



WARNING

CALIFORNIA PROPOSITION 65

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

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

For more information go to www.P65warnings.ca.gov/diesel.

91K4-07310-EN

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FOREWORD

This manual contains a number of instructions and safety recommendations regarding driving, handling, lubrication, maintenance, inspection and adjustment of the excavator.

This manual provides important instructions regarding the excavator, including important safety warnings and instructions for proper operation and maintenance of the excavator.

Keep this manual handy and have all personnel read it periodically.

If you sell the machine, you must provide this manual with the excavator.

This machine complies with EC directive "2006/42/EC".

1. **Read and understand** this manual before operating the machine.

This operator's manual may contain attachments and optional equipment that are not available in your area. Please consult your local HD Hyundai Construction Equipment distributor for those items you require.

▲ Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

The procedures and precautions given in this manual apply only to intended uses of the machine.

If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for you and others. In no event should you or others engage in prohibited uses of actions as described in this manual.

Some illustrations in this manual show details or attachments that can be different from your machine. Covers and guards might have been removed for illustrative purposes. Never operate the machine without the proper covers and guards in place.

2. **Inspect** the jobsite and **follow** the safety recommendations in chapter 1, **Safety hints** before operating the machine.

3. Use **genuine HD Hyundai Construction Equipment spare parts** for the replacement of parts.

HD Hyundai Construction Equipment will not accept any responsibility for defects resulting from non-genuine parts or non workmanlike repair.

In such cases HD Hyundai Construction Equipment cannot assume liability for any damage.

Continuing improvements in the design of this machine can lead to changes in detail which may not be reflected in this manual. Consult HD Hyundai Construction Equipment or your HD Hyundai Construction Equipment distributor for the latest available information for your machine or for questions regarding information in this manual.

EMISSION-RELATED COMPONENTS WARRANTY (USA AND CANADA ONLY)

This machine complies with all applicable Environmental Protection Agency (EPA) regulations for warranties for Emission-related components. The term of this warranty is 3,000 hours or five years, whichever occurs first.

This warranty does not cover damage arising from accident, misuse or negligence, use of non-HD Hyundai Construction Equipment parts, or alterations not authorized by HD Hyundai Construction Equipment.

※ Emission-related components according to the EPA regulation.

1. Air-induction system.
2. Fuel system.
3. Ignition system.
4. Exhaust gas recirculation systems.
5. After treatment devices.
6. Crankcase ventilation valves.
7. Sensors.
8. Electronic control units.

BEFORE SERVICING THIS MACHINE

It is the responsibility of the owner and all service and maintenance personnel to avoid accidents and serious injury by keeping this machine properly maintained.

It also is the responsibility of the owner and all service and maintenance personnel to avoid accidents and serious injury while servicing the machine.

No one should service or attempt to repair this machine without proper training and supervision.

All service and maintenance personnel should be thoroughly familiar with the procedures and precautions contained in this manual.

All personnel also must be aware of any federal, state, provincial or local laws or regulations covering the use and service of construction equipment.

The procedures in this manual do not supersede any requirements imposed by federal, state, provincial or local laws.

HD Hyundai Construction Equipment can not anticipate every possible circumstance or environment in which this machine may be used and serviced.

All personnel must remain alert to potential hazards.

Work within your level of training and skill.

Ask your supervisor if you are uncertain about a particular task. Do not try to do too much too fast.

Use your common sense.

※ How to set the language of cluster

Selection of preferred language will change the language on all displays.



140WA0BS01

※ Please refer to the page 3-40 for the cluster.

EC REGULATION APPROVED

- Noise level (Directive 2000/14/EC) is as following.
 - LwA(Guaranteed) : 100 dB
- The value of vibrations transmitted by the operator's seat are lower than standard value of (EN474-1 and 2002/44/EC)



EC Declaration of Conformity
(Original instruction)

This declaration of conformity is issued under the sole responsibility of manufacturer:

HD HYUNDAI CONSTRUCTION EQUIPMENT CO., LTD.
477 Bundangsuseo-ro, Bundang-gu,
Seongnam-si, Gyeonggi-do 13553, Korea

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

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

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

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

EMC (2014/30/EU)

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

Noise levels (2000/14/EC)

Certificate number: *****
Date: DD/MM/YYYY
Conformity assessment proc.: Annex VIII Full Quality Assurance
Notified body: *****

Measured sound power level: nnn.n dB(A)
Guaranteed sound power level: nnn.n dB(A)

Engine information

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

Harmonized standards, other technical standards and specifications applied:

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

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

TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

Machine Serial No.	
Engine Serial No.	
Manufacturing year	
Manufacturer Address	HD Hyundai Construction Equipment Co., Ltd. 477 Bundangsuseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13553, Korea
Distributor for U.S.A Address	HD Hyundai Construction Equipment Americas, Inc 6100 Atlantic Boulevard Norcross GA 30071 U.S.A
Distributor for Europe Address	HD Hyundai Construction Equipment Europe N. V. Hyundailaan 4 3980 Tessenderlo Belgium
Dealer Address	

MACHINE DATA PLATE

DO NOT DEFACE OR REMOVE THIS PLATE
이 명판을 훼손하거나 오손시키지 마시오

MACHINE TYPE / MODEL
PRODUCT IDENTIFICATION NUMBER
ENGINE POWER
OPERATING MASS

477, Bundangseoseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13553, Korea
91LM-14112

HD HYUNDAI CONSTRUCTION EQUIPMENT

For general

DO NOT DEFACE OR REMOVE THIS PLATE
이 명판을 훼손하거나 오손시키지 마시오

MACHINE TYPE
MODEL
MAX. CERTIFIED WEIGHT
STANDARDS ROPS : ISO 12117-2

477, Bundangseoseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13553, Korea
91Q6-01255

HD HYUNDAI CONSTRUCTION EQUIPMENT

For ROPS

CE UK DO NOT DEFACE OR REMOVE THIS PLATE
이 명판을 훼손하거나 오손시키지 마시오

MACHINE TYPE / MODEL		
PRODUCT IDENTIFICATION NUMBER / VEHICLE IDENTIFICATION NUMBER		
ENGINE POWER	MAX. AXLE LOAD (FRONT / REAR)	
OPERATING MASS / GROSS VEHICLE WEIGHT	MFG. YEAR	YEAR INTO SERVICE

477, Bundangseoseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13553, Korea
91LM-14142

HD HYUNDAI CONSTRUCTION EQUIPMENT

For EU only

DO NOT DEFACE OR REMOVE THIS PLATE
이 명판을 훼손하거나 오손시키지 마시오

MACHINE TYPE
MODEL
STANDARDS FOG : ISO 10262 (LEVEL 2)

477, Bundangseoseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13553, Korea
91N6-01283

HD HYUNDAI CONSTRUCTION EQUIPMENT

For FOPS/FOG

EAC DO NOT DEFACE OR REMOVE THIS PLATE
이 명판을 훼손하거나 오손시키지 마시오

MACHINE TYPE / MODEL
PRODUCT IDENTIFICATION NUMBER
ENGINE POWER
OPERATING MASS

477, Bundangseoseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13553, Korea
91LM-14122

HD HYUNDAI CONSTRUCTION EQUIPMENT

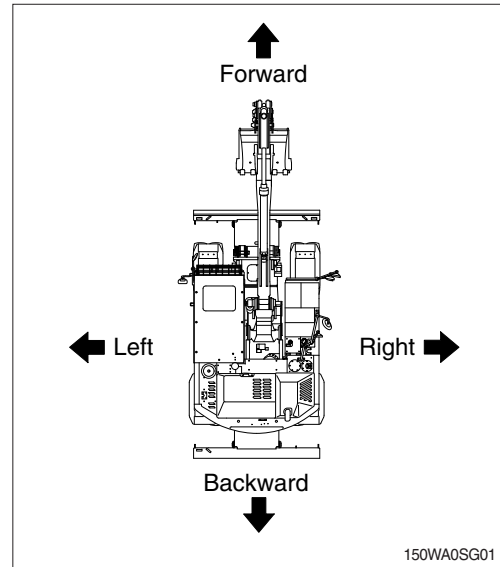
For EAC only

EX0MD01

※ The machine serial number assigned to this particular machine should be used when requesting information or ordering service parts for this machine from your authorized HD Hyundai Construction Equipment dealer. The machine serial number is also stamped on the frame.

1. DIRECTION

The direction of the arrows (as they are indicated) are with the travel motors to the rear and the boom facing the opposite direction. Refer to the right illustration.

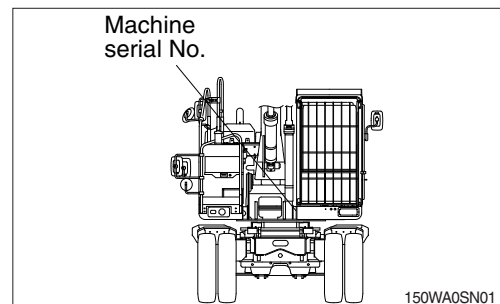


2. SERIAL NUMBER

Provides the serial number when ordering parts or seeking assistance.

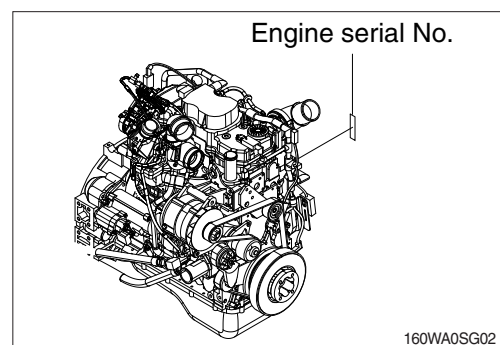
1) MACHINE SERIAL NUMBER

The numbers are located below the right window of the operator's cab.



2) ENGINE SERIAL NUMBER

The numbers are located on the engine name plate.



3. INTENDED USE

This machine is designed to be used mainly for the following work:

- Excavation work
- Loading work
- Leveling work
- Drainage work
- Lifting work
- Demolition work

※ Please refer to section, Efficient working method further details.

4. SYMBOLS

- ▲ Provides important safety warnings. Failure to follow these warnings could result in serious injury or death.
- △ Provides important instructions to prevent damage to the equipment.
- ※ Provides useful information for the operator.

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For more information go to www.P65warnings.ca.gov/diesel.

2. SAFETY INSTRUCTIONS

Safety Message

Intended Use

Machines should be operated in accordance with the procedures described in the operator manual.

The products described in the operator manual are designed and manufactured mainly for the following purposes:

- Excavation work
- Loading work
- Leveling work
- Drainage work
- Lifting work
- Demolition work

Do not operate the machine for any purpose other than those stated above or in areas where potential hazards have been identified. Make sure that you comply strictly with all safety instructions at all times. Please contact HD Hyundai Construction Equipment Co., Ltd. or your local dealer for more information.

HD Hyundai Construction Equipment strictly prohibits the use or operation of the machine in any of the following circumstances:

- Operation by an unskilled worker
- Lifting a worker up
- Transporting flammable or dangerous materials
- Driving down or extracting piles with the bucket
- Towing damaged vehicles

Safety guidelines

Most safety accidents related to the operation, maintenance/ inspection, and repair of the machine result from a failure to comply with the safety instructions or to take adequate preventive measures. Safety accidents can be prevented by eliminating potentially hazardous situations. The operator should attend all mandatory training courses on the operation of the machine, and fully understand how to use the tools.

Improper operation, refueling, inspection or repair of this machine may cause serious injury or death.

Do not attempt to operate, refuel, inspect or repair this machine before reading and understanding the product information on such tasks.

This manual describes preventive measures and warnings about the product.

Failure to comply with the warnings about potential risks may result in serious injury or death.

General Safety Information

Unauthorized modification

Any attempt to modify the machine, including the use of unauthorized accessories or spare parts, may have adverse effects on the conditions of the machine and its ability to function as it was designed.

Do not attempt to modify the machine in any way without advanced written consent of the company.

Unauthorized modification will void the manufacturer's warranty.

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

The user is responsible for all damages and liabilities resulting from unauthorized modifications.

1. The attachment, the accessory, or the spare part has been made or distributed by HD Hyundai Construction Equipment and has been installed according to approved methods described in a publication available from HD Hyundai Construction Equipment.
2. Any modification must be approved by the company in writing.

ROPS/FOPS

The cabin is designed to provide sufficient space to minimize impacts pursuant to ISO 12117-2 of Rollover Protective Structures (ROPS). If any additional devices are installed that exceed the Max. certified weight indicated on ROPS name plate, the ROPS certification may be nullified. The protective structure of the cabin should be replaced immediately if it is permanently deformed or damaged.

Machines operated in areas where there is a risk of objects falling onto the cabin are fitted with a Falling Object Protective Structure (FOPS) pursuant to ISO 10262.

Fire and Explosion

Preventing fires

The following actions should be taken to minimize the risk of fire:

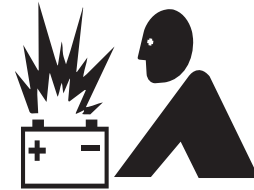
- Do a visual inspection before operating the machine to check for any risk of fire.
- Do not operate the machine if there is a risk of fire.
- Be sure to identify the primary exit and alternative exit of the machine, and fully understand how to use the exits in the event of a fire.
- Do not perform any welding or drilling work on the engine cover.
- Keep the engine compartment free from the build-up of flammable materials such as dead leaves, small branches, paper, and other types of trash.
- Keep the covers of the major parts of the machine closed. Make sure that the covers operate normally in order to be able to use firefighting equipment in the event of a fire.
- Be careful when handling fuel. Fuel is a highly flammable.
- Always stop the engine when refueling the machine.
- Refuel outdoors.
- Remove any build-up of flammable materials from the machine.
- Do not operate the machine near a flame.
- All fuels and most lubricant and coolant mixtures are flammable materials, so special care should be exercised when handling such materials to prevent fire and explosion.
- Keep all fuels and lubricant in adequate containers.
- Never smoke in the area where refueling is taking place or in the space for handling battery electrolytes and other flammable materials.
- Oil leaked to a hot surface or electronic component may cause a fire.
- Do not operate the machine if there is an oil leak. Repair the source of the oil leak, and wipe clean any leaked oil before operating the machine.
- Always clean all electrical lines, connectors, and clamps, and check whether they are securely connected on a regular basis.
- If any electrical wire or connector is loose or damaged, repair it immediately.
- Do not weld, cut or use a cutting torch through any tubes or lines in which flammable flows. Check all tubes and lines for signs of abrasion or deterioration and replace if damaged.
- Dust or particles generated when repairing the non-metallic hood or fender are flammable or explosive. Repair such parts in a well ventilated area well away from flames or sparks, and be sure to wear suitable PPE (Personal Protective Equipment).



Preventing explosions

The following actions should be taken to minimize the risk of explosion:

- Never use starting aid fluid in a low-temperature environment as it can have an adverse effect on the engine performance and may cause an explosion.
- Do not attempt to charge a frozen battery. Forcibly charging a frozen battery may result in an explosion.
- Use caution when handling the batteries. Never let a tool make contact with the positive battery post and the frame of the machine simultaneously. Sparks may be generated, resulting in an explosion.
- Only charge the battery with a charger of equal voltage. Incorrect voltage may cause overheating and explosion.
- Do not use or charge the battery if the level of electrolytes in the battery is low. Regularly check the electrolyte level, and refill with distilled water to the maximum level.
- Do not attempt to start the engine using an unsuitable booster cable as it may result in an explosion and serious injury or death. Only use the booster cable to start the engine in a well ventilated open space. Starting the engine with a booster cable may generate flammable gas.
- When hydraulic equipment and piping are overheated, flammable gas or airborne particles may explode. Protect and insulate such parts to prevent overheating.



Corrective Actions Before and After a Fire

In the event of a fire in the machine, the top priority should be the safety of the operator and workers in the work area. In the event of a fire at a level that does not endanger the operator or workers, the following actions should be taken:

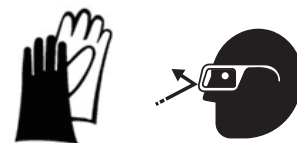
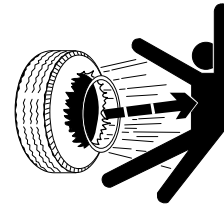
- Move the machine well away from any flammable materials (e.g., fuel, engine oil, clothes, and bits of wood) and adjacent buildings.
- If the engine is running, it may cause a persistent fire. Immediately stop the engine.
- In the event of an electric short, disconnect the batteries to eliminate the main ignition source.
In the event of an electricity leak resulting from damage to the power wiring caused by fire, disconnect the batteries to eliminate the secondary ignition source.

If a fire becomes too large to control, assess the following risks:

- If the machine is equipped with wheels, there is a risk of tire combustion and explosion. If exploded, high-temperature fragments may scatter.
- If the machine is mounted with wheels, the tires may be subject to a risk of combustion and explosion, and high temperature particles may splash into the air.
- The tank, accumulator, hose and fitting may burst into flames, splashing fuel and scattering particles throughout the surrounding area.

If you have to handle a machine that has been damaged by fire or one that is exposed to excessively high heat after extinguishing a fire, take the following precautions:

- Wear thick protective gloves and protective goggles.
- Never touch any materials left after combustion with your bare hands.
- Avoid contact with melted polymer materials (e.g., plastics).



Information on fire extinguisher

Fire extinguishers (if equipped) should be kept in a fully operable condition, and be inspected by a qualified person on a regular basis. Workers should complete a training course on the use of fire extinguishers in advance.

Use fire extinguishers in accordance with the following procedures, if required:

- ① Pull the safety pin of the fire extinguisher first.
- ② Extend the nozzle, and stand toward the fire.
- ③ Aim the nozzle at the flames, and firmly press the top and bottom handles.
- ④ Stand in a downwind position, and evenly spray the foam over the flames.

If the weight of the fire extinguisher exceeds 4.5 kg, mount the extinguisher in a location near the bottom of the cabin. Do not mount the fire extinguisher at a level higher than one third of the height of the cabin.

Do not weld or drill ROPS to mount a fire extinguisher. Contact your dealer or distributor for more information about the correct mounting of fire extinguishers.












Health and Safety

Personal protective equipment

The wearing of personal protective gear is mandatory for protecting the human body from hazardous chemicals and hazardous environments.

The wearing of personal protective gear is a means of preventing injury, and should not interfere with the performance of jobs. It is designed to protect the human body from hazardous environments and hazardous materials, and should be kept in an easily accessible place.

List of personal protection gear

Name	Symbol	Remarks
Safety helmet		Protects the head from falling objects, and reduces risks when falling down.
Dust mask		Air-purifying dust mask should not be worn in workplaces with an oxygen concentration of less than 18%.
Gas mask		Prevents the inhalation of mist, airborne particles, or protects against the spray of hazardous chemicals.
Welding helmet		Blocks airborne dust and slag, and shields the face from bright light during welding.
Protective clothing		Blocks dust, mist and hazardous chemicals, and protects against burns.
Protective gloves		Electric insulation gloves: Should be worn when working in areas with a high risk of electric shock. Chemical protective gloves: Should be worn when working in areas where there is a risk of contact with hazardous chemicals including materials leaked from batteries.
Protective goggles		Protects the eyes from dust, particles and airborne materials in work areas.
Earplugs and earmuffs		Wear earplug and earmuffs separately or in combination depending on the level and duration of noise.
Safety shoes		Protects the feet from falling objects, impacts, and sharp objects.

Health and safety instructions in hazardous environments

Comply with the following instructions during operation and maintenance of the machine.

When handling oil

Failure to wear personal protection may result in burns caused by contact with a high-temperature liquid. Make sure you wear protective goggles, protective gloves and protective clothing when handling oils such as hydraulic oils and engine oil.

If the eyes come into contact with oil, wash them with a sufficient quantity of water for 15 minutes or longer. If the skin comes into contact with oil, take off contaminated clothes and shoes, and wash the skin with soap and water for 15 minutes or longer.

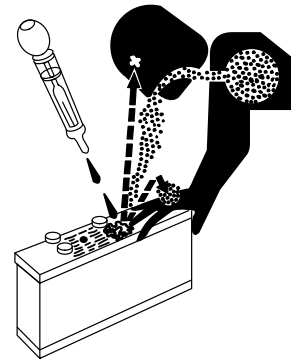


When handling the battery

If battery electrolyte leaks while handling the battery, the sulfuric acid contained in the electrolyte may cause burns. The lead components in battery electrolyte are toxic, so be sure to wear protective gloves and protective clothing. Always wash your hands after handling the battery.

If a part of your body not protected by personal protective equipment comes into direct contact with battery electrolyte, immediately wash the affected part with flowing water for 20 minutes or more, and then see a doctor without delay.

If you accidentally swallow battery electrolyte, drink water, do not forcibly induce vomiting, and immediately seek medical help.



When handling refrigerant

Always wear protective goggles, protective gloves and other personal protective equipment when handling refrigerant to prevent direct contact of the skin with the refrigerant.

Wear protective gloves made of materials that are resistant to chemicals (such as neoprene and butyl rubber).

Never smoke when handling refrigerant.

If refrigerant comes into direct contact with the skin, wash the skin with warm water immediately.



When handling coolants

Do not remove the radiator cap after operation of the machine until the engine has cooled and the pressure has dropped to a safe level. Failure to comply may result in serious burns.

Coolant contains toxic and combustible ethylene glycol, and should be handled in a cool, well-ventilated place only when wearing protective goggles, protective gloves, protective clothing, and a gas mask.

Avoid inhaling airborne particles or spray from coolant. If the substances make contact with skin or eyes, immediately wash the skin and eye with flowing water for 20 minutes or longer.



When working in a place subject to airborne particles and falling objects,

Always wear a safety helmet, protective goggles and safety shoes to prevent injury from airborne particles and thrown or falling objects. Earplugs or earmuffs may be necessary when working in a noisy place.








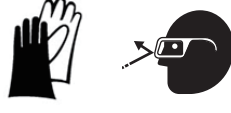


When working in places with a high level of noise

When the operator is exposed to the noise exceeding 90 dB (A) for 8 hours or longer, wear earplugs or earmuffs.



Personal protection gear for various situations

Situation	Symbol
Oil handling	
Battery handling	
Refrigerant handling	
Coolant handling	
Repair by welding	
Working in areas subject to airborne particles and falling objects	
Working in places with a high level of noise	
Handling machines damaged by fire or exposed to excessively high temperature	

Noise and Vibration

Information on vibration

This part describes the vibration data of the machine, and methods of calculating the vibration level.

The vibration level of the machine varies according to any of the following conditions:

- Driving habits of the operator
- Quality of seat and suspension
- Type of machine, attachments, and conditions of machine
- Conditions of work site, working environment, ground surface conditions, and weather

Vibration also varies according to the duration of operation.

Physical Agents Directive 2002/44/EC defines the exposure action value as 0.5 m/s^2 , and the exposure limit value as 1.15 m/s^2 . If the predicted value is near the exposure action value or exposure limit value, the predicted value should be assumed to exceed the two latter values, and necessary action should be taken.

Vibration levels are as followings.

- Whole body : $\leq 0.5 \text{ m/s}^2$ or $\leq 1.15 \text{ m/s}^2$ (Uncertainty K 0.07 m/s^2)

※ Although the level of whole body vibration exceeds exposure action value, is less than the exposure limit value.

- Hand/arm : $\leq 2.5 \text{ m/s}^2$ (Uncertainty K 0.21 m/s^2)

In regards to the actions taken according to the vibrations, refer to the following table:

Daily vibration exposure (A(8))	Vibration exposure range	Actions to be taken
$A(8) \leq 0.5 \text{ m/s}^2$	Exposure action value or lower	When approaching the exposure activity value, reasonable measures should be taken to minimize exposure to vibration. The relevant information and opportunities for training on vibration reduction should be provided to the operator.
$0.5 \text{ m/s}^2 < A(8) \leq 1.15 \text{ m/s}^2$	Exceeding the exposure action value, but not exceeding the exposure limit value	It is required to execute certain measures for reducing exposure to and risks of vibration to the minimum. The health of an operator who has been exposed to excessive vibration should be examined.
$1.15 \text{ m/s}^2 < A(8)$	Exceeding the exposure limit value:	Immediate action is required to reduce the vibration exposure level to below the exposure limit value.

※ For further information, please contact your local HD Hyundai Construction Equipment dealer.

The vibration level can be predicted based on the information in the following table which is used to calculate the daily level of vibration exposure.

Predict the vibration level in the three vibration directions of axes X, Y, and Z. The mean vibration level should be used under normal operation conditions. Scenario factors from mean vibration level based on operation by skilled operator and on smooth terrain are excluded. Scenario factors are included to obtain the mean vibration level based on aggressive operation and severe terrain to assess the expected vibration level.

※ **All vibration values are indicated in m/s².**

ISO Reference table - Vibration level equivalent to whole body vibration emission of the excavator (Unit : m/s²)

Machine family	Machine kind	Typical operating condition	Vibration Levels			Scenario Factors		
			X axis	Y axis	Z axis	X axis	Y axis	Z axis
Excavator	Compact crawler excavator	Excavating	0.33	0.21	0.19	0.19	0.12	0.10
		Hydraulic breaker app.	0.49	0.28	0.36	0.20	0.13	0.17
		Transfer movement	0.45	0.39	0.62	0.17	0.18	0.28
	Crawler excavator	Excavating	0.44	0.27	0.30	0.24	0.16	0.17
		Hydraulic breaker app.	0.53	0.31	0.55	0.30	0.18	0.28
		Mining application	0.65	0.42	0.61	0.21	0.15	0.32
		Transfer movement	0.48	0.32	0.79	0.19	0.20	0.23
	Wheeled excavator	Excavating	0.52	0.35	0.29	0.26	0.22	0.13
		Transfer movement	0.41	0.53	0.61	0.12	0.20	0.19

Instructions on mitigating vibration

Machines should be correctly adjusted and maintained to ensure smooth operation. The terrain conditions should be observed. The following instructions will help reduce the whole body vibration level:

- ① Use the correct size attachments for your machine.
- ② Maintain the machines pursuant to the manufacturer's recommendations.
 - Brake and steering systems
 - Tire pressure
- ③ Maintain and provide good terrain conditions.
 - Remove any large rocks or obstacles.
 - Fill gutters or holes.
 - Adjust speed and driving path as needed for the conditions.
- ④ Use a driver's seat that satisfies ISO 7096.
 - Adjust the driver's seat and suspension for the weight and the size of the operator.
 - Inspect the suspension and adjusting devices of the driver's seat.
- ⑤ Perform the following maneuvers without using excessive force :
 - Steering
 - Braking
 - Accelerating
 - Gear shifting
- ⑥ Move the attachments smoothly.
- ⑦ Adjust the speed and path of machine to keep the vibration level minimal.
 - Operate the machine so as to avoid obstacles and rough terrain.
 - Decelerate the machine when driving on rough terrain.
- ⑧ Keep the level of vibration minimal when working for a long time or driving for a long distance.
 - Use a machine mounted with suspension system.
 - Transport the machine when moving between worksites; do not drive the machine to get to another worksite.

⑧ Take the following actions for optimal operator comfort and convenience:

- Adjust the driver's seat adjustment device to allow a convenient posture.
- Adjust the angles of the mirrors to minimize awkward, compromised posture
- Avoid working for an excessively long time, and take regular breaks.
- Do not jump on or off the cabin.
- Minimize repeated handling of loads and lifting of loads.
- The vibration information and calculation procedures are based on <ISO/TR 25398> has been defined according to the emission of vibrations measured under the actual working conditions of the machines.

Information on noise

Noise level (Directive 2000/14/EC) is as followings.

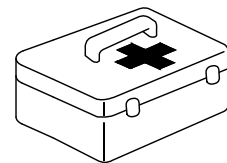
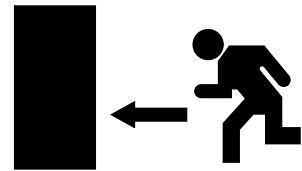
- LwA(Guaranteed) : 100 dB (Uncertainty K 1.0 dB(A))
- LpA(Measured) : LH - 70.6 dB
RH - 69.9 dB (Uncertainty K 1.0 dB(A))

Emergency situations

In the event of an emergency situation, use the emergency hammer installed inside the cabin to break the windshield of the cabin, and carefully escape from the cabin. The emergency hammer should always be kept inside the cabin for emergencies, and should not be removed or used for other purposes. If the emergency hammer is lost, replace it immediately.

Keep a first-aid kit inside the cabin or in another place at the worksite for safety accidents.

Keep contact information (e.g., phone number) to request help with an emergency situation or injury.



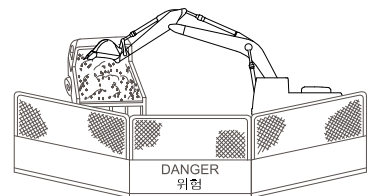
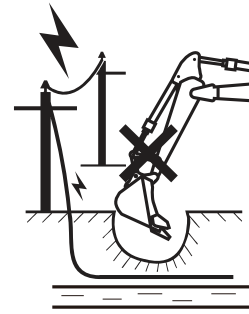
Safety Information on the Machines and Operation

Before Operating the Machine

Carefully examine the following conditions and take any necessary actions to prevent risk factors before operating the machine:

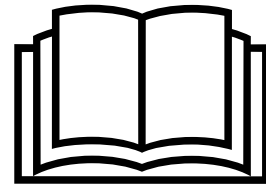
Checking the worksite

- Always be aware of weather conditions at your worksite. Fog or heavy rain may decrease visibility or render the machine inoperable. In the event of lightning, immediately put the bucket to the ground and evacuate to a safe place.
- Check the worksite for obstacles, and avoid collisions with such obstacles during operation. Check the surroundings of the machine for any obstacles that may hinder operation.
- Check the worksite for buried waterlines, telecommunication cables, power cables and oil pipelines in advance, and avoid damaging them.
- If the terrain of the worksite is too rough for normal operation of the machine, flatten the terrain before operating the machine. Make sure that the ground of the worksite is not soft as it may cause hazards during operation.
- If the worksite is a marshy place (e.g., shallow river, large or small lake, swamp, etc), check the conditions and the depth of marshy areas and the flow rate before driving or operating the machine. Do not operate the machine underwater.
- When operating the machine in water or when crossing shallow, check the bed soil condition and depth and flow speed of water, then proceed taking care that water is not above upper rollers.
- Do not operate the machine on cliffs or at the end of a road on soft ground as the machine may overturn.
- When operating the machine in areas with pedestrian or vehicle traffic, or in a zone in the vicinity of such an area, appoint workers exclusively responsible for controlling the traffic, or install fences or blocking wall to separate the worksite from the traffic area. Prevent unauthorized workers or machines from accessing the worksite.



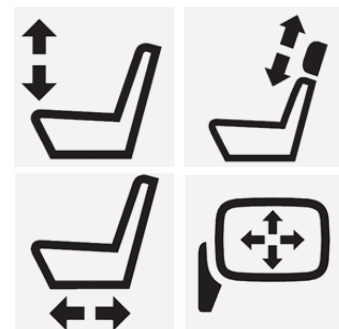
Instructions before operating the machine

- The machine shall be operated by authorized and skilled operators only.
- The operator should wear clothes and personal protection gear that are appropriate for the work environment.
- Do not operate the machine while under the influence of alcohol or drugs or while experiencing extreme fatigue or other conditions that may affect your awareness of your surroundings or your reaction time.
- The operator should read and fully understand the operator's manual before operating the machine.
- The operator should fully understand the details and procedures of the work to be performed.
- Do not perform work when a hazard is anticipated or encountered. Remove the hazard before beginning work. Failure to comply may result in serious injury or death.



Inspect the machine before operating the machine

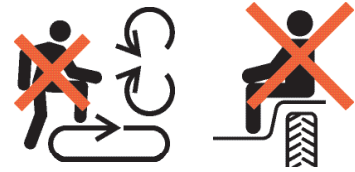
- Check the machine for abnormal noise, vibration or heat, and for the leakage of engine oil, hydraulic oil, fuel or refrigerant.
- Remove any foreign substances from the engine and the battery. The buildup of such substances may cause a fire.
- Do not operate a machine until any necessary repairs are completed.
- Do not operate the machine until all regular inspection and service recommended in the operator's manual have been executed.
- Adjust the operator's seat to suit the physical condition of the operator. Check the seatbelt for damage, and replace it if damaged. Do not store unnecessary objects or tools in the cabin.
- Keep clean all parts related to visibility, such as the windshield and rearview mirror. Adjust the rearview mirror to ensure that the operator's field of vision is clear.
- Check the acoustic alarms (e.g., the horn and warning signal when driving backward or moving) for normal operation.



During Operation of the Machine

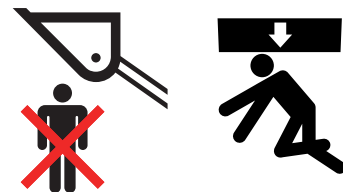
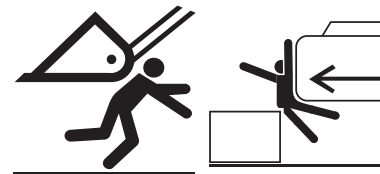
Getting on and off

- Do not jump on or off the machine.
 - Do not try to get on or off the machine while it is moving.
 - Get on or off the machine using the handrail and step (or stepladder, if any). Always keep the handrail and step clean and free from mud or oil.
 - Wear anti-slip shoes.
 - Comply with the principle of three-point contact* by contacting the machine with either both hands and one foot or vice versa when getting on or off the machine.
 - Do not sit on any part of the machine not intended for sitting.
- ※ **Three-point contact means making contact with the machine with both hands and one foot, or with one hand and both feet.**



During operation

- The operator should start the engine only after sitting on the operator's seat. Make sure that all levers are shifted to the neutral position before starting the engine.
- Pay close to any obstacles when operating the machine, particularly when turning or moving backward, to prevent collision. Failure to comply may result in serious injury or death.
- Do not exceed the recommended size and weight of an object when lifting a load. Do not lift a heavy object with slings by suspending the slings on the tooth of the bucket.
- Do not allow anyone to stand under the bucket.

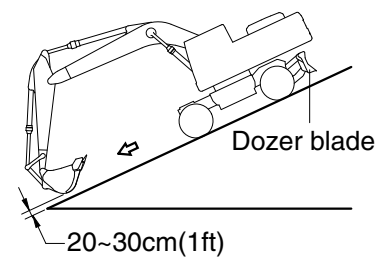
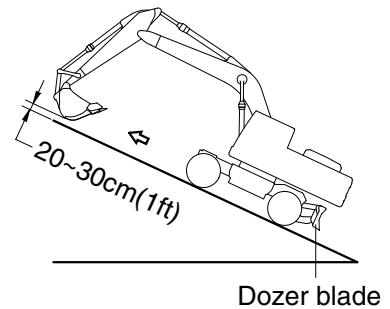
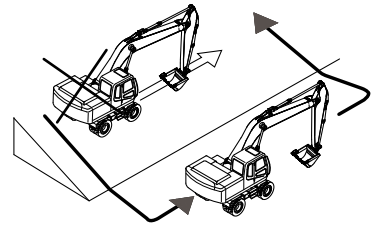
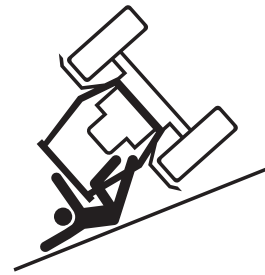


Operation on a slope

When operating the machine on a slope, failure to comply with these instructions could result in the machine tipping over, which may lead to serious injury or death.

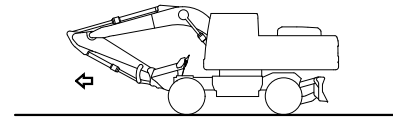
- Do not work on slopes of 10° or more.
- Do not exceed the maximum climbing angle of 30°.
- If operation of the machine on a slope is unavoidable, perform the work after flattening the ground.
- When operating the machine laterally on a slope, there is a high risk of machine overturning or slipping. Do not operate the machine in such conditions.
- Do not operate the machine on a slope covered with wet grass or a thick layer of dead leaves, as the machine may slip.
- Do not park or stop the machine on a slope. If parking or stopping the machine on a slope is unavoidable, bring the bucket down to the ground, and support the wheels with wheel chocks.

- When traveling up a slope, operate the machine at a slow speed with the attachment extended forward to keep the machine balanced, and with the bucket raised at least 20 ~30 cm (1 ft) from the ground.
- Never travel down a slope in neutral. Keep the bucket 20~30 cm (1 ft) above the ground, and use the bucket as a brake in an emergency situation.
- If the engine suddenly stalls, immediately bring the bucket to the ground.
- If the fuel gauge reaches the red zone while operating the machine, immediately refill with fuel. (If the machine operates on a slope under these conditions, air may be introduced into the engine, causing it to stall suddenly.)



Cautions to Be Taken When Driving the Machine

- If you operate the machine with the parking brake on, it may cause serious damage to the parking brake disk.
- Select the appropriate gear for the driving speed.
- Do not change direction when driving the machine at max. speed as this may cause serious damage to the transmission.
- Only drive the machine for short distances on the road.
- Make sure you fully comply with the local road traffic regulations and legislation of your country when driving on the road.
- Please note that the machine is wider and travels at a lower driving speed than other vehicles on the roads.
- Pay attention to any vehicles behind your vehicle, and allow them to overtake your vehicle safely.
- Check the following conditions before driving the machine on the public road :
 - Remove any dirt and sand from the machine.
 - Empty the bucket and move it to the driving position (40~50 cm above the ground) and fix it.
 - Close the windshield. Turn the working light off.
 - Wear the seat belt.
 - Use the lighting devices, such as the headlights, emergency warning light and rotating beacon, pursuant to the local road traffic legislation.
 - Pay attention to people in the vicinity of the machine.
 - Do not operate the machine on roads or bridges where the machine exceeds the weight limit.
 - Familiarize yourself fully with the width, length and height of the machine.
 - Check the tire pressure.
 - When traveling for a long distance, stop the machine after every 40 km or on an hourly basis, and take a break.
 - Check the level of fuel and coolant.
 - Never shift the gear to the neutral position when driving down a slope.
 - Changing direction when operating the machine on a slope is dangerous.
 - Do not drive on a slope of 30° or more.
 - Drive slowly when traveling the machine on rough terrain or moving over obstacles.
 - Install chains on the tires when operating the machine on slippery roads covered with snow or rainwater, and do not attempt to start, stop or turn the machine suddenly.
 - Be sure to avoid any obstacles when traveling the machine on paths.



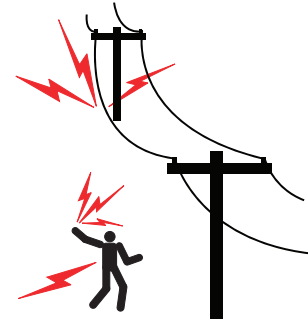
Operations to be avoided or prohibited

- Pay attention when operating the machine in an enclosed space as this may result in the risk of a buildup of hazardous gases.

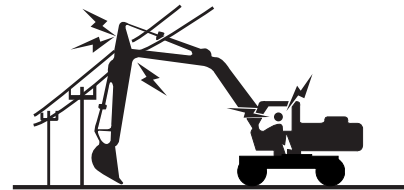


- If the machine is operated in the vicinity of a high-voltage line, there is a risk of death or serious injury.
- Be aware of the height and working radius of the machine, and maintain the minimum safety distance.

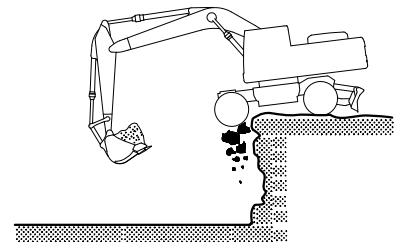
Voltage	Minimum safety distance
6.6 kV	3 m (10 ft)
33.0 kV	4 m (13 ft)
66.0 kV	5 m (16 ft)
154.0 kV	8 m (26 ft)
275.0 kV	10 m (33 ft)



- In the event of contact with a high-voltage line, keep sitting on the operator's seat until the electric current has been shut down.
- Warn any workers on the ground in the vicinity of the machine not to make contact with the machine.
- If leaving the machine is unavoidable, jump down to a place free from any contact with the machine.



- Avoid operating the machine on soft ground, a slope or cliff as there is a risk that it may overturn. Pay special attention when it is raining as the rainfall may soften the ground.

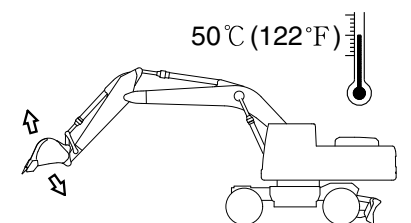


- When operating or driving the machine in water, check the floor conditions, depth of water and flow rate, and make sure that the top roller and axle housing are not immersed in water.
- Do not operate the machine under adverse weather conditions caused by overcast skies, snow and rainfall.
- Do not turn or travel with the machine when the bucket is stuck in the ground.

Cautions when operating in specific areas

Operating in extremely cold environments

- Do not attempt to start, stop or turn the machine suddenly as this may cause it to slip. There is potential for the machine to slip.
- Snow-covered or frozen ground may be slippery and dangerous.
- Idle operation of the machine may be required to elevate the engine temperature during startup.
- An impact resulting from a sudden movement of the boom or the attachments at an extremely low temperature may cause serious damage to the machine.
- The working cycle or loading weight might be reduced to lower than those under normal conditions.
- Follow these instructions when operation in cold environments:
 - Warm up the engine for 3~4 seconds when starting up the engine.
 - Always fully charge the battery. A discharged battery will freeze earlier than a fully charged battery.
 - Use engine oil and fuel that are appropriate for the temperature.
 - Keep the fuel tank full.
 - Remove any moisture from the fuel tank, and change the fuel filter regularly.
 - If the fuel filter is frozen, the flow of fuel may be blocked.
 - Pour the proper volume of antifreeze into the coolant.
 - Wait until the various parts of the machine reach the operating temperature after starting the engine.
 - Make sure that every controller and function of the machine operates normally.
 - Remove any dirt, snow and ice from the machine after completing the operation.



Operating in extremely hot environments

- Continuous operation of the machine for a long period of time may cause the machine to overheat. Pay special attention to prevent overheating of parts such as the engine and the hydraulic system. Stop the machine and take a break if necessary.
- Check the following conditions frequently:
- Check the level of the coolant in the radiator.
 - Check the radiator grill for clogging by any debris, and remove them, if any.
 - Check the level of the battery electrolyte.
 - If the battery will not be used for a long period of time, store it in a cool place.
 - Check the hydraulic system for oil leakage.
 - Check the lubrication oil on the respective parts, and lubricate as needed.
 - If the paint coating of any parts has been effaced or damaged, coat the parts with paints or treat them with an anti-rust additive.
 - Do not park the machine under direct light for a long period of time.
 - When parking or storing the machine outdoors, use the proper cover to protect the machine from sunlight and dust.

Operating in dusty or sandy environments

- Check the radiator grill for clogging by any debris, and remove any debris.
- Check the fuel system, and protect it from dust or sand when refueling.
- Inspect the air cleaner regularly, and replace it if necessary.
- If the gauge lamp on the dashboard lights up and the buzzer sounds at the same time, clean or replace the air cleaner.
- Frequently check consumables such as hydraulic oil and lubrication oil, and change them if necessary. Protect against the introduction of dust or sand when changing the consumables.
- Check the air-conditioner and the heater filters regularly, and clean or replace them if necessary.
- When parking or storing the machine outdoors, use the proper cover to protect the machine from dust and sand.

