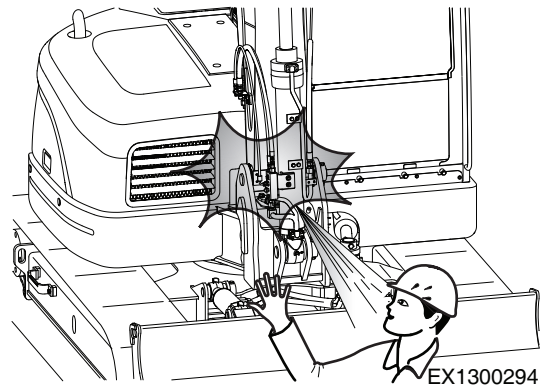


Figure 3



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, 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 4).

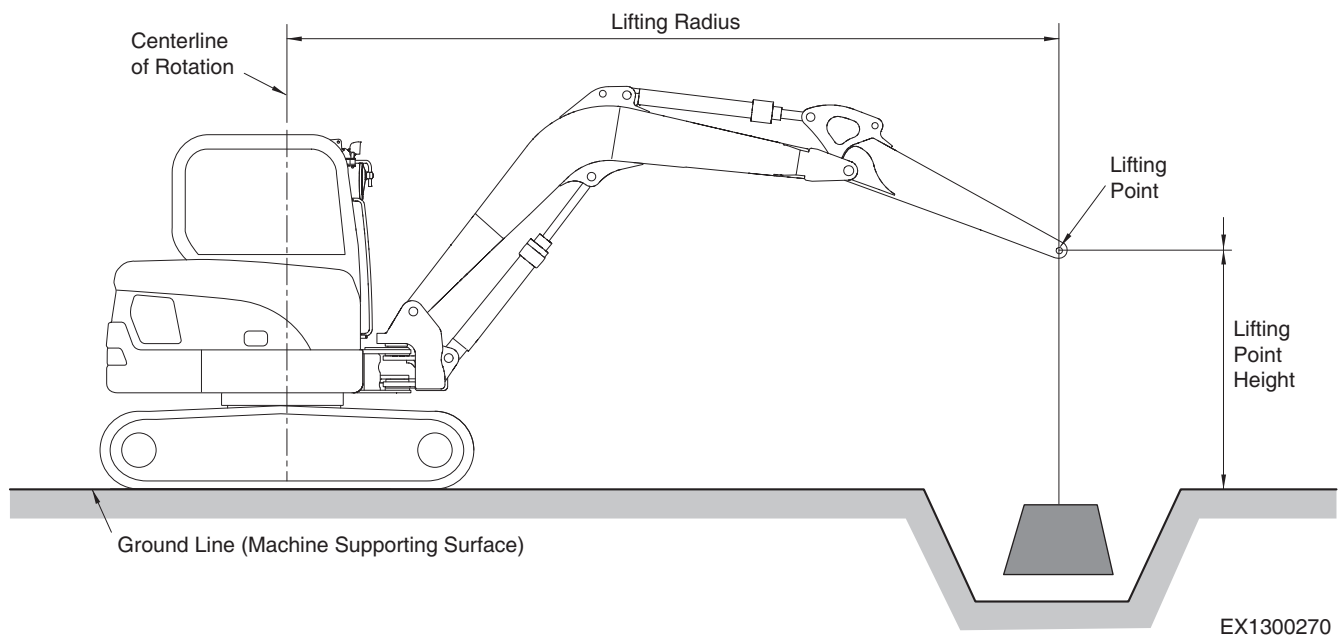


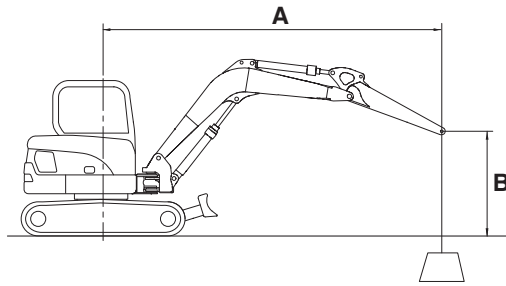
Figure 4

The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine net lifting load. The lift point must be on the end of the arm, as shown in Figure 4.

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.