Operating in rainy or humid environments

- Do not operate the machine in areas where there is heavy rainfall or thick fog.
- If operating the machine in such areas is unavoidable, perform operation after ensuring sufficient field of vision.
 - Use lighting devices such as the head lamp and working light.
 - Warn any workers within the radius of operation of the machine.
- Pay attention when operating the machine on smooth ground as there is a risk of it overturning.
- If the paint coating on any parts has been effaced or damaged, coat the parts with paint or treat them with an anti-rust additive.

Operating the machine in coastal areas

- Special care should be taken when operating the machine in coastal areas as exposed parts may be corroded easily.
- If the paint coating on any parts has been effaced or damaged, coat the parts with paint or treat them with an anti-rust additive.
- Perform inspection and maintenance of the parts promptly.

Cautions during maintenance

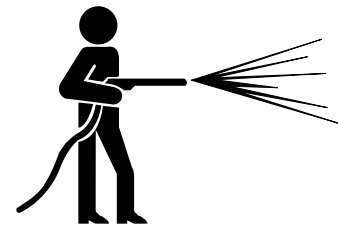
Tools

- Use the correct tools for each type of work.
- Using improper tools may damage the machine and its parts.
- Using deteriorated or damaged tools may result in bodily injury.



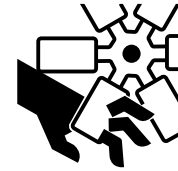
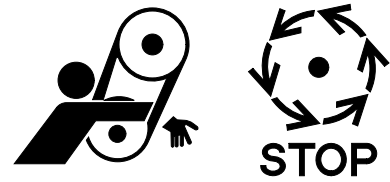
Inspection and servicing

- Prevent access to the machine by all unauthorized workers.
- Prior to inspection, park the machine in a flat area and attach a 'Under Inspection' sign.
- Clean the machine before inspection or maintenance.
 - When performing inspection or maintenance on a dirty machine, it may be difficult to diagnosis or detect the cause of a problem with the machine.
 - Dust or dirt accumulated on the machine may cause a worker to slip or fall.
 - Wear protective goggles and protective clothes when cleaning the machine using a compressed water.
 - Do not spray water directly on sensors or electric connectors (sensors or electrical connection units, etc.). If water gets into the electrical system, it can cause operational problems.
- Use proper lighting devices when operating the machine in a dark area.
- Use lighting devices that are explosion-proof when handling flammable materials such as fuel and hydraulic oil.
- Never attempt to use a direct flame such as a cigarette lighter in lieu of the lighting device.
- Check the level of the cooling water after stopping and sufficiently cooling down the engine.
- Sufficiently relieve the inside pressure before opening the cooling water cap.
- The cooling system contains basic components. Use caution to prevent the skin or eyes from coming into contact with the basic materials.
- Exercise special care to protect the body from contact with hot fluid or parts.
- Replace the filters only after shutting off and sufficiently cooling down the engine.
- Slowly remove the operating oil filter plug to relieve the inside pressure.
- Relieve the pressure from the hydraulic system before disconnecting any lines and fittings.



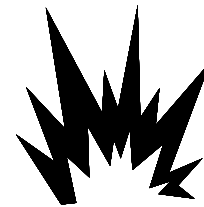
Collision or cutting

- Never perform a maintenance while the engine is running.
- Never open or remove the engine hood while the machine is in operation.
- If an inspection is required while the engine is running, two or more workers must perform the inspection.
- Keep areas in the vicinity of rotating or moving parts clean.
- Keep articles in the vicinity of the fan clean.
 - Wear safety gloves when handling the wire cables.
 - Wear protective goggles and protective clothes



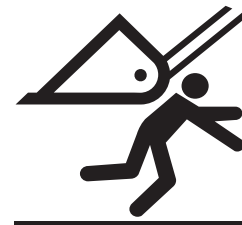
Preventing fire and explosion

- Use caution when handling fuels, lubrication oils, and coolant mixtures to prevent fire and explosion. Failure to comply may result in serious injury or death.
- Oil that leaks on to a hot surface or electronic components may cause a fire.
- Keep all fuels and lubrication oils in adequate containers.
- Do not smoke while refueling or while adding any fluids to the machine. Do not smoke near the fuel tank at anytime.
- Do not smoke in a space where battery electrolyte and other flammable materials are handled.
- Always keep all electrical lines, connectors, and clamps clean, and check whether they are securely connected on a regular basis.
- If any electrical wire or connector is loose or damaged, repair it immediately.
- Do not weld or cut with gas cutter pipes or tubes that contains flammable fluids.



Cautions on decoupling the attachments

- Do not allow unauthorized workers to access the machine.
- Place the machine in a safe position.
- Install safety fences around the machine.



Repair by welding

- Only weld in an area where adequate facilities for welding are available.
- Welding work may be subject to risks of gas leak, flame and electric shock.

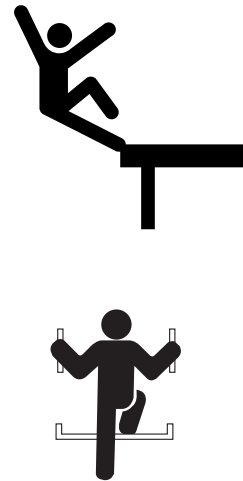
Welding should be performed only by a qualified welder.

- Take the following precautions when welding to avoid serious injury or death:
 - Separate and remove the battery to prevent battery explosion.
 - Perform direct heating in a place free from the risk of explosion.
 - Cover parts such as rubber hoses subject to damage by welding with flame-resistant materials.
 - Wear a welding helmet, protective clothes, protective gloves, and safety shoes.
 - Perform welding work in a well-ventilated place.
 - Remove all inflammable materials from areas in the vicinity of welding work.
 - Provide fire extinguishers.



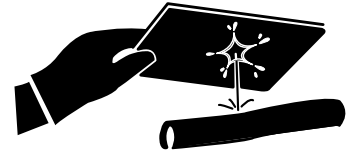
Precautions to take when working on the machine

- There is a risk of falling when working on the machine.
- Keep the area around the workers' feet clean and tidy.
- Do not spill oil or grease.
- Do not leave tools lying on the floor.
- Be careful on the floor when moving.
- Never jump from the machine.
- When getting off the machine, use the step or handrail and get off the machine while keeping to the principle of three-point contact.
- Wear protective clothes if necessary.
- Do not perform maintenance work in an area where no anti-slipping pads have been installed.
- Replace anti-slipping pads and step treads with new ones if they have deteriorated or no longer function.



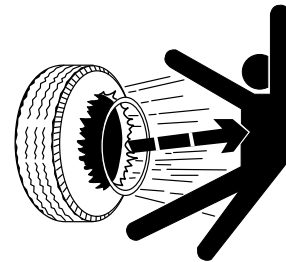
Cautions when working with the high-pressure line or hose

- Make sure that the internal pressure is released before replacing or checking the high-pressure line or hose.
- If the internal pressure is not released, serious injury may result.
- Take the following precautions to avoid serious injury or death:
 - Always check to make sure a working fire extinguisher is nearby
 - Leaked oil may penetrate the skin or cause serious injury.
 - Never check for oil leaks with your bare hands.
 - Check an oil leak using a wooden plate or cardboard.
 - Never bend or hit the high-pressure line hard.
 - Do not install a bent or damaged line or hose.
 - Make sure that all of the clamps and protective devices are properly installed.
- Check the pipes and hoses regularly and replace any damaged parts if necessary.



Cautions on inspecting the tire

- Always keep the tires inflated to the proper pressure.
- Overheating or rupture of the tires may result in serious injury.
- Repairing or changing the tires requires exclusive facilities and expertise. Please contact a professional tire repair shop if repairs are necessary.



Cautions on inspecting the counterweight

- Failure to comply with these instructions may lead to serious injury or death.
- Never stand beneath the counterweight when installing or removing it.
- Make sure the condition of the lifting device is rated for the weight being lifted.
- Make sure lifting device is in good working order and free of damage or defects.



Battery

- The battery contains flammable materials.
- Never smoke in the vicinity of the battery.
- The battery electrolyte is strong acid. Pay attention to prevent the skin and eyes from coming into contact with the electrolyte.
- If the battery electrolyte accidentally comes into contact with the body or clothes, immediately wash off the electrolyte with water.
- If the battery electrolyte is frozen, do not use other devices to start the engine up.
- Always wear protective goggles and protective gloves when working on the battery.
- Always keep the switch in the 'OFF' position when working on the battery.
- Securely fasten the battery cap.
- Always disconnect the battery from the machine before charging the battery.
- Disconnect the cathode (-) first when removing the battery.
- Connect the anode (+) first when connecting the battery.
- Follow the safety procedures when jump starting or charging the battery. Improper connection of the cable may result in an explosion and serious injury.
- Use a voltmeter when inspecting the charging system.
- Regularly inspect the battery cable, and replace it if damaged.
- A battery cable with exposed wires may cause a short if it comes into contact with the grounding surface.
- A short circuit of the battery cable may cause heat from the battery current and result in a fire.
- If the wires of the ground cable are exposed between the battery and the master switch, the exposed wires make contact with the grounding surface and the current may bypass to the master switch. This may destabilize the machine operation.

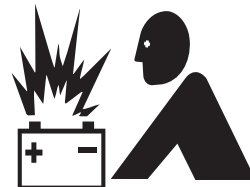
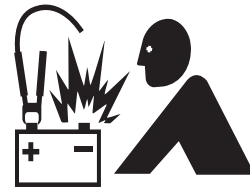
Repair or replace the part before operating the machine.

Battery disconnection switch

- Do not turn off the battery disconnect switch while engine is running. There is a risk of damaging electrical system.
- The battery disconnect switch can be found under the left-hand door of the machine.
- Make sure to turn off the battery disconnect switch when welding or servicing electrical systems, and before clocking out.

Switchboard

- The relay and fuse can be found on the switchboard at the rear of the cab.
- Do not use the fuse that has a higher amperage than indicated on the decal. There is a risk of damaging electric circuits or catching fire.



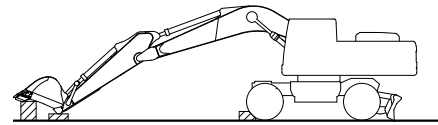
Parking and Storage

Cautions on parking

- Park the machine on flat ground.
- If parking the machine on a slope is unavoidable, use wheel chocks to prevent the machine from moving.
- Bring the bucket down and make firm contact with ground.
- Make sure that all of the switches are turned to the 'OFF' position.
- Do not turn off battery disconnect until led lamp at the disconnect goes off.
- Make sure that all of the controllers are turned to the neutral position.
- Activate the parking brake.
- Stop the engine, and withdraw the ignition key.
- Close and lock the windshield, door and all covers.
- Install fences around the machine when parking it on a public road, and put up a warning sign.

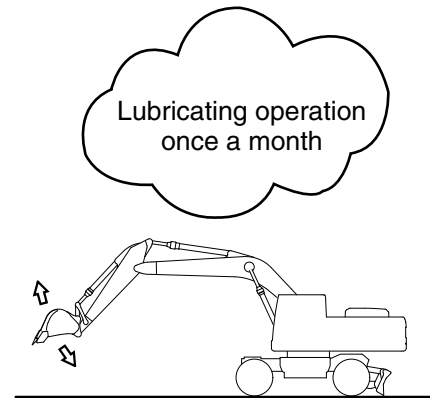
Cautions on storage for a long period of time

- Park the machine in accordance to any state and local laws.
- When storing the machine for a month or longer, follow these instructions to prevent deterioration of the machine performance :
 - Thoroughly clean the machine before storing.
 - Inject sufficient lubrication oil and grease into the injection ports.
 - If any of the machines fluids are low top them off. If any fluids are close to or in need of changing, do so before storing.
 - Oils and coolant may deteriorate during storage based on the length of storage. Please take this into consideration before using the machine.
 - The density of the oil may drop during storage.
 - Apply an anti-rust additive to the exposed area of the piston rod of the cylinder in areas where it is likely to rust quickly.
 - Keep the master switch mounted in the power box (or the toolbox on the left of the rear frame of the machine) turned 'OFF'.
 - Keep the machine in a dry indoor environment.
If storing the machine outdoors is unavoidable, store it on a wooden pallet.
 - Keep all cylinders collapse so that the cylinder rods are not exposed.
 - Bring the attachments right down to the ground, and keep the wheels immobile by placing wheel chocks.



Regular lubrication (during storage)

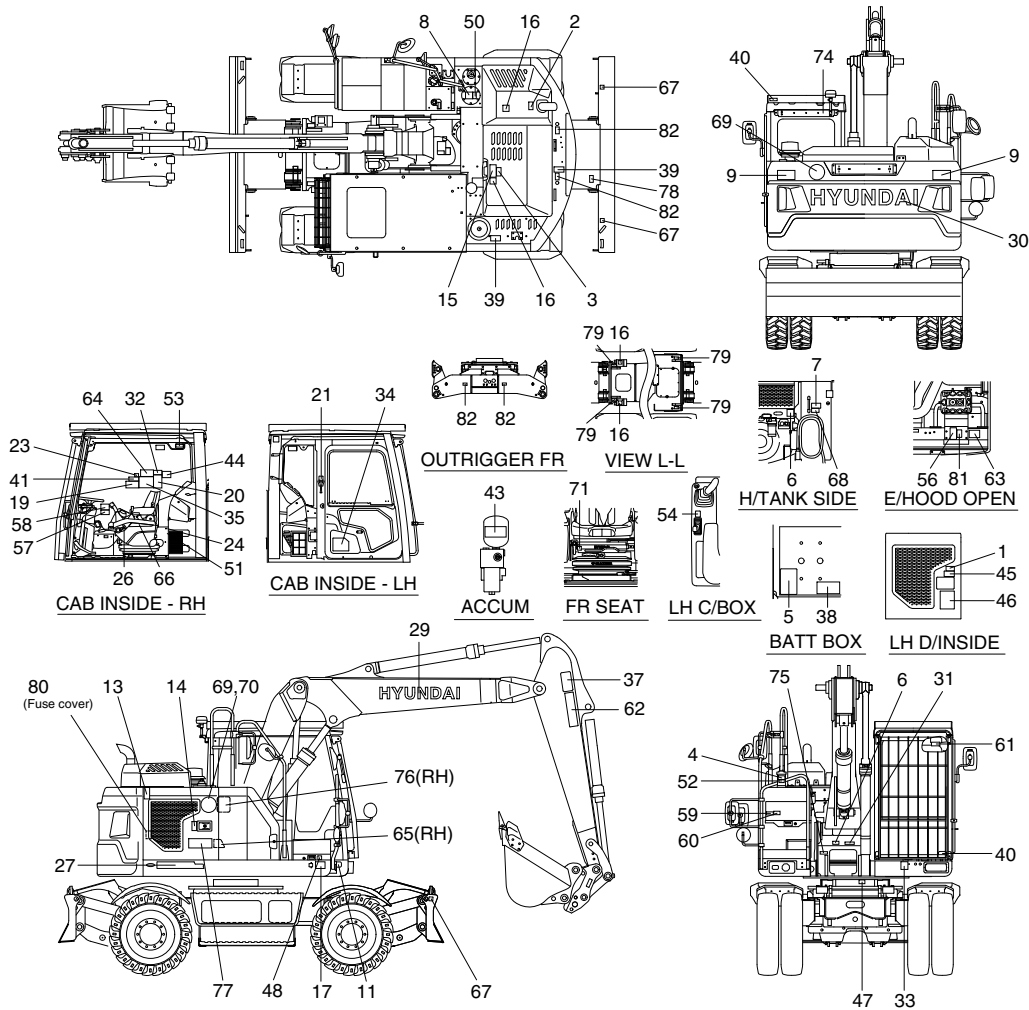
- Breaking the lubrication film on parts may cause abnormal abrasion during the next operation.
- Check the level of the engine oil and coolant when starting the engine up, and top them up if necessary.
- Thoroughly wipe off any oil from cylinder rod before operating machine as it will attract dust and debris.
- Start up the engine once a month, perform all functions. Operate machine utilizing all functions for a minimum of 15 minutes. Apply lubrication oil to every part.
- Fully charge and store the battery.
- If storing the excavator for longer than 6 months, disconnect the battery negative (-) terminal.
- Check the tire pressure.



SAFETY LABELS

1. LOCATION

Always keep these labels clean. If they are lost or damaged, replace them with a new label.



90K5-01300

- | | | |
|-----------------------------|---------------------------------------|--------------------------|
| 1 Air cleaner filter | 31 Reduction gear grease | 58 RCV lever |
| 2 Turbocharger cover | 32 Coupler locking | 59 Diesel exhaust fluid |
| 3 High pressure | 33 Noise level LWA | 60 DEF/AdBlue® fill up |
| 4 Fueling | 34 Service instruction | 61 Sliding caution |
| 5 Battery accident | 35 Lifting chart | 62 Reflecting |
| 6 High pressure hose | 36 Keep clear-attach | 63 Refrigerant |
| 7 Hydraulic oil level | 37 Electric welding | 64 Control RCV |
| 8 Hydraulic oil lubrication | 38 Falling | 65 Band |
| 9 Keep clear-rear | 39 Accumulator | 66 Console log |
| 11 Name plate | 40 M/control pattern change valve | 67 Tie |
| 13 Keep clear-side | 41 M/control pattern change-w/o valve | 68 Leftover fuel |
| 14 Stay fix | 42 M/control pattern change-w/valve | 69 Speed limit - 35 km/h |
| 15 Shearing-engine hood | 43 Swing bearing grease | 70 Speed limit - 20 km/h |
| 16 No step | 44 Battery position | 71 Middle lever |
| 17 Transporting | 45 Fuel shut off | 74 Beacon lamp |
| 19 M/control pattern | 46 MCU/ECU connector | 75 Ride control |
| 20 Ref operator's manual | 47 Ultra low sulfur diesel | 76 Cummins |
| 21 Hammer | 48 ROPS plate | 77 Bio oil |
| 23 Emergency exit | 49 Dozer/outrigger ideogram | 78 Trailer hitch |
| 24 Air conditioner filter | 50 Surge tank | 79 Lift and tie |
| 26 Safety knob | 51 Key off caution | 80 Fuse caution |
| 27 Model name | | 81 Surge tank |
| 29 Trade mark (boom) | | 82 Lifting eye |
| 30 Trade mark (CWT) | | |

2. DESCRIPTION

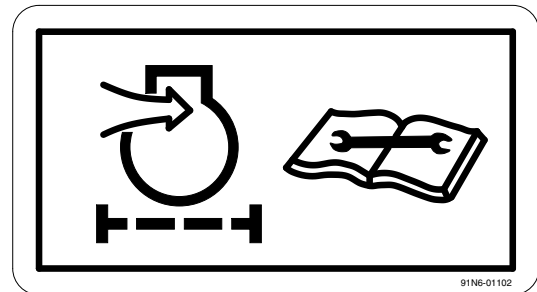
There are labels on this machine. Ensure you are familiar with all labels before operating the machine.

Replace any label that is damaged or missing. If a label is attached to a part that is replaced, install a label on the replacement part.

1) AIR CLEANER FILTER (item 1)

This label is positioned on the inside of the LH door.

- ※ Periodic and proper inspection, cleaning and change of elements prolong engine life and maintains good engine performance.

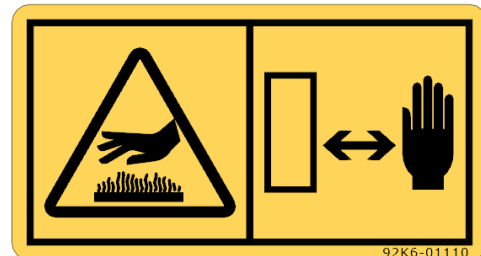


91N6-01102

2) TURBOCHARGER COVER (item 2)

This label is positioned on the exhaust hood.

- ▲ Do not touch turbocharger or it may cause severe burn, while the engine is running or immediately after the engine is shut down.



92K6-01110

3) HIGH PRESSURE (item 3)

This label is positioned on the top side of the engine hood.

- ▲ Do not touch hot or high pressure parts or it may cause server burn.

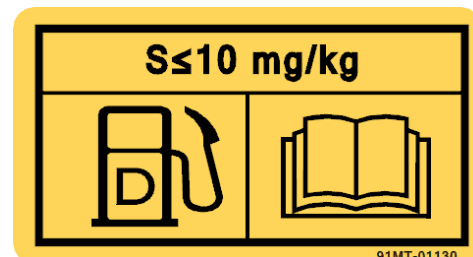


94K8-01110

4) FUELING (item 4)

This label is positioned on the front side of fuel filler neck.

- ▲ Stop the engine when refueling. Any lights or flames must be kept at a safe distance while refueling.
- ※ Use ultra low sulfur fuel only.
- ※ Ultra low sulfur fuel sulfur content ≤ 10 ppm



91MT-01130

5) BATTERY ACCIDENT (item 5)

This label is positioned on the battery box. Follow all warnings. Failure to comply may result in serious injury or death.

▲ Electrolyte containing sulfuric acid can cause severe burns. Avoid allowing contact with the skin, eyes or clothes. In the event of accident flush with sufficient water and contact a physician immediately. Failure to comply may result in serious injury or death.

※ Maintain the electrolyte at the recommended level. Add distilled water to the battery only when starting up, never when shutting down.

With electrolyte at proper level, less space may cause the gases to be accumulated in the battery.

▲ Do not allow any open flames or excessive heat near or when checking the battery.

▲ Do not allow unauthorized personnel to change the battery or to use booster cables.

▲ To prevent electric shock, do not touch battery terminal with wet hands.



91N6-02122

6) HIGH PRESSURE HOSE (item 6)

This label is positioned on the right side of the hydraulic tank and front side of the upper frame. Follow all warnings. Failure to comply may result in serious injury or death.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury or death.

▲ Relieve all pressure before disconnecting any hydraulic, coolant or fuel lines etc.

※ See the maintenance section for details.

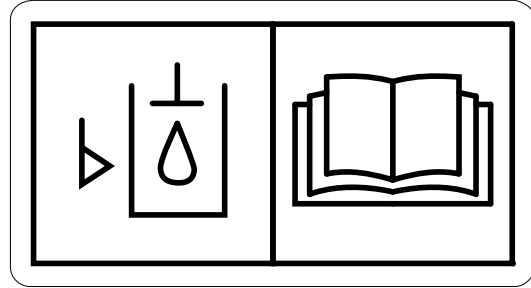


91N6-03133

7) HYDRAULIC OIL LEVEL (item 7)

This label is positioned on the right side of the hydraulic tank.

- ▲ Place the bucket on the ground whenever servicing the hydraulic system.
- ※ Check oil level on the level gauge as shown in the upper right hand illustration.
- ※ Using the recommend hydraulic oil, fill to the specified level if necessary. Please refer to section, Maintenance.



94K6-03400

8) HYDRAULIC OIL LUBRICATION (item 8)

This label is positioned on the top side of the hydraulic tank.

- ※ Do not mix with different brand oils.
- ▲ Never open the filler cap while high temperature.
- ▲ Loosen the cap slowly and release internal pressure completely.



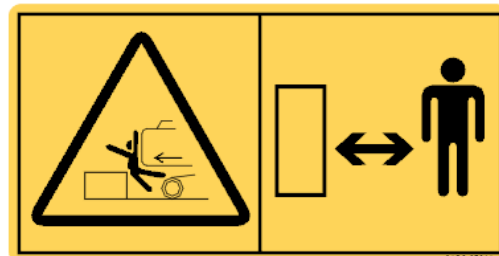
91N6-03112

91N6-03112

9) KEEP CLEAR-REAR (item 9)

This label is positioned on the both sides of the counterweight.

- ▲ To prevent serious personal injury or death keep clear of machine swing radius.
- ▲ Do not deface or remove this label from the machine.



91Q6-07011

91Q6-07011

10) KEEP CLEAR-SIDE (item 13)

This label is positioned on the left and right side covers.

- ⚠ To prevent serious personal injury or death keep clear of machine swing radius.
- ⚠ Do not deface or remove this label from the machine.

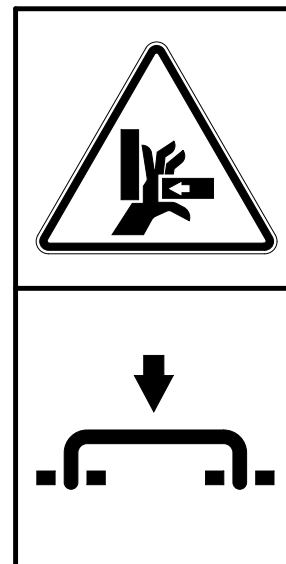


9106-07022

11) STAY FIX (item 14)

This label is positioned on the left and right side covers.

- ⚠ Be sure to fix the stay when the door needs to be opened.
- ⚠ A door which is not fixed in the fully closed or open position (via stay) can suddenly move causing severe personal injury or death.

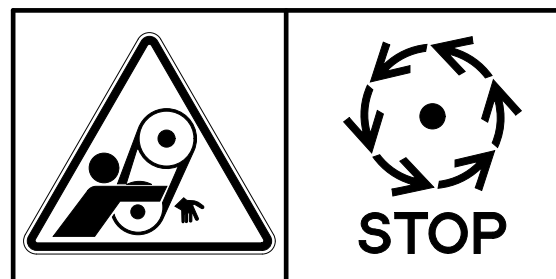


21070FW14

12) ENGINE HOOD SHEARING (item 15)

This label is positioned on the top side of engine hood.

- ⚠ Do not open the engine hood while the engine is running. Stay clear of rotating parts. Failure to comply may cause serious injury or death.
- ⚠ Do not touch exhaust pipe or it may cause severe burn.

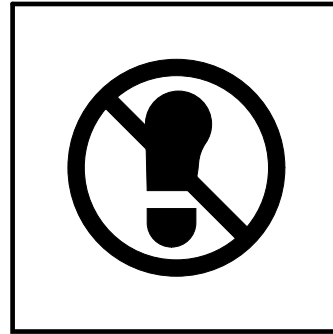


21070FW15

13) NO STEP (item 16)

This label is positioned on the top side of engine hood and exhaust hood.

- △ **Don't step on the engine hood and counterweight.**

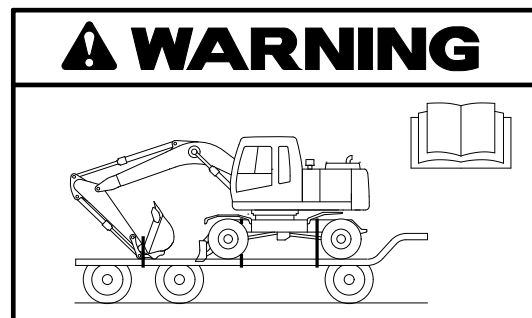


21070FW16

14) TRANSPORTING (item 17)

This label is positioned on the right front side of upper frame.

- ▲ **Review the operator's manual before transporting the machine. Tie down arm and lower frame to the carrier with appropriate rated straps or chains.**
- ▲ **Be sure to protect machine from damage when strapping by using appropriate material such as wood, cardboard etc. See page 5-8 for details.**



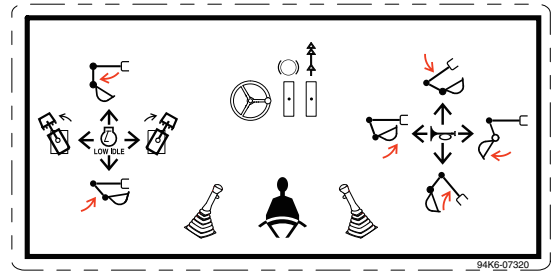
20W70FW17

15) MACHINE CONTROL PATTERN (item 19)

This label is positioned in the right window of inside the cab.

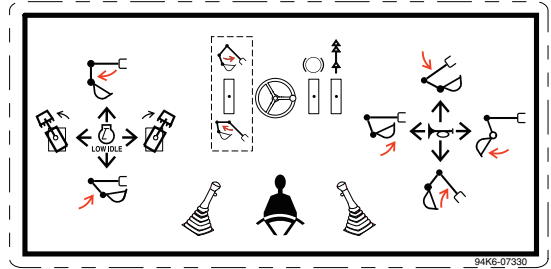
- ⚠ Always ensure the label matches the control pattern. If it does not, replace label with appropriate control pattern label.
- ⚠ Failure to do so could result in serious injury or death.
See page 2-12 for details.

Mono boom



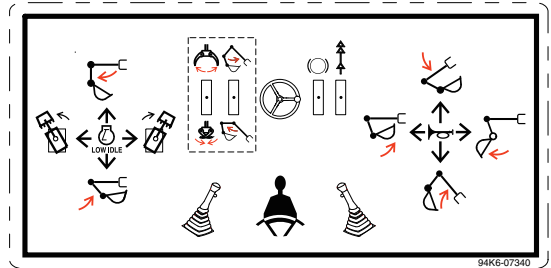
94K6-07320

2 pcs boom+2 way with proportional



94K6-07330

2 pcs boom+2 way with prop & pedal choice



94K6-07340

16) REFER TO OPERATOR'S MANUAL (item 20)

This label is positioned on the right window of inside the cab.

- ⚠ Review the operator's manual before starting and operating machine.
- ⚠ Do not operate this machine unless you have read and understand the instructions and warnings in this manual. Failure to follow the instructions or warnings could result in serious injury or death.

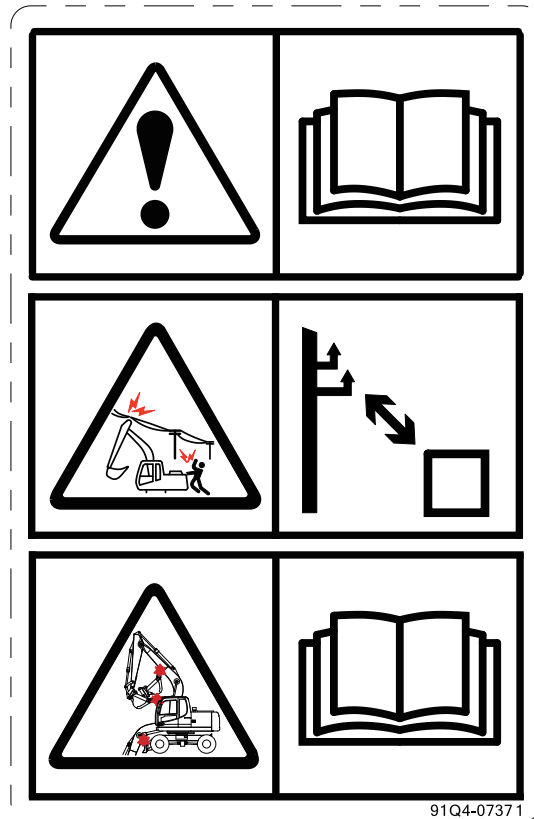
(1) Max height

- ⚠ Serious injury or death can result from contact with electric lines. It is possible to receive shock by merely coming into the vicinity of electric lines, the minimum distance based on supply voltage should never be exceeded. Refer to page 1-22.

(2) Interference

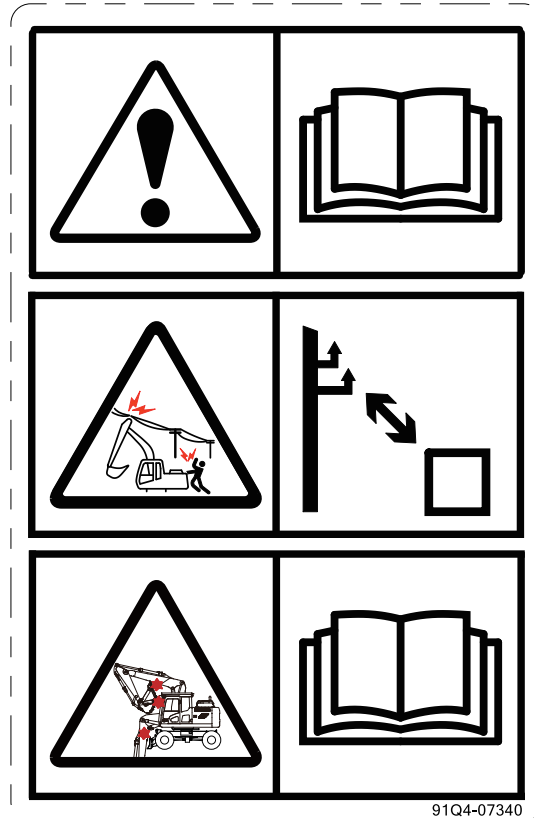
- ⚠ When operating machine equipped with quick coupler or extensions, the bucket may come into contact with the boom, boom cylinders or cab, during the bucket or arm retraction operation.

Mono boom



91Q4-07371

2 pcs boom



91Q4-07340

17) HAMMER (item 21)

This label is located on the left stay of inside the cab.

- ※ The window serves as an alternate exit.
- ※ In emergency, break out the window using the hammer and escape from the cabin.



91Q6-07280

18) EMERGENCY EXIT (item 23)

This label is positioned on the right window of inside the cab.

- ※ The rear window serves as an alternate exit.
- ※ To remove rear window, pull the ring and push out the glass.

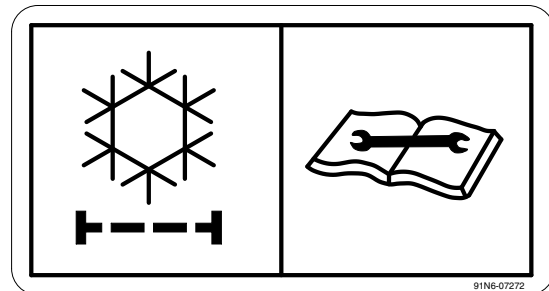


94MT-07280

19) AIR CONDITIONER FILTER (item 24)

This label is positioned on the air conditioner cover.

- ※ Periodic and proper inspection, cleaning and change of filter prolong air conditioner life and maintain good performance.



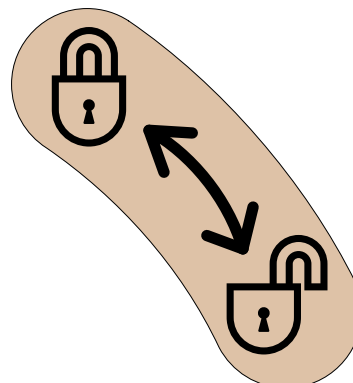
91N6-07272

91N6-07272

20) SAFETY KNOB (item 26)

This label is positioned on the cover of the safety knob, on the left side operators console.

- ▲ Before you get off the machine be sure to place the safety knob in the LOCKED position.
- ※ See page 3-59 for detail.

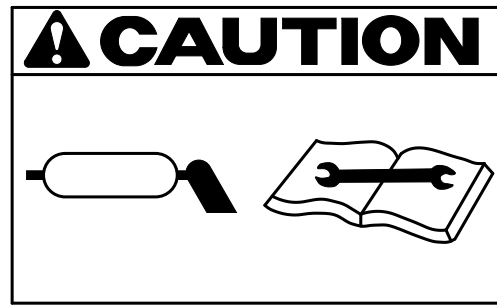


30007A1FW07A

21) REDUCTION GEAR GREASE (item 31)

This label is positioned on the front side of upper frame.

- ⚠ **Grease is under high pressure.**
Grease coming out of the grease plug under pressure can penetrate the body causing serious injury or death.



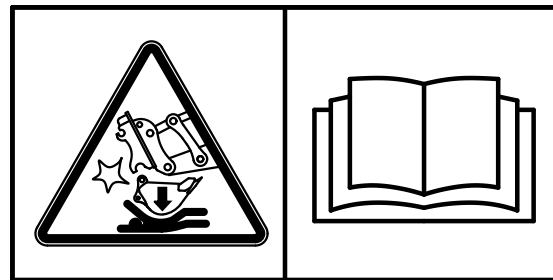
21070FW35

22) COUPLER LOCKING (item 32)

This label is positioned on the right window of inside the cab.

- ⚠ **Serious injury or death can result from a falling bucket.**
- ⚠ **Operating the machine with quick coupler switch unlocked or without safety pin of moving hook can cause the bucket to fall off.**

※ See page 8-10 for detail.



14070FW60

23) KEEP CLEAR-ATTACHMENT (item 37)

This label is positioned on both sides of the arm.

- ⚠ **Serious injury or death can result from a falling attachment.**
- ⚠ **To prevent serious injury or death, do not walk near, under implements or attachments. This applies when machine is in use, the implements are suspended in air or while the machine is being worked on.**



14070FW31

24) ELECTRIC WELDING (item 38)

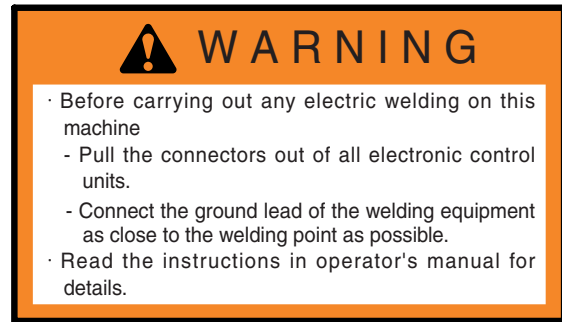
This label is positioned on the battery box.

⚠ Before carrying out any electric welding on this machine, follow the below procedure.

- Pull the connectors out of all electric control units.
- Connect the ground lead of the welding equipment as close to the welding point as possible.

※ **Be sure to remove paint where ground will be applied to ensure proper grounding of welder. Once welding is complete, clean and repaint area.**

※ **See page 4-62 for detail.**



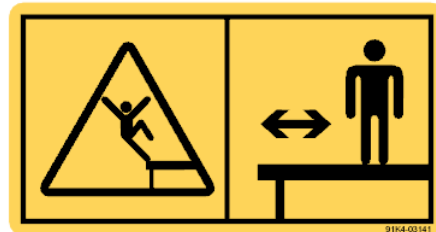
7807AFW20

25) FALLING (item 39)

This label is positioned on the top side of cooling room cowl and counterweight.

⚠ Falling from machine is one of the major causes of personal injury or death.

⚠ Be careful of slippery conditions on the platforms, steps and handrails when standing on the machine.



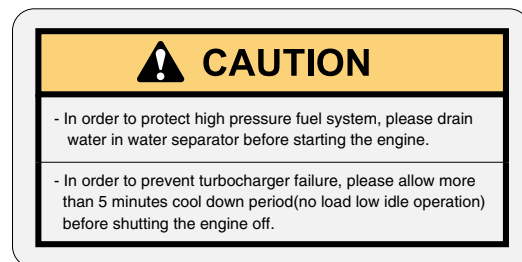
91K4-03141

26) CAUTION (W/SEPARATOR, TURBOCHARGER) (item 41)

This label is positioned on the right window of inside the cab.

⚠ In order to protect high pressure fuel system, please drain water in water separator before starting the engine.

⚠ In order to prevent turbocharger failure, please allow more than 5 minutes cool down period (no load low idle operation) before shutting the engine off.



120090SL02

27) ACCUMULATOR (item 43)

This label is positioned on the accumulators of the solenoid valve, brake supply valve, travel control valve and transmission control valve.

- ※ The accumulator is filled with high-pressure nitrogen gas, and it is extremely dangerous if it is handled in the wrong way. Always observe the following precautions.
- ▲ Never make any holes in the accumulator or expose it to open flame or fire.
- ▲ Do not weld anything to the accumulator.
- ※ When carrying out disassembly or maintenance of the accumulator, or when disposing of the accumulator. It is necessary to release the gas from the accumulator. A special air bleed valve is necessary for this operation, so please contact your HD Hyundai Construction Equipment distributor.



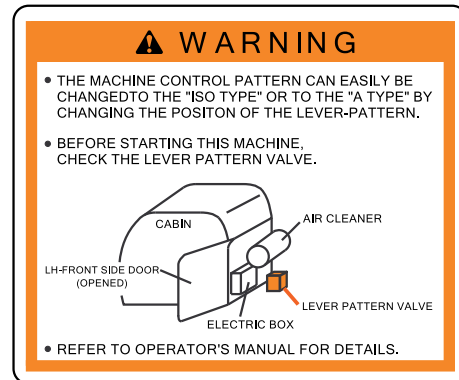
91N6-03201

28) MACHINE CONTROL PATTERN CHANGE VALVE (item 44)

This label is positioned on the right window of inside the cab.

- ▲ The machine control pattern can easily be changed to the "ISO type" or to the "A type" by changing the position of the lever-pattern.
- ▲ Before starting this machine, check the lever pattern change valve.
- ※ See page 2-34 for detail.

2 PATTERN CHANGE VALVE

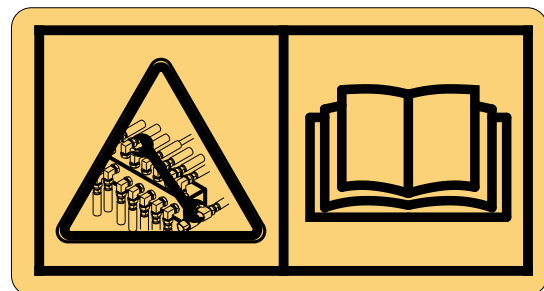


91N6-07400

29) MACHINE CONTROL PATTERN CHANGE-W/O VALVE (item 45)

This label is positioned on the inside of the LH door.

- ▲ Check the machine control pattern before starting this machine.
- ※ See page 2-33 for detail.



14W90FW47

**30) MACHINE CONTROL PATTERN CHANGE-
W/VALVE (item 46)**

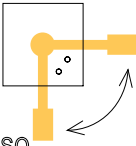
This label is positioned on the inside of the LH door.

- ▲ **Check the machine control pattern for conformance to the pattern on this label. If not, change label to match pattern before operating machine.**
- ▲ **Failure to do so could result in serious injury or death.**
- ※ **See page 2-34 for details.**

2 PATTERN CHANGE VALVE

⚠ WARNING

- THE MACHINE CONTROL PATTERN CAN EASILY BE CHANGED TO THE "ISO TYPE" OR TO THE "A TYPE" BY CHANGING THE POSITION OF THE LEVER-PATTERN.
- BEFORE STARTING THIS MACHINE, CHECK THE LEVER PATTERN VALVE.




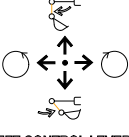
- HOW TO USE :
- MOVE LEVER TO THE "ISO" OR "A" POSITION.
- REFER TO OPERATOR'S MANUAL FOR DETAILS.

ISO

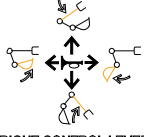
ISO TYPE

POSITION OF LEVER-PATTERN :






LEFT CONTROL LEVER

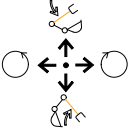


RIGHT CONTROL LEVER

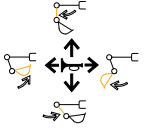
A TYPE

POSITION OF LEVER-PATTERN :





LEFT CONTROL LEVER



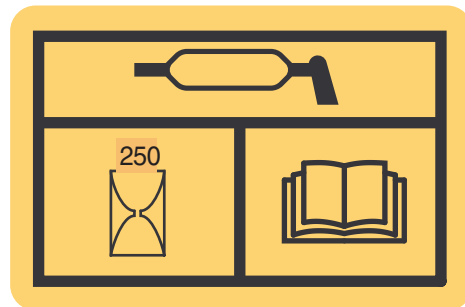
RIGHT CONTROL LEVER

91N6-07411
91N6-07411

31) SWING BEARING GREASE (item 47)

This label is positioned in the front side of swing bearing housing.