DX62R-3



Track Width	: 1.98 m (6' 6") STD Track
Boom	: 2.9 m (9' 6")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 835 kg (1,840 lb)
Shoe	: 600 mm (24")
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

EX1300271

Figure 5

METRIC

1,000 kg

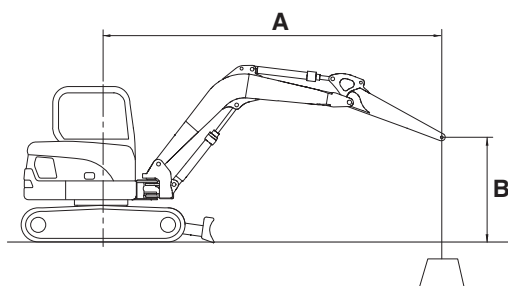
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
4							1.17	0.98			1.02	0.85	4.32
3							1.16	0.96			0.80	0.67	4.95
2					1.75	1.42	1.11	0.92	0.78	0.65	0.71	0.59	5.27
1					1.62	1.3	1.05	0.87	0.75	0.62	0.68	0.56	5.34
0					1.56	1.24	1.02	0.83	0.74	0.61	0.70	0.58	5.18
-1	* 2.56	* 2.56	* 3.16	2.39	1.55	1.24	1.00	0.82			0.79	0.65	4.77
-2	* 4.07	* 4.07	3.30	2.45	1.58	1.26					1.04	0.85	3.98

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		
									A (ft)
15							2.86	2.38	12.25
10					2.04	1.7	1.78	1.49	16.17
5			3.62	2.93	1.94	1.61	1.52	1.26	17.49
0			3.35	2.68	1.85	1.52	1.54	1.28	17.00
-5	* 7.88	* 7.88	3.35	2.68			1.95	1.61	14.47

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. The total weight of machine is 5,700 kg (12,566 lb). Included are the; boom 2.9 m (9' 6"), arm 1.6 m (5' 3"), 835 kg (1,840 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.



Track Width	: 1.98 m (6' 6") STD Track
Boom	: 2.9 m (9' 6")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 835 kg (1,840 lb)
Shoe	: 600 mm (24")
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

EX1300272

Figure 6

METRIC

1,000 kg

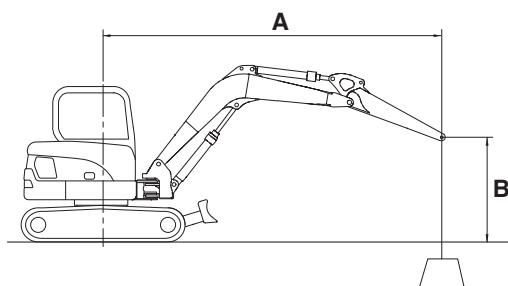
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
4							* 1.34	1.29			* 1.23	1.13	4.32
3							* 1.38	1.28			* 1.13	0.90	4.95
2					* 2.18	1.94	* 1.65	1.23	* 1.44	0.87	* 1.13	0.80	5.27
1					* 2.98	1.81	* 1.96	1.18	* 1.55	0.85	* 1.19	0.77	5.34
0					* 3.27	1.74	* 2.15	1.14	* 1.60	0.83	* 1.35	0.79	5.18
-1	* 2.56	* 2.56	* 3.16	* 3.16	* 3.11	1.74	* 2.09	1.13			* 1.56	0.89	4.77
-2	* 4.07	* 4.07	* 4.06	3.66	* 2.51	1.77					* 1.57	1.17	3.98

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		A (ft)
									
15							* 3.02	* 3.02	12.25
10					* 3.03	2.27	* 2.50	1.99	16.17
5			* 5.59	4.02	* 3.52	2.17	* 2.54	1.71	17.49
0			* 7.03	3.75	* 3.97	2.08	* 2.98	1.74	17.00
-5	* 7.88	* 7.88	* 6.19	3.75			* 3.48	2.20	14.47

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. The total weight of machine is 5,700 kg (12,566 lb). Included are the; boom 2.9 m (9' 6"), arm 1.6 m (5' 3"), 835 kg (1,840 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.