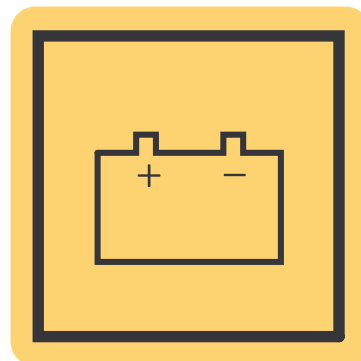
- ※ **See page 4-48 for details.**



38090FW02

32) BATTERY POSITION (item 48)

This label is positioned on the right front side of the upper frame.

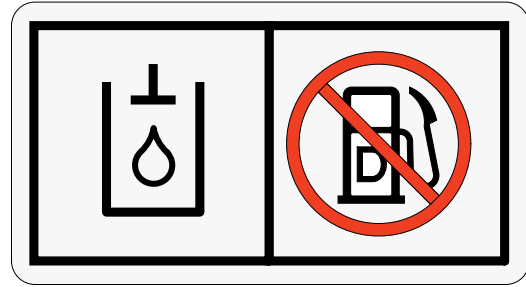


38090FW03

33) FUEL SHUT OFF (item 50)

This label is positioned on the top side of the hydraulic tank.

- ※ Fill only with hydraulic oil.
- ※ Do not fill with diesel fuel.
- ▲ Relieve tank pressure with the engine off by removing the cap slowly to prevent burns from hot oil.



140WH90FW51

34) MCU/ECU CONNECTOR (item 51)

This label is positioned on the lower cover of the air conditioner inside the cab.

- ※ MCU communicates the machine data through Laptop computer through RS232 service socket.
- ※ ECU communicates the engine data with cummins INSITE tool adapter through J1939 service socket.
- ※ See page 3-93 for details.

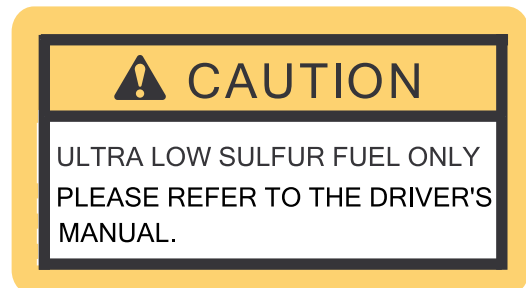


91Q4-15860

35) ULTRA LOW SULFUR DIESEL (item 52)

This label is positioned on the right side of fuel filler neck.

- ※ Use ultra low sulfur fuel only.
- ※ Ultra low sulfur fuel sulfur content ≤ 10 ppm



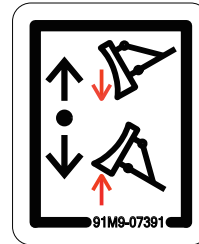
2609A0SL03

36) DOZER/OUTRIGGER IDEOGRAM (item 54)

This label is positioned on the LH console box.

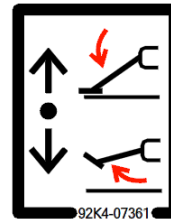
- ※ See page 2-13 for details.
- ※ Guidelines for using the general dozer blade.
 - Be careful not to apply an excessive load when using a blade.
 - Avoid impacts and loads on the bottom due to machine modification or excessive working conditions.
 - Check the BLADE UP status before traveling the machine.
 - Avoid any collision with the upper working device and the blade.
 - Do not move machine in the blade jack up state.
 - When using blade jack up, use it in an environment where the ground is not rough and the machine and ground are same level.

Dozer only



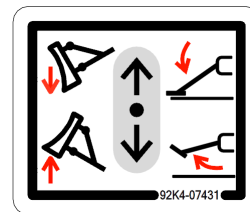
91M9-07391

Outrigger only



92K4-07361

Dozer+outrigger



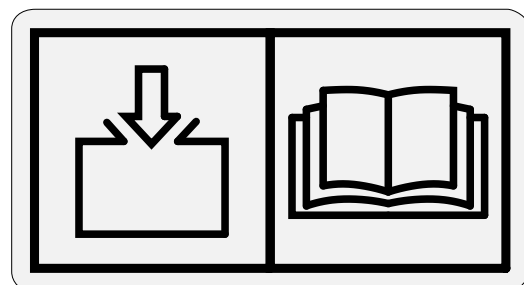
92K4-07431

37) SURGE TANK (item 56)

This label is positioned on the top of the radiator support.

This system must be filled slowly to prevent air locks.

- ※ Fill rate ≤ 11 lpm



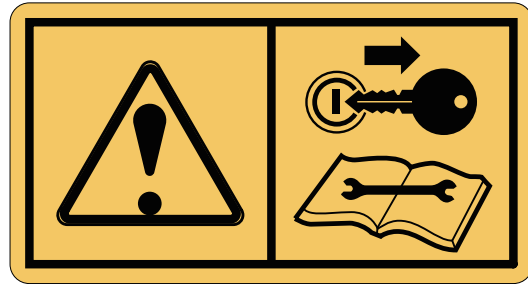
3009A0FW54

38) KEY OFF CAUTION (item 57)

This label is positioned on the right side window of inside the cab.

- ※ **Park on a flat place and stop the engine for inspecting and repairing. Properly TAG machine is not operational. (remove start key)**

Extreme care shall be taken during maintenance work.



290F0FW05

39) RCV LEVER (item 58)

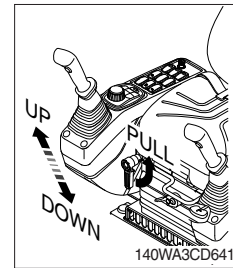
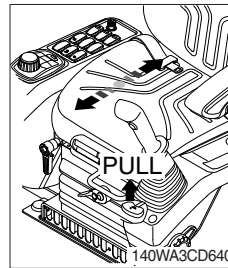
This label is positioned on the right side window of inside the cab.

- ※ **When moving seat forward, interference is possible between cluster and RCV lever. To prevent such interference, follow the procedure below.**

- (1) Rotate cluster.
- (2) Adjust the seat position using the seat height adjustment lever (grey lever which is front center of seat).
- (3) Lower the console height using knob between RH console and seat cushion.
- (4) Push back console and seat at the same time by using console adjust knob which is located between the LH console and lower seat cushion.



290F0FW04

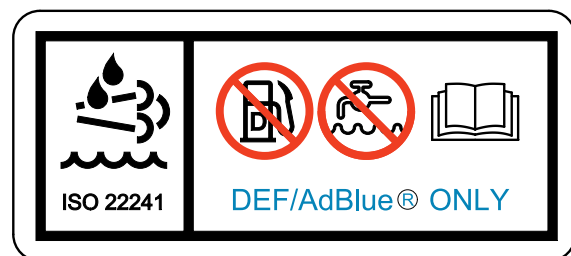


40) DIESEL EXHAUST FLUID (item 59)

This label is positioned on the front side of the urea tank box.

- ※ **Fill only with DEF/AdBlue® (Diesel Exhaust Fluid, standardised as IS 2241). Aqueous urea solution made with 32.5% high-purity urea and 67.5% deionized water.**

- ※ **Do not fill with diesel fuel.**

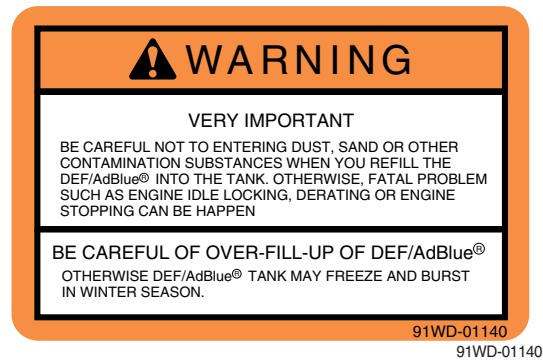


290F0SL04

41) DEF/AdBlue® TANK (item 60)

This label is positioned on the front side of the urea tank box.

- ▲ **Be careful not to entering dust, sand or other contamination substances when you refill the DEF/AdBlue® into the tank. Otherwise, fatal problem such as engine idle locking, derating or engine stopping can be happen.**
- ※ **Do not pour DEF/AdBlue® overfull. Otherwise DEF/AdBlue® tank may freeze and burst in winter season.**
- ※ **Fill the tank with DEF/AdBlue® after key on and then turn off the start key.**

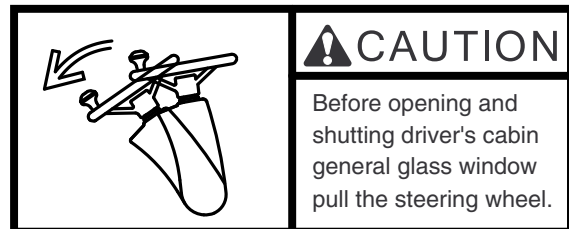


91WD-01140

42) SLIDING CAUTION (item 61)

This label is positioned on the front window of inside the cab.

- ※ **Before opening and general glass window shutting driver's cab pull the steering wheel.**



55W91FW04A

43) REFLECTING (item 62)

This label is positioned on the LH and RH side of the arm.

- ▲ **To prevent serious personal injury or death keep clear of attachment working area.**
- ▲ **Do not deface or remove this label from the machine.**

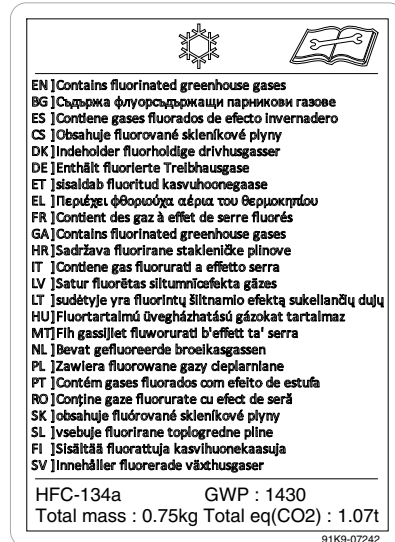


91K4-07010

44) REFRIGERANT (item 63)

This label is positioned on the top side of the radiator support.

- ⚠ **Inhalation of A/C refrigerant gas in any form can result in serious injury or death.**
- ✳ **Refer to page 4-65.**

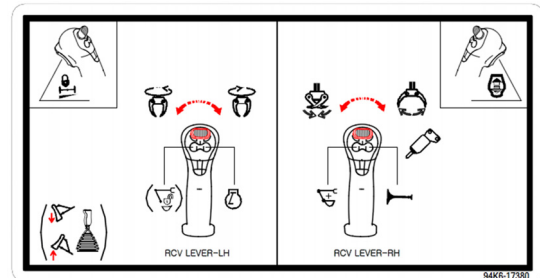


91K9-07242

45) CONTROL RCV (item 64)

This label is positioned on the right side window of inside the cab.

- ✳ **Read and understand the operation of the RCV lever.**

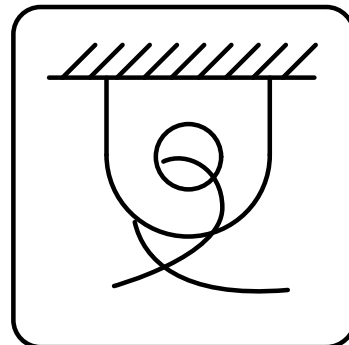


94K6-17380

46) TIE (item 67)

This label is positioned on the right and left side of the front and rear dozer blade and top both side of the rear dozer blade.

- ⚠ **In order to tie down the machine, attach the tie-downs to the tying points.**



4507A0FW02

47) LEFTOVER FUEL (item 68)

This label is positioned right side of the hydraulic tank.

- ⚠ **Do not fuel a machine near open flames or sparks. Failure to comply may result in serious injury or death.**
- ⚠ **Properly clean areas of spillage.**



91K4-02700

48) MIDDLE LEVER (item 71)

This warning label is positioned on the front side of the seat base.

- ⚠ **When you use ratchet to adjust console box, it is possible to take place interference with lever or bellows at specific position. Handle with care to avoid interference.**



93K8-05110

49) BEACON LAMP (item 74)

This warning label is positioned on the rear top side of the cab.

- ⚠ **Keep the beacon lamp straight up condition.**



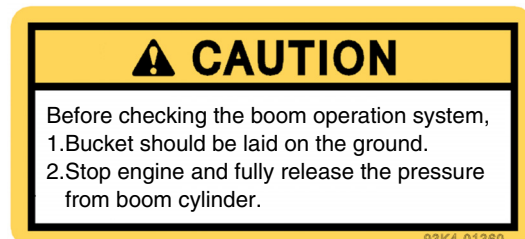
91Q4-13301

50) RIDE CONTROL (item 75)

This label is positioned on the front side of upper frame.

- ⚠ **Before checking the boom operation system.**

- (1) Bucket should be laid on the ground.
- (2) Stop engine and fully release the pressure from boom cylinder.



91Q4-13320

51) CUMMINS (item 76)

This label is located on the left rear stay of the cabin outside.

- ※ This machine is powered by Cummins.

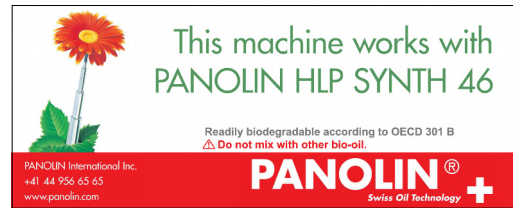


93WD-01500

52) BIO OIL (item 77)

This label is positioned on the RH side door.

- ※ This machine works with PANOLIN HLP SYNTH 46.
- ※ Readily biodegradable according to OECD 301 B.
- ▲ Do not mix with other bio-oil.



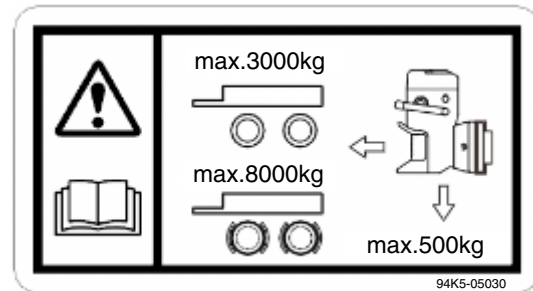
91WD-99110

53) TRAILER HITCH (item 78)

This label is positioned on the top side of the dozer blade cover.

- Max vertical hitch load : 500 kg (1102 lb)
- Max trailer mass : 3000 kg (6614 lb) (without brakes on trailer)
- Max trailer mass : 8000 kg (17637 lb) (with brakes on trailer)

- ※ Please refer to the page 2-20 for details.



94K5-05030

54) LIFT AND TIE (item 79)

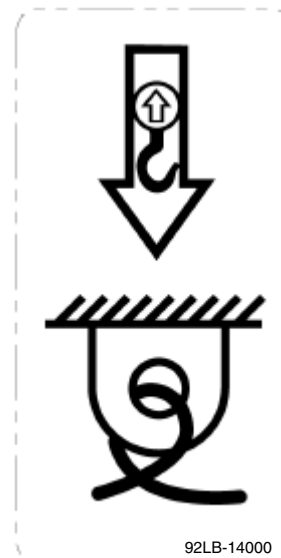
This label is positioned on the top side of the upper frame.

-Lifting point

In order to lift the machine, attach the lifting devices to the lifting points.

-Tying point

In order to tie down the machine, attach the tie-downs to the tying points.



92LB-14000

55) FUSE CAUTION (item 80)

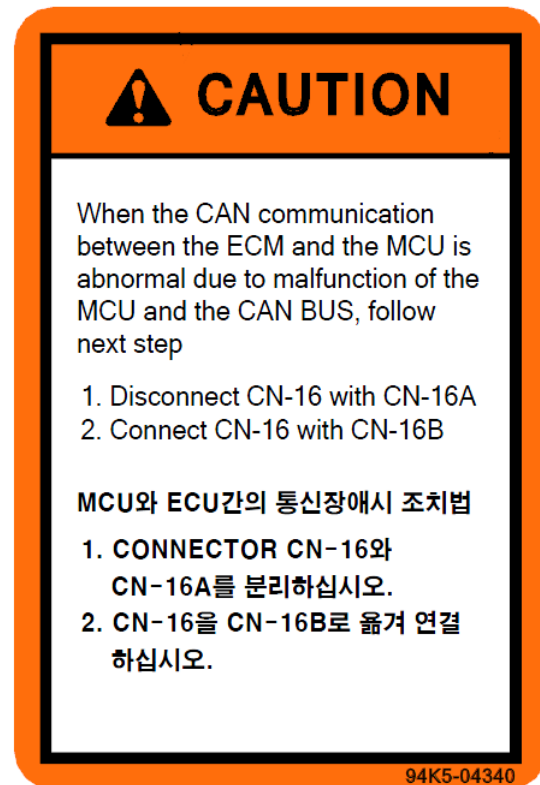
This label is positioned on the electric box cover.

- ※ When the CAN communication between the ECU and the MCU is abnormal due to malfunction of the MCU and the CAN BUS, follow next step.

Disconnect CN-16 with CN-16A

Connect CN-16 with CN-16B

- ※ See page 3-93 for details.

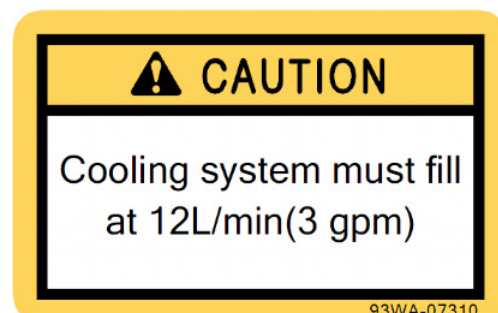


94K5-04340

56) SURGE TANK (item 81)

This label is positioned on the top side of the radiator support.

- ※ The cooling system has a maximum fill rate of 12 liters (3.2 U.S. gallons) per minute. Do not exceed this fill rate.
- ※ The cooling system must be filled slowly to prevent air locks.



93WA-07310

57) LIFTING EYE (item 10)

This label is positioned on the left and right upper sides of the counterweight and both side of the outrigger.

- ▲ Do not lift the machine by using lifting eyes on the counterweight or the lifting eyes may be subject to break causing serious injury or death.
- ※ See page 5-9 for proper lifting method of the machine.



91K4-04411

Visibility

Before you start the machine, perform a walk-around inspection in order to ensure that there are no hazards around the machine.

While the machine is in operation, constantly survey the area around the machine in order to identify potential hazards as hazards become visible around the machine.

Your machine may be equipped with visual aids. Some examples of visual aids are CCTV (Closed Circuit Television), AAVM (Advanced Around View Monitoring) and mirrors. Before operating the machine, ensure that the visual aids are in proper working condition and that the visual aids are clean.

If may not be possible to provide direct visibility on large machines to all areas around the machine, appropriate job site organization is required in order to minimize hazards that are caused by restricted visibility. Job site organization is a collection of policies and procedures that coordinates machines and people that work together in the same area.

Examples of job site organization include the following:

- Safety instructions
- Controlled patterns of machine movement and vehicle movement
- Workers that direct traffic to move when it is safe
- Restricted areas
- Operator training
- Warning symbols or warning signs on machines or on vehicles
- A system of communication
- Communication between workers and operators prior to approaching the machine

Modifications of the machine configuration by the user could result in a restriction of the machine visibility. In this case, a new risk assessment must be performed according to ISO 5006:2017.

1. INSTRUCTION FOR NEW MACHINE

- 1) It takes about 100 operation hours to enhance its designed performance.
- 2) Operate according to the 3 steps below and avoid excessive operation for the initial hours.

Service meter	Load
Until 10 hours	About 60 %
Until 100 hours	About 80 %
After 100 hours	100 %

※ **Excessive operation may deteriorate the performance of the machine and shorten the life of the machine.**

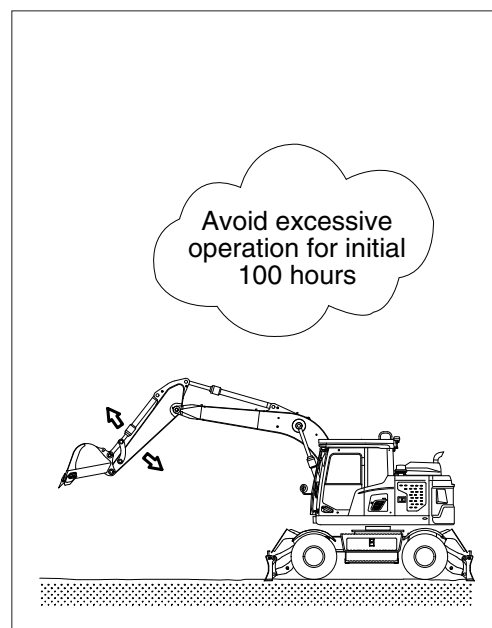
3) Be careful during the initial 100 hours operation

- (1) Check daily for the level and leakage of fluids.
- (2) Check greasing points on a regular basis and grease all points as needed. Refer to greasing chart located on the machine.
- (3) Check over all hose connections, bolts, nuts and screws, on a daily basis.
- (4) Warm up the machine fully before operating.
- (5) Check all gauges occasionally during the operation.
- (6) Check if the machine is operating normally during operation of the machine.
- (7) Automatic exhaust system cleaning may be performed up to 4 times for 30 minutes each.

※ **Refer to Page 2-35 for detail information of exhaust system cleaning.**

4) After the initial 250 or 500 hours of operation replace the following:

Checking items	Hours
Engine oil	250
Engine oil filter	
Fuel filter element	
Fuel pre-filter element	
Transmission oil	
Hydraulic oil return filter	
Drain filter	
Pilot line filter element	
Pressure filter element (clean)	500
Axle gear oil	

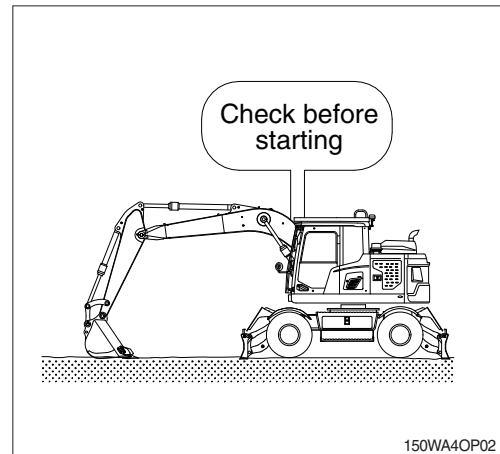


150WA4OP01

2. CHECK BEFORE STARTING THE ENGINE

- 1) Look around and under the machine to check:
 - Check for loose nuts, bolts or wiring
 - Collection of dirt
 - Collection of dust at places which reach high temperature
 - Leakage of oil, fuel or coolant
 - Condition of the work equipment and hydraulic system.

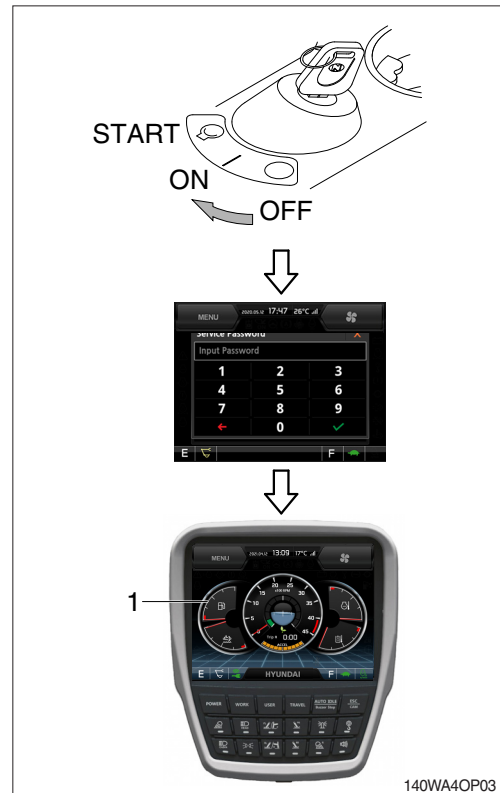
※ Refer to section, Maintenance check list in chapter 4.
- 2) After checking air pressure of tire, make sure that around the machine is clear.
- 3) Adjust operator seat to best fit the operator.
- 4) Adjust all mirrors to best fit the operator.



3. STARTING AND STOPPING THE ENGINE

1) CHECK INDICATOR LIGHTS

- (1) Confirm all operating levers are in the neutral position.
- (2) Turn the starting switch to the ON position.
Buzzer will sound for 4 seconds with HYUNDAI logo on cluster.
 - ※ If the ESL mode is set to enable mode, enter the password to start engine.
 - ※ If the incorrect password is entered a total of 5 times, you must wait 30 minutes before trying again.
 - ※ Refer to page 3-35 for ESL mode.
- (3) After initialization of cluster, the operating screen is displayed on LCD (1).
Also, self-diagnostic function is carried out.



2) STARTING ENGINE IN NORMAL

- ▲ Check if any obstacles or people are in the working area. Sound the horn to warn anyone in the vicinity that you are starting the engine.
- (1) Turn the multimodal dial to low idle position.
 - (2) Turn the starting switch to START position to start the engine.
 - △ Do not hold the starting switch in the START position for longer than 20 seconds. The start system may be seriously damaged.
 - ※ If the engine does not start, allow the stator to cool for about 2 minutes before re-attempting to start the engine again.
 - (3) Release the starting switch instantly after the engine starts to avoid possible damage to the starting motor.



3) STARTING ENGINE IN COLD WEATHER

※ By following below steps, you will be able to improve startability and fuel consumption in cold weather.

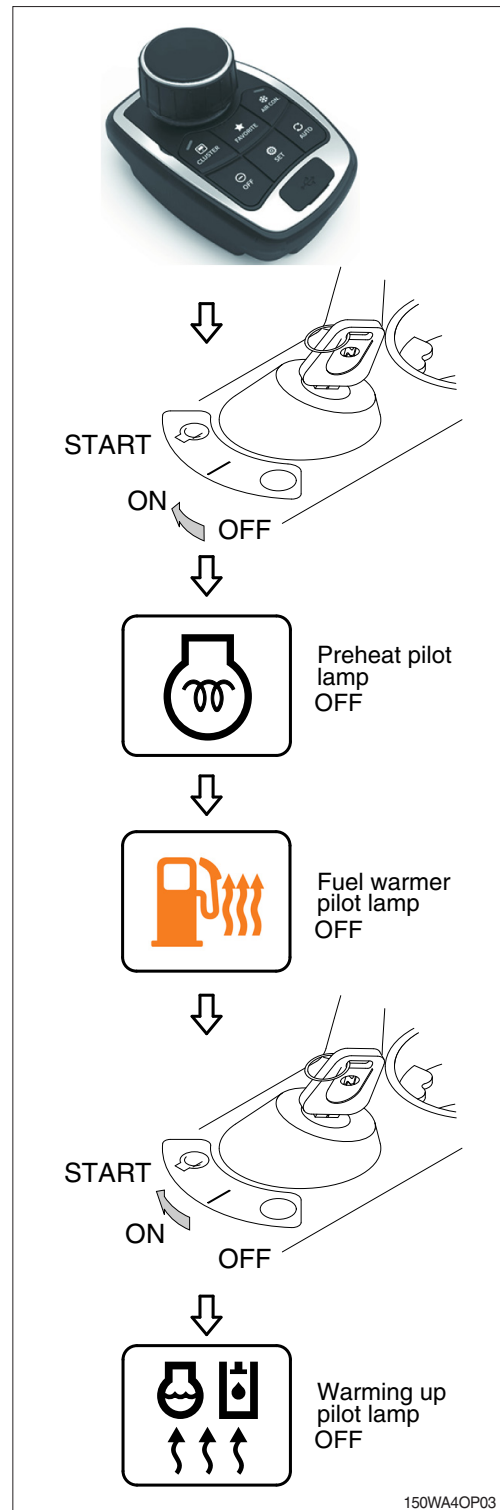
▲ Always check for obstacles in the area and sound horn before starting the engine.

※ Check engine oil and fuel and replace as necessary. See page 7-29.

※ Top off coolant as needed.

※ When you turn ON starting switch, the fuel warmer automatically heats the fuel as needed by sensing coolant temperature.

- (1) Confirm all levers are in the neutral position.
 - (2) Turn the multimodal dial to low idle position.
 - (3) Turn the starting switch to the ON position, and wait 1~2 minutes. More time might be required, it depends on the ambient temperature.
 - (4) Wait for five minutes to warm up the engine after the preheating pilot lamp turns off, and then turn the starting switch to the START position to start the engine.
- ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (5) Release the starting switch immediately after starting engine.
 - (6) If the temperature of the coolant is lower than 30 °C (86 °F) the warming up process automatically starts.
- ※ Do not operate the working devices, or change the operation mode during the warming up.



4) INSPECTION AFTER ENGINE START

Inspect and confirm the following after engine starts.

- (1) Is the oil level gauge of hydraulic tank in the normal operation range?
- (2) Is there any leakage of oil or water?
- (3) Are any warning lamps ON?
The seat belt reminder warning lamp (1) pops up and the buzzer sounds until seat belt is fastened.
- (4) Are indicators for coolant temperature gauge (2) and hydraulic temperature gauge (3) in the normal operating range?
- (5) Is the engine sound and the color of exhaust gas normal?
- (6) Are the sound and vibration normal?

△ **Do not increase engine speed quickly after starting, it can damage engine or turbocharger.**

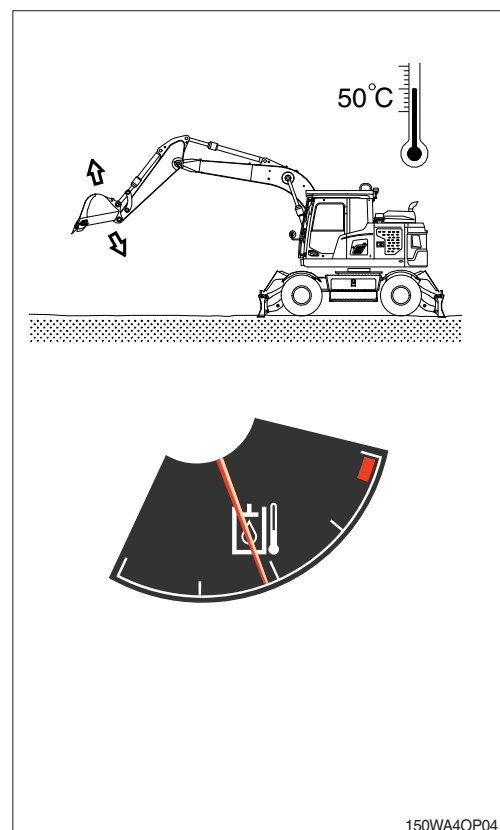
※ **If there are problems in the cluster, stop the engine immediately and correct problems as required.**

5) WARMING-UP OPERATION

※ **The most suitable temperature for the hydraulic oil is about 50°C (122°F).**

△ **If the hydraulic oil temperature drops below 25°C (77°F), sudden operation can damage the hydraulic system. So temperature must be raised to at least 25°C (77°F) before starting work.**

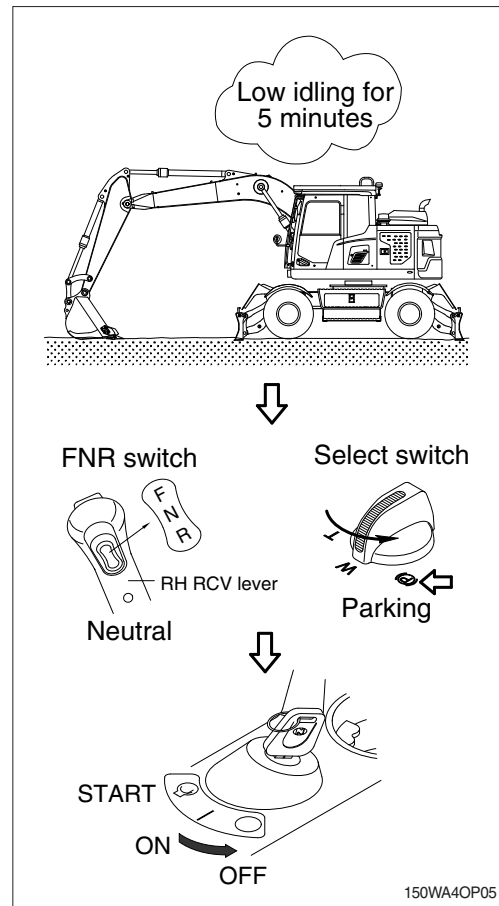
- (1) Run the engine at low idle speed for 5 minutes.
- (2) Speed up the engine by multimodal dial and run the engine at mid-range speed.
- (3) Operate bucket lever for 5 minutes.
※ **Do not operate anything except bucket lever.**
- (4) Run the engine at high speed and operate the bucket lever and arm lever for 5-10 minutes.
※ **Operate only the bucket lever and arm lever.**
- (5) Finally this warming-up process will be completed by operating all cylinders several times along with the operation of swing and traveling.
※ **Increase the time for warming-up during winter.**



6) TO STOP THE ENGINE

- ※ If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine apart from an emergency.
- ※ In particular, if the engine has overheated, do not abruptly stop it but run it at low speed to allow it to cool gradually, then stop the engine.

- (1) Place the FNR switch on the RH RCV lever in the neutral.
- (2) Lower the bucket, outrigger and dozer blade to the ground then put all the levers in the neutral position.
- (3) Put the select switch in the parking position.
- (4) Run the engine at low idle for about 5 minutes.
- (5) Return the key of starting switch to the OFF position.
- (6) Remove the key to prevent other people using the machine and LOCK the safety knob.
- (7) Lock the cab door.



4. MODE SELECTION SYSTEM

1) STRUCTURE OF MECHATRONICS SYSTEM

CAPO, Computer Aided Power Optimization system, is the name of mode selection system developed by HD Hyundai Construction Equipment.

※ Please refer to chapter 3, cluster for below modes setting.

(1) Power mode

Power mode designed for various work loads supports high performance and reduces fuel consumption.

- P mode : Heavy duty power
- S mode : Standard power
- E mode : Economy power

(2) Work mode

One of the two work modes can be selected for the optimal work condition of the machine operation.

① General work mode (bucket)

When key switch is turned ON, this mode is selected automatically.

② Option work mode

- Breaker, crusher

It controls the pump flow and system pressure for the optimal operation of breaker or crusher.



- 1 Power mode switch
- 2 Work mode switch
- 3 User mode switch
- 4 Travel mode switch
- 5 Auto idle mode switch
- 6 LCD

(3) User mode

- ① User mode is useful for setting the user preferable power quickly.
(engine speed, power shift and idle speed)

- ② There are two methods for use of user mode.

a. In operation screen

User mode switch is used to memorize the current machine operating status and activate the memorized user mode.

Refer to page 3-21.

b. In menu

Engine high idle rpm, auto idle rpm and pump torque (power shift) can be modulated and memorized separately in menu status.

- Each memory mode has a initial setting which is mid-range of max engine speed, power shift and auto idle speed.

- High idle rpm, auto idle rpm, power shift and pump flow can be adjusted and memorized in the U-mode.

※ Refer to the page 3-27 for setting the user mode (available on U mode only).





140WA4OP06



140WA4OP07A

(4) Travel mode

-  : Low speed traveling.
-  : High speed traveling.

(5) Auto idle mode

- Pilot lamp ON : Auto idle function is activated.
- Pilot lamp OFF : Auto idle function is canceled.

(6) Monitoring system

Information of machine performance as monitored by the MCU can be displayed on the LCD. Refer to page 3-32.

(7) Self diagnostic system

① MCU (Machine Control Unit)

The MCU diagnoses machine status and problems and displays fault code in the cluster (fault code detected by MCU is composed of HCESPN and FMI).

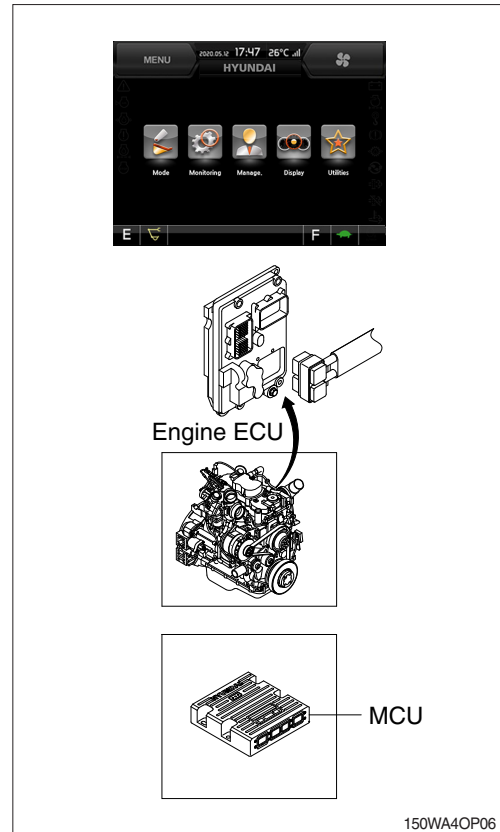
② Engine ECU (Electronic Control Unit)

If the engine or relevant system has problem, engine ECU detects and displays on the LCD as fault codes (this code is composed of SPN and FMI).

※ Refer to page 3-31 for LCD display.

(8) Anti-restart system

The system protects the starter from inadvertent restarting after the engine is already operational.



2) HOW TO OPERATE MODE SELECTION SYSTEM

(1) When start key switch is turned ON

- ① When start key switch is turned on, the cluster turns on and buzzer sounds for 4 seconds. Information including gauges and engine speed will be displayed on the LCD.
- ② Initial default mode settings are displayed in the cluster.

Mode		Status
Power mode	E	ON
Work mode		ON
Travel mode	Low (ON
Auto idle		ON

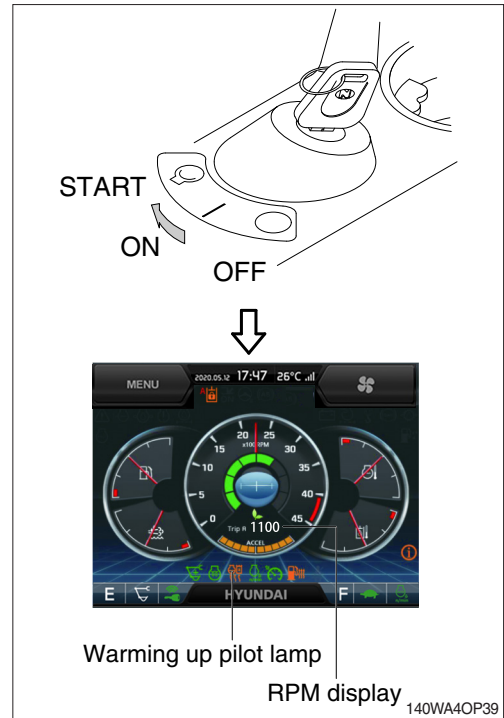
※ These setting can be changed at U mode.

- ③ Self-diagnostic function can be carried out from this point.



(2) After engine start

- ① When the engine is started, rpm display indicates low idle speed.
 - Low idle (safety knob unlock) : 1100 rpm
 - Low idle (safety knob lock) : 1000 rpm
- ② If coolant temperature is below 30°C, the warming up pilot lamp lights up. After 4 seconds the engine speed increases to 1200 rpm automatically to warm up the machine.
 - After 2-3 minutes, you can select any mode depending on job requirement.



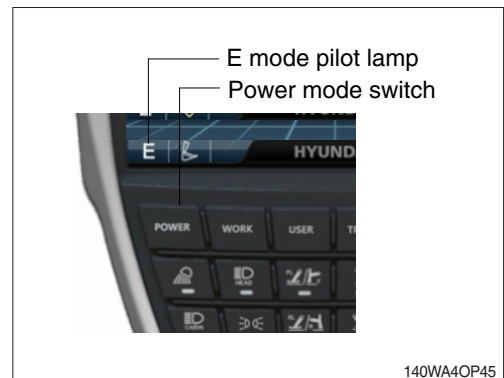
3) SELECTION OF POWER MODE

(1) E mode

The multimodal dial is set to 10 and the auto idle mode is canceled.

Engine rpm	Effect
1450	Variable power control in proportion to lever stroke (improvement in fuel efficiency) ※ Same power as S mode in full lever operation.

- ※ When the multimodal dial is located below 9 the engine speed decreases about 50~100 rpm per dial set.



(2) S mode

The multimodal dial is set to 10 and the auto idle mode is canceled.

Engine rpm	Effect
1500	Standard power

- ※ When the multimodal dial is located below 9 the engine speed decreases about 50~100 rpm per dial set.

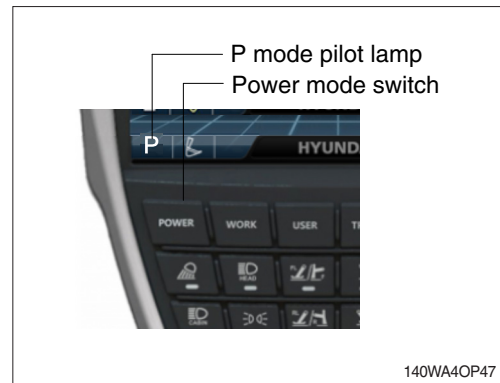


(3) P mode

The multimodal dial is set to 10 and the auto idle mode is canceled.

Engine rpm	Effect
1600	Approximately 120 % of power and speed available than S mode.

※ When the multimodal dial is located below 9 the engine speed decreases about 50~100 rpm per dial set.

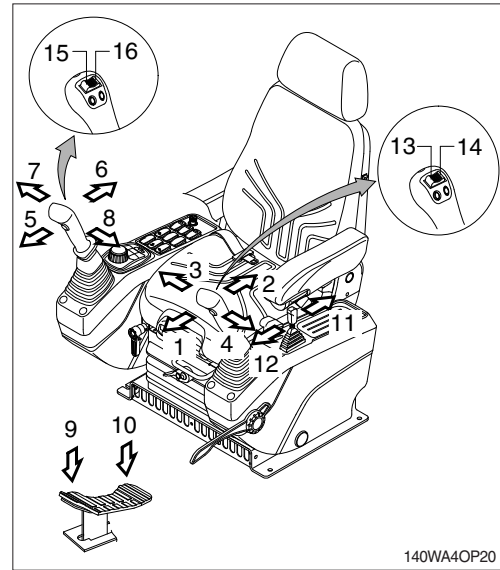


5. OPERATION OF THE WORKING DEVICE

※ **Confirm the operation of control lever and working device.**

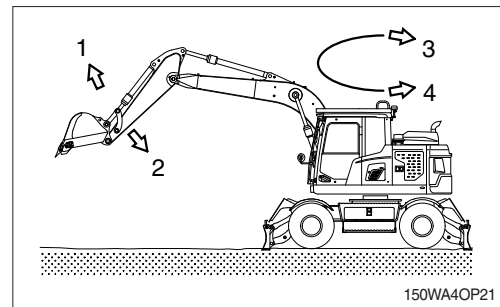
- 1) Left control lever controls arm and swing.
- 2) Right control lever controls boom and bucket.
- 3) When you release the control lever, control lever returns to neutral position automatically.

※ **When operating swing, consider the swing distance by inertia.**



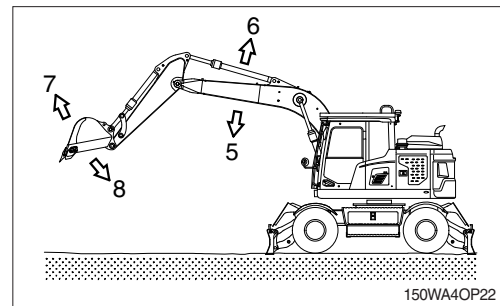
※ **Left control lever**

- 1 Arm roll-out
- 2 Arm roll-in
- 3 Swing right
- 4 Swing left



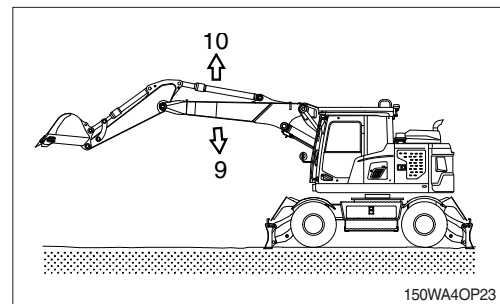
※ **Right control lever**

- 5 Boom (or 1st boom) lower
- 6 Boom (or 1st boom) raise
- 7 Bucket roll-out
- 8 Bucket roll-in



※ **Single pedal (option)**

- 9 2nd boom lower
- 10 2nd boom raise

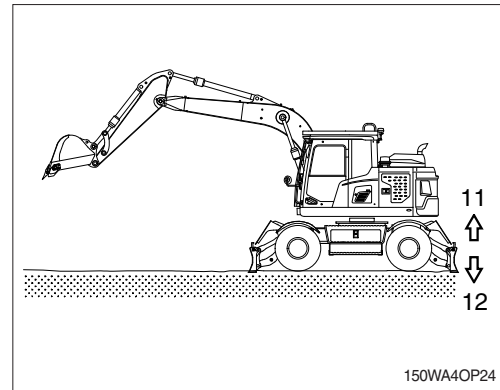


※ Confirm the operation of control lever and working device.

※ Dozer and outrigger control lever

11 Dozer blade (outrigger) up

12 Dozer blade (outrigger) down



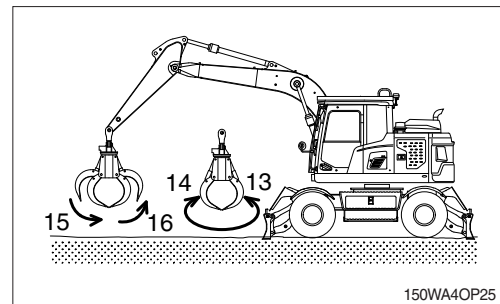
※ Crusher, ripper and grapple control switch

13 Counterclockwise rotate

14 Clockwise rotate

15 Close

16 Open



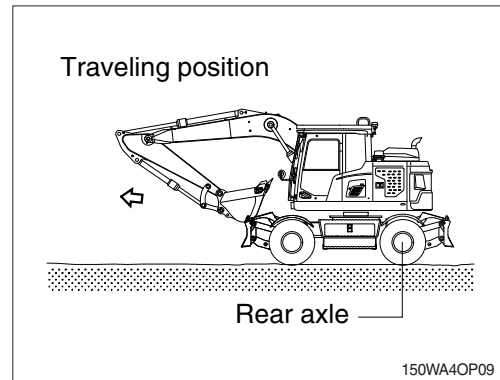
6. TRAVELING OF THE MACHINE

1) BASIC OPERATION

(1) Traveling position

The dozer is in the up and rear axle is in the rear and the working device is forward.

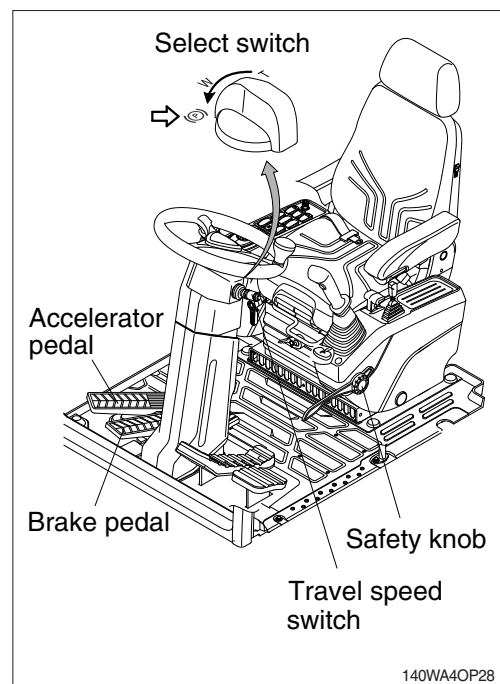
- ▲ **Travel directions will be reversed if lower structure is positioned with dozer in front.**



(2) Traveling operation

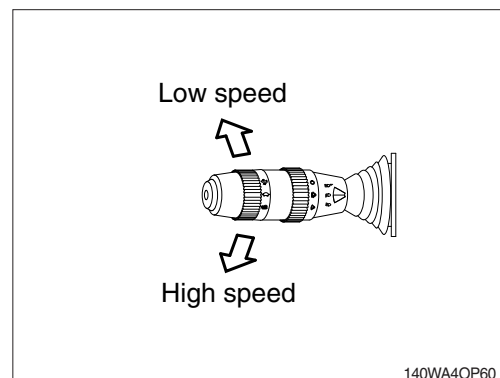
When warm-up operation is completed after the engine is started, move the machine according to the following procedure.

- ① Put the swing lock switch to lock position.
 - ② Set the safety knob to the UNLOCK position.
 - ③ Put the select switch in the traveling position.
 - ④ Lift up the dozer blade or outrigger.
 - ⑤ Select traveling direction.
 - ⑥ Place the travel speed switch in low speed.
 - ⑦ Press gently the accelerator pedal to move the machine.
- ※ **When speed up on a slope, a noise for valve of travel motor may occur. It is not out of order in machine but peculiar sound.**
 - ※ **Be sure that the brake works normally on the safe place before fast traveling.**



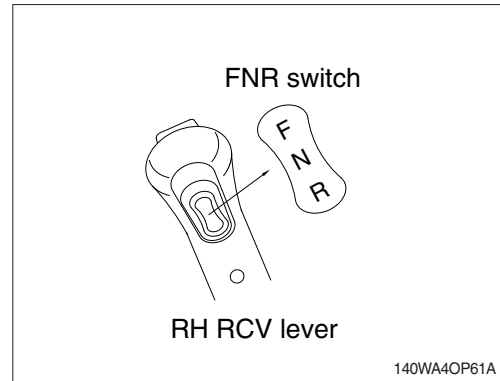
(3) Changing speed

If you want to change the speed, select the travel speed switch desired position.



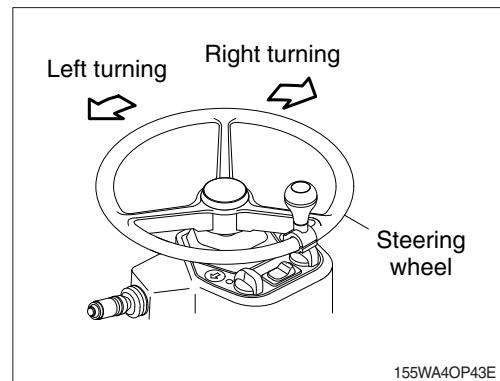
(4) Changing direction (forward/reverse)

- ① Be sure to stop the machine when changing the direction forward or backward while traveling.
 - ② Put the FNR switch on the RH RCV lever in the desired position to change direction.
- ※ **When changing direction, check beforehand there is no obstacle in the direction you will be headed.**
 - ※ **It could be cause of machine failure to change the direction forward or backward while traveling.**



(5) Turning the machine

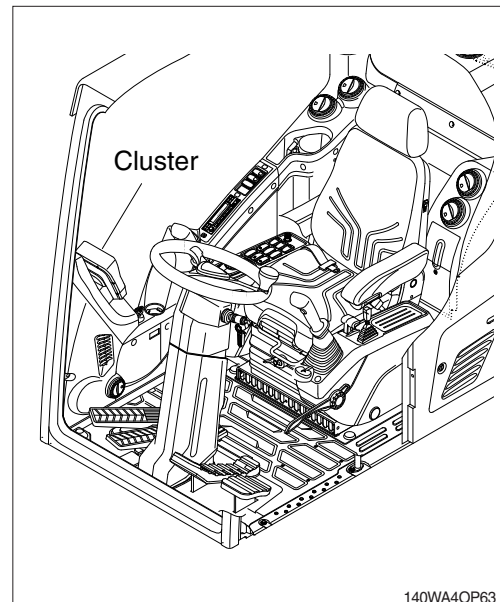
- ① Turn the machine by moving the steering wheel into the desired direction.
 - ② You can turn the machine to the left or right.
- ※ **Do not turn the machine abruptly when traveling at high speed and avoid turn on a slope.**
- ▲ **Steering does not function with engine OFF.**



(6) Precautions when driving

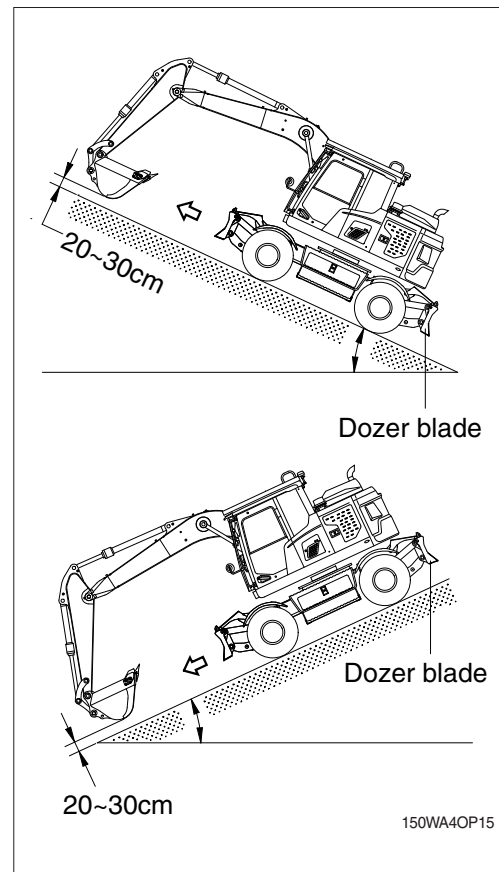
The operators must be familiar with the following precautions including general safety hints.

- ① If the warning lamp lights up on the cluster, stop the machine immediately and check carefully whether the relevant parts are out of order or not.
- ② Do not allow the engine to run at overload.
- ③ Stop the engine and check as soon as finding out abnormal noise or smell.
- ④ Check the pilot lamp on the cluster frequently.
- ⑤ Do not allow passengers or riders on the machine while it is running or in operation.
- ⑥ Never get on or off the machine while it is moving.



2) TRAVELING ON A SLOPE

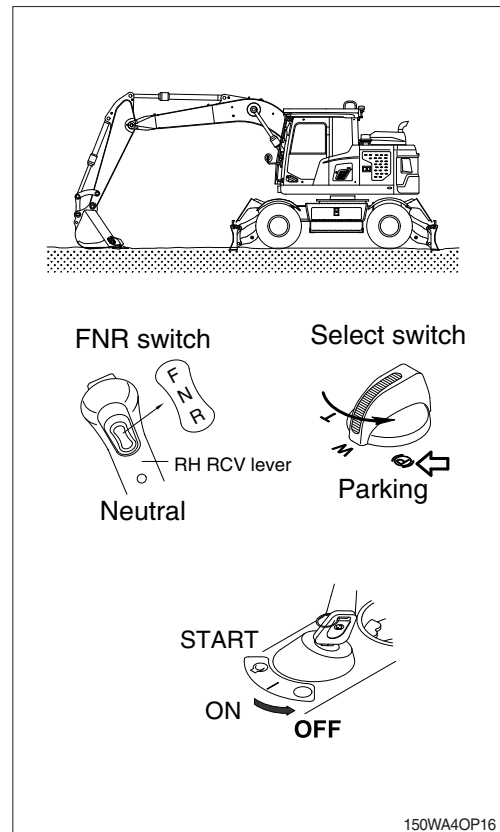
- (1) Never travel down a slope in neutral.
 - (2) Maintain the bucket 20 to 30cm (1ft) from the ground so that it can be used as a brake in the event of an emergency.
 - (3) If the machine starts to slide or loses stability, lower the bucket immediately as it will help slow or stop the machine.
 - (4) When parking on a slope, use the bucket as a brake and place blocks behind the tires to prevent sliding.
- ※ Machine can not travel effectively on a slope when the oil temperature is low. Do the warming-up operation when it is going to travel on a slope. Serious injury or death could occur.
 - ※ Be careful when working on slopes. It may cause the machine to lose its balance and turn over.
- ▲ Be sure to keep the travel speed switch on the LOW (turtle mark) while traveling on a slope.
- ▲ Be sure to keep the swing lock switch on the LOCK while traveling on a slope.



3) PARKING THE MACHINE

To park the machine, keep the steps below.

- (1) Release the accelerator pedal slowly.
 - (2) Depress the brake pedal.
 - (3) Place the FNR switch on the RH RCV lever in the neutral.
 - (4) Put the select switch in the parking position and release the brake pedal.
 - (5) Lower the bucket, outrigger and dozer blade to the ground.
 - (6) Stop the engine, place the start key switch in the OFF and remove the key.
 - (7) Turn the safety knob to the LOCK position.
 - (8) Put the swing lock switch to the lock position and lock the cab door.
- ※ **Whenever parking on a slope, always block the tires after lowering the bucket to the ground.**
 - ※ **Contain the outrigger lock pin in the tool box to avoid loss.**



4) TOWING THE MACHINE

Except for an emergency, do not tow this machine. If it is inevitable to tow this machine, observe the following.

(1) General

- ① Parking brake cylinder of the machine is operated by the spring force and released by hydraulic pressure.
If the engine does not operate, the brake will be operated to stop the machine.
 - ② When the machine is towed move it for a repair to nearby place at the low speed.
Transport it on a trailer, if it has to be moved for a long distance.
 - ③ When the steering device and the brake of the machine to be towed can not be operated, transport by trailer.
- ▲ **Injury or death could result if a disabled machine is towed incorrectly.**
 - ▲ **If your machine is towed by another machine, ALWAYS use a wire rope with a sufficient towing capacity.**
 - ▲ **NEVER allow a disabled machine to be towed on a slope.**
 - ▲ **When connecting up a towing machine, do not let anyone enter the area between the towing machine and the equipment being towed.**
 - ▲ **Set the towing machine and the towing connection of the equipment being towed in a straight line when connecting it.**
 - ▲ **Never tow machine using a light-duty towing hook.**

(2) Towing the machine

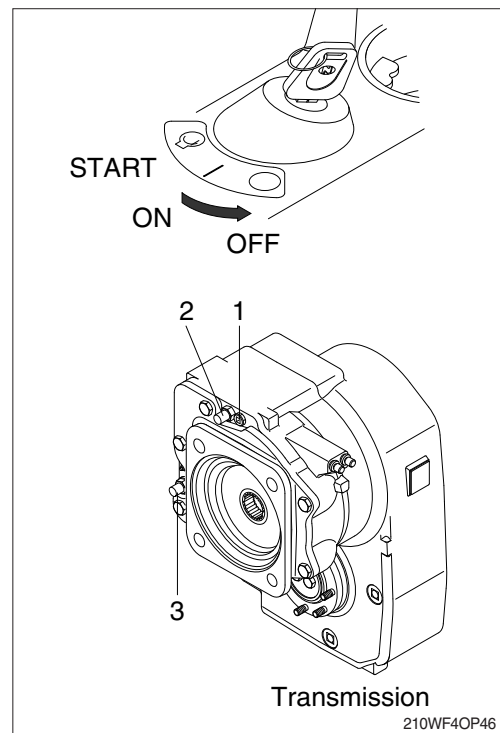
- ① The emergency device is to interrupt the power flow between input and output in case of control pressure failure or a travel motor defect and thus allows an emergency towing of the machine.
 - Towing speed : Max 10 km/h
 - Towing distance : Max 5 km
- ② Since there is no transmission lubrication, damages may occur due to lacking oil supply if the instructions are not observed. For a long distance it is best to have transported the defective machine on a trailer.

③ Activate the emergency device

- Turn the start key OFF position.
- Block the machine against rolling away.
- By means of a grease gun pump in the grease on the grease nipple (1) until it comes visibly out at the pressure relief valve (3) of the parking brake.

④ Deactivate the emergency device

- The bleeder (2) of the parking brake must be opened and then shift into the road speed (apply a control pressure of 30 to 35 bar at the connection of the brake).
- Then close the bleeder again.



5) TRAILER TOWING SOLUTION (OPTION)

(1) The trailer towing option is intended to be used for short transports of work side equipment with a trailer on the excavator. The trailer hitch for towing is attached on the blade and can be installed if needed and removed for normal machine operation.

(2) This section about trailer towing contains rules that must be followed in order to operate the machine safely with a trailer.

However, these rules are to be followed in conjunction with laws or other national regulations applicable in the area where the machine is operated.

▲ An open jaw of a trailer hitch could close unexpectedly and crush your fingers.

For all work on the trailer hitch the jaw must be closed.

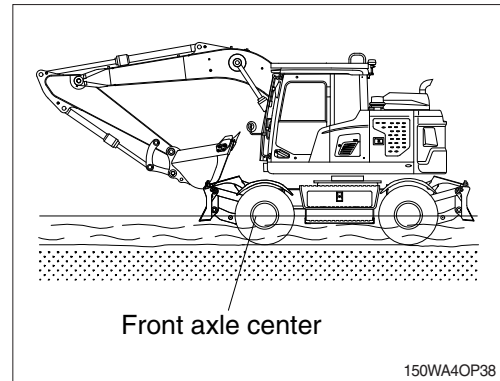
※ The maximum allowed axle loads by law can be below the maximum technical axle loads.

Item	Specification
D-value	60 kN (13489 lbf)
Max vertical hitch load	1000 kg (2205 lb)
Max trailer mass without brakes on trailer	3000 kg (6614 lb)
Max trailer mass with brakes on trailer	8000 kg (17637 lb)
Height hitch blade	500~770 mm (19.7~30.3 in)
Hydraulic max. pressure	350 bar (5076 psi)
Hydraulic connector	ISO 228-1 PF 1/2

6) PRECAUTIONS FOR OPERATION

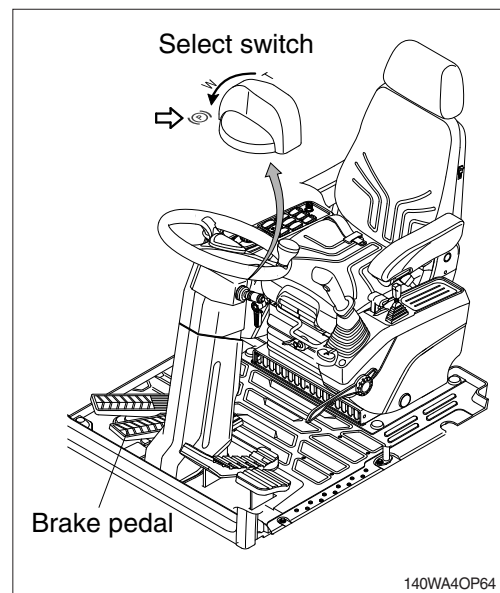
(1) Permissible water depth

- ① Do not immerse the machine in water by more than the permissible depth (axle center).
- ② For parts that have been immersed in water for a long time, pump in grease until the old grease comes out from the bearings.



(2) When the brake does not operate

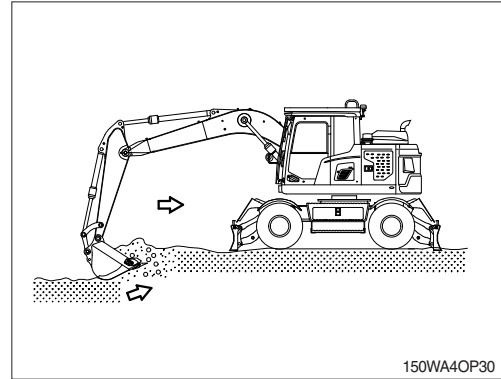
- ① If the machine does not stop even though the brake pedal is applied, put the parking position to activate the emergency brake by select switch.
- ※ After using the parking brake as an emergency brake, ask HD Hyundai Construction Equipment dealer to check complete brake system.
- ▲ Never use emergency brake, except when the service brake fails.



7. EFFICIENT WORKING METHOD

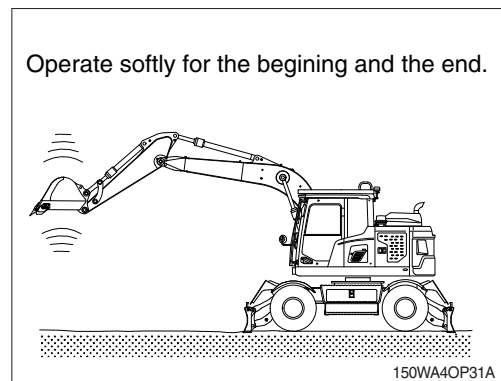
- 1) Do the digging work by arm.

Use the pulling force of arm for digging and use together with the digging force of the bucket if necessary.

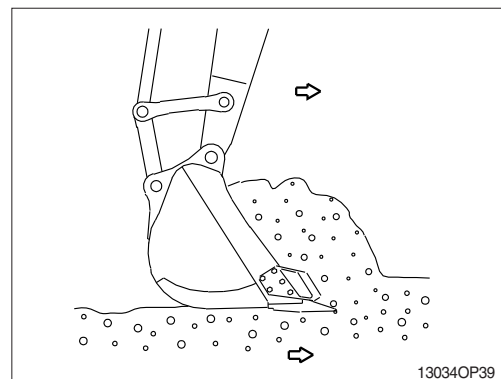


- 2) When lowering and raising the boom operate softly for the beginning and the end.

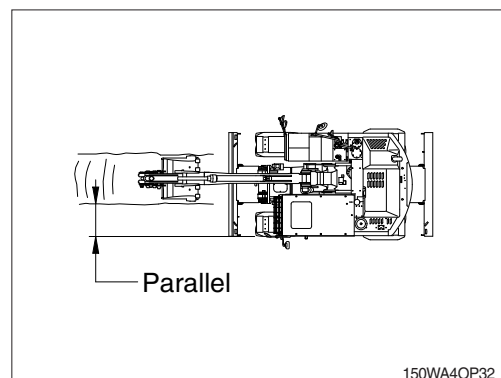
In particularly, sudden stops while lowering the boom may cause damage to the machine.



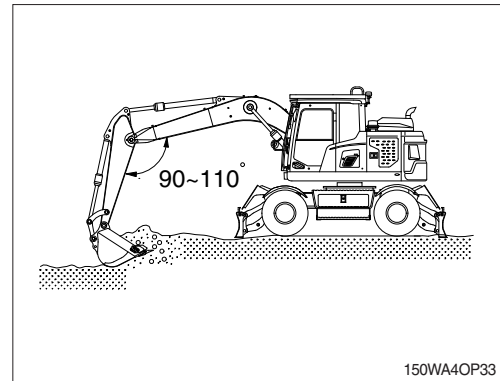
- 3) The digging resistance and wearing of tooth can be reduced by putting the end of bucket tooth to the digging direction.



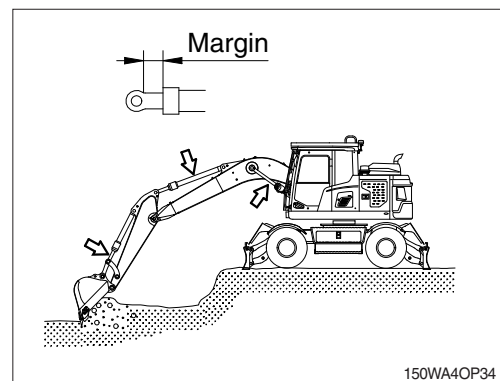
- 4) Set the wheels parallel to the line of the ditch to be excavated when digging ditch. Do not swing while digging.



- 5) Dig slowly while keeping the angle of boom and arm at a 90-110° when maximum digging force is required.

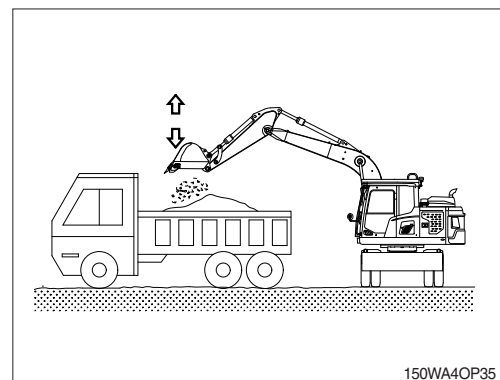


- 6) Leave a small margin of cylinder stroke to prevent damage of cylinder when working with the machine.

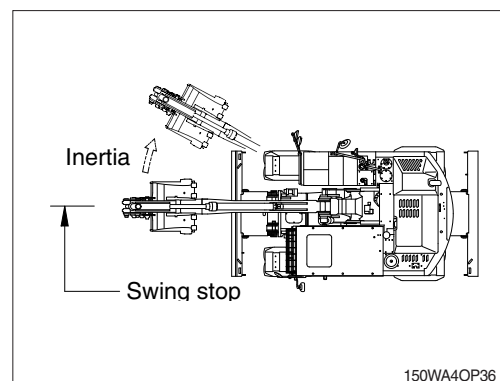


- 7) Keep the bucket to the dumping position and the arm horizontal when dumping the soil from the bucket.
Operate bucket lever 2 or 3 times when hard to dump.

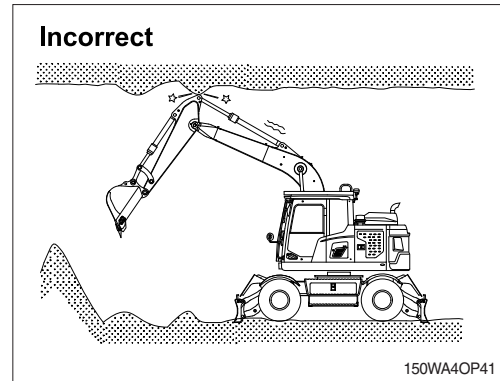
※ Do not use the impact of bucket tooth when dumping.



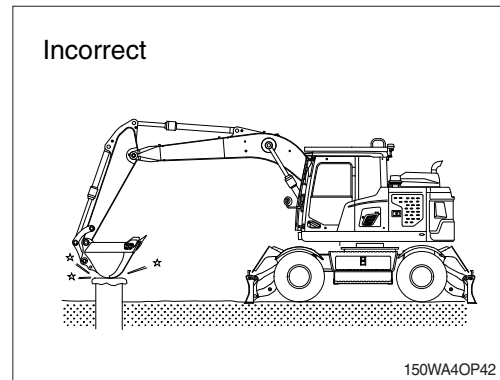
- 8) Operate stop of swing considering the swing slip distance is created by inertia after neutralizing the swing lever.



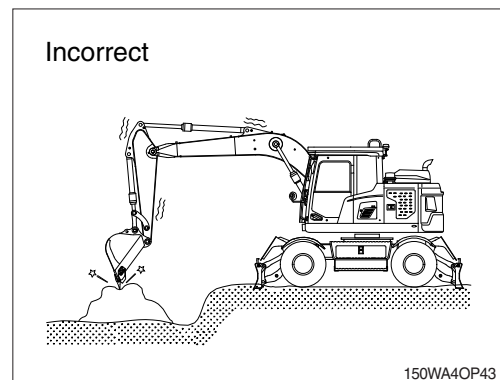
- 9) If the excavation is in an underground location or in a building, make sure that there is adequate overhead clearance and that there is adequate ventilation.



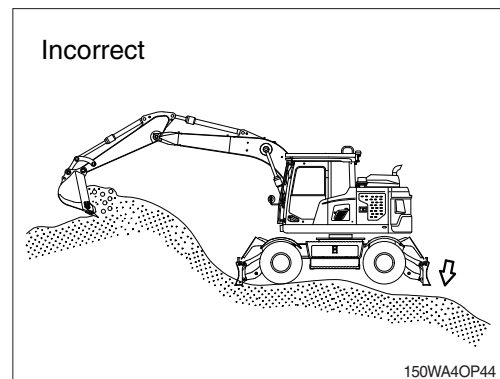
- 10) Do not use the dropping force of the work equipment for digging.
The machine can be damaged by the impact.



- 11) Do not use the bucket to crack hard objects like concrete or rocks.
This may break a tooth or pin, or bend boom.



- 12) Do not use the dropping force of the machine for digging.



13) NEVER CARRY OUT EXCESSIVE OPERATIONS

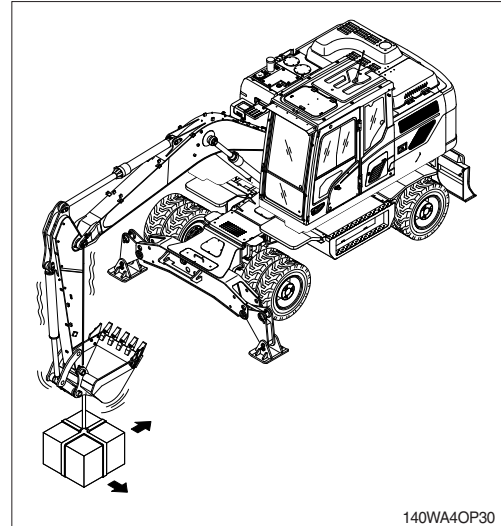
Operation exceeding machine performance may result in accident or failure causing serious injury or death.

Carry out lifting operation within specified load limit.

Never carry out operations which may damage the machine such as overload or over-impact-load.

Never travel while carrying a load.

If you need an overload warning device installed for object handling procedure, please contact your local HD Hyundai Construction Equipment distributor.



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14) BUCKET WITH HOOK

When carrying out lifting work, the special lifting hook is necessary.

The following operations are prohibited.

- Lifting loads with a wire rope fitted around the bucket teeth.
- Lifting loads with the wire rope wrapped directly around the boom or arm.

When performing lifting operation, securely hook the wire rope onto the special lifting hook.

When performing lifting operation, never raise or lower a person.

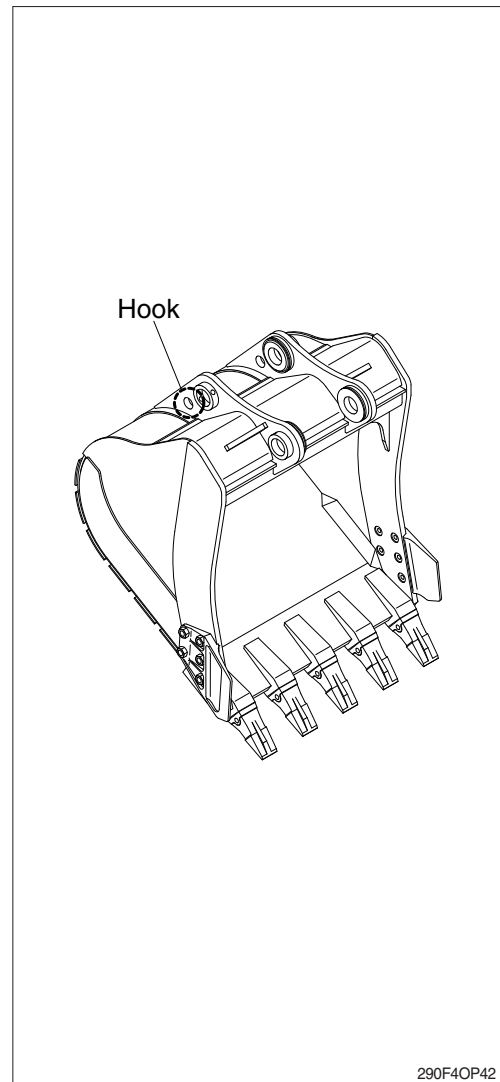
Due to the possible danger of the load falling or of collision with the load, no persons shall be allowed in the working area.

Before performing lifting operation, designate an operation supervisor.

Always execute operation according to their instructions.

- Execute operating methods and procedures under their direction.
- Select a person responsible for signaling.
Operate only on signals given by such person.

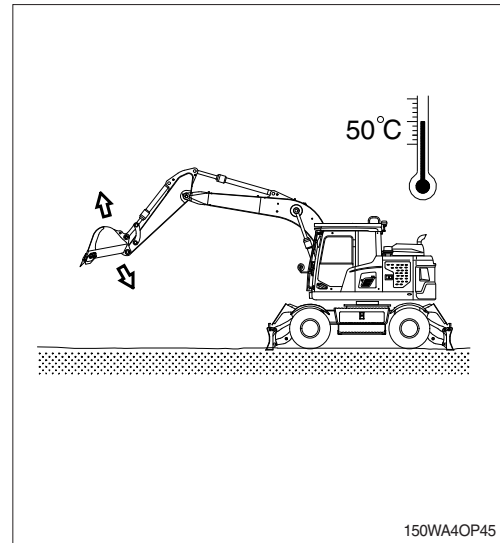
Never leave the operator's seat while lifting a load.



8. OPERATION IN THE SPECIAL WORK SITES

1) OPERATING THE MACHINE IN A COLD WEATHER

- (1) Use proper engine oil and fuel for the weather.
- (2) Fill the required amount of antifreeze in the coolant.
- (3) Refer to the starting engine in cold weather. Start the engine and extend the warming up operation.
- (4) Be sure to open the heater cock when using the heater.
- (5) Always keep the battery completely charged.
※ **Discharged batteries will freeze more easily than fully charged.**
- (6) Clean the machine and park on wood plates.



2) OPERATION IN SANDY OR DUSTY WORK SITES

- (1) Inspect air cleaner element frequently. Clean or replace element more frequently if warning lamp lights up and buzzer sounds simultaneously, regardless of inspection period.
※ **Replace the inner and outer element after 4 times of cleaning.**
- (2) Inspect radiator, oil cooler and condenser frequently, and keep cooling fins clean.
- (3) Prevent sand or dust from getting into fuel tank and hydraulic tank during refilling.
- (4) Prevent sand or dust from penetrating into hydraulic circuit by tightly closing breather cap of hydraulic oil tank. Replace hydraulic oil filter and air breather element frequently. Also, replace the fuel filter frequently.
- (5) Keep all lubricated parts, such as pins and bushings, clean at all times.
- (6) If the air conditioner and heater filters clog, the heating or cooling capacity will drop. Clean or replace the filter element more frequently.
- (7) Clean electrical components, especially the starting motor and alternator, to avoid accumulation of dust.

3) SEA SHORE OPERATION

- (1) Prevent ingress of salt by securely tightening plugs, cocks and bolts of each part.
- (2) Wash machine after operation to remove salt residue.
Pay special attention to electrical parts, hydraulic cylinders and drive shafts to prevent corrosion.
- (3) Inspection and lubrication must be carried out more frequently.
Supply sufficient grease to replace all old grease in bearings which have been submerged in water for a long time.

4) OPERATION IN MUD, WATER OR RAIN WORK SITES

- (1) Perform a walk around inspection to check for any loose fittings, obvious damage to the machine or any fluid leakage.
- (2) After completing operations, clean mud, rocks or debris from the machine. Inspect for damage, cracked welds or loosened parts.
- (3) Perform all daily lubrication and service.
- (4) If the operations were in salt water or other corrosive materials, make sure to flush the affected equipment with fresh water.

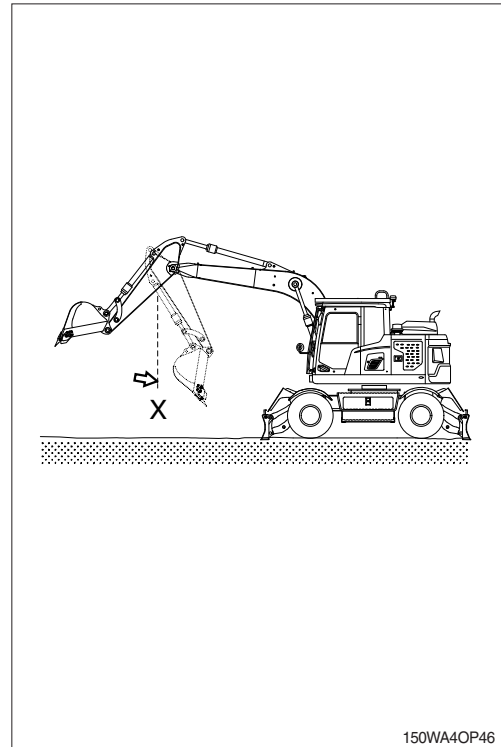
5) OPERATION IN ROCKY WORK SITES

- (1) Check for damage to the undercarriage and for looseness, flaws, wear and damage in bolts and nuts.
- (2) Do not turn the tire directly over the sharp edge rock.

9. NORMAL OPERATION OF EXCAVATOR

The following may occur during operation due to the nature of a hydraulic excavator.

- 1) When rolling in the arm, the roll-in movement stops momentarily at point X in the picture shown, then recovers speed again after passing point X. This is because movement by the arm weight is faster than the speed of oil flow into the cylinder.
- 2) When lowering the boom, you may hear continuous sound. This is caused by oil flow in the valve.
- 3) Overloaded movement will produce sound caused by the relief valves, which are for the protection of the hydraulic systems.
- 4) When the machine is swinging or stopped, a noise near the swing motor may be heard. The noise is generated when the brake valve relieves.



10. ATTACHMENT LOWERING (when engine is stopped)

1) On machines equipped with an accumulator, for a short time (within 1 minute) after the engine is stopped, the attachment will lower under its own weight when the attachment control lever is shifted to LOWER. This happens only when the starting switch is ON and the safety knob is in the UNLOCK position. After the engine is stopped, set the safety knob to the LOCK position.

⚠ Be sure no one is under or near the attachment before lowering the boom. Failure to comply could result in serious injury or death.

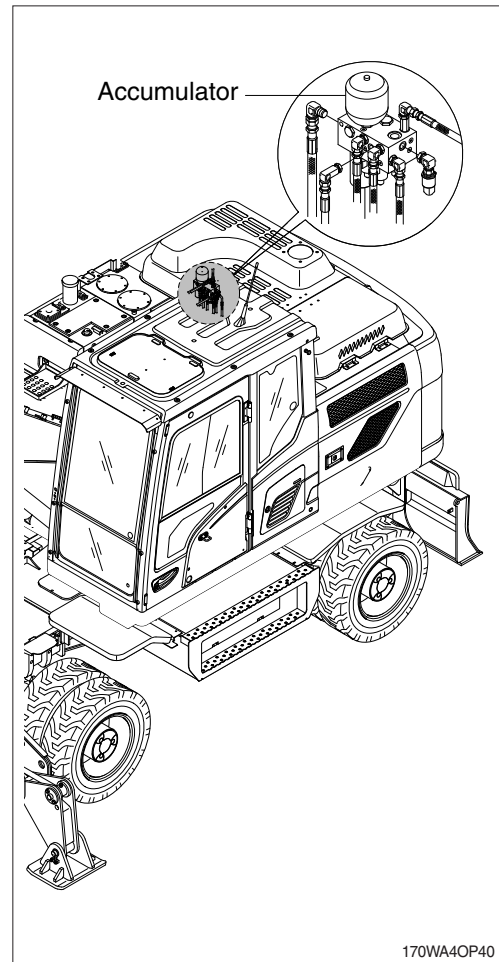
2) The accumulator is filled with high-pressure nitrogen gas, and it is extremely dangerous if it is handled in the wrong way. Always observe the following precautions.

⚠ Never make any hole in the accumulator, expose it to flames or fire.

⚠ Do not weld anything to the accumulator.

※ When carrying out disassembly or maintenance of the accumulator, or when disposing of the accumulator, it is necessary to release the gas from the accumulator.

A special air bleed valve is necessary for this operation, so please contact your HD Hyundai Construction Equipment distributor.



11. STORAGE

When storing the machine for longer than 1 month, follow these procedures:

1) BEFORE STORAGE

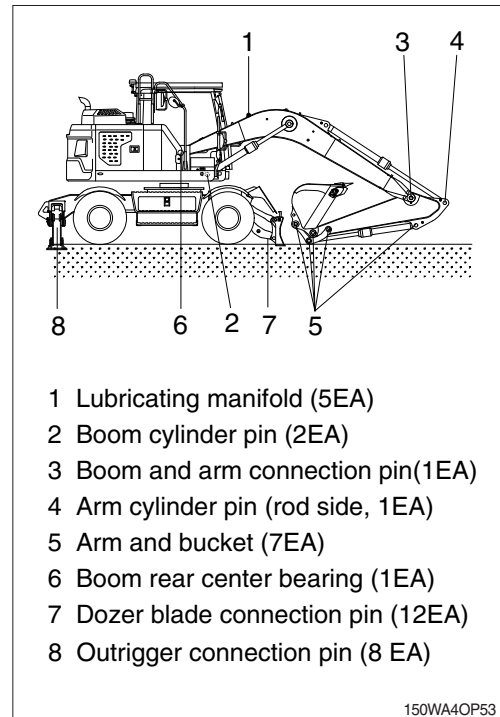
(1) Cleaning the machine

Clean the machine and dried.
Grease each lubrication part.

(2) Lubrication position of each part

Change all oil.

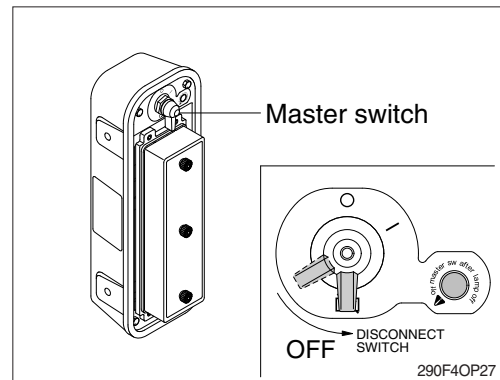
- ※ Be particularly careful when you reuse the machine. As oil can be diluted during storage. Apply an anticorrosive lubricant on the exposed part of piston rod of cylinder and in places where the machine rusts easily.



(3) Master switch

Turn OFF the master switch mounted electric box and store the machine.

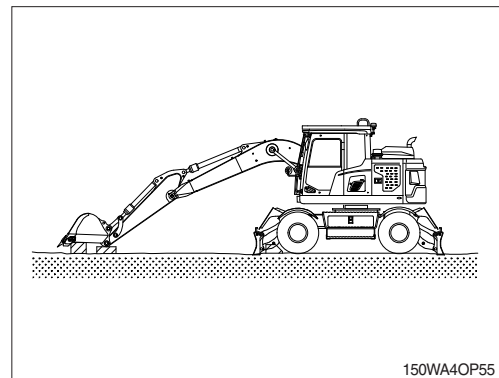
- ▲ Turn OFF the master switch after the lamp goes OFF.
 - ▲ It may cause severe failure of aftertreatment device. Because aftertreatment system still is working while the lamp lights up.
- (4) Be sure to mix anticorrosive antifreezing solution in the radiator.



(5) Prevention of dust and moisture

Keep machine dry. Store the machine setting wood on the ground.

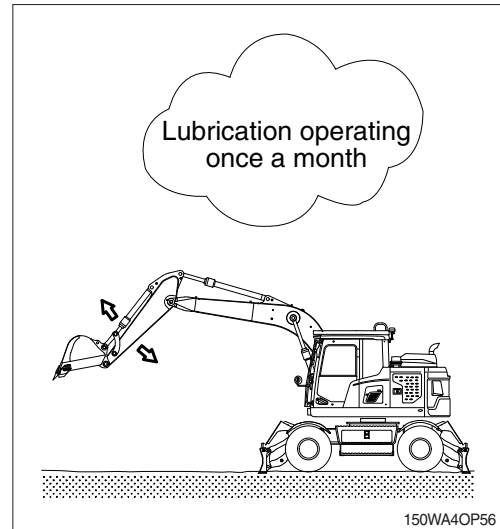
- ※ Cover exposed part of piston rod on cylinder.
- ※ Lower the bucket to the ground and set a support under tires.



2) DURING STORAGE

Start engine and move the machine and work equipment once a month and apply lubrication to each part.