Track Width	: 1.98 m (6' 6") STD Track
Boom	: 2.9 m (9' 6")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 933 kg (2,058 lb)
Shoe	: 600 mm (24")
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

EX1300273

Figure 7

METRIC

1,000 kg

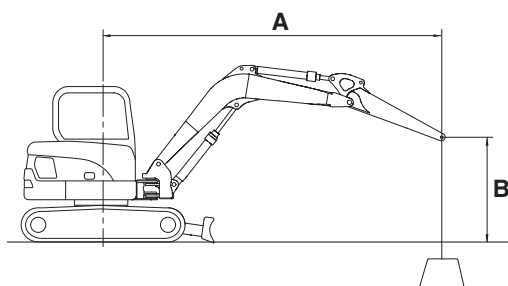
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
													
5											* 1.26	1.17	3.65
4							* 1.14	1.03			0.93	0.78	4.69
3							1.22	1.02	0.83	0.70	0.75	0.63	5.27
2					1.86	1.51	1.17	0.97	0.81	0.68	0.68	0.56	5.56
1					1.71	1.38	1.10	0.91	0.79	0.65	0.65	0.54	5.63
0					1.62	1.30	1.06	0.87	0.76	0.63	0.67	0.55	5.49
-1	* 2.16	* 2.16	* 2.80	2.45	1.60	1.28	1.04	0.85	0.76	0.63	0.74	0.61	5.10
-2	* 3.39	* 3.39	3.38	2.50	1.62	1.29	1.05	0.86			0.93	0.76	4.39
-3			* 2.47	* 2.47	* 1.41	1.37					* 1.33	* 1.33	3.05

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		A (ft)
									
15							* 2.47	2.07	13.72
10					2.14	1.80	1.68	1.40	17.22
5			3.84	3.11	2.03	1.69	1.45	1.21	18.45
0			3.49	2.80	1.92	1.58	1.47	1.22	18.00
-5	* 6.71	* 6.71	3.45	2.76	1.90	1.56	1.79	1.48	15.68
-10							* 2.87	* 2.87	9.72

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. The total weight of machine is 5,800 kg (12,787 lb). Included are the; boom 2.9 m (9' 6"), arm 1.9 m (6' 3"), 933 kg (2,058 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.



Track Width	: 1.98 m (6' 6") STD Track
Boom	: 2.9 m (9' 6")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 933 kg (2,058 lb)
Shoe	: 600 mm (24")
Dozer	: Dozer Down
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

EX1300274

Figure 8

METRIC

1,000 kg

A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
5											* 1.26	* 1.26	3.65
4							* 1.14	* 1.14			* 1.03	* 1.03	4.69
3							* 1.22	* 1.22	* 1.26	0.93	* 0.95	0.84	5.27
2					* 1.88	* 1.88	* 1.50	1.29	* 1.34	0.91	* 0.95	0.76	5.56
1					* 2.76	1.89	* 1.85	1.23	* 1.48	0.88	* 1.00	0.73	5.63
0					* 3.21	1.81	* 2.09	1.18	* 1.58	0.86	* 1.11	0.75	5.49
-1	* 2.16	* 2.16	* 2.80	* 2.80	* 3.18	1.79	* 2.12	1.16	* 1.51	0.85	* 1.34	0.83	5.10
-2	* 3.39	* 3.39	* 4.66	3.74	* 2.74	1.81	* 1.81	1.17			* 1.48	1.04	4.39
-3			* 2.47	* 2.47	* 1.41	* 1.41					* 1.33	* 1.33	3.05

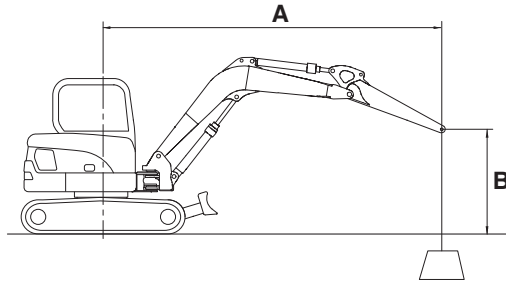
FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		A (ft)
15							* 2.47	* 2.47	13.72
10					* 2.72	2.37	* 2.11	1.87	17.22
5			* 5.00	4.23	* 3.30	2.26	* 2.13	1.63	18.45
0			* 6.89	3.89	* 3.88	2.15	* 2.45	1.66	18.00
-5	* 6.71	* 6.71	* 6.50	3.85	* 3.59	2.13	* 3.24	2.01	15.68
-10							* 2.87	* 2.87	9.72

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. The total weight of machine is 5,800 kg (12,787 lb). Included are the; boom 2.9 m (9' 6"), arm 1.9 m (6' 3"), 933 kg (2,058 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.