- ※ Check the level of engine oil and coolant and fill if required when starting engine.
- ※ Clean the anticorrosive on the piston rod of cylinder.
- ※ Operate the machine such as traveling, swing and work equipment operation to make sure enough lubrication of all functional components.



※ BATTERY

- ① Once a month, start the engine for 15 minutes (or use a charger) to charge the battery.
- ② Every 2 months, check the battery voltage and keep battery voltage over 25.08V.
- ③ If the machine stock period is over 6 months, disconnect the battery negative (-) terminal.

3) AFTER STORAGE

Carry out the following procedure when taking out of a long time storage.

- (1) Wipe off the anticorrosive lubricant on the hydraulic piston rod.
- (2) Completely fill fuel tank, lubricate and add oil.

(3) When storage period is over 6 months

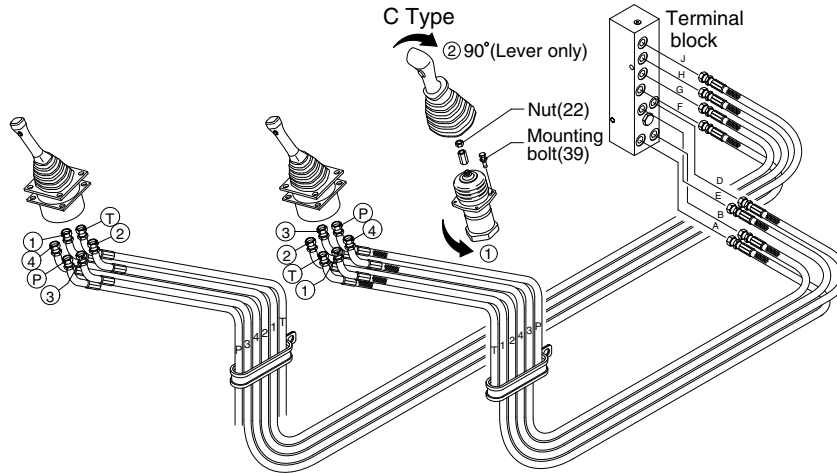
If the machine stock period is over 6 months, carry out the following procedure.

This procedure is to drain condensation water for the **swing reduction gear** durability.

- ※ Remove the drain port plug and drain the water until the gear oil comes out and then tighten the drain plug.
- ※ Refer to the service instruction, section 4 for the drain plug location.
- ※ If the machine is stored without carrying out the monthly lubricating operation, consult your HD Hyundai Construction Equipment dealer for service.

12. RCV LEVER OPERATING PATTERN

1) PATTERN CHANGE VALVE NOT INSTALLED (standard)



※ Whenever a change is made to the machine control pattern, also exchange the pattern label in the cab to match the new pattern.

※ The hose modification works must be carried out between RCV lever and terminal block (Not between terminal block and MCV).

170WA4OP51

Pattern	Operation		Control function	Hose connection (port)			
	Left RCV lever	Right RCV lever		RCV lever	Change of Terminal block		
					From	To	
ISO Type HD Hyundai Construction Equipment			Left	1 Arm out	②	D	-
				2 Arm in	④	E	-
				3 Swing right	③	B	-
				4 Swing left	①	A	-
	Right	5 Boom lower	④	J	-		
		6 Boom raise	②	H	-		
		7 Bucket out	①	G	-		
		8 Bucket in	③	F	-		
A Type			Left	1 Boom lower	②	D	J
				2 Boom raise	④	E	H
				3 Swing right	③	B	-
				4 Swing left	①	A	-
	Right	5 Arm out	④	J	D		
		6 Arm in	②	H	E		
		7 Bucket out	①	G	-		
		8 Bucket in	③	F	-		
B Type			Left	1 Boom lower	②	D	J
				2 Boom raise	④	E	H
				3 Bucket in	③	B	F
				4 Bucket out	①	A	G
	Right	5 Arm out	④	J	D		
		6 Arm in	②	H	E		
		7 Swing right	①	G	B		
		8 Swing left	③	F	A		
C Type			Left	① Loosen the RCV lever mounting bolt (39) and rotate lever assy 90° counterclockwise; then install. ② To put lever in correct position, disassemble nut (22) and rotate only lever 90° clockwise.			
			Right	Same as ISO type			

2) PATTERN CHANGE VALVE INSTALLED (option)

※ If the machine is equipped with the pattern change valve, the machine operation pattern can be easily changed.

※ Whenever a change is made to the machine control pattern also exchange the pattern label in the cab to match the new pattern.

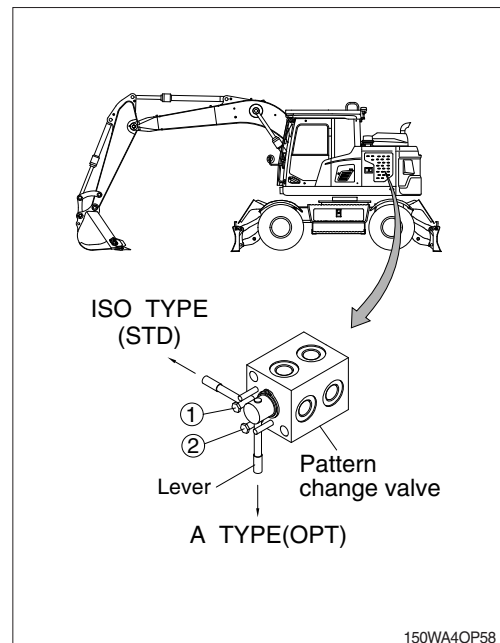
Operation	ISO type	A type
Left RCV lever		
Right RCV lever		

(1) The machine control pattern can be changed from the "ISO type" to "A type" by changing the position of the lever.

▲ Before starting the machine, check the lever position of pattern change valve and actual operating of attachment.

(2) Change of operating pattern

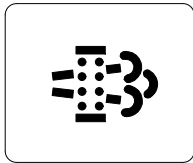
- ① Loosen bolt.
- ② Move lever to the "ISO" or "A" position.
- ③ After the lever is set, tighten the bolt in order to secure the lever.
 - Position ① for "ISO" pattern.
 - Position ② for "A" pattern.



13. EXHAUST SYSTEM CLEANING

- ※ Exhaust system cleaning events for the catalyst system will happen automatically under normal engine conditions and are controlled by the ECU as long as the exhaust system cleaning Inhibit switch is not engaged. During automatic exhaust system cleaning, low idle speed may increase and the exhaust system cleaning lamp will blink.
It may be automatically performed up to 4 times in initial 100 hours operation, and after that conducted based on the soot level when needed.
- ※ If automatic exhaust system cleaning does not occur, the exhaust system cleaning lamp will illuminate, indicating to the operator that they will need to perform a manual exhaust system cleaning.
- ※ The HEST Lamp will be illuminated during the entire manual exhaust system cleaning.
- ※ While the exhaust system cleaning occurs, fuel consumption will be increased 20~30% more than usual due to post fuel injection to the exhaust system to reach enough exhaust temperature for regeneration.
- ※ The operator can check logs of exhaust system cleaning events on an engine diagnostic tool (INSITE).
- ▲ Tampering, modifying, or removing any component of the exhaust system is strictly prohibited by law.
- ▲ Exhaust system cleaning generates hot exhaust and causes hot exhaust system components.
- ▲ Exhaust system components get very hot and can cause severe burns. Risk of fire.
- ▲ Do not perform exhaust system cleaning in a flammable environment.

(1) Exhaust system cleaning warning lamp

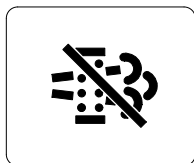


2609A3CD19

This warning lamp will light up or blink when the exhaust system cleaning is needed or activated.

- ※ Refer to page 3-9 for details.
- ※ The machine must be in a fireproof area during the entire exhaust system cleaning process.

(2) Exhaust system cleaning inhibit warning lamp

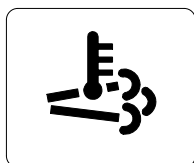


2609A3CD20

This warning lamp will light up when the exhaust system cleaning switch is pushed inhibit position.

- ※ Refer to page 3-9 for details.

(3) HEST (high exhaust system temperature) warning lamp

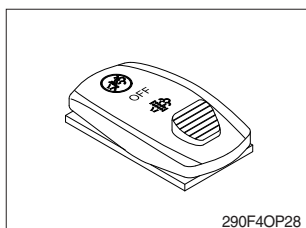


2609A3CD21

This warning lamp will light up when the exhaust temperatures are high due to exhaust system cleaning.

- ※ Refer to page 3-10 for details.

(4) Exhaust system cleaning switch



290F4OP28

This switch is used to select the exhaust system cleaning.

- ※ If system conditions are not met, the exhaust system cleaning will not start.
- ※ Refer to page 3-47 for details.
- ※ Manual exhaust system cleaning : refer to page 3-10 for details.

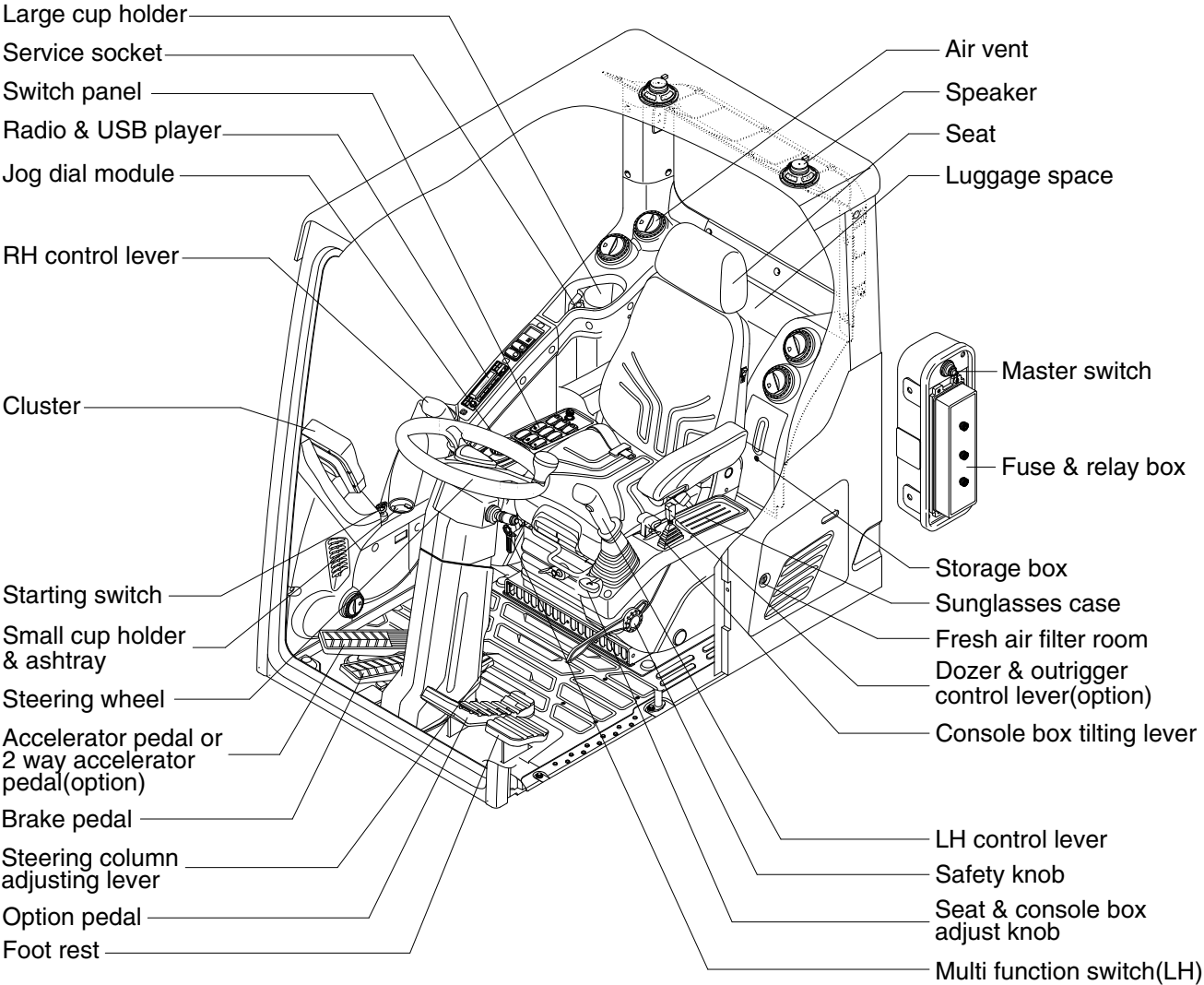
CONTROL DEVICES

1. CAB DEVICES

1) The ergonomically designed console box and suspension type seat provide the operator with comfort.

2) ELECTRONIC MONITOR SYSTEM

- (1) The centralized electronic monitor system allows the status and conditions of the machine to be monitored at a glance.
- (2) It is equipped with a warning system for early detection of machine malfunction.



150WA3CD01

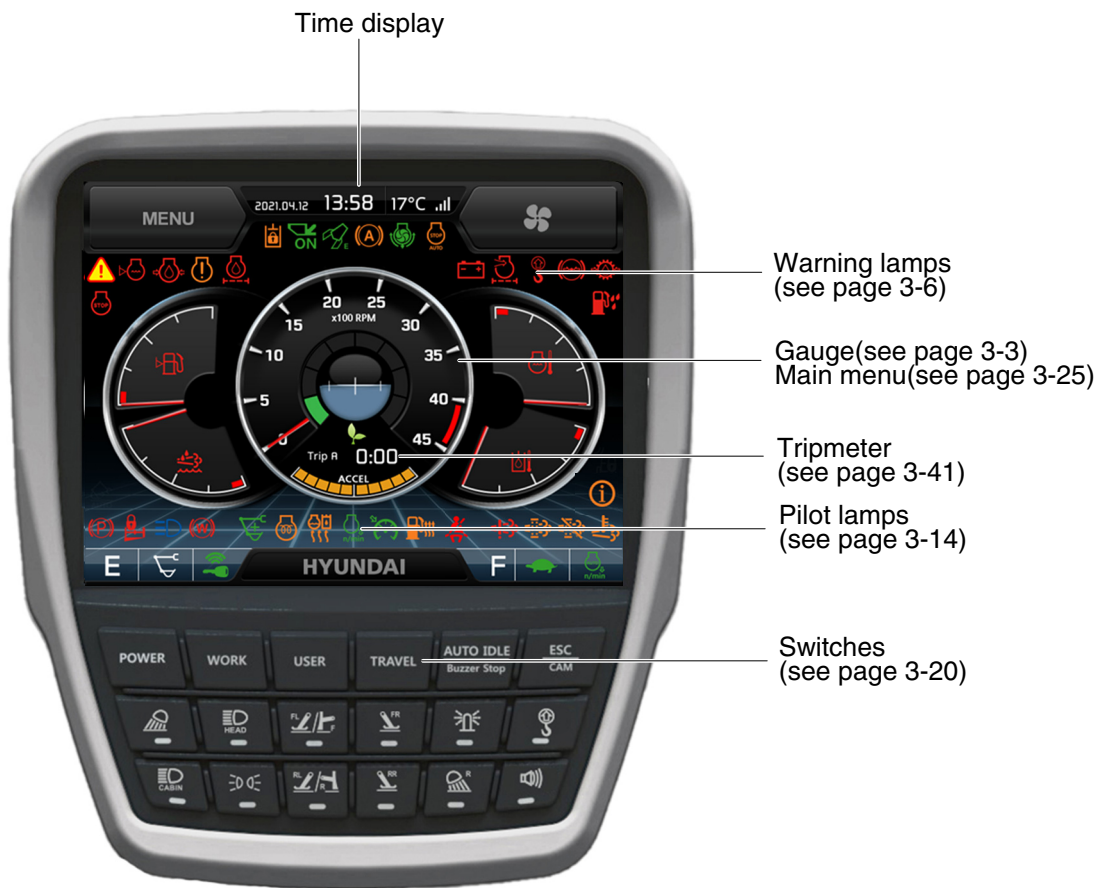
2. CLUSTER

1) STRUCTURE

The cluster consists of LCD and switches as shown below. The LCD is to warn the operator in case of abnormal machine operation or conditions for the appropriate operation and inspection. The LCD is to set and display for modes, monitoring and utilities with the switches.

The switches or touch screen are to set the machine operation modes.

- ※ The cluster installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to chapter 4, Maintenance.
- ※ When the cluster provides a warning immediately check the problem, and perform the required action.



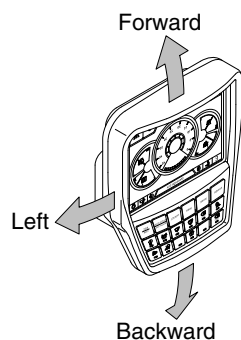
150WA3CD10

- ※ The warning lamp pops up and/or blinks and the buzzer sounds when the machine has a problem.

The warning lamp blinks until the problem is cleared. Refer to page 3-6 for details.

- ※ This cluster is adjustable.

- Vertical (forward/backward) : each 15°
- Horizontal (left only) : 8°



290F3CD47

2) GAUGE

(1) Operation screen

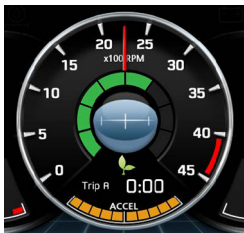
When you first turn starting switch ON, the operation screen will appear.



140WA3CD11

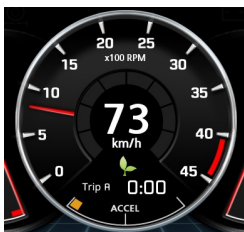
- | | | | |
|---|----------------------------------|---|-------------------------|
| 1 | RPM / Speed gauge | 5 | DEF/AdBlue® level gauge |
| 2 | Engine coolant temperature gauge | 6 | Tripmeter display |
| 3 | Hydraulic oil temperature gauge | 7 | Eco gauge |
| 4 | Fuel level gauge | 8 | Accel dial gauge |

(2) RPM / Speed gauge



300A3CD22

- ① This displays the engine speed.





140WA3CD22

- ② When traveling, the speed gauge is displayed.

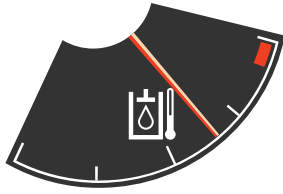
(3) Engine coolant temperature gauge





290F3CD53

- ① This gauge indicates the temperature of coolant.
- White range : 40-107°C (104-225°F)
 - Red range : Above 107°C (225°F)
- ② If the indicator is in the red range or  lamp pops up and the buzzer sounds, turn OFF the engine and check the engine cooling system.
- ※ If the gauge indicates the red range or  lamp blinks in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

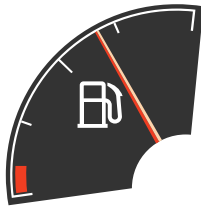
(4) Hydraulic oil temperature gauge





290F3CD54

- ① This gauge indicates the temperature of hydraulic oil.
 - White range : 40-105°C(104-221°F)
 - Red range : Above 105°C(221°F)
 - ② If the indicator is in the red range or  lamp pops up and the buzzer sounds reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause of the problem.
- ※ If the gauge indicates the red range or  lamp blinks in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of electricity or sensor.

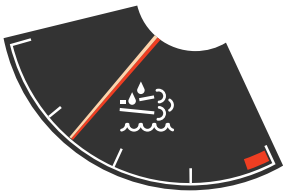
(5) Fuel level gauge





290F3CD55

- ① This gauge indicates the amount of fuel in the fuel tank.
 - ② Fill the fuel when in the red range, or  lamp pops up and the buzzer sounds.
- ※ If the gauge indicates the red range or  lamp blinks in red even though the machine is on the normal condition range, check the electric device as this can be caused by poor connection of electricity or sensor.

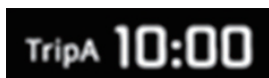
(6) DEF/AdBlue® Level gauge



290F3CD57

- ① This gauge indicates the amount of liquid in the DEF/AdBlue® tank.
 - ② Fill the DEF/AdBlue® when in the red range, or  lamp pops up and the buzzer sounds.
 - ③ Do not overfull DEF/AdBlue®.
- ※ Refer to page 3-11.
- ※ If the gauge indicates the red range or  lamp blinks in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of electricity or sensor.

(7) Tripmeter display



290F3CD56

- ① This displays the engine the tripmeter.
- ※ Refer to page 3-41 for details.

(8) Eco gauge



290F3CD58

- ① This gauge indicates the fuel consumption rate and machine load status so that the operators can operate the machine efficient in regards to fuel consumption.
- ② Fuel consumption rate or machine load is higher if the number of segments are increased.
- ③ The color of Eco gauge indicates operation status.
 - White : Idle operation
 - Green : Economy operation
 - Yellow : Non-economy operation at a medium level.
 - Red : Non-economy operation at a high level.

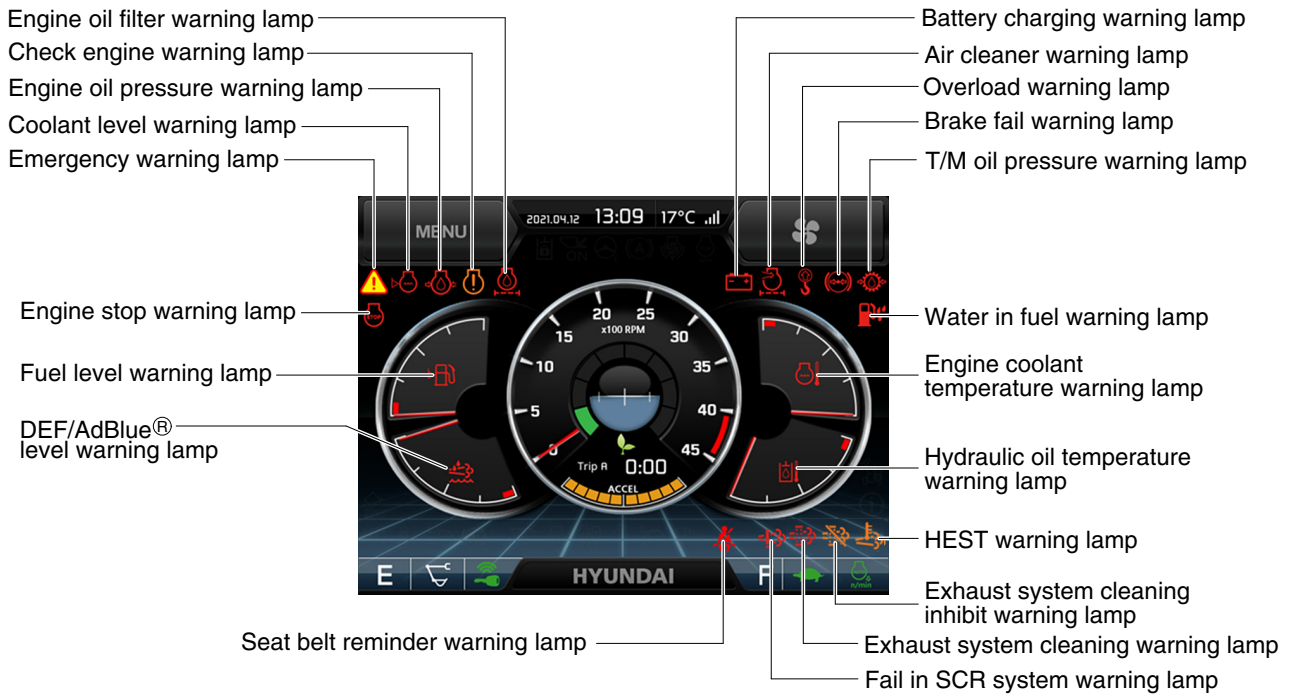
(9) Accel dial gauge



290F3CD59












- ① This gauge indicates the level of accel dial.

3) WARNING LAMPS



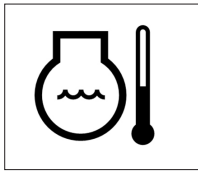
140WA3CD20

※ Warning lamps and buzzer








Warnings	When error happened	Lamps and buzzer
All warning lamps except below	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> The pop-up warning lamp moves to the original position, blinks and the buzzer stops when; <ul style="list-style-type: none"> the buzzer stop switch  is pushed the knob of the jog dial module is pushed the lamp of the LCD is touched
	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> The pop-up warning lamp moves to the original position, lights up or blinks and the buzzer stops when; <ul style="list-style-type: none"> the buzzer stop switch  is pushed the knob of the jog dial module is pushed the lamp of the LCD is touched <p>※ Refer to page 3-11 for details.</p>
  	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> The pop-up warning lamp moves to the original position, lights up and the buzzer stops after 2 seconds elapses.
	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> The pop-up warning lamp moves to the original position, blinks and the buzzer stops after 2 seconds elapses.
	Warning lamp pops up on the center of the LCD and the buzzer sounds	<ul style="list-style-type: none"> Cluster displays this pop-up when it has communication error with MCU. If communication with MCU become normal state, it will disappear automatically.
 	Warning lamp pops up on the center of the LCD and the buzzer sounds	※ Refer to page 3-7 for details.
	Warning lamp lights up and the buzzer sounds	※ Refer to page 3-11 for details.

※ Refer to page 3-21 for the buzzer stop switch  and page 3-80 for the jog dial module.

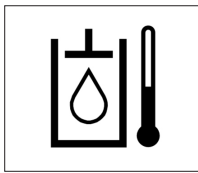
(1) Engine coolant temperature warning lamp










290F3CD61

- ① Engine coolant temperature warning is indicated in 2 steps.
 - 103°C over : The  lamp pops up and the buzzer sounds.
 - 107°C over : The  lamp pops up and the buzzer sounds.
- ② The pop-up ,  lamps move to the original position and blinks when the buzzer stop switch  is pushed. The buzzer will stop and ,  lamps will blink.
- ③ Check the cooling system when the lamps keep blinking.

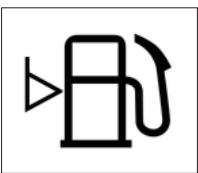
(2) Hydraulic oil temperature warning lamp



290F3CD62

- ① Hydraulic oil temperature warning is indicated in 2 steps.
 - 100°C over : The  lamp pops up and the buzzer sounds.
 - 105°C over : The  lamp pops up and the buzzer sounds.
- ② The pop-up ,  lamps move to the original position and blinks when the buzzer stop switch  is pushed. The buzzer will stop and ,  lamps will blink.
- ③ Check the hydraulic oil level and hydraulic cooling system.

(3) Fuel level warning lamp




290F3CD63

- ① This warning lamp pops up and the buzzer sounds when the fuel level is below 21 ℓ (5.5 U.S. gal).
- ② Fill the fuel immediately after the lamp blinks.

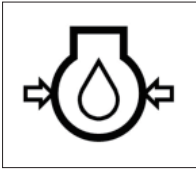
(4) Emergency warning lamp



290F3CD64

- ① This warning lamp pops up and the buzzer sounds when each of the below warnings occurs.
 - Engine coolant overheating (over 107°C)
 - Hydraulic oil overheating (over 105°C)
 - MCU input voltage abnormal
 - Cluster communication data error
 - Engine ECU communication data error
- ※ The pop-up warning lamp moves to the original position and blinks when the buzzer stop switch  is pushed. The buzzer will stop.
- ② When this warning lamp blinks, machine must be checked and serviced immediately.

(5) Engine oil pressure warning lamp



290F3CD65

- ① This warning lamp pops up and the buzzer sounds when the engine oil pressure is low.
- ② If the lamp lights ON, shut OFF the engine immediately. Check oil level.

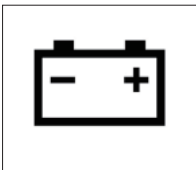
(6) Check engine warning lamp



290F3CD66

- ① This warning lamp pops up and the buzzer sounds when the communication between MCU and engine ECU is abnormal, or if the cluster received specific fault code from the engine ECU.
- ② Check the communication line between the two. If the communication line is OK, then check the fault codes on the cluster.

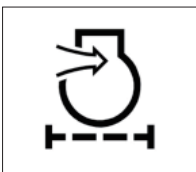
(7) Battery charging warning lamp



290F3CD67

- ① This warning lamp pops up and the buzzer sounds when the battery charging voltage is low.
- ② Check the battery charging circuit when this lamp blinks.

(8) Air cleaner warning lamp



290F3CD68

- ① This warning lamp pops up and the buzzer sounds when the air cleaner is clogged.
- ② Check, clean or replace filter.

(9) Overload warning lamp (opt)



290F3CD69

- ① When the machine is overloaded, the overload warning lamp pops up and the buzzer sounds when the overload switch is ON. (if equipped)
- ② Reduce the machine load.

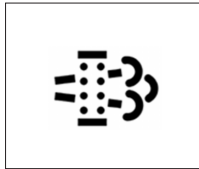
(10) Engine stop warning lamp



290F3CD252





- ① This warning lamp pops up and the buzzer sounds after 30 minutes of run time elapses, when the DEF/AdBlue® tank has reached its minimum level. Stop engine immediately and check actual DEF/AdBlue® level.
- ② Fill the DEF/AdBlue® immediately.
※ Refer to page 3-11.
- ③ This lamp pops up and the buzzer sounds when the manual (stationary) exhaust system cleaning is not performed.
※ Refer to page 3-9.
※ Please contact your HD Hyundai Construction Equipment service center or local dealer.
※ "Engine shutdown" cluster message pops up when the exhaust gas temperature reaches above 800°C.

(11) Exhaust system cleaning warning lamp

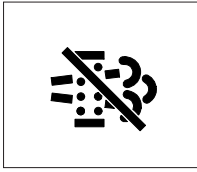


290F3CD70A

- ① This warning lamp lights up or blinks when exhaust system cleaning is needed as seen in the table below.

Warning lamp				Description
Exhaust	HEST	Check engine	Stop engine	
				
Off	Off	Off	Off	· Normal operating mode
On (Amber)	Off	Off	Off	· Manual (stationary) exhaust system cleaning is recommended. ※ Refer to page 3-10.
On (Amber)	Off	On (Red)	Off	· Manual exhaust system cleaning must be conducted immediately. · Engine power will be reduced automatically if action is not taken. ※ Refer to page 3-10.
On (Amber)	Off	On (Red)	On (Red)	· These lamps will be ON if manual exhaust system cleaning is not conducted for a certain period of time. Stop the engine immediately. · Please contact HD Hyundai Construction Equipment service center or local dealer.
Blink (Red)	Off	Off	Off	· The exhaust system cleaning lamp will blink without HEST lamp while automatic exhaust system cleaning is being performed. · Low idle speed will increase to 1500 rpm. · The machine can be operated as normal operating mode. · Fuel consumption may slightly increase.
Blink (Red)	On (Amber)	Off	Off	· The exhaust system cleaning lamp will blink with HEST lamp while manual exhaust system cleaning is being performed. · The machine must remain stationary at low idle. ※ Refer to page 3-10.

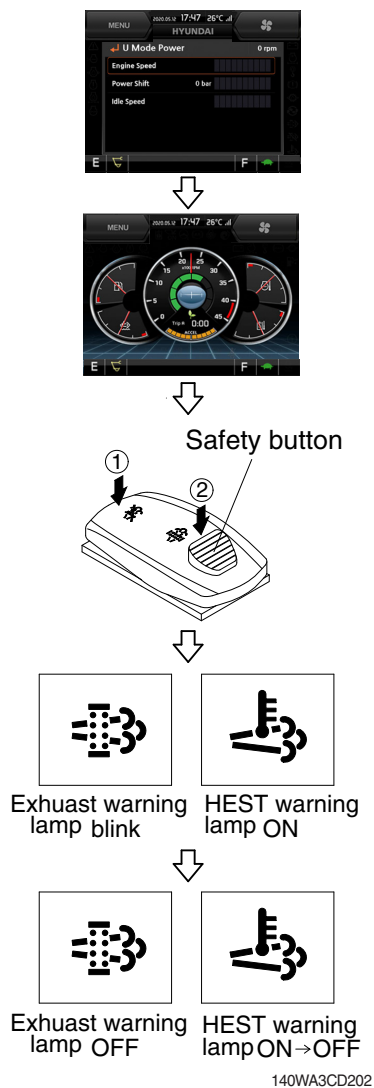
(12) Exhaust system cleaning inhibit warning lamp



2609A3CD201

- ① This warning lamp indicates the exhaust system cleaning switch is pushed to the inhibit position, therefore automatic and manual exhaust system cleaning can not occur.
- ※ Refer to page 3-50 for the exhaust system cleaning switch.

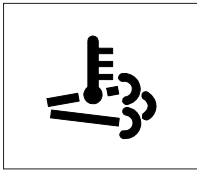
※ Manual exhaust system cleaning



- ※ Manual exhaust system cleaning must be operated in a fireproof area.
- ※ To stop a manual exhaust system cleaning before it has completed, set to the exhaust system cleaning switch to the inhibit position or turn OFF the engine.

- ① Stop and park the machine.
- ② Pull the safety button and push the switch to position ② to initiate the manual exhaust system cleaning.
- ※ Refer to the page 3-50 for the exhaust system cleaning switch operation.
- ※ The engine speed may increase to 950~1050 rpm and exhaust system cleaning begins and it will take approximately 20~30 minutes.
- ③ The exhaust system cleaning warning lamp will blink and HEST warning lamp will light up during the exhaust system cleaning operation.
- ④ The exhaust system cleaning and/or HEST warning lamp light will go off when the exhaust system cleaning is completed.

(13) HEST (High exhaust system temperature) warning lamp



2609A3CD211A

- ① This warning lamp indicates, when illuminated, that exhaust temperatures are high due to exhaust system cleaning.
- ② The lamp will also illuminate during a manual exhaust system cleaning.
- ③ When this lamp is illuminated, be sure the exhaust pipe outlet is not directed at any surface or material that can melt, burn, or explode.

⚠ When this lamp is illuminated, the exhaust gas temperature could reach 800°C [1500°F], which is hot enough to ignite or melt common materials, and to burn people.

※ The lamp does not signify the need for any kind of equipment or engine service; It merely alerts the equipment operator to high exhaust temperatures. It is common for the lamp to illuminate on and off during normal equipment operation as the engine completes exhaust system cleaning cycles.

(14) DEF/AdBlue® level warning lamp



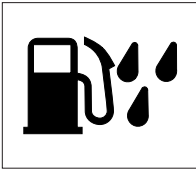
290F3CD257A

- ① This warning lamp when ON or blinking, indicates that the DEF/AdBlue® level is low as per the table below.

※ It is recommended that the DEF/AdBlue® tank be filled completely full of the DEF/AdBlue® in order to correct any fault conditions.

Warning lamp				Description
Fail in SCR system	DEF/AdBlue® level	Check engine	Stop engine	
On	On	Off	Off	<ul style="list-style-type: none"> · The DEF/AdBlue® level has fallen below the initial warning level (10%).
On	On	On	Off	<ul style="list-style-type: none"> · The DEF/AdBlue® level has fallen below the initial derate level (2.5%). · The engine power will be limited automatically.
On	Blink	On	On	<ul style="list-style-type: none"> · This happens when 30 minutes has elapsed with empty conditions (0%) of the DEF/AdBlue® tank. · The engine will enter the final derate level which may include low idle lock or engine shutdown with restart limitations. · In order to remove the final derate, the DEF/AdBlue® tank must be filled to above 10% gauge reading.

(15) Water in fuel warning lamp



300A3CD24A

- ① This warning lamp lights up and the buzzer sounds when the water separator is full of water or malfunctioning.
- ※ **When this lamp lights up, stop the machine and drain water from the separator.**

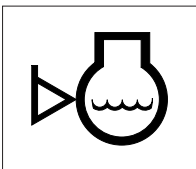
(16) Seat belt reminder warning lamp



300A3CD25

- ① When operator does not fasten the operator's the seat belt, the seat belt reminder warning lamp pops up and the buzzer sounds.
- ② Fasten the seat belt.

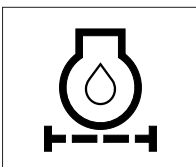
(17) Coolant level warning lamp



760F3CD58

- ① This warning lamp indicates lack of coolant.
- ② Check and refill coolant.

(18) Engine oil filter warning lamp



300A3CD306

- ① This warning lamp pops up and the buzzer sounds when the filter of engine oil is clogged.
- ② Check, clean or replace filter.

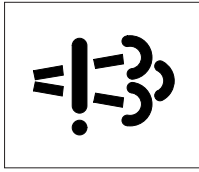
(19) Brake fail warning lamp



140WA3CD95


- ① This lamp blinks when the oil pressure of service brake drops below the normal range.
 - ② Stop the engine and check for its cause.
- ※ **Do not operate until any problems are corrected.**

(20) Fail in SCR system warning lamp



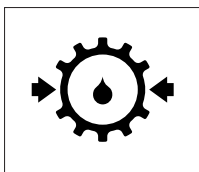
300A3CD15

- ① This warning lamp indicates there are faults related to SCR system.
- ② The lamp lights up when each of the below warnings is happening.
 - a. Low DEF/AdBlue® level
 - b. Poor quality of DEF/AdBlue®
 - c. Tempering or malfunction in the aftertreatment system
- ③ Once the lamp lights up, the engine will derate soon.
- ※ **Please contact your HD Hyundai Construction Equipment service center or local dealer.**

Warning lamp		Torque reduction
	Time	
On	Fault detected	-
On	After 2 h 30 min	· Torque is reduced to 75% of the highest torque.
Blink	After 3 h 45 min	· Torque is reduced to 50% of the highest torque.
Blink rapidly	After 4 hours	· Torque is reduced to 0% (low idling) of the highest torque within 2~10 min.

- ※ **If a new fault occurs within 40 hours of operation since the first fault, the warning lamp will light up. After 3 hours of operation, the warning lamp will blink rapidly and torque will be reduced to 0% (low idling) within 2~10 minutes.**
- ※ **Once the fault has been remedied and the engine control unit has received an indication that it is working, torque returns to the normal level.**

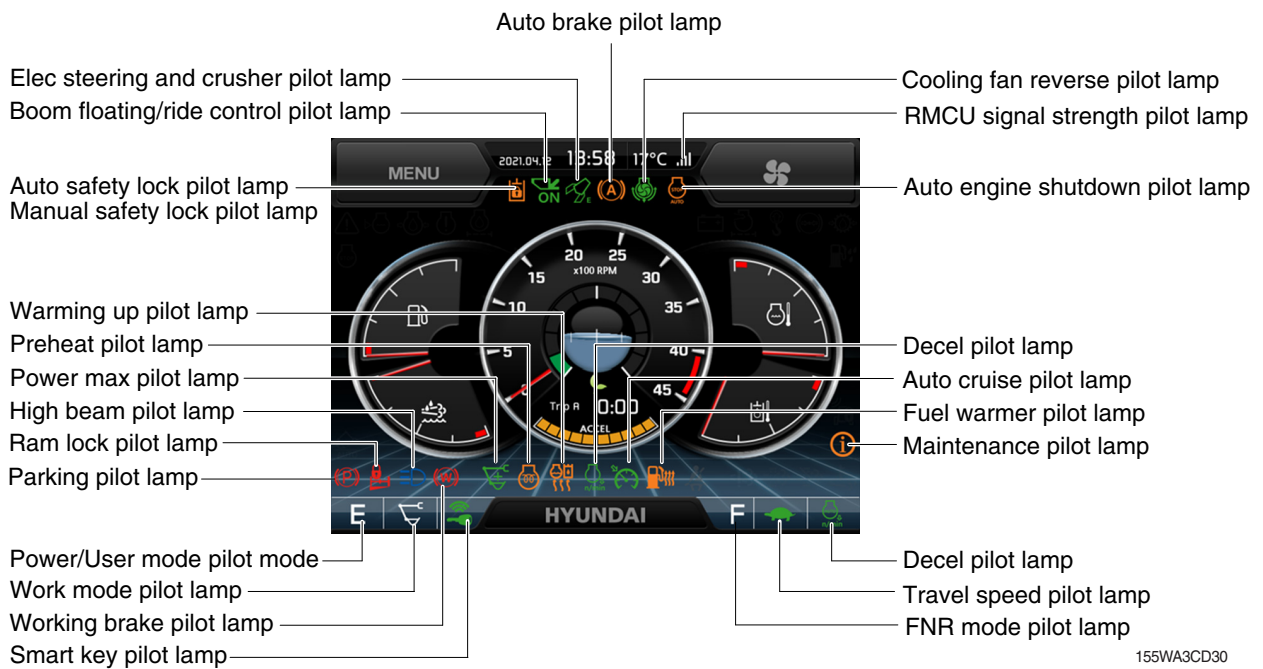
(21) T/M oil pressure warning lamp



140WA3CD96

- ① This lamp blinks when the oil pressure of the transmission drops.
- ② Stop the engine and check the transmission system.

4) PILOT LAMPS



(1) Mode pilot lamps

No	Mode	Pilot lamp	Selected mode
1	Power mode		Heavy duty power work mode
			Standard power mode
			Economy power mode
2	User mode		User preferable power mode
3	Work tool mode		General operation - IPC speed mode (null)
			General operation - IPC balance mode (null)
			General operation - IPC efficiency mode (null)
			Breaker operation mode
			Crusher operation mode
4	Travel mode		Creep mode traveling
			Low speed traveling
			High speed traveling
5	Auto idle mode		Auto idle

(2) Power max pilot lamp



300A3CD32

- ① The lamp will be ON when pushing power max switch on the LH RCV lever.
 - ② The power max function operates for a max period of 8 seconds.
- ※ Refer to the page 3-56 for power max function.

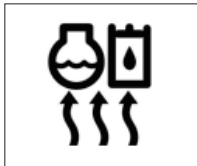
(3) Preheat pilot lamp



290F3CD79

- ① Turning the start key switch to the ON position starts preheating in cold weather.
- ② Start the engine after this lamp goes OFF.

(4) Warming up pilot lamp



290F3CD80

- ① This lamp lights up when the coolant temperature is below 30°C (86°F).
- ② The automatic warming up is cancelled when the engine coolant temperature is above 30°C (86°F), or when 10 minutes have passed since starting the engine.

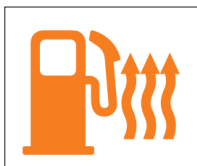
(5) Decel pilot lamp



300A3CD33

- ① Operating one touch decel switch on the RCV lever makes the lamp light up.
 - ② Also, the lamp will light up and engine speed will be reduced automatically to save fuel when all levers and pedals are in the neutral position, and the auto idle function is selected.
- ※ **One touch decel is not available when the auto idle pilot lamp is turned ON.**
- ※ Refer to the page 3-56.

(6) Fuel warmer pilot lamp



300A3CD34

- ① This lamp lights up when the coolant temperature is below 10°C (50°F) or the hydraulic oil temperature is 20°C (68°F).
- ② The automatic fuel warming is cancelled when the engine coolant temperature is above 60°C (140°F), and the hydraulic oil temperature is above 45°C (113°F) since the start switch was ON position.

(7) Maintenance pilot lamp








300A3CD35

- ① This lamp lights up when consumable parts are in need of replacement. It means that the change or replacement interval of parts is 30 hours from the required change interval.
 - ② Check the message in maintenance information of main menu. Also, this lamp lights up for 3 minutes when the start switch is switched to the ON position.
- ※ Refer to page 3-34.

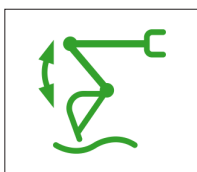
(8) RMCU signal strength pilot lamp (mobile only)



220A3CD200

- ① This lamp indicates RMCU signal strength as below.
 -  : Searching
 -  : Bad
 -  : Normal
 -  : Good
 -  : Excellent

(9) Boom floating mode pilot lamp



140WA3CD639

- ① This lamp lights ON when the boom floating is activated.
- ※ Refer to page 3-51.

(10) Ride control pilot lamp (option)



140WA3CD638

- ① **Manual ride control**
This lamp lights ON when the manual ride control function is activated (ON, Always setting).
- ※ Refer to page 3-51.

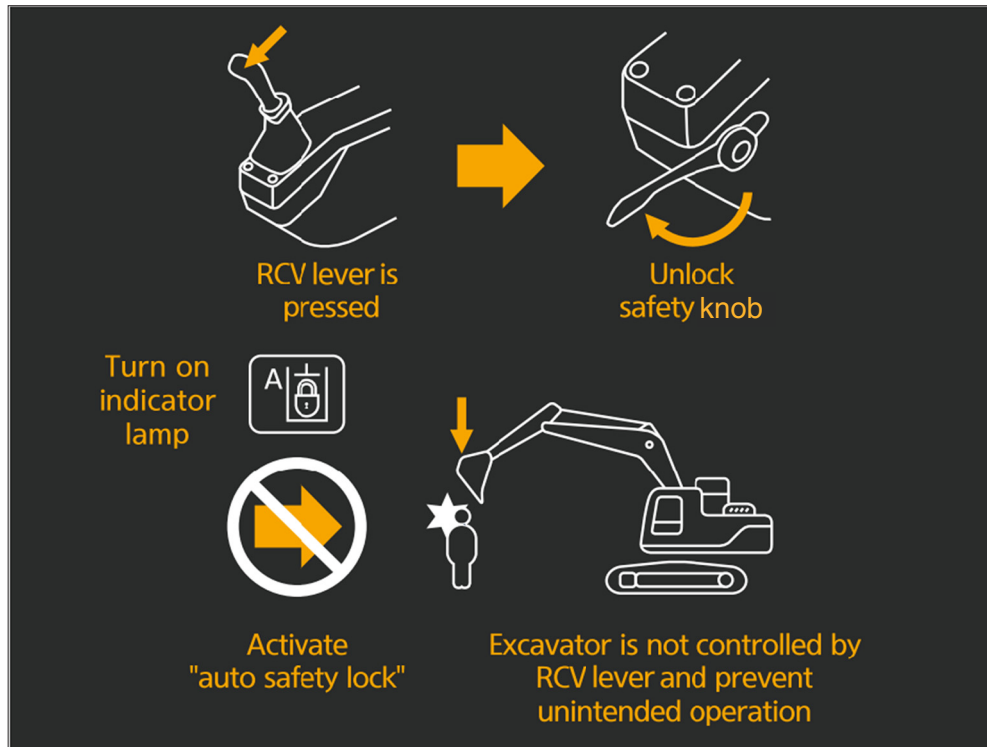
(11) Auto safety lock pilot lamp



300A3CD37A

- ① Auto safety lock system prevents unintended operation of the machine in order to improve safety.
- ② Engine will only start if safety knob is locked.
- ③ If operator unlocks safety knob when RCV lever is pressed, machine is not controlled by RCV lever.

⚠ If operator unlocks safety knob while any control/function is being operated, the machine will move violently. This could cause serious injury, death or damage to property.



300A3CD38A

(12) Manual safety lock pilot lamp



140WA3CD37

- ① This lamp lights up when the safety knob is set to the LOCK position.
- ※ Refer to page 3-59 for the safety knob.

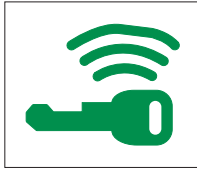
(13) Auto engine shutdown pilot lamp



220A3CD202A

- ① This lamp lights up when the auto engine shutdown is activated.
- ※ Refer to page 3-29.

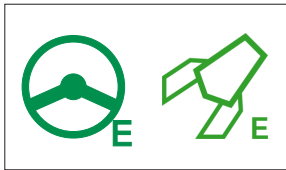
(14) Smart key pilot lamp (opt)



300A3CD36A



- ① This lamp lights up when the engine is started by the start button.
 - ② This lamp is red when the authentication fails, it will be green when authentication is successful.
- ※ Refer to the page 3-35.

(15) Elec steering and crusher pilot lamp



140WA3CD649

140WA3CD637

- ① This lamp lights up when the electric steering and crusher switch is positioned to operate as below.
 -  : Electric steering
 -  : Crusher
- ※ Refer to page 3-62.

(16) Auto brake pilot lamp



140WA3CD33

- ① This lamp lights up in amber when the auto digging brake is ready to operate.
 - ② This lamp lights up in green when the auto digging brake is operating.
- ※ Refer to the page 3-52.

(17) Cooling fan reverse pilot lamp



140WA3CD647

- ① This lamp lights up when the cooling fan reverse function is activated.
- ※ Refer to page 3-30.

(18) FNR mode pilot lamp



140WA3CD631

- ① This lamp indicates the selection of the FNR switch on the RH RCV lever.
 - **F** : Machine moves forward
 - **N** : Neutral position
 - **R** : Machine moves backward

(19) FNR mode pilot lamp (emergency)



140WA3CD634

① This lamp indicates the selection of the FNR switch on the switch board when when the FNR switch on the RH RCV lever is failed.

- **F** : Machine moves forward
- **N** : Neutral position
- **R** : Machine moves backward

(20) Ram lock pilot lamp



210WF3CD04

① This lamp lights up when the ram lock switch is set to the LOCK position.

※ Refer to the page 3-55.

(21) Parking pilot lamp

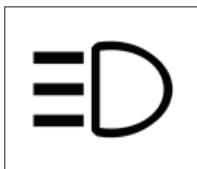


210WF3CD05

① This lamp lights up when the the parking switch is set to the parking position.

※ Refer to the page 3-55.

(22) High beam pilot lamp



210WF3CD06

① The lamp lights up when the head lamp switch is set to the high beam position.

② When passing other machines ahead, this lamp must be used for a few seconds to give other machines warning for a few seconds.

(23) Working brake pilot lamp



210WF3CD07

① This lamp lights up when the working brake switch is set to working position.

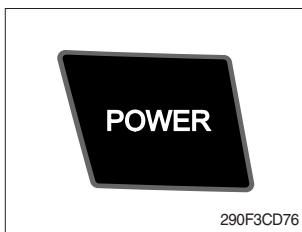
※ Refer to page 3-55.

5) SWITCHES



※ When some of the switches are selected, the pilot lamps are displayed on the LCD. Refer to page 3-14 for details.

(1) Power mode switch

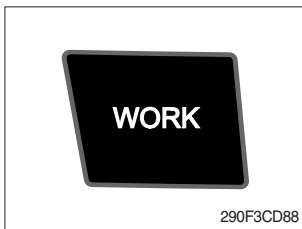


① This switch is to select the machine power mode and when pressed, the power mode pilot lamp will be displayed on the section of the monitor.

- P : Heavy duty power work.
- S : Standard power work.
- E : Economy power work.

② The pilot lamp changes E → S → P → E in this order.

(2) Work mode switch

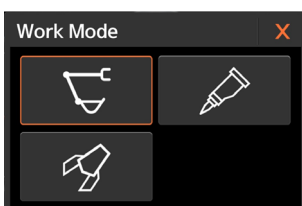


① This switch is to select the machine work mode, which shifts from general operation mode to optional attachment operation mode.

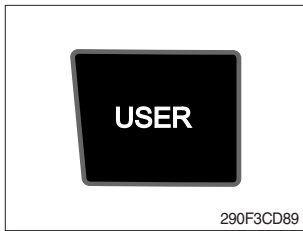
- : General operation mode
- : Breaker operation mode (if equipped)
- : Crusher operation mode (if equipped)
- Not installed : Breaker or crusher is not installed.

※ Refer to page 2-7 for details.

② If you press this switch for a time (1 second), quick pop-up will appear. When you select an attachment from the popup, the operation mode will immediately switch to selected attachment.





(3) User mode switch



- ① This switch is used to memorize the current machine operating status in the MCU and activate the memorized user mode.
 - Memory : Push more than 2 seconds.
 - Action : Push within 2 seconds.
 - Cancel : Push this switch once more within 2 seconds.
- ② Refer to the page 3-27 for another set of user mode.

(4) Travel speed switch (null)



- ① This switch is used to select the travel speed alternatively.
 -  : Low speed
 -  : High speed

※ Do not change the setting of the travel speed switch while machine is moving. Machine stability may be adversely affected.

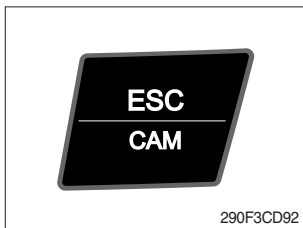
▲ Serious injury or death can result from sudden changes in machine stability.

(5) Auto idle/ buzzer stop switch



- ① This switch is used to activate or cancel the auto idle function.
 - Pilot lamp ON : Auto idle function is activated.
 - Pilot lamp OFF : Auto idle function is cancelled.
- ② The buzzer sounds when the machine has a problem. In this case, push this switch and buzzer stops, but the warning lamp blinks until the problem is cleared.

(6) Escape/Camera switch



- ① This switch is used to return to the previous menu or parent menu.
- ② In the operation screen, pushing this switch will display the view of the camera on the machine (if equipped). Please refer to page 3-41 for the camera.
- ③ If the camera is not installed, this switch is used only ESC function.

(7) Work light switch



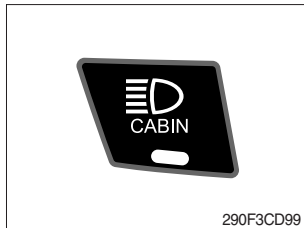
- ① This switch is used to operate the work light.
- ② The pilot lamp lights up when this switch is pressed.

(8) Head light switch



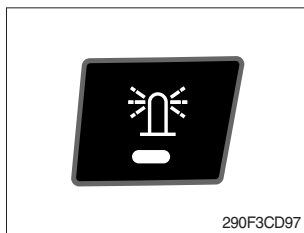
- ① This switch is used to operate the head light.
- ② The pilot lamp lights up when this switch is pressed.

(9) Cab light switch



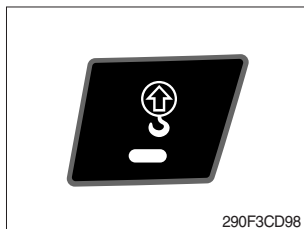
- ① This switch turns on the cab light.
- ② The pilot lamp lights up when this switch is pressed.

(10) Beacon switch (opt)



- ① This switch activates the rotary light on the cab.
- ② The pilot lamp lights up when this switch is pressed.

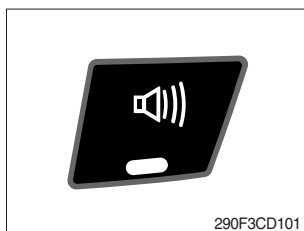
(11) Overload switch (opt)



- ① When this switch is activated, buzzer makes sound and overload warning lamp lights up in the event that the machine is or becomes in an overloaded situation.
- ② When the switch is inactivated, buzzer stops and warning lamp goes off.

⚠ Overloading the machine could impact the machines stability which could result in tipover hazard. A tipover hazard could result in serious injury or death. Always activate the overload warning device before you handle or lift objects.

(12) Travel alarm switch



- ① This switch is to activate travel alarm function surrounding when the machine travels.
 - ON : When the machine travels, the travel alarm function is activated.
 - OFF : When the FNR switch is positioned on R, the travel alarm function is activated.

(13) Air conditioner quick touch switch



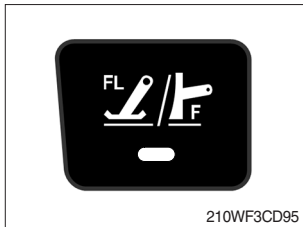
- ① This switch used to select air conditioner control mode.
- ※ Refer to page 3-45.

(14) Main menu quick touch switch



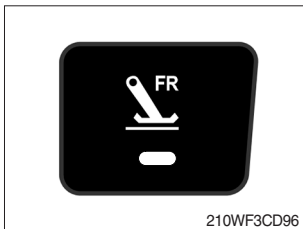
- ① This switch is to activate the main menu in the cluster.
- ※ Refer to page 3-25.

(15) Front left outrigger/Front dozer switch



- ① This switch is used to select the front left outrigger or front dozer blade operation.
- ② The pilot lamp lights up when this switch is pressed.
- ※ Please check the installed equipment (outrigger or dozer) on your machine before selecting the switch.
- ※ Refer to page 3-59 for the dozer and outrigger lever.

(16) Front right outrigger switch



- ① This switch is used to select the front right outrigger operation if equipped.
- ② The pilot lamp lights up when this switch is pressed.
- ※ Refer to page 3-59 for the dozer and outrigger lever.

(17) Rear left outrigger/Rear dozer switch



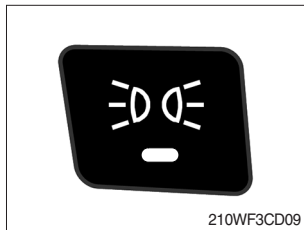
- ① This switch is used to select the rear left outrigger or rear dozer blade operation.
- ② The pilot lamp lights up when this switch is pressed.
- ※ Please check the installed equipment (outrigger or dozer) on your machine before selecting the switch.
- ※ Refer to page 3-59 for the dozer and outrigger lever.

(18) Rear right outrigger switch



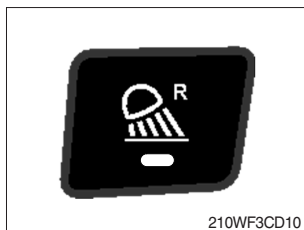
- ① This switch is used to select the rear right outrigger operation if equipped.
- ② The pilot lamp lights up when this switch is pressed.
- ※ Refer to page 3-59 for the dozer and outrigger lever.

(19) Illumination switch



- ① This switch is used to operate on the clearance lamp and all panel lamps.
- ② The pilot lamp lights up when this switch is pressed.

(20) Rear work lamp switch

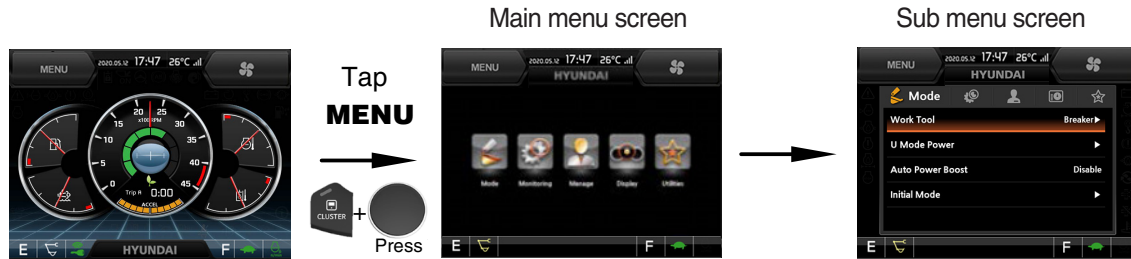


- ① This switch is used to operate the rear work lamp.
- ② The pilot lamp lights up when this switch is pressed.

6) MAIN MENU

- ※ You can select or set the menu by the jog dial module or touch screen.
On the operation screen, tap MENU to access the main menu screen.
On the sub menu screen, you can tap the menu bar to access functions or applications.






· Operation screen



140WA3CD50

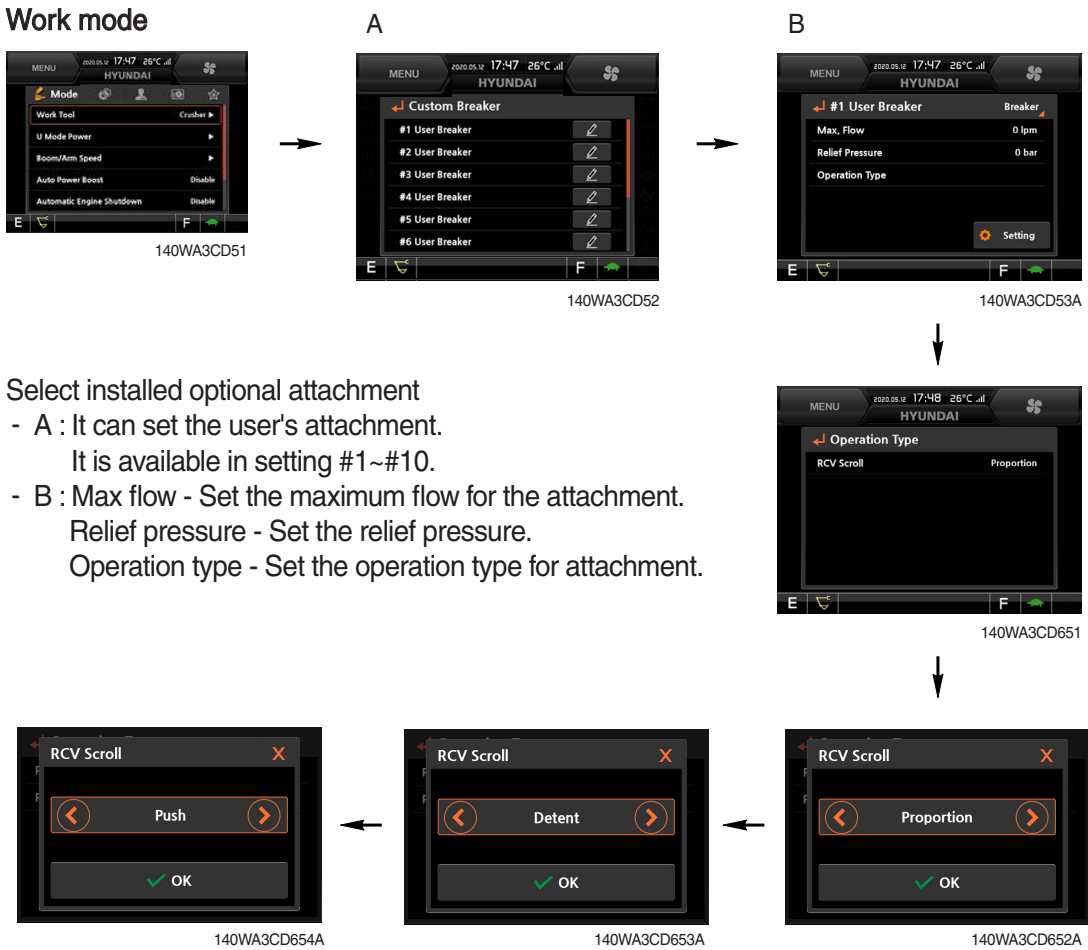
- ※ Please refer to the jog dial module, page 3-80 for selection and change of menu and input value.

(1) Structure

No	Main menu	Sub menu	Description
1	 Mode 290F3CD103	Work mode U mode power Boom/Arm speed (null) Auto power boost IPC mode (null) Auto engine shutdown Initial mode Emergency mode	Breaker, Crusher, Not installed User mode only Boom speed, Arm speed Enable, Disable Speed mode, Balance mode, Efficiency mode One time, Always, Disable Key on initial mode / initial work mode, Accel initial mode / step Switch function
2	 Monitoring 290F3CD104	Active fault Logged fault Delete logged fault Monitoring	MCU, Engine ECM, FATC, AAVM (option) MCU, Engine ECM, FATC, AAVM (option) All logged fault delete, Initialization canceled Machine information, Switch status, Output status
3	 Management 290F3CD105	Fuel rate information Maintenance information Machine security Machine information Contact Clinometer Update	General record, Hourly, Daily, Mode record Replacement, Change interval oils and filters ESL mode setting, Password change Model, MCU, Monitor, jog dial module, switch controller, RMCU, Relay drive unit, FATC, AAVM (option) A/S phone number, A/S phone number change Clinometer setting Cluster, ETC device
4	 Display 290F3CD106	Display item Clock Brightness Unit setup Language selection Screen type	Engine speed, Tripmeter A, Tripmeter B, Tripmeter C Clock Manual, Auto Temperature, Pressure, Flow, Distance, Date format Korean, English, Chinese, ETC A type, B type
5	 Utilities 290F3CD107	Tripmeter Camera Exterior aural warning Auto idle time setting	3 kinds (A, B, C) Camera setting, Auto mode (travel) Enable, disable 3~30 sec

(2) Mode setup

① Work mode

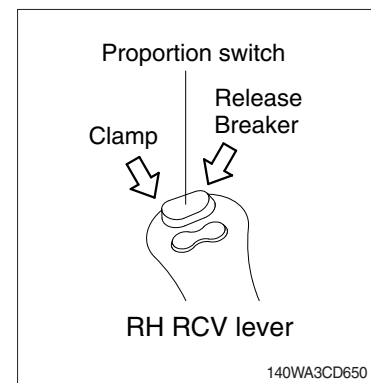


- Select installed optional attachment
 - A : It can set the user's attachment.
It is available in setting #1~#10.
 - B : Max flow - Set the maximum flow for the attachment.
Relief pressure - Set the relief pressure.
Operation type - Set the operation type for attachment.

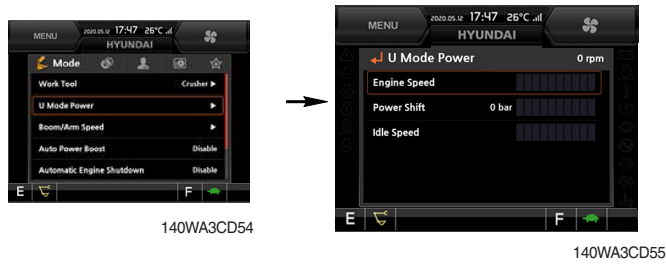
■ Operation type

Operation type is used to set the operation of the proportion switch on the RCV lever if equipped proportional function.

- Push : Switch actuation will be deactivated when the proportion switch is released.
- Detent : Switch actuation will remain even if the proportion switch is released.
To deactivate, move the switch in the same direction again or to the opposite direction.
- Proportion : Switch actuation is proportional to the movement of the proportion switch.



② U mode power

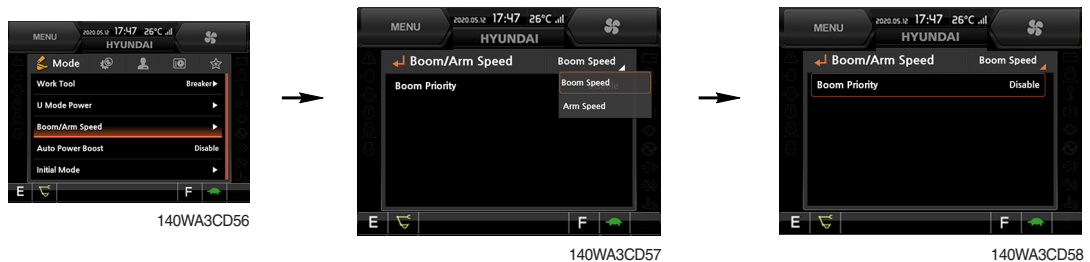


- Engine speed, idle speed, power shift (pump power) and pump flow can be modulated and memorized separately in U-mode.
- U-mode can be activated by user mode switch.

User mode level position (█)	Unit	1	2	3	4	5	6	7	8	9	10
Engine speed	rpm	1400	1450	1500	1550	1600	1650	1700	1750	1800	1900
Idle speed	rpm	800	850	900	950	1000	1050	1100	1150	1200	1250
Power shift (pf EPPR)	mA	600	555	511	466	422	377	333	288	244	200
Pump flow (delta EPPR)	mA	600	555	511	466	422	377	333	288	244	200

※ One touch decel and auto idle rpm : 1100 rpm

③ Boom/Arm speed (null)



- **Boom speed**
 - Boom priority function can be activated or cancelled
 - Enable - Boom up speed is automatically adjusted as working conditions by the MCU.
 - Disable - Normal operation
- **Arm speed**
 - Arm regeneration function can be activated or cancelled.
 - Enable - Arm in speed is up.
 - Disable - Normal operation.

④ Auto power boost



- The power boost function can be activated or cancelled.
 Enable - The digging power is automatically increased as working conditions by the MCU.
 It is operated max 8 seconds, then goes off for a period of 1 second and then activates again for 8 seconds and continues this cycle.
 Disable - Not operated.

⑤ IPC mode (null)



- The IPC mode can be selected by this menu.
 - Speed mode
 - Balance mode (default)
 - Efficiency mode
- ※ Please update the cluster programs if this mode is not displayed in the mode setup menu. Refer to the page 3-37.

⑥ Automatic engine shutdown



- The automatic engine shutdown function can be set by this menu.
 - One time
 - Always
 - Disable
 - Wait time setting : Max 40 minutes, min 2 minutes

⑦ Initial mode



- **Key on initial mode**
 - Selected the power mode is activated when the engine is started.
- **Key on initial work mode**
 - Not installed
 - Last setting
 - Work mode
- **Accel initial mode**
 - Last setting value
 - User setting value
- **Accel initial step**
 - 0~9 step

⑧ Emergency mode



- This mode can be used when the switches are abnormal on the cluster.
- The cluster switches can be selected by touching each icon.

⑨ Cooling fan reverse mode



- Manual : Rotate the fan with reverse direction while pressing the button "Excute".
 - Automatic : Rotate the fan with reverse direction by preset cycle.
 - Interval : 30 minutes ~ 5 hours
 - Time : 30 seconds ~ 5 minutes
- ※ Default : interval (60 minutes), time (120 seconds)

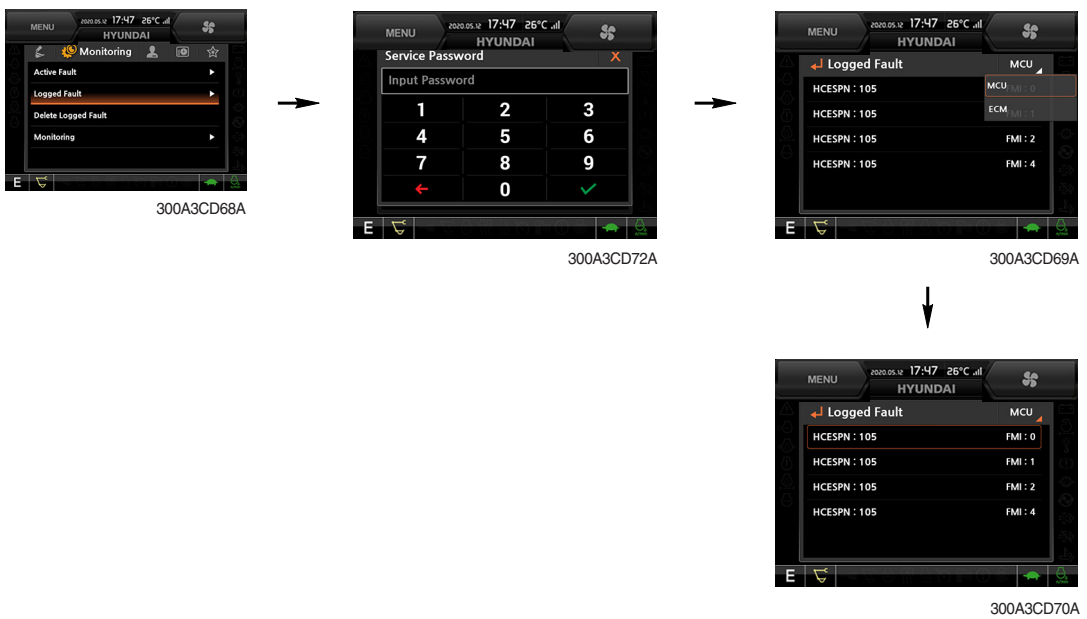
(3) Monitoring

① Active fault



- The active faults of the MCU, ECM, FATC, AAVM (option) can be checked by this menu.

② Logged fault



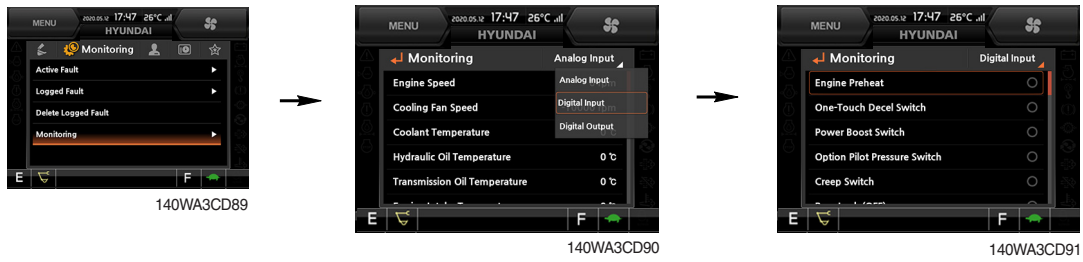
- The logged faults of the MCU, ECM, FATC, AAVM (option) can be checked by this menu.

③ Delete logged fault



- The logged faults of the MCU, ECM, FATC, AAVM (option) can be deleted by this menu.

④ Monitoring

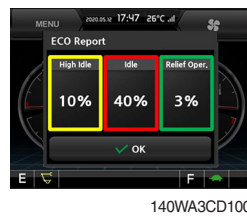


- The machine status such as the engine rpm, oil temperature, voltage and pressure etc. can be checked by this menu (Analog input).
- The switch status or output status can be confirmed by this menu (Digital input & Digital output).
- The activated switch or output pilot lamps ● will light up.

(4) Management

① ECO report

This reports the machine's inefficient operation status in order to improve operator's improper working habit.



High idle



Idle



- Shows a breakdown of high idle, idle and relief operation when monitor is on.
- Gives a daily usage breakdown record for a 7 day period and an overall accumulated record from the first operation.

Relief operation



② Fuel rate information



140WA3CD105

A



140WA3CD106

B



140WA3CD107

C



140WA3CD108

D



140WA3CD109

· General record (A)

- Average fuel rate (left) (from "Reset" to now)
Fuel consumption divided by engine run time (service meter time).
- A days fuel used (right)
Fuel consumption from 24:00 (or "Reset" time) to now (MCU real time).

· Hourly record (B)

- Hourly fuel rates for past 12 hours (service meter time).
- No record during key-off time.
- One step shift to the right for every one hour.
- Automatic deletion of data from 12 hours and earlier.
- "Reset" deletes all hourly records.

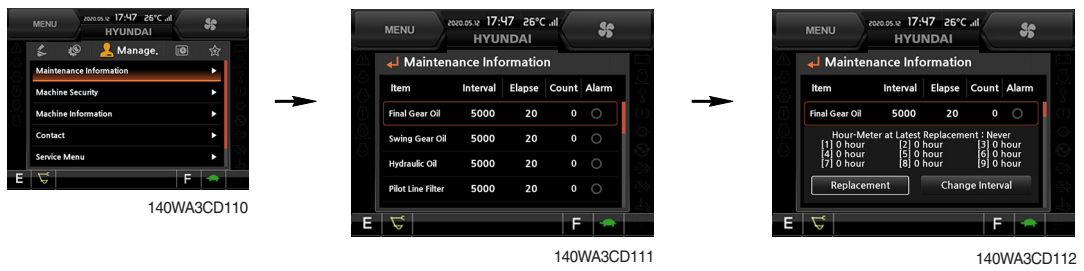
· Daily record (C)

- Daily fuel consumption for past seven days (MCU real time).
- No record during key-off time.
- One step shift to the right at 24:00 for every day.
- Automatically deletes data from 7 days and earlier.
- All daily records deletion by "Reset".

· Mode record (D)

- Average fuel rate for each power mode/accel dial (at least 7) from "Reset" till present.
- No record during idle.
- All records can be deleted by "Reset".

③ Maintenance information



- Alarm lamp (●) is ON when oil or filter needs to be changed or replaced.
 - Replacement : The elapsed time will be reset to zero (0).
 - Change interval : The change intervals can be changed in hour increments of 50.
- ※ Refer to section, Maintenance chart for further information of maintenance interval.

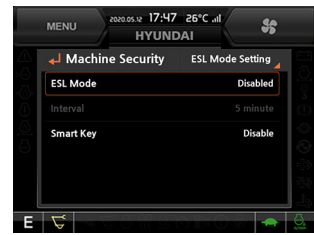
④ Machine security



300A3CD90A



300A3CD91A



300A3CD92A



300A3CD93A



300A3CD94A

· ESL mode setting

- ESL : Engine Starting Limit
- ESL mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
- When you Enable the ESL mode, the password will be required when the starting switch is turned to the on position.

- Machine security

Disable : ESL function is disabled and password is not required to start engine.

Enable (always) : The password is required whenever the operator starts engine.

- **Interval** : The password is required when the operator starts engine first. But the operator can restart the engine within the interval time without inputting the password. The interval time can be set to a maximum 4 hours.

※ Default password : 00000 + ✓

※ Password length : (5~10 digits) + ✓

- Smart key (option) : Refer to next page.

· Password change

- The password is 5~10 digits.



300A3CD95A



300A3CD96A



300A3CD91A

Enter the current password



300A3CD98A

Enter the new password again



300A3CD99A

Enter the new password

※ Before first use, please set user password and owner password in advance for machine security.

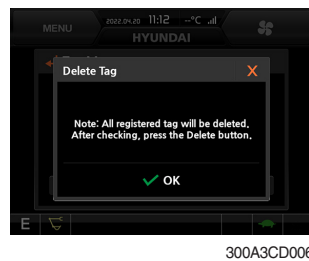
- Smart key



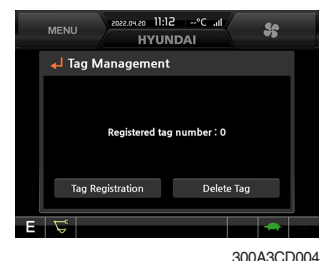
- Smart key is registered when equipped with optional smart key. If smart key is not inside of the cabin, authentication process fails and the password is needed.
- Tag management menu is activated when the Smart key menu is Enabled.
You can register and delete the tags.

- Tag management

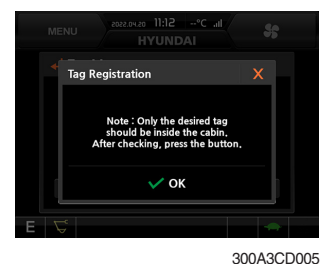
- When registering a tag : Only the tag you want to register must be in the cabin.
- When deleting a tag : All registered tags are deleted.



Deleting



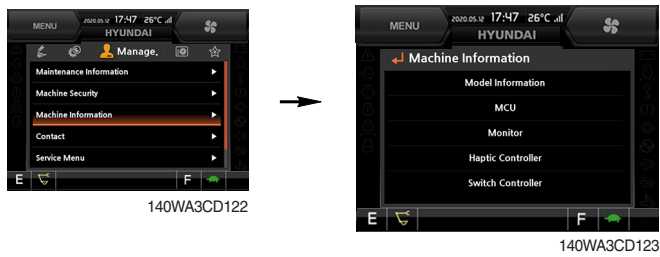
Registering



※ Engine Starting Condition

Case	ESL Mode	Smart Key	Condition
1	Disable	Disable	- With registered tag : Engine can be started without password input. - Without registered tag : Engine can be started without password input.
2	Disable	Enable	If Smart Key is enabled, ESL Mode is automatically enabled. This Case 2 work the same as the Case 4.
3	Enable	Disable	- With registered tag : Engine can be started with password input. - Without registered tag : Engine can be started with password input.
4	Enable	Enable	- With registered tag : Engine can be started without password input. - Without registered tag : Engine can be started with password input.

⑤ Machine Information



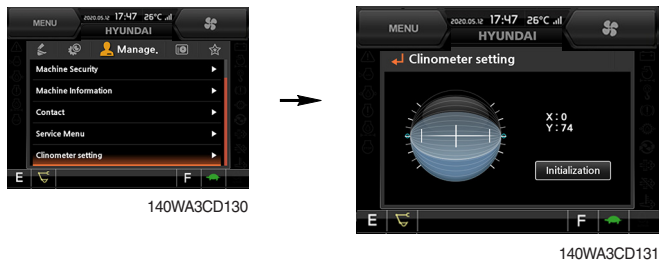
- This can confirm the identification of the model information (ECU), MCU, monitor, jog dial module, switch controller, RMCU, relay driver unit, FATC (air conditioner controller), AAVM (opt).

⑥ Contact (A/S phone number)



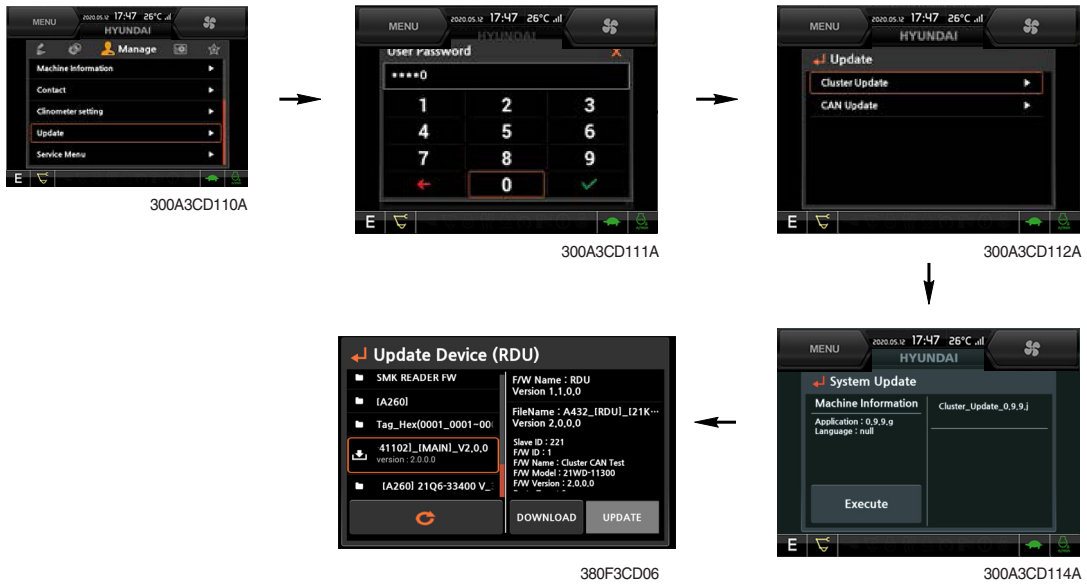
Enter the new A/S phone number

⑦ Clinometer



- When the machine is on the flatland, if you touch "initialization" on cluster, the values of X, Y will reset to "0".
- You can confirm tilt of machine in cluster's operating screen.

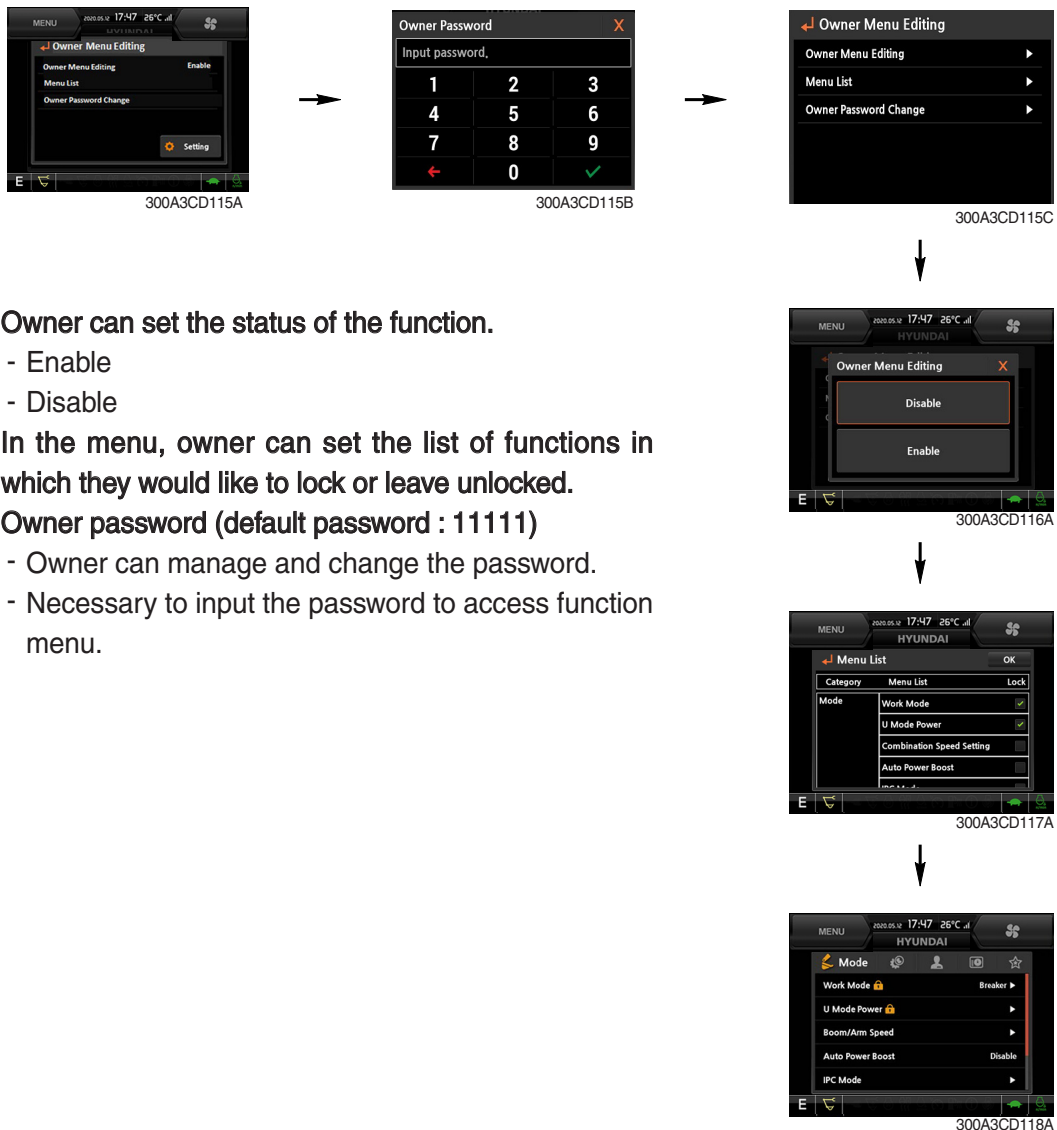
⑧ Update (cluster & ETC devices)



- ETC devices and cluster can be updated through CAN 2 network.
- Insert USB memory stick which includes program files, start download.

⑨ OME (owner menu editing)

The owner of machine can restrict operator access to set functions.



- **Owner can set the status of the function.**
 - Enable
 - Disable
- In the menu, owner can set the list of functions in which they would like to lock or leave unlocked.
- **Owner password (default password : 1111)**
 - Owner can manage and change the password.
 - Necessary to input the password to access function menu.

(5) Display

① Display item



140WA3CD150



140WA3CD151



140WA3CD152

- The center display type of the LCD can be selected by this menu.
- The engine speed or the tripmeter menu (A,B,C) is displayed on the center display.