DX63-3



Track Width	: 1.98 m (6' 6") STD Track
Boom	: 2.9 m (9' 6")
Arm	: 1.6 m (5' 3")
Bucket	: Without Bucket
Counterweight	: 835 kg (1,840 lb)
Shoe	: 600 mm (24")
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

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Figure 9

METRIC

1,000 kg

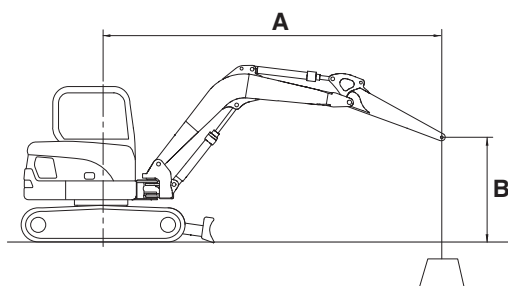
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
4							1.31	1.11			1.23	1.04	4.15
3							1.30	1.10			0.97	0.82	4.78
2					1.98	1.63	1.26	1.06	0.89	0.75	0.86	0.73	5.10
1					1.86	1.52	1.21	1.01	0.87	0.73	0.82	0.70	5.17
0					1.80	1.46	1.17	0.98	0.85	0.72	0.85	0.72	5.01
-1	* 2.55	* 2.55	* 3.46	2.78	1.78	1.45	1.16	0.97			0.96	0.81	4.60
-2	* 4.20	* 4.20	* 3.68	2.83	1.81	1.48					1.28	1.06	3.81

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		
									A (ft)
15							* 3.02	2.92	11.69
10					2.30	1.95	2.14	1.82	15.61
5			4.13	3.40	2.22	1.88	1.84	1.56	16.93
0			3.86	3.15	2.13	1.80	1.88	1.59	16.44
-5	* 8.30	* 8.30	3.86	3.15			2.39	2.00	13.91

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. The total weight of machine is 5,700 kg (12,566 lb). Included are the; boom 2.9 m (9' 6"), arm 1.6 m (5' 3"), 835 kg (1,840 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.



Track Width : 1.98 m (6' 6") STD Track
 Boom : 2.9 m (9' 6")
 Arm : 1.6 m (5' 3")
 Bucket : Without Bucket
 Counterweight : 835 kg (1,840 lb)
 Shoe : 600 mm (24")
 Dozer : Dozer Down
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

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Figure 10

METRIC

1,000 kg

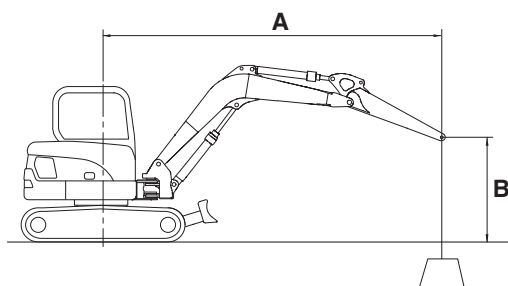
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		
													A (m)
4							* 1.37	* 1.37			* 1.23	* 1.23	4.15
3							* 1.38	* 1.38			* 1.13	1.07	4.78
2					* 2.05	* 2.05	* 1.60	1.38	* 1.43	0.98	* 1.13	0.95	5.10
1					* 2.71	2.05	* 1.87	1.33	* 1.51	0.96	* 1.19	0.91	5.17
0					* 3.00	1.98	* 2.03	1.30	* 1.45	0.95	* 1.35	0.94	5.01
-1	* 2.55	* 2.55	* 3.46	* 3.46	* 2.89	1.97	* 1.97	1.29			* 1.56	1.07	4.60
-2	* 4.20	* 4.20	* 3.68	* 3.68	* 2.33	2.00					* 1.57	1.41	3.81

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		
									A (ft)
15							* 3.02	* 3.02	11.69
10					* 3.04	2.53	* 2.50	2.37	15.61
5			* 5.16	4.53	* 3.42	2.45	* 2.54	2.04	16.93
0			* 6.47	4.26	* 3.79	2.37	* 2.98	2.08	16.44
-5	* 8.30	* 8.30	* 5.77	4.26			* 3.48	2.64	13.91

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. The total weight of machine is 5,700 kg (12,566 lb). Included are the; boom 2.9 m (9' 6"), arm 1.6 m (5' 3"), 835 kg (1,840 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.