② Clock



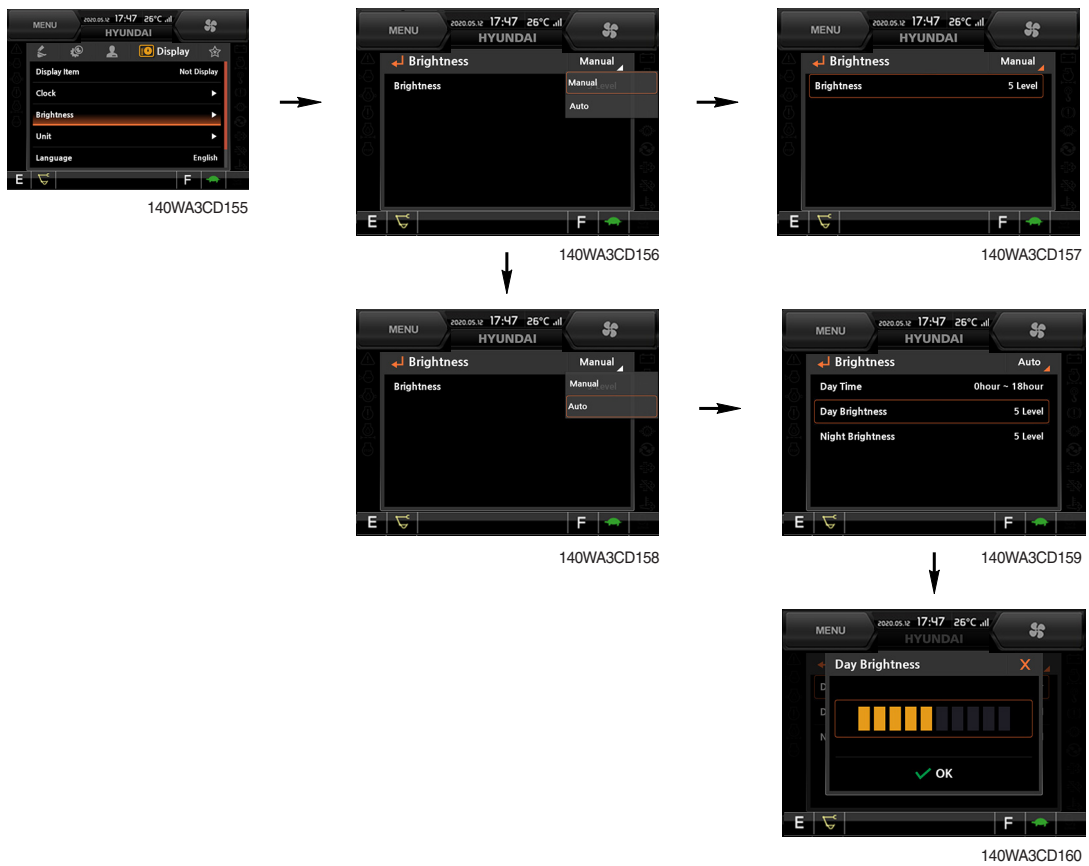
140WA3CD153



140WA3CD154

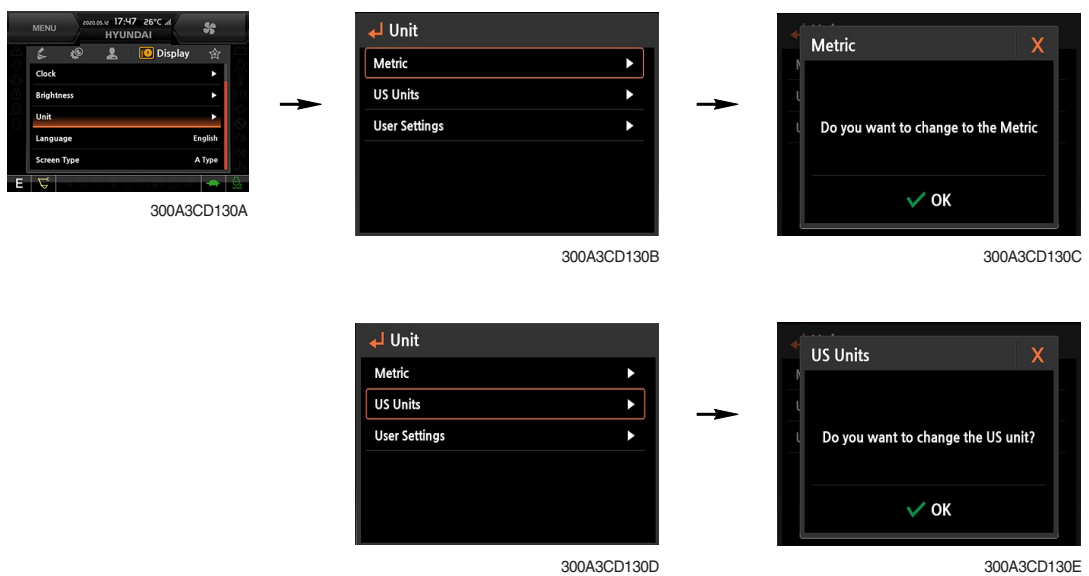
- The first row of boxes indicate Year/Month/Day.
- The second row shows the current time. (0:00~23:59)

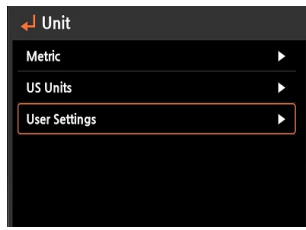
③ Brightness



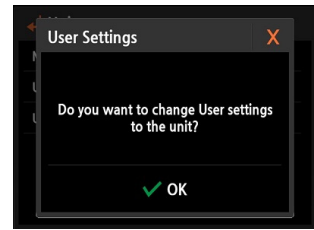
- If "Auto" is chosen, brightness for day and night can be set accordingly. Also by using the bar in lower side, users can define which an operation interval belongs to day and night. (in bar figure, white area represents night time while orange shows day time)

④ Unit





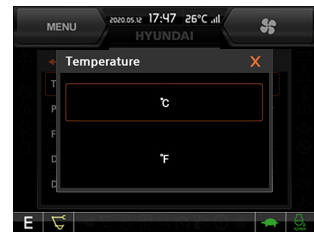
300A3CD130F



300A3CD130G



300A3CD131A



300A3CD132A

- Temperature : °C ↔ °F
- Pressure : bar ↔ MPa ↔ kgf/cm²
- Volume : l ↔ gal
- Flow : lpm ↔ gpm
- Distance : km ↔ mile
- Date format : yy/mm/dd ↔ mm/dd/yy ↔ dd-mm-yy

⑤ Language



140WA3CD164

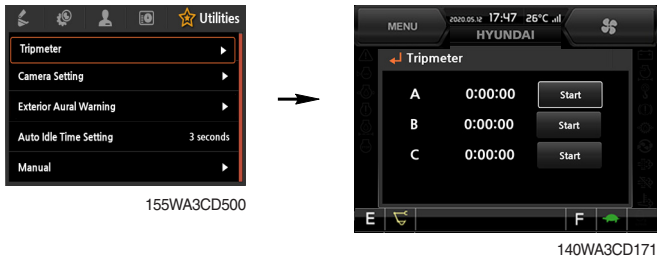


140WA3CD165

- User can select preferable language and all displays are changed to the selected language.

(6) Utilities

① Tripmeter



- A maximum of 3 types of tripmeters can be used at the same time.
- Each tripmeter can be turned on by choosing "Start". It can be turned off by choosing "Stop".
- If the tripmeter icon is activated in the operation screen, it can be controlled directly in this screen.

② Camera setting

- If the rear camera is not installed on the machine, set disable.
- If the rear camera is installed on the machine, set enable.

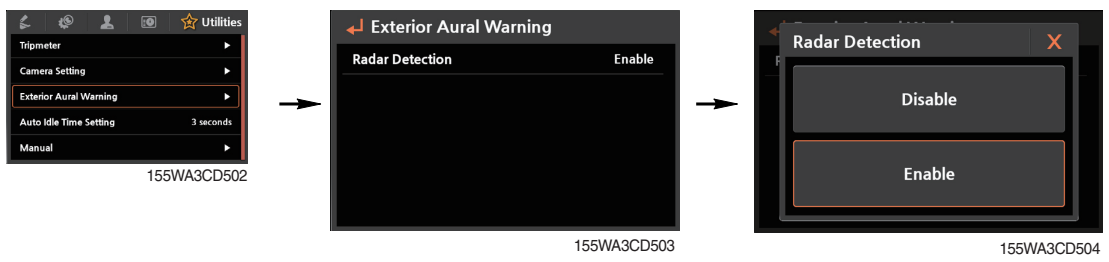


- Auto mode (travel) : Enable
The cluster will automatically show camera view while machine is traveling.
- In the operation screen, rear camera screen shows up when ESC/CAM switch is pushed.



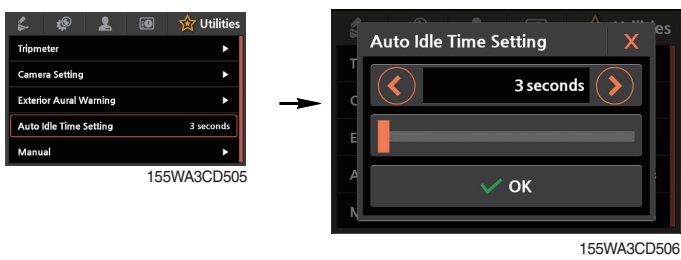
- ※ The monitor's screen can be set by the camera monitor in case the camera option is rear camera only/mirror view/AAVM etc.
- ※ The monitor's screen can't be set by the camera monitor in case the camera option is CIC etc. Set the monitor's detail screen by the main cluster.

③ Exterior aural warning (option)



- This menu is activated when the radar/siren amplifier is equipped optionally.
- The siren amplifier will sounds aural warning when the radar detection menu is set to the Enable.

④ Auto idle time setting



- The auto idle time is can be set by this menu.
- Time : 3~30 seconds

⑤ **AAVM** (Advanced Around View Monitoring, option)

- The AAVM switches of the cluster consist of ESC/CAM and AUTO IDLE/Buzzer stop.



- **Escape switch**

- Activates AAVM mode from the beginning if AAVM is installed.
- While in the AAVM mode, select the ESC switch to return to the home screen.



Home screen



AAVM mode

- **Buzzer stop switch**

- AAVM mode detects surrounding pedestrians or objects and the warning buzzer sounds.
- User can turn OFF the warning sound by pressing the buzzer stop switch.



220A3CD246

- When a worker/pedestrian reaches the green line, which is an external danger area equipped on the cluster, warning buzzer sounds and it displays a green rectangular box recognizing the worker/pedestrian. Stop work immediately. Stop the buzzer by pressing the buzzer stop switch. Then resume work after you confirm that the area is safe and clear of workers/objects.



220A3CD247

- When a worker/pedestrian reaches the red line, which is an internal danger area equipped on the cluster, warning buzzer sounds and it displays a red rectangular box recognizing the worker/pedestrian. Stop work immediately. Stop the buzzer by pressing the buzzer stop switch. Then resume work after you confirm that the area is safe and clear of workers/objects.

▲ Failure to comply may result in serious injury or death.

※ In AAVM mode, a touch screen of the LCD is available only. The multimodal dial of the jog dial module is not available.

⑥ Mirror / RH view camera UI setting (opt)

- The mirror / RH view camera mode can be set by the main cluster.



- **Escape switch**

- Activate mirror / RH mode from the beginning if the option is installed.
- While in that mode, select the ESC switch to return to the home screen.



Home screen



Cam image control (CIC) mode

- **Cam image control (CIC) mode**

- ※ Type A / Type B are divided by equipment camera option.

- **Type A. RH view option**

- Touch (a) (rear), (b) (RH) button on screen to set single-view camera mode.
- Touch (d) (2CH split-view) button to set split-view camera mode.

- **Type B. mirror view option**

- Touch (a) (rear), (c) (mirror) button on screen to set single-view camera mode.
- Touch (d) (2CH split-view) button to set split-view camera mode.

- ※ (a) (rear), (c) (mirror) camera image is inverted for a mirror effect.



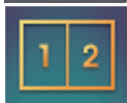
(a) (Rear)



(b) (RH)



(c) (Mirror)



(d) (2CH split-view)

140WA3CD177K



Type A. RH view opt



Type B. mirror view opt

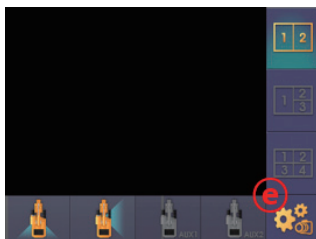
- **Split-view camera order setting**

- Touch  (camera setting) button to set split-view camera order.



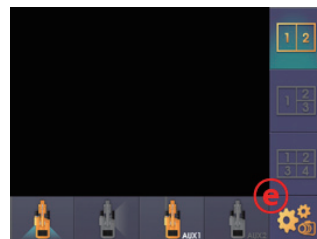
140WA3CD180K

Camera setting



140WA3CD181K

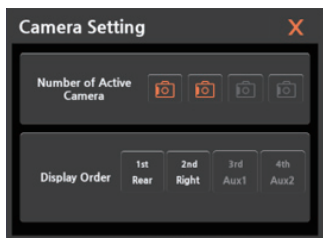
Type A. RH view option



140WA3CD182K

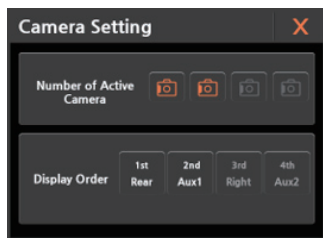
Type B. mirror view option

- You can change split-view camera order on display order menu.



140WA3CD183K

Type A (RH view) default setting
1st rear / 2nd right



140WA3CD184K

Type B (mirror view) default setting
1st rear / 2nd Aux1

- **With 2nd camera monitor option**

- ※ You can set camera view on main cluster.



140WA3CD185K

Set camera view
on main cluster

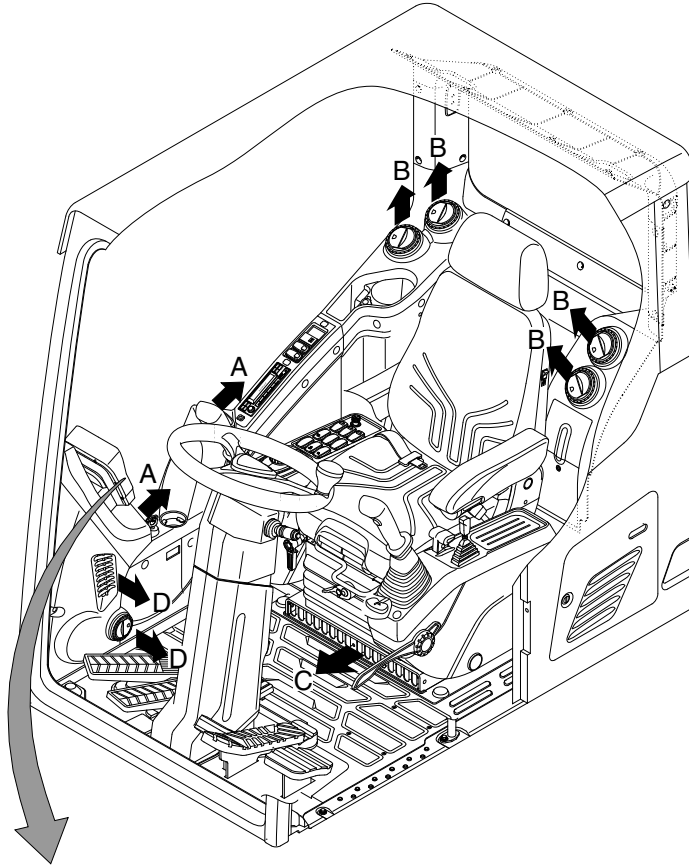


140WA3CD186K

7) AIR CONDITIONER AND HEATER

Full auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration, sensing ambient and cabin inside temperature.

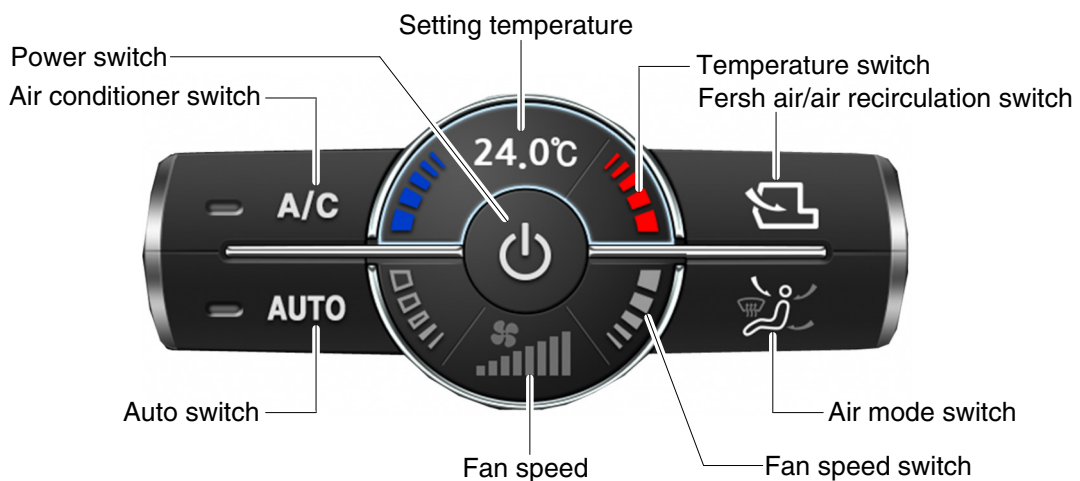
· Location of air flow ducts



Cluster LCD



Cluster :  or
Jog dial module : 



※ Jog dial module : Refer to page 3-80.

150WA3CD201

(1) Power switch



- ① This switch turns the system ON and OFF.
Just before powering OFF, set values are stored.
- ② Default setting values

Function	Air conditioner	In/outlet	LCD	Temperature	Mode
Value	OFF	Inlet	OFF	Previous sw OFF	Previous sw OFF

(2) Air conditioner switch



- ① This switch turns the compressor ON/OFF.
- ※ **Air conditioner operates to remove vapor and drains water through a drain hose. Water can be sprayed into the cab in case that the drain cock at the ending point of drain hose has a problem.**
In this case, exchange the drain cock.

(3) Auto switch



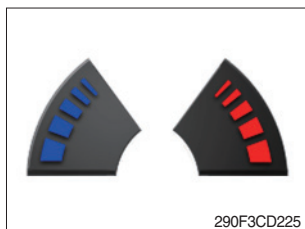
- ① Auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration sensing ambient and cabin inside temperature.

(4) Setting temperature



- ① Displays the temperature setting.

(5) Temperature switch

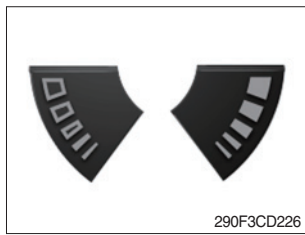


- ① Setting temperature indication
· Lo (17°C), 17.5~31.5°C, Hi (32°C)
- ② Max cool and max warm beeps 5 times.
- ③ The max cool or the max warm position operates per the following table.

Temperature	Compressor	Fan speed	In/outlet	Mode
Max cool	ON	Hi (8 step)	Recirculation	Face
Max warm	OFF	Hi (7 step)	Fresh	Def/Foot

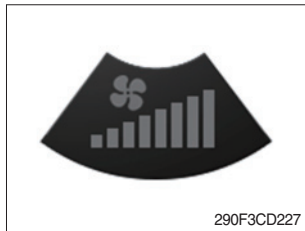
- ④ Temperature unit can be changed between celsius (°C) and fahrenheit (°F)
 - a. Default status (°C)
 - b. The temperature unit can be changed (°C ↔ °F) by pressing temperature switches (Up/Down) simultaneously for more than 5 seconds.

(6) Fan speed switch



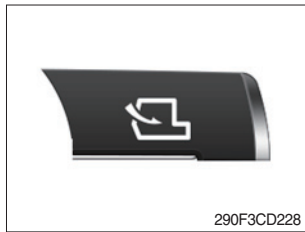
- ① Fan speed is controlled automatically by set temperature.
- ② This switch controls fan speed manually.
 - There are 8 up/down steps to control fan speed.
 - The maximum step or the minimum step beeps 5 times.

(7) Fan speed



- ① Steps 1 through 8 to display the amount of air being circulated.

(8) Fresh air/air recirculation switch



- ① It is possible to change the air-inlet method.
 - a. **Fresh air** (☞)
 - Inhaling air from the outside.
 - b. **Air recirculation** (☞)
 - It recycles the heated or cooled air to increase the energy efficiency.
 - ※ **Change air occasionally when using recirculation for a long periods of time.**
 - ※ **Check condition of fresh air filter and recirculation filter periodically to maintain good efficiency of the system.**

(9) Air mode switch



- ① Operating this switch, it beeps and displays symbol of each mode in the following order. (Face → Face/Rear → Face/Rear/Foot → Foot → Def/Foot)

Mode switch	Face	Face/Rear	Face/Rear/Foot	Foot	Def/Foot
Outlet	A	●	●	●	
	B		●	●	
	C			●	●
	D				●

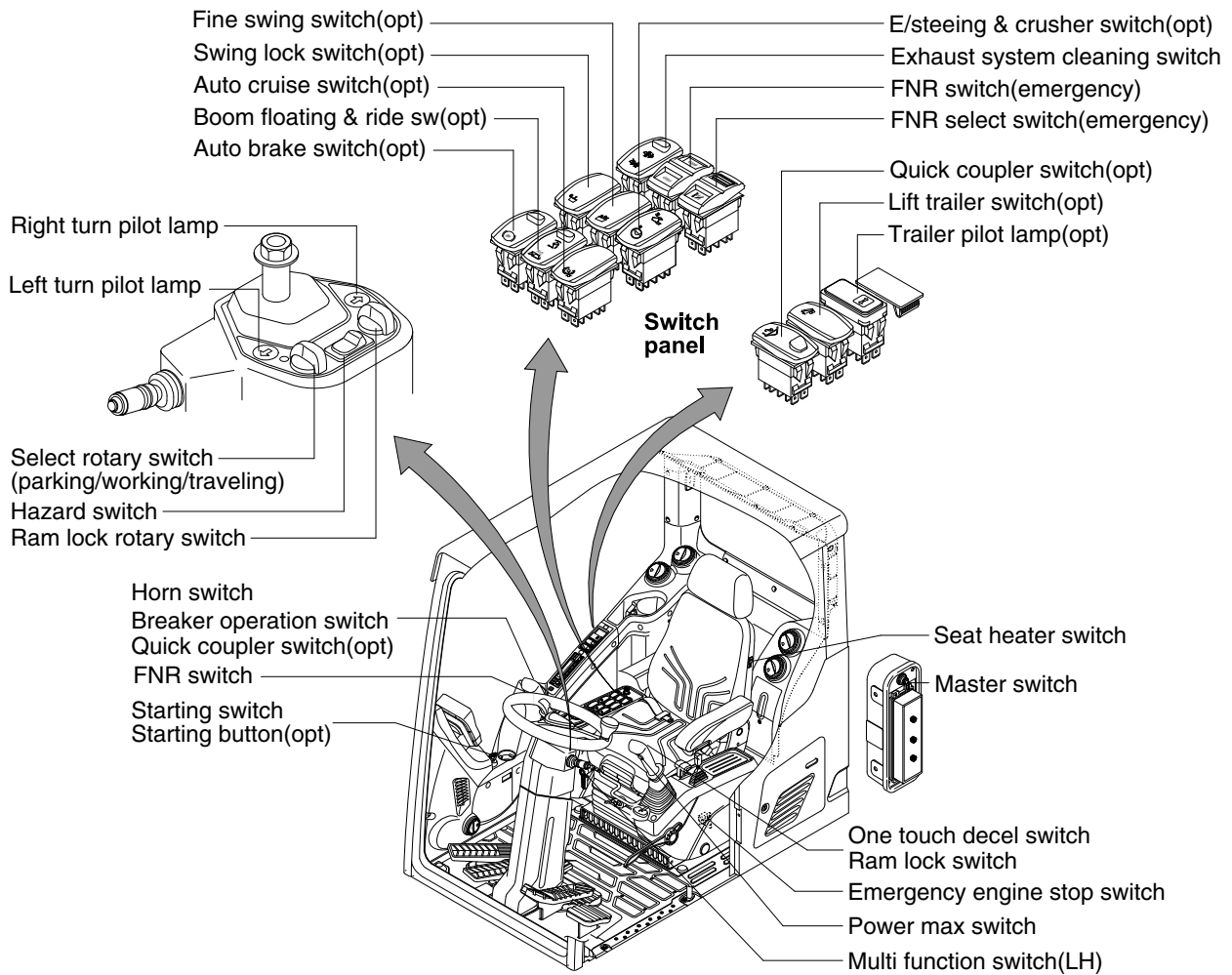
- ② When operating defroste, FRESH AIR/AIR RECIRCULATION switch turns to FRESH AIR mode and air conditioner switch turns ON.

(10) Self Diagnosis Function

- ① Diagnostic methods : Diagnostic information window, select
- ② Diagnostic indication (Displays fault)

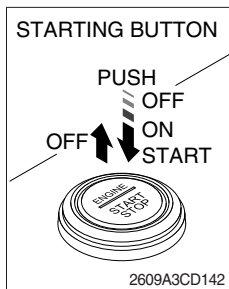
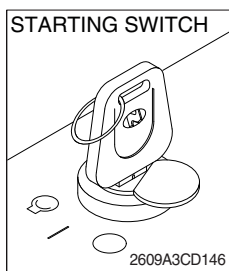
Fault code	Description	Fail safe function
F01	Ambient temperature sensor open	20°C alternate value control
F02	Ambient temperature sensor short	
F03	Cab inside temperature sensor open	25°C alternate value control
F04	Cab inside temperature sensor short	
F05	Evaporate temperature sensor open	0°C alternate value control
F06	Evaporate temperature sensor short	
F07	Null	-
F08	Null	-
F09	Mode 1 actuator open/short	The alternate value is face
F10	Mode 1 actuator drive circuit malfunction	If not, the alternate value is Def/Foot
F11	Intake actuator open/short	The alternate value is air recirculation
F12	Intake actuator drive circuit malfunction	The alternate fresh air
F13	Temperature actuator open/short	If opening amount is 0 %, the alternate value is 0 %
F14	Temperature actuator drive circuit malfunction	If not, the alternate value is 100 %
F15	Null	-
F16	Null	-

3. SWITCHES



150WA3CD46A

1) STARTING SWITCH AND STARTING BUTTON (OPT)



Starting button with smart key tag (opt)

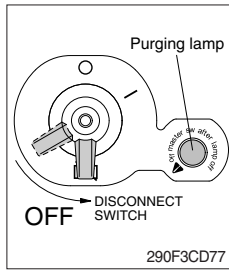
(1) There are three positions, OFF, ON and START.

- ○ (OFF) : No of electrical circuits activate.
- | (ON) : All the systems of machine operate.
- ○ (START) : Use when starting the engine.

Release key immediately after starting.

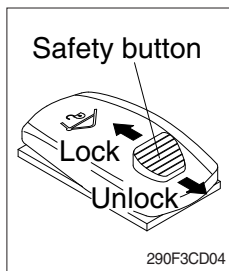
- ※ If you turn ON the starting switch in cold weather, the fuel warmer is automatically operated to heat the fuel by sensing the coolant temperature. Start the engine in 1~2 minutes after turning ON the starting switch. More time may be required according to ambient temperature.
- ※ Starting switch controller tries engine starting at least 3 seconds even if switch is released after driver's start trial (key switch : start position / starting button : long push) to prevent short-time cranking (which can not starting engine). If no-start conditions (unlock safety knob) are resolved (lock safety knob) during the 3 seconds of engine starting attempt, engine can be started.
- ※ Key must be in the ON position with engine running to maintain electrical and hydraulic function and prevent serious machine damage.

2) MASTER SWITCH



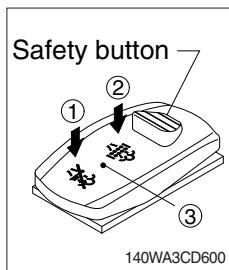
- (1) This switch is used to shut off the entire electrical system.
 - (2) I : The battery remains connected to the electrical system.
O : The battery is disconnected from the electrical system.
- ※ **Never turn the master switch to O (OFF) with the engine running. Engine and electrical system damage could result.**
 - ※ **Turn OFF the master switch after purging lamp goes OFF.**

3) QUICK COUPLER SWITCH (option)



- (1) This switch is used to engage or disengage the moving hook on quick coupler.
- ※ **Refer to the page 8-10 for details.**

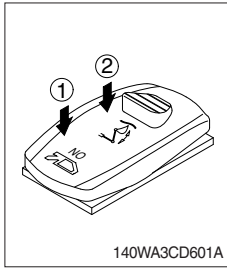
4) EXHAUST SYSTEM CLEANING SWITCH



- (1) This switch is used to select the exhaust system cleaning.
- (2) **Inhibit position (①)**
 - ① The inhibit position disallows any automatic or manual exhaust system cleaning.
 - ② This may be used by operator to prevent exhaust system cleaning when the machine is operating in a hazardous environment and is concerned about high exhaust temperatures.
 - ③ It is strongly recommended that this position is only activated when high temperatures may cause a hazardous condition.
- (3) **Auto position (③)**

This position will initiate an automatic exhaust system cleaning.
- (4) **Manual position (②)**
 - ① This position will only initiate a manual exhaust system cleaning when the machine is in non-mission condition, engine must run at low idle speed and exhaust system levels are high enough to allow cleaning.
 - ② HEST lamp will be illuminated during the entire exhaust system cleaning.
 - ※ **Refer to the page 3-10 for details.**
 - ※ **This switch can be moved to the manual position (②) only when the safety button is pulled backward.**
 - ※ **Also, this switch returns to the auto position when released from the manual position (②).**

5) BOOM FLOATING AND RIDE CONTROL SWITCH (option)



(1) This mode is used to smooth boom operation or ride control and the pilot lamp is display in the cluster.

① : Ride control ()

② : Boom floating ()

(2) Ride control position

① The large chambers of the boom cylinders will be connected to the ride control accumulators.

② This removes shocks when driving over a bumpy road.

※ **As soon as you turn on this switch, the boom can go down or up a few decimeters. Please be aware of the movement.**

(3) Boom floating position

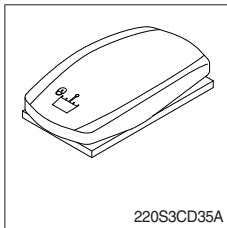
① When the bucket is placed on the ground, you can start pulling in the arm.

② Then the boom cylinders will extend automatically and digging becomes impossible.

③ The bucket slides over the ground and can be used to scrape off the hard ground.

※ **Boom float cannot be used on soft ground, as the attachment will sink.**

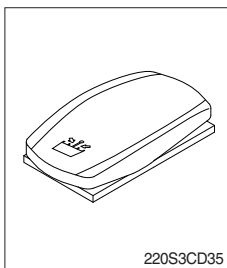
6) SWING LOCK SWITCH (option)



(1) This switch is used to lock the swing parking brake.

(2) Swing control is not available when this switch is activated.

7) FINE SWING SWITCH (null)



(1) When the switch is pressed ON position, the fine swing valve is operated with below conditions.

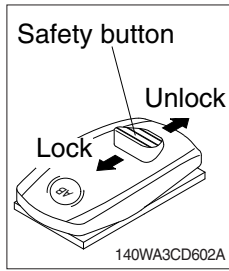
① General operation mode & attach (breaker/crusher) mode : when swing levers are operated

(2) Fine swing

Enhanced fine swing is implemented to allow smooth stop during swing control.

▲ **If the machine is operating on a slope with the switch on position, swing motion may become uncontrollable which could result in property damage, personal injury or death. Do not use on position when the machine is operating on a slope.**

8) AUTO BRAKE SWITCH

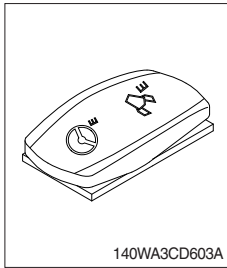


(1) When the switch is pressed ON position, the auto digging brake is operated with below conditions.

- ① When vehicle speed is 0 km
- ② When PWT rotary switch is work mode
- ③ When travel speed switch is not high speed

⚠ Do not use on position when the machine is operating on a slope.

9) E/STEERING AND CRUSHER SWITCH

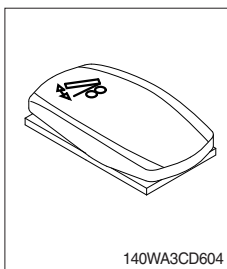


(1) When this switch is pressed E/STEERING (E) position, the electric steering is operated with below conditions

- ① When PWT rotary switch is not travel mode
- ② When travel speed switch is not high speed

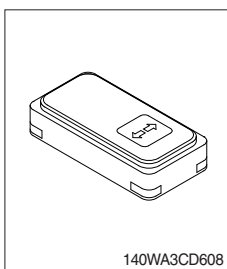
(2) When the switch is pressed CRUSHER (E) position, the crusher is operated.

10) LIFT TRAILER SWITCH



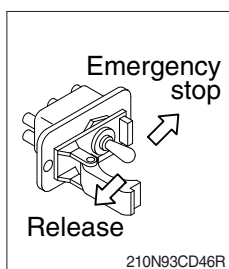
(1) When the switch is pressed ON position, the trailer supply line opens.

11) TRAILER PILOT LAMP



(1) This lamp blinks when operator turns on directional indicators or warning light. It only turns on when trailer lamp is connected to the machine.

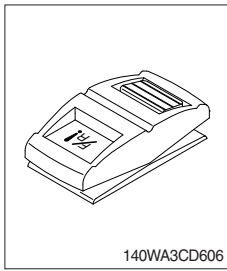
12) EMERGENCY ENGINE STOP SWITCH



(1) This switch is used to stop the engine in the event of an emergency.

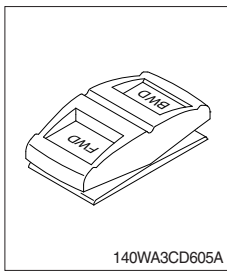
※ Be sure to return the emergency switch to the release or run position before trying to restart the engine.

13) FNR SELECT SWITCH (EMERGENCY)



- ① This switch makes emergency FNR to enable when the FNR switch on the RH RCV lever is failed.

14) FNR SWITCH (EMERGENCY)



- ① This switch changes travel direction of machine only when the emergency FNR select switch is in ON.
- F : Machine moves forward
 - N : Neutral position
 - R : Machine moves backward

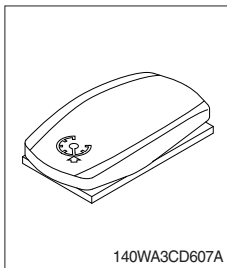
▲ Travel direction will be reversed if lower structure is positioned with dozer in front.

- ② The warning buzzer sounds when the switch is in the reverse position.

▲ If this switch is not in the neutral position, engine does not start.

▲ Be sure to stop the machine when changing the direction forward or backward while traveling.

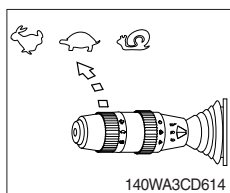
15) AUTO CRUISE SWITCH



- (1) This switch is used to keep uniform motion while driving.
- (2) Auto cruise function is available when the FNR switch is forward and high speed position.

16) LH MULTI FUNCTION SWITCH

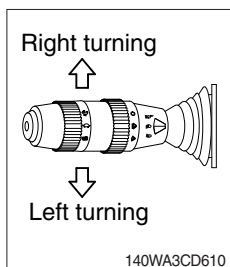
(1) Travel speed switch



① This switch is used to select travel speed as below.

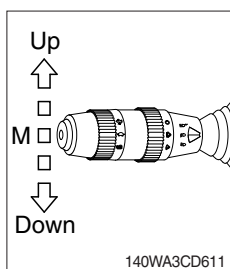
- : 35 km/hr (21.7 mph)
- : 10 km/hr (6.2 mph)
- : 3 km/hr (1.9 mph)

(2) Direction indication lamp switch



- ① This switch is used to warn or signal the turning direction of the machine to other machines or equipment.
- ② Push the lever to forward for turning right, pull the lever to backward for turning left.
- ③ The turning pilot lamp comes ON at the travel pilot lamp on the steering column.

(3) Dimmer switch

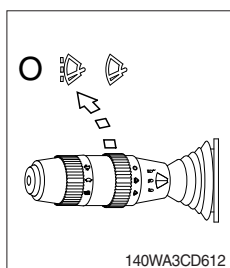


① This switch is used to turn the head lights direction.

- Up () : To flash for passing
- Middle () : Head lights low beam ON
- Down () : Head lights high beam ON

② If you release the switch when it's in up position, the switch will return to middle.

(4) WIPER SWITCH

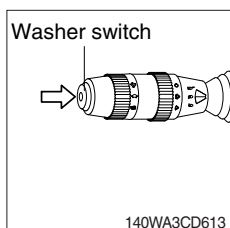


① This switch is used to operate the wiper as below.

- : OFF
- : Wiper moves continuously
- : Wiper moves continuously and washer liquid is also sprayed.

※ If the wiper does not operate with the switch in operation position, turn the switch OFF immediately. Check the cause. If the switch remains operation position, motor failure can result.

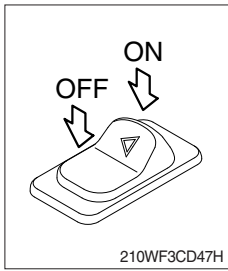
(5) WASHER SWITCH



① If you push the grip of the lever, washer liquid will be sprayed and the wiper will be activated 2-3 times.

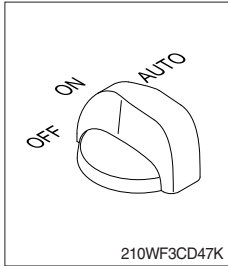
※ Check the quantity of washer liquid in the tank. If the level of the washer liquid is LOW, add the washer liquid (in cold, winter days) or water. The capacity of tank is 1.5 liter.

17) HAZARD SWITCH



- (1) Use for parking, or roading machine.
- (2) LH and RH turn signal lamps light up at the same time by this switch.
- ※ If the switch is left ON for a long time, the battery may be discharged.

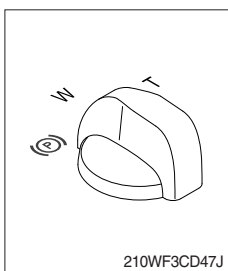
18) RAM LOCK ROTARY SWITCH



- (1) This switch activate front axle oscillation cylinder to locking position for increase of stability.
 - ON : Set front axle to locking position for excavation work or travels even ground. Also, the ram lock pilot lamp lights up at the cluster.
 - OFF : Front axle will be oscillate depend on ground condition when the machine travel uneven ground.
 - AUTO : Set front axle to locking or unlocking as table.

Select switch (parking/working/traveling)	Ram lock	Conditions
Parking	Locking	· Always
Traveling	Unlocking	· Always
Working	Locking	· FNR switch in neutral position · Service brake pedal is depressed.
	Unlocking	· FNR switch in forward/reverse position and service brake pedal is not depressed. · 2 way pedal is equipped and service brake pedal is not depressed.

19) SELECT ROTARY SWITCH (parking / working / traveling)

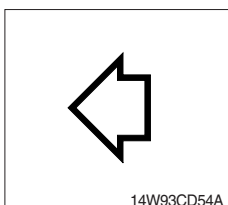


- (1) This switch is used to select the operation mode as below.
 - Parking (P) : The parking brake is applied.
 - Working (W) : The machine needs to be working.
 - Traveling (T) : The machine needs to be traveling.

Mode		Working	Traveling
P	Parking	X	X
W	Working	O	O
T	Traveling	X	O

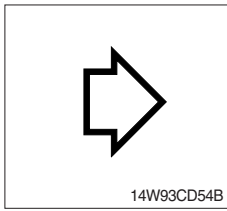
- (2) When you set this switch to parking or working, the parking or working lock pilot lamp lights up at the cluster.

20) LEFT TURNING PILOT LAMP



- ① This lamp flashes with sound when the LH multifunction switch is move to backward position.

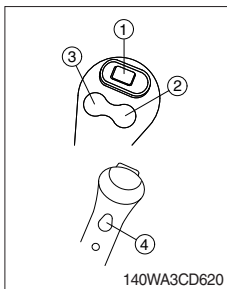
21) RIGHT TURNING PILOT LAMP



- ① This lamp flashes with sound when the LH multifunction switch is move to forward position.

22) LH RCV LEVER SWITCH

(1) Button type

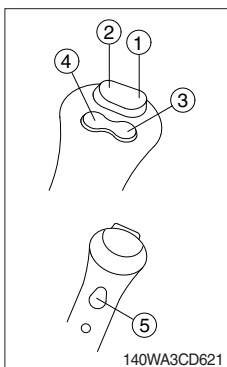


The switches on the LH RCV lever is function as below.

- ① None
- ② One touch decel switch
 - a. This switch is used to actuate the deceleration function quickly.
 - b. The engine speed is increased to previous setting value by pressing the switch again.
 - c. One touch decel function is available only when the auto idle pilot lamp is turned OFF.
- ③ Ram lock switch
 - a. This button activates only auto mode.
 - b. When RCV button is pressed for 0.5 seconds, set front axle to locking position.
 - c. Ram lock pilot lamp is blinking at the cluster.
- ④ Power max switch
 - a. This switch activates power max function.
When this switch is pressed and held, hydraulic power of work equipment will be increased to approx 110 percent for a period of 8 seconds.
 - b. After 8 seconds, function is cancelled automatically even if the switch remains pressed.

※ Do not use for craning purposes.

(2) Proportional type (opt)

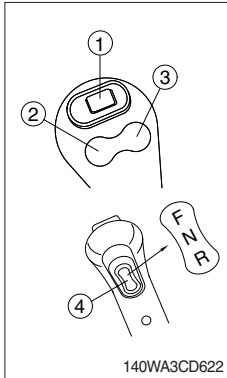


The switches on the LH RCV lever is function as below.

- ① CW rotating switch
When this switch is pressed, the clockwise rotating will operate.
- ② CCW rotating switch
When this switch is pressed, the counterclockwise rotating will operate.
- ③ One touch decel switch : Refer to (1)-② above.
- ④ Ram lock switch : Refer to (1)-③ above.
- ⑤ Power max switch : Refer to (1)-④ above.

23) RH RCV LEVER SWITCH

(1) Button type



The switches on the RH RCV lever is function as below.

① Breaker switch

When this switch is pressed, the breaker will only operate when the breaker operation mode is selected.

② Quick coupler switch

This switch is used to engage or disengage the moving hook on quick coupler.

Refer to the page 8-10.

③ Horn switch

When this switch is pressed, the horn will sound.

④ FNR switch

a. This switch changes travel direction of machine.

- F : Machine moves forward
- N : Neutral position
- R : Machine moves backward

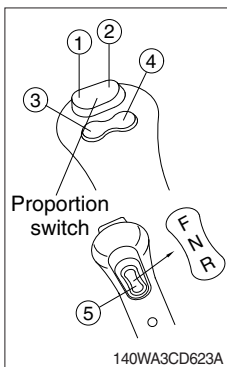
▲ Travel direction will be reversed if lower structure is positioned with dozer in front.

b. The warning buzzer sounds when the switch is in the reverse position.

▲ If this switch is not in the neutral position, engine does not started.

▲ Be sure to stop the machine when changing the direction forward or backward while traveling.

(2) Proportional type (opt)



The switches on the RH RCV lever is function as below.

① 2-way clamp switch

When this switch is pressed, the clamp will only operate when the crusher operation mode is selected.

② 2-way release switch

When this switch is pressed, the release or breaker will operate when the crusher operation mode or breaker operation mode is selected.