Track Width	: 1.98 m (6' 6") STD Track
Boom	: 2.9 m (9' 6")
Arm	: 1.9 m (6' 3")
Bucket	: Without Bucket
Counterweight	: 933 kg (2,058 lb)
Shoe	: 600 mm (24")
Dozer	: Dozer Up
	: Rating Over Front
	: Rating Over Side or 360 degree
Unit	: 1,000 kg (1,000 lb)

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Figure 11

METRIC

1,000 kg

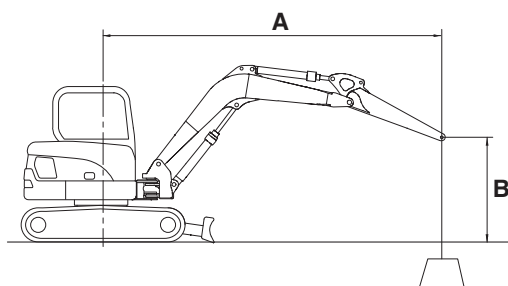
A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
5											* 1.28	* 1.28	3.48
4							* 1.17	1.17			* 1.03	0.95	4.52
3							* 1.23	1.16	0.94	0.80	0.91	0.77	5.10
2					* 1.79	1.72	1.32	1.11	0.93	0.79	0.82	0.69	5.39
1					1.95	1.60	1.26	1.06	0.90	0.76	0.79	0.67	5.46
0			* 1.79	* 1.79	1.87	1.52	1.22	1.02	0.88	0.75	0.81	0.68	5.32
-1	* 2.18	* 2.18	* 3.08	2.85	1.84	1.50	1.20	1.00			0.90	0.76	4.93
-2	* 3.50	* 3.50	3.85	2.90	1.86	1.51	1.21	1.01			1.13	0.95	4.22
-3			* 2.26	* 2.26							* 1.33	* 1.33	2.88

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		A (ft)
15							* 2.47	* 2.47	13.16
10					2.42	2.06	2.02	1.72	16.66
5			4.35	3.58	2.32	1.96	1.76	1.49	17.89
0			4.02	3.28	2.21	1.86	1.78	1.51	17.44
-5	* 7.09	* 7.09	3.97	3.24	2.21	1.85	2.18	1.84	15.12
-10	* 6.08	* 6.08					* 2.87	* 2.87	9.16

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. The total weight of machine is 5,800 kg (12,787 lb). Included are the; boom 2.9 m (9' 6"), arm 1.9 m (6' 3"), 933 kg (2,058 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. Lift capacities are in compliance with ISO 10567.



Track Width : 1.98 m (6' 6") STD Track
 Boom : 2.9 m (9' 6")
 Arm : 1.9 m (6' 3")
 Bucket : Without Bucket
 Counterweight : 933 kg (2,058 lb)
 Shoe : 600 mm (24")
 Dozer : Dozer Down
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

EX1300274

Figure 12

METRIC

1,000 kg

A (m) \ B (m)	1		2		3		4		5		MAX. REACH		A (m)
5											* 1.26	* 1.26	3.48
4							* 1.17	* 1.17			* 1.03	* 1.03	4.52
3							* 1.23	* 1.23	* 1.22	1.04	* 0.95	* 0.95	5.10
2					* 1.79	* 1.79	* 1.47	1.44	* 1.33	1.02	* 0.95	0.90	5.39
1					* 2.52	2.14	* 1.76	1.39	* 1.44	1.00	* 1.00	0.87	5.46
0			* 1.79	* 1.79	* 2.94	2.05	* 1.98	1.34	* 1.52	0.98	* 1.11	0.90	5.32
-1	* 2.18	* 2.18	* 3.08	* 3.08	* 2.94	2.03	* 2.00	1.32			* 1.34	0.99	4.93
-2	* 3.50	* 3.50	* 4.17	* 4.17	* 2.55	2.05	* 1.68	1.34			* 1.48	1.25	4.22
-3			* 2.26	* 2.26							* 1.33	* 1.33	2.88

FEET

1,000 lb

A (ft) \ B (ft)	5		10		15		MAX. REACH		A (ft)
15							* 2.47	* 2.47	13.16
10					* 2.73	2.65	* 2.11	* 2.11	16.66
5			* 4.66	* 4.66	* 3.22	2.55	* 2.13	1.94	17.89
0			* 6.33	4.42	* 3.72	2.45	* 2.45	1.98	17.44
-5	* 7.09	* 7.09	* 6.04	4.37	* 3.31	2.44	* 3.24	2.41	15.12
-10	* 6.08	* 6.08					* 2.87	* 2.87	9.16

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. The total weight of machine is 5,800 kg (12,787 lb). Included are the; boom 2.9 m (9' 6"), arm 1.9 m (6' 3"), 933 kg (2,058 lb) counterweight, without bucket, all operating fluids and a 75 kg (165 lb) operator.
6. 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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