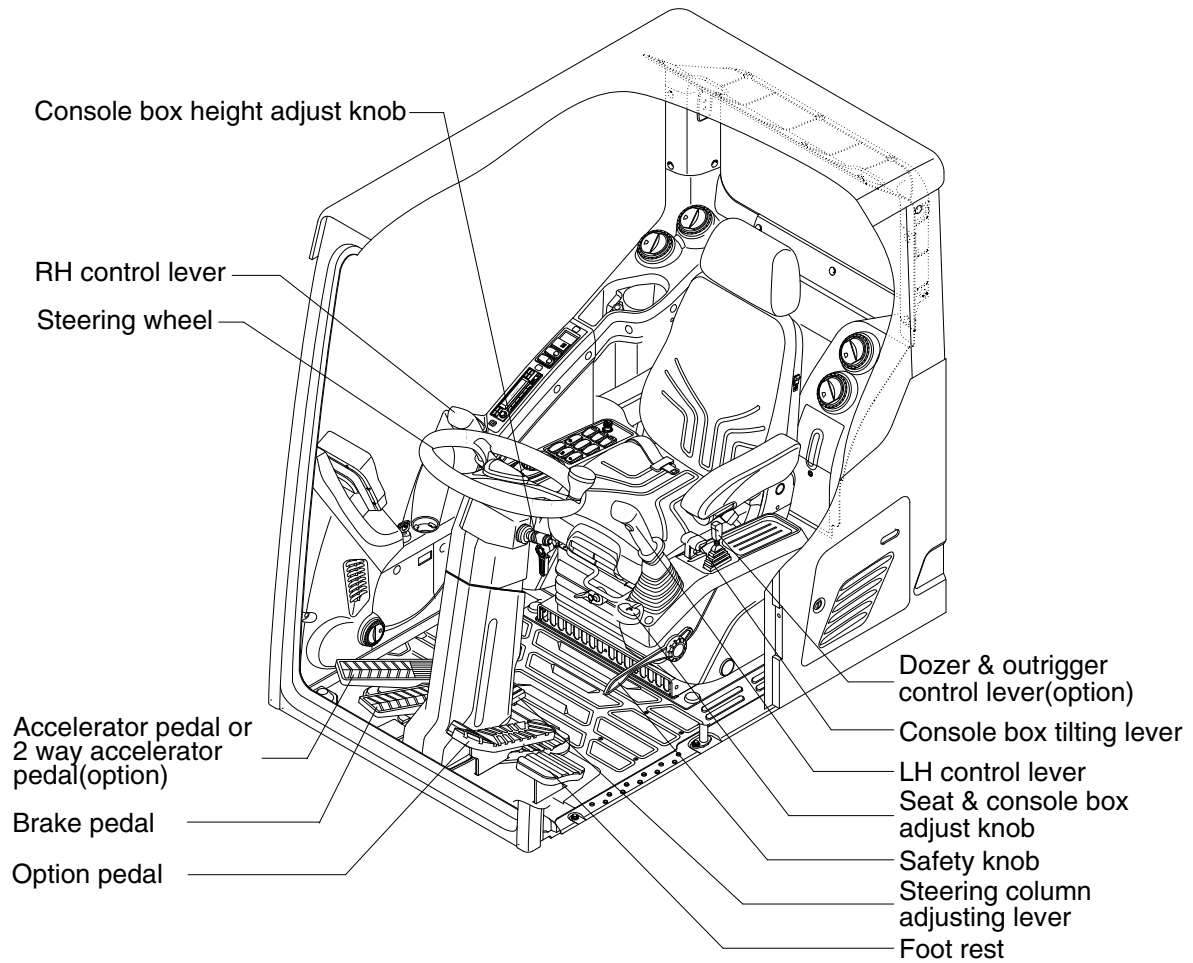
③ Quick coupler switch : Refer to (1)-② above.

④ Horn switch : Refer to (1)-③ above.

⑤ FNR switch : Refer to (1)-④ above.

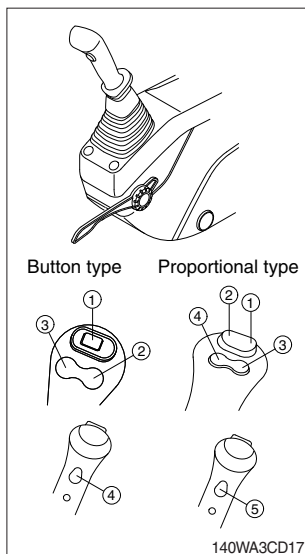
※ Refer to the page 3-26 for the control type of the proportion switch.

4. LEVERS AND PEDALS



150WA3CD47

1) LH CONTROL LEVER



(1) This joystick is used to control the swing and the arm.

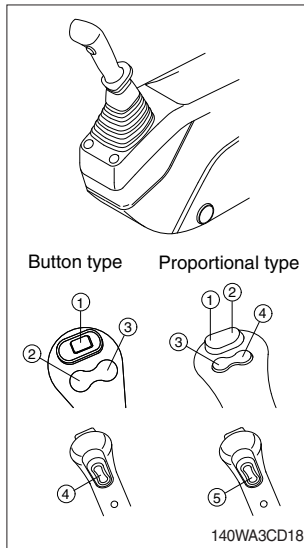
※ Refer to operation of working device in chapter 2 for details.

(2) The switch functions are as below.

No.	Button type	Proportional type (opt)
①	N.A	Rotating-CW
②	One touch decel	Rotating-CCW
③	Ram lock	One touch decel
④	Power max	Ram lock
⑤	-	Power max

※ Refer to the page 3-56 for the details of the switch function.

2) RH CONTROL LEVER



(1) This joystick is used to control the boom and the bucket.
 ※ Refer to operation of working device in chapter 2 for details.

(2) The switch functions are as below.

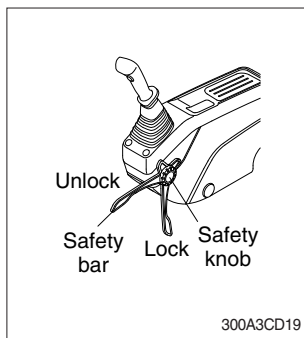
No.	Button type	Proportional type (opt)
①	Breaker	2-way clamp
②	Quick coupler	2-way release
③	Horn	Quick coupler
④	FNR switch	Horn
⑤	-	FNR switch

※ Refer to the page 3-57 for the details of the switch function.

(3) Also, this joystick is used to control the steering.

※ Refer to the page 3-62 for the details of the joystick steering.

3) SAFETY KNOB



(1) All control levers and pedals are disabled from operation by locating the knob the LOCK position as shown.

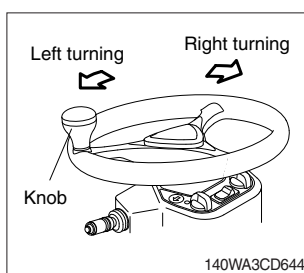
※ Be sure to turn the safety knob to the LOCK position when entering or leaving the operators seat/cabin.

(2) The machine is operational by turning the safety knob to the UNLOCK position.

※ Do not use the safety bar for a handle when getting on or off the machine.

⚠ The machine is able to travel even when the safety knob is in the LOCK position.

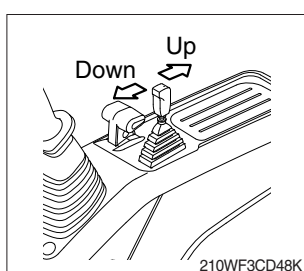
4) STEERING WHEEL



(1) If the steering wheel is turned to left, the machine will move to the left and turn it to the right, the machine will move to the right.

(2) As the handle is equipped with a knob, it is convenient to operate with one hand or quickly.

5) DOZER AND OUTRIGGER CONTROL LEVER

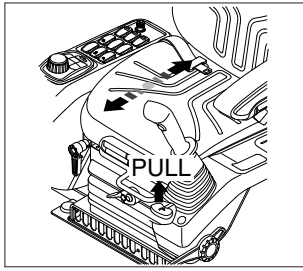


(1) This lever is used to operate dozer blade or outrigger by selecting the switches on the cluster.

※ Please refer to the switch (dozer / outrigger) at page 3-23.

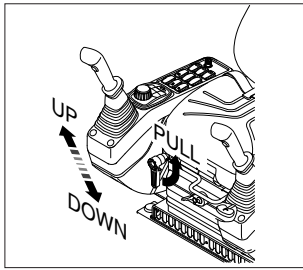
(2) If the lever is pushed forward, the dozer blade or outrigger will be going down. And if the lever is pulled back, the dozer blade or outrigger will be going up.

6) SEAT AND CONSOLE BOX ADJUST KNOB (forward / backward)



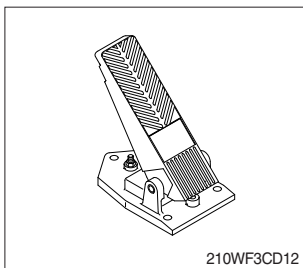
- (1) This knob is used to move the seat and console box to fit the contours of the operator's body.
- (2) Pull the knob to adjust forward or backward over 150 mm (5.9").

7) CONSOLE BOX HEIGHT ADJUST KNOB



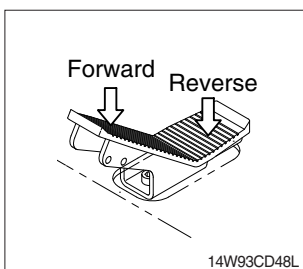
- (1) This knob is used to move the LH and RH control lever to fit the contours of the operator's body.
- (2) The control lever can be moved upward and downward at 45° over 75 mm (3.0").

8) ACCELERATOR PEDAL



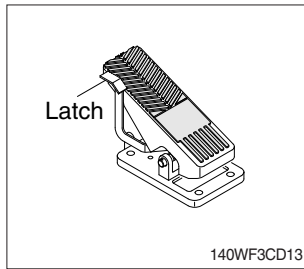
- (1) When this pedal is stepped, the machine starts traveling.
- ▲ Before starting the machine with stepping on the pedal, check if the underframe is certainly in the traveling direction.**

9) 2 WAY ACCELERATOR PEDAL (option)



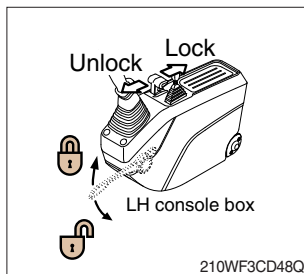
- (1) This pedal is used to select traveling direction and to accelerate of the machine.
- (2) Push the pedal to front for forward traveling, push the pedal to rear for reverse traveling regardless FNR switch at working mode of select switch.

10) BRAKE PEDAL



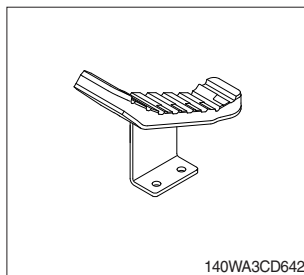
- (1) Pedal and latch provide two kinds of service brake function.
- (2) To operate service brake, push pedal with latch by foot.
▲ Push pedal and latch at once to avoid unexpected locking of pedal in traveling condition.
▲ During travel, do not push pedal only in full stroke. It is dangerous due to the locking of service brake.
- (3) If you want to choose working brake, just push pedal in full stroke without latch then the latch locks pedal and service brake is working continuously until you push the latch to release the pedal.
- (4) Push latch to release working brake.

11) CONSOLE BOX TILTING LEVER



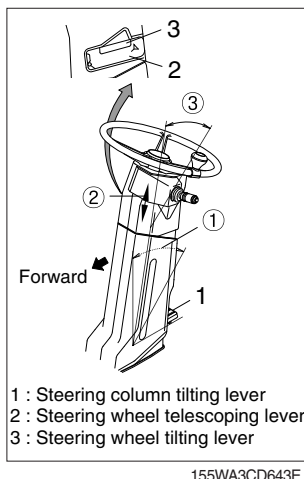
- (1) All control levers and pedals are disabled from operation by locating the lever to lock position as shown.
※ **Be sure to tilt the lever to LOCK position when leaving from operator's seat.**
- (2) By push lever to UNLOCK position, the machine is operational.
※ **Do not use the tilt lever for handle when getting on or off the machine.**

12) OPTION PEDAL



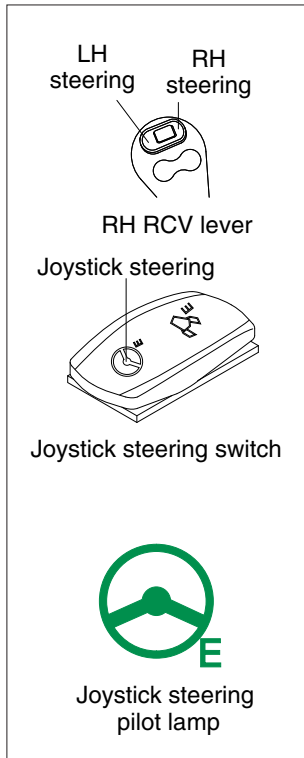
- (1) This pedal is used to operate the option attachment if equipped.

13) STEERING COLUMN ADJUSTING LEVER



- (1) The steering column and wheel are adjusted by the adjusting levers as below.
 - ① Steering column tilting : forward 8°, backward 22°
 - ② Steering wheel telescoping : 90 mm
 - ③ Steering wheel tilting : backward 20°

14) JOYSTICK STEERING CONTROL LEVER (OPTION)



(1) This means that the operator does not need to touch the steering wheel during normal work.

(2) The joystick steering pilot lamp on the cluster will be ON when the joystick steering switch is pressed.

⚠ When operating on a public road, the steering wheel should always be used and the joystick steering be disconnected. Also when the travel speed mode is high speed mode (rabbit), this function is limited.

(3) Joystick steering

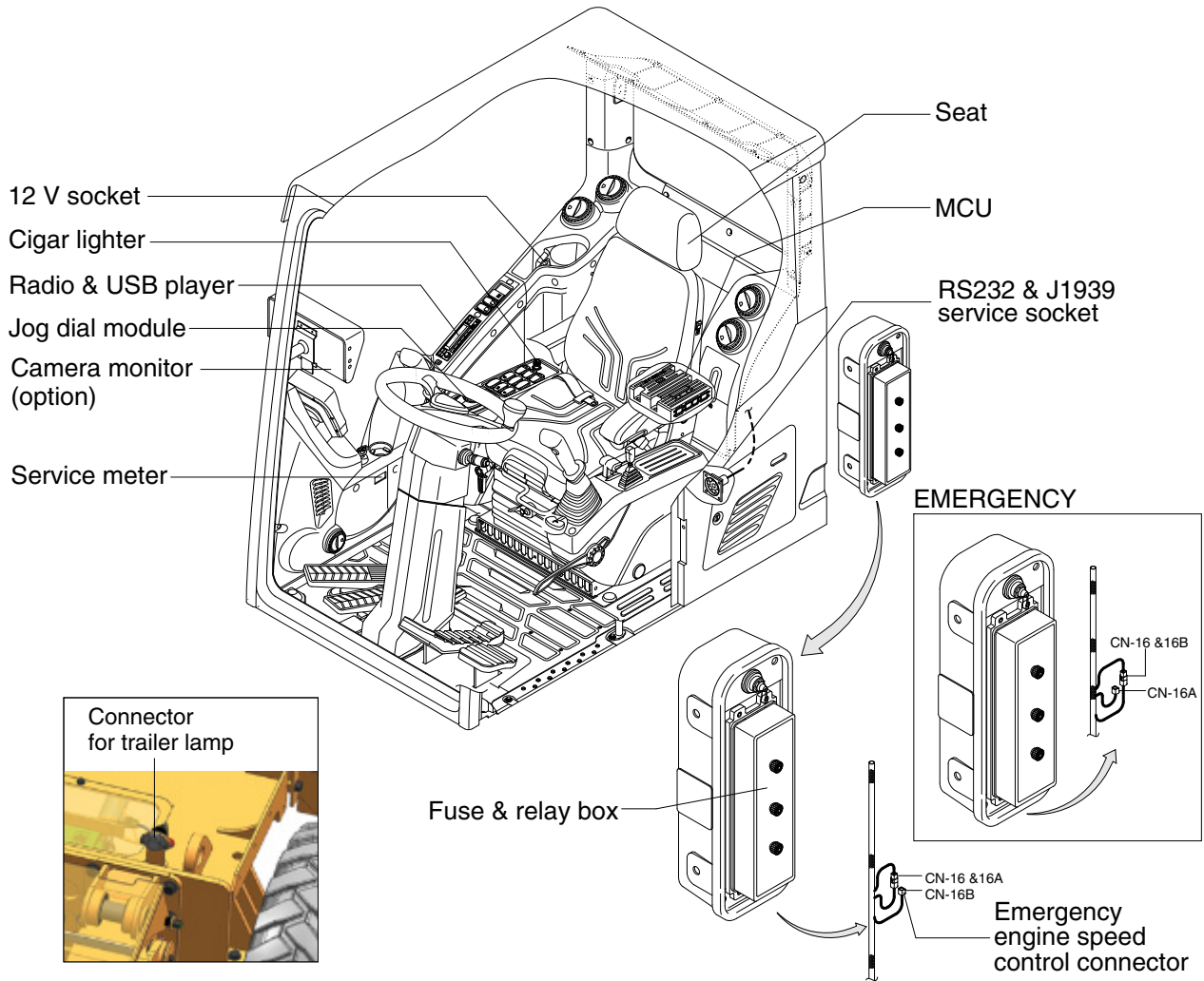
① Joystick steering can be enabled after following conditions have been satisfied.

- Engine is running.
- Steering wheel is not operating.
- PWT rotary switch is P or W.
- Travel mode is creep or low speed.
- The vehicle speed is indicated on cluster. (speed sensor is not a malfunction)

② After above conditions are met, press the select switch. Then joystick steering pilot lamp (🚦) on the cluster will be ON and joystick steering can be activated.

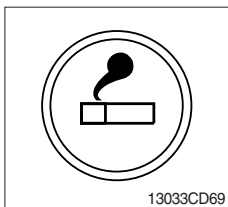
※ **The steering wheel works as usual, even if the joystick steering is activated.**

5. OTHERS



150WA3CD48

1) CIGAR LIGHTER



- (1) This can be used when the engine starting switch is ON.
- (2) The lighter can be used when it springs out in a short while after being pressed down.

※ **Service socket**

**Use cigar lighter socket when you need emergency power.
Do not use the lighter exceeding 24 V, 100 W.**


















2) RADIO AND USB PLAYER (MACHINE SERIAL NO. : -#0163)

■ WITH BLUETOOTH



9403CD100

■ FRONT PANEL PRESENTATION

















- | | |
|---|--|
| <p>1  Power ON/OFF,
Volume UP/DOWN button</p> <p>2  Manual UP/DOWN Tuning,
File search, SEL button</p> <p>3  Mode button,
Audio mute button</p> <p>4  Call & Pair button</p> <p>5  Call end button</p> <p>6  Station preset 1
DIS Display button</p> <p>7  Station preset 2</p> <p>8  Station preset 3
RPT Repeat play button</p> <p>9  Station preset 4
RDM Random play button</p> | <p>10  Station preset 5
DIR- Directory down button</p> <p>11  Station preset 6
DIR+ Directory up button</p> <p>12  Scan play button (SCAN)
Best station memory (BSM) button</p> <p>13  Auto tune up, Seek up button</p> <p>14  Auto tune down, Track down button</p> <p>15  USB connector</p> <p>16  AUX IN Jack</p> <p>17  MIC hole</p> |
|---|--|

■ WITHOUT BLUETOOTH



9403CD101

■ FRONT PANEL PRESENTATION

- | | |
|--|---|
| <p>1  Power ON/OFF,
Volume UP/DOWN button</p> <p>2  Manual UP/DOWN Tuning,
File search, SEL button</p> <p>3  Mode button,
Audio mute button</p> <p>4  Radio seek up button</p> <p>5  Radio seek down button</p> <p>6  Station preset 1
DIS Display button</p> <p>7  Station preset 2</p> <p>8  Station preset 3
RPT Repeat play button</p> <p>9  Station preset 4
RDM Random play button</p> | <p>10  Station preset 5
DIR- Directory down button</p> <p>11  Station preset 6
DIR+ Directory up button</p> <p>12  Scan play button (SCAN)
Best station memory (BSM) button</p> <p>13  Track up button</p> <p>14  Track down button</p> <p>15  USB connector</p> <p>16  AUX IN Jack</p> |
|--|---|

■ GENERAL

(1) Power and volume button



① Power ON / OFF button

Press power button (1) to turn the unit on or off.

② Volume UP/DOWN control knob

Turn VOL knob (1) right to increase the volume level.

Turn VOL knob (1) left to decrease the volume.

After 5 seconds the display will return to the previous display mode.

③ Initial volume level set up

I-VOL is the volume level the unit will play at when it is next turned on. To adjust the I-VOL level, press and hold VOL button (1) for longer than 2 seconds. The current volume level displays on the display panel.

Then turn button (1) right or left to set the volume level as the I-VOL level.

④ Clock ON/OFF control

The CLOCK was default at off status. To turn CLOCK ON, press and hold VOL button (1) for longer than 2 seconds to display I-VOL, then short press VOL again, turn VOL knob while CLOCK OFF display, then the CLOCK ON will be displayed.

※ Due to time tolerance, the clock display on the Audio unit might have slight difference.

⑤ Clock adjustment

With CLOCK ON selected, press VOL knob again after CLOCK ON display, the hour will blink, turn VOL knob right or left to adjust hour.

Simply press VOL again, the minute will blink, turn VOL knob to adjust minute. Then press VOL again to confirm the clock once finished.

(2) Menu Selection



- ① This button can adjust the effect of the sound and other things. Each time you press this button (2), LCD displays as follows :

BAS → TREB → BAL L=R → FAD F=R → EQ → LOUD ON → BEEP 2ND

On each setting, the level can be controlled by turning TUNE knob (2). When the last adjustment is made, after 5 seconds, the display will automatically return to the previous display mode.

② Bass control

To adjust the bass tone level, first select the bass mode by pressing SEL button (2) repeatedly until BASS appears on the display panel. Then turn knob (2) right or left within 5 seconds to adjust the bass level as desired. The bass level will be shown on the display panel from a minimum of BASS-7 to a maximum of BASS+7.

③ Treble control

To adjust the treble tone level, first select the treble mode by pressing SEL button (2) repeatedly until TREB appears on the display panel. Then turn knob (2) right or left within 5 seconds to adjust the treble level as desired. The treble level will be shown on the display panel from a minimum of TREB -7 to a maximum of TREB +7.

④ Balance control

To adjust the left-right speaker balance, first select the balance mode by pressing SEL button (2) repeatedly until BAL indication appears on the display panel. Then turn knob (2) right or left within 5 seconds to adjust the balance as desired. The balance position will be shown by the bars on the display panel from BAL 10R (full right) to BAL 10L (full left).

⑤ Fader control

To adjust the front-rear speaker balance, first select the fader mode by pressing SEL button (2) repeatedly until FADER indication appears on the display panel. Then turn knob (2) right or left within 5 seconds to adjust the front-rear speaker level as desired. The fader position will be shown by the bars on the display panel from FAD 10F (full front) to FAD 10R (full rear).

⑥ EQ control

You can select an equalizer curve for 4 music types (CLASSIC, POP, ROCK, JAZZ). Press button (2) until EQ is displayed, then turn knob (2) right or left to select the desired equalizer curve. Each time you turn the knob, LCD displays as follows :

EQ OFF → CLASSIC → POP → ROCK → JAZZ

- ※ When the EQ mode is activated, the BASS and TREBLE modes are not displayed.

⑦ Loud control

When listening to music at low volume levels, this feature will boost the bass and treble response. This action will compensate for the reduction in bass and treble performance experienced at low volume.

To select the loudness feature, press button (2) until LOUD is displayed, then turn knob (2) right or left to activate or deactivate loudness.

⑧ Beep control

To adjust the BEEP mode, first select the BEEP mode by pressing button (2) repeatedly until BEEP indication appears on the display panel. Then turn knob (2) left or right within 5 seconds to select BEEP 2ND, BEEP OFF or BEEP ON.

- BEEP 2ND : You will only hear the beep sound when the buttons are held down for more than 2 seconds.
- BEEP OFF : You can not hear the sound beep when you press the buttons.
- BEEP ON : You can hear the beep sound each time you press the buttons.

(3) Mute control

- ① Press and hold MUTE button (3) for over 2 seconds to mute sound output and MUTE ON will blink on the LCD. Press the button again to cancel MUTE function and resume to normal playing mode.

(4) Mode selection

- ① Repeat press MODE button (3) to switch between FM1, FM2, AM, USB, AUX, BT MUSIC.
- ※ If there is no USB, AUX, Bluetooth Phone connected, it would not display USB, AUX, BT when you press button (3).

■ RADIO

(1) Mode button



- ① Repeat press MODE button to select FM1, FM2 or AM.

(2) Manual tuning button



- ① To manually tune to a radio station, simply turn encoder TUNE (2) left or right to increase or decrease the radio frequency.

(3) Auto tuning button



- ① To automatically select a radio station, simply press Seek up or Track down button.



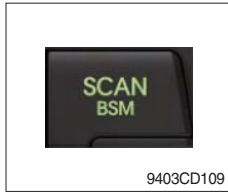
(4) Station preset button



- ① In radio mode, pressing buttons (6) to (11) will recall the radio stations that are memorized. To store desired stations into any of the 6 preset memories, in either the AM or FM bands, use the following procedure :

- Select the desired station.
- Press and hold one of the preset buttons for more than 2 seconds to store the current station into preset memory. Six stations can be memorized on each of FM1, FM2, and AM.

(5) Preset scan (PS) / Best station memory (BSM) button



① Press BSM button (12) momentarily to scan the 6 preset stations stored in the selected band. When you hear your desired station, press it again to listen to it.

Press BSM button (12) for longer than 2 seconds to activate the Best Station Memory feature which will automatically scan and enter each station into memory.

※ **If you have already set the preset memories to your favorite stations, activating the BSM tuning feature will erase those stations and enter into the new ones. This BSM feature is most useful when travelling in a new area where you are not familiar with the local stations.**

■ USB PLAYER

(1) USB playback



- ① The unit was equipped with a front USB jack and also a rear USB Jack.

With a USB device plugged in the front USB jack, it will be detected as front USB mode. And with a USB device plugged in the rear USB jack, it will be detected as rear USB. To get to a USB mode, press MODE (3) button momentarily or insert the USB device in front or rear USB jack.

- ※ If there are no mp3 or wma files in USB device, it will revert to the previous mode after displaying NO FILE.

(2) Track Up / Down button



- ① Press SEEK up (13) or TRACK down (14) to select the next or previous track. Press and hold the buttons to advance the track rapidly in the forward or backward direction.



(3) MP3 directory / File searching



- ① Button (2) is used to select a particular directory and file in the device. Turn button (2) right or left to display the available directories. Press button (2) momentarily when the desired directory is displayed, then turn button (2) right or left again to display the tracks in that directory. Press button (2) to begin playback when the desired file is displayed.

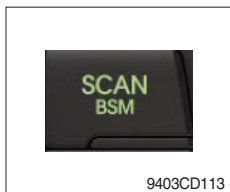
(4) Directory Up / Down button



- ① During MP3/WMA playback, simply press DIR- button (10) to select the previous directory (if available in the device); simply press DIR+ button (11) to select the next directory (if available in the device).

- ※ If the USB device does not contain directories, it would play MP3/WMA tracks at 10- file when you press DIR- button (10), and play MP3/WMA tracks at 10+ file when you press DIR+ (11) button.

(5) Track Scan Play (SCAN) button



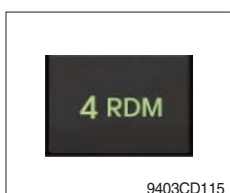
- SCAN playback : Simply press SCAN (12) button to play the first 10 seconds of each track.
- SCAN folder : Press and hold SCAN button for longer than 2 seconds to scan play the tracks in current folder.
- SCAN off : Simply press it again to cancel SCAN feature.

(6) Track Repeat Play (RPT) button



- REPEAT playback : Simply press RPT (8) button to play current track repeatedly.
- REPEAT folder : Press and hold RPT for longer than 2 seconds to repeat play the tracks in current folder.
- REPEAT off : Simply press it again to cancel REPEAT feature.

(7) Track Random Play (RDM) button



- RANDOM playback : Simply press RDM (9) button to play the tracks in the device in a random sequence.
- RANDOM folder : Press and hold RDM button for longer than 2 seconds to randomly play the tracks in the current folder.
- RANDOM off : Simply press it again to cancel RANDOM feature.

(8) ID3 v2 (DISP)



- ① While a MP3 file is playing, press DISP button (6) to display ID3 information. Repeat push DISP button (6) to show directory name / file name and album name / performer / title.

※ If the MP3 disc does not have any ID3 information, it will show NO ID3.

* USB Information and Notice

- a. Playback FILE SYSTEM and condition allowance.
 - FAT, FAT12, FAT16 and FAT32 in the file system.
 - V1.1, V2.2 and V2.3 in the TAG (ID3) version.
 - b. Display up to 32 characters in the LCD display.
 - c. No support any of MULTI-CARD Reader.
 - d. No high speed playback but only playing with normal full speed.
- ※ DRM files in the USB may cause malfunction to playback in the radio unit.
- ※ In temperatures below -10°C (14°F), the audio unit with USB hook up may be affected and not play well.

■AUX OPERATION

It is possible to connect your portable media player to the audio system for playback of the audio tracks via the cab speakers.

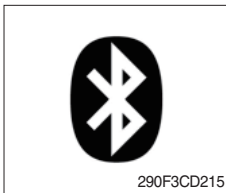
To get the best results when connecting the portable media to the audio system, follow these steps :

- Use a 3.5 mm stereo plug cable to connect the media player headphone socket at each end as follows.
 - Adjust the portable media player to approximately 3/4 volume and start playback.
 - Press the MODE button (3) on the audio unit to change into AUX mode.
 - The volume and tone can now be adjusted on the audio unit to the desired level.
- ※ The audio quality of your media player and the audio tracks on it may not be of the same sound quality as the audio system is CD Player.
- ※ If the sound of the media player is too low compared with the radio or CD, increase the volume of the player.
- ※ If the sound of the media player is too loud and/or distorted, decrease the volume of the player.
- ※ When in AUX mode, only the Volume, Bass, Treble, EQ and Mode functions of the audio unit can be used.

■ BLUETOOTH (if equipped)

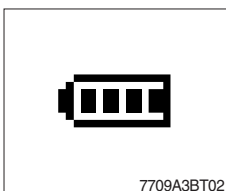
(1) Using a bluetooth wireless connection

- ① Your audio unit supports bluetooth wireless technology. You can set up a wireless link with bluetooth cellular phone.
 - ② Continue to pair the cellular phone with the audio unit. Within a few moments the two should be able to connect.
- ※ Since this audio unit is on standby to connect with your cellular phone via bluetooth wireless technology, using this audio unit without running the engine can result in battery drainage.
 - ※ This audio units phone call reception is on standby when ignition switch is set to ACC OFF or ON.
 - ※ The line-of-sight distance between this audio unit and your cellular phone must be 10 meters or less for sending and receiving voice and data via bluetooth wireless technology. However the transmission distance may become shorter than the estimated distance depending on the environment where it is being used.
 - ※ Digital Noise & Echo suppression system provides the best sound clarity with little or no distortion (Echo & side tone will happen depending on cellular phone or service network).
 - ※ To ensure the quality of calling, you should select a proper bluetooth VR level. This audio unit is already equipped with the best bluetooth VR level.



a. Bluetooth icon

It will blink while establishing the bluetooth pairing.
It will light up after a bluetooth device connected.



b. Battery icon

It indicates the battery status of the connected bluetooth device.



c. Single strength icon

It indicates the signal strength of the connected bluetooth device.

(2) Pairing in hands free modes



- ① Press and hold CALL button (4) for 2 seconds until you hear beep sound, then PAIR STR will appear on the display.
- ② For the next procedure, go to cellular phone pairing mode.
- ③ If it is in pairing status with audio unit and cellular phone, PAIRING will show on the display.
- ④ If you want to exit pairing mode, press CALL END button (5) briefly while pairing, then it will show PAIR CLR on the display.
- ⑤ Bluetooth Icon and PAIR OK appear on the display when pairing is successful.

(3) Cellular phone pairing mode

- ① Browse your cellular phone menu and find the connectivity or bluetooth connection section.
 - ② Select search for a new handsfree device function and allow the phone to find the mobile.
 - ③ HYUNDAI should appear on your cellular phone screen.
 - ④ Press connect menu among the handsfree option on your cellular phone.
 - ⑤ The cellular phone should prompt for a pin code. Insert the pin code 1234.
 - ⑥ The cellular phone should confirm that it has established a new paired connection.
 - ⑦ Close the menu. The pairing is now completed. It appears PAIR FAIL on the display for 3 seconds.
- ※ Each cellular phone type has distinct phone menu so you may need to refer to your manufactures instruction for the correct procedure on how to connect a new bluetooth device.
 - ※ Please retry the pairing instruction if HYUNDAI does not appear on the cellular phone screen.
 - ※ Please select authorized, if there is authorized menu in the menu of bluetooth connection in your cellular phone.
 - ※ Once the bluetooth pairing is completed between your cellular phone and this audio unit, both units will be automatically recognized on its paring like when you turn on the key in your car even though the audio unit is turned off.
 - ※ This audio unit can store up to 6 phones pairings. If the memory is full, the first stored paired phone will be deleted.
 - ※ The connecting priority will be given to the last connected cellular phone.
 - ※ If you want to change the connecting priority, try to connect this audio unit from the cellular phone you want.

(4) Bluetooth connection and disconnection



① When established bluetooth connection is made between this audio unit and the cellular phone, bluetooth icon on the display appears and then the display shows HF/AV CONN when handsfree & AV profile is connected.

② To disconnect bluetooth link
Press and hold CALL END button (5) for 2 seconds, it shows DIS CON and bluetooth Icon disappears on the display.

③ To connect bluetooth link
Press CALL button (4) briefly, it blinks bluetooth Icon on the display while bluetooth is being connected. If the connection is completed, bluetooth Icon displays on the display.

※ When your cellular phone battery is at low charge, the bluetooth connection may occasionally be lost. To maintain good connectivity ensure that your phone battery is adequately charged.

※ In case of failure of bluetooth pairing :

- Delete item in paired list on your phone.
- Reset both phone by power off/on and the audio unit by ACC off/on.

※ Connecting priority of handsfree profile is higher than headset profile.

※ The headset mode does not support caller ID, reject call and call Transfer.

(5) Using the audio unit as a handsfree device



① When the audio unit is ringing, it shows CALL and follows with the phone number ***** on the display.

② To accept call
Press CALL button (4), ANSWER CALL followed by TALKING will show in the display.

③ To end call
To end call, press CALL END button (5), REJECT appears on the display.

※ If reject call is activated in your phone, then your cellular phone does not support reject call function.

(6) Audio transfer between the audio unit and phone

The audio transfer function is for switching the call from the audio unit to the cellular phone for private conversation.



① Press CALL button (4) briefly during conversation, it appears CALL TRANS on the display. To switch back to the audio unit, press button (4) briefly during private conversation, then it appears CALL TRANS on the display again.

※ **This function will be a cause of disconnection of bluetooth link in some nokia phones, but do not worry, just press button (4) during private conversation, then switch back to the audio unit automatically.**

※ **The quality of calling between cellular phone and audio unit is better than calling between one audio unit and another one.**

(7) Last call number dialing



① Press CALL button (4) briefly, it appears CALL TO on the display, then simply press CALL button once again, it would make the last call with phone number displayed on LCD.

If Reject call is activated in your phone, then your cellular phone does not support Reject Call function.

※ **If you are using SAMSUNG phone, then you may need to press send button once more. With the first press of button it should show contact list in your phone, then if you press again you should be ready to make the last call.**

(8) To make a call by cellular phone

The audio transfer function is for switching the call from the audio unit to the cellular phone for private conversation.

- ① The audio unit will be activated automatically when you make a call with cellular phone.
- ② When you make a call processing by cellular phone, it shows CALLING on the display.
- ③ When you receive a call, the phone number ***** appears on the display.

(9) Using the audio unit as bluetooth music





The audio unit supports A2DP (Audio Advanced Distribution Profile) and AVRCP (Audio Video Remote Control Profile), and both profiles are available to listen music at the audio unit via cellular phone which is supporting the two profiles above.

- ① To play music, search the menu on your cellular phone as below :
i.e : Menu→ File manager→ Music→ Option→ Play via bluetooth.
It appears BT MP3 on the display.
 - ② During BT MP3 playing, you could select the previous or next track by pressing SEEK up or TRACK down button on audio unit or operate via your cellular phone.
 - ③ To stop music, press button (5) briefly and it will automatically switch into the previous mode.
 - ④ To resume music playing, press the play button on your cellular phone.
- ※ **This function may be different depending on cellular phone. Please follow the cellular phone menu. Some types of phones need to pair once more for bluetooth MP3 connection.**
 - ※ **This function will be caused to disconnect A2DP, AVRCP depends on cellular phone.**
 - ※ **Information about songs (e.g.: the elapsed playing time, song title, song index, etc.) cannot be displayed on this audio unit.**

■ RESET AND PRECAUTIONS

(1) Reset function

Interfering noise or abnormal compressed files in the MP3 disc or USB instrument may cause intermittent operation (or unit frozen/locking up). It is strongly recommended to use appropriate USB storage to not cause any malfunction to the audio unit. In the unlikely event that the player fails to operate correctly, try to reset unit by any of following two methods.

- ① press and hold   simultaneously for about 5 seconds. (without Bluetooth)
- ② Press and hold   simultaneously for about 5 seconds. (with Bluetooth)

※ Take out the fuse for the audio system in the vehicle once and then plug it back in.

※ It will be necessary to re-enter the radio preset memories as these will have been erased when the microprocessor was reset.

After resetting the player, ensure all functions are operating correctly.

(2) Precautions

When the inside of the cab is very cold and the player is used shortly after switching on the heater, moisture may form on the disc or the optical parts of the player and proper playback may not be possible.

If moisture forms on the optical parts of the player, do not use the player for about one hour. The condensation will disappear naturally allowing normal operation.

- ① Operation voltage : 9~32 volts DC, negative
- ② Output power : 40 watts maximum (20 watts x 2 channels)
- ③ Tuning range

Area	Band	Frequency range	Step
USA	FM	87.5~107.9 MHZ	200K
	AM	530~1710 KHZ	10K
EUROPE	FM	87.5~108.0 MHZ	50K
	AM	522~1620 KHZ	9K
ASIA	FM	87.5~108.0 MHZ	100K
	AM	531~1602 KHZ	9K
LATIN	FM	87.5~107.9 MHZ	100K
	AM	530~1710 KHZ	10K

● AREA Selection :

- To select an area, press and hold related buttons at FM1 band for about 3 seconds.
- USA Area: Press and hold mode + 1DIS buttons for 3 seconds
- EUROPE Area: Press and hold mode + 2 buttons for 3 seconds
- ASIA Area: Press and hold mode + 3RPT buttons for 3 seconds
- LATIN Area: Press and hold mode + 4RDM buttons for 3 seconds.

- ④ USB version : USB 1.1
- ⑤ Bluetooth version : V2.1
- ⑥ Bluetooth supported profile :
 - A2DP : Advanced Audio Distribution Profile
 - AVRCP : Audio/Video Remote Control Profile
 - HFP : Hands-Free Profile

2) RADIO AND USB PLAYER (MACHINE SERIAL NO. : #0164-)

■ WITH BLUETOOTH



19A3RD02

- 1 USB port with cover : Open the cover and connect the USB storage device.
- 2 ENTER/AST button with tune dial.
- 3 Display window for play / reception / menu state and information.
- 4 POWER button with VOLUME dial : turns power on, mute function on/off or selects a menu item (press), control the volume level or menu item.
- 5 AUX port with cover : Open the cover and plugging the external audio device.
- 6 Call / call end button :
 - when a call comes in : accepts a call (press); rejects a call (press and hold)
 - during a call connection : ends a call (press) ; switches between hands-free and private call modes (press and hold)
 - in standby mode: opens call list (press) ; makes a call a recently connected number (press and hold)
- 7 BAND button : enters Radio mode or changes the radio band (press).
- 8 Preset button :
 - Radio: Recall each stored station (press) ; store each station (press and hold).
 - USB : changes playback mode (press 1 II, 2 RPT or 3 RDM buttons); shows available information about the current track (press 4 INFO button) ; move to folder down/up (press 5 D-/6 D+ buttons).
 - Bluetooth audio : pause/resume playback (press 1 II) ; shows information of the connected Bluetooth device (press 4 INFO button).
- 9 MODE button : selects USB, Bluetooth audio or AUX play mode (press).
- 10 MENU button : enters Menu setting mode or returns to the previous menu (press).

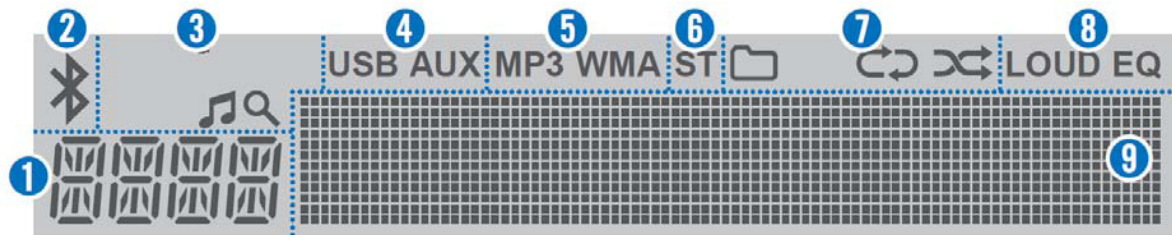
■ WITHOUT BLUETOOTH






19A3RD01

- | | |
|---|----|
| 1 USB port with cover : Open the cover and connect the USB storage device. | 8 |
| 2 ENTER/AST button with tune dial. | |
| 3 Display window for play/reception/menu state and information. | |
| 4 POWER button with VOLUME dial : turns power on, mute function on/off or selects a menu item (press), control the volume level or menu item. | 9 |
| 5 AUX port with cover : Open the cover and plugging the external audio device. | 10 |
| 6 FM button : enters FM Radio mode. | |
| 7 AM button : enters AM Radio mode. | |

■ DISPLAY WINDOW (LCD)

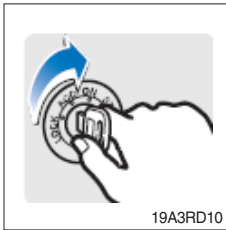


19A3RD03

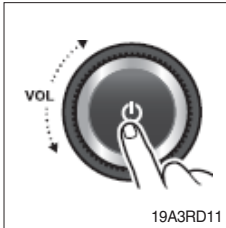
- | | |
|--|--|
| <p>1 Function display area for showing the function mode.</p> <p>2 Bluetooth indicator for the Bluetooth connection.</p> <p>3 Search indicator for USB play list.</p> <p>4 USB/AUX indicators for the USB or External device connection.</p> <p>5 MP3/WMA indicators for USB's Audio Stream detections.</p> <p>6 ST (Stereo) indicators for FM stereo reception.</p> | <p>7 Playback mode indicators for USB playback mode.</p> <p>  : Folder mode.</p> <p>  : Repeat playback.</p> <p>  : Random playback.</p> <p>8 LOUD/EQ indicators for sound effect.</p> <p> LOUD : Loudness mode.</p> <p> EQ : EQ mode.</p> <p>9 Multi-function display area for showing the play, reception or menu information.</p> |
|--|--|

■ GENERAL

(1) Power and volume button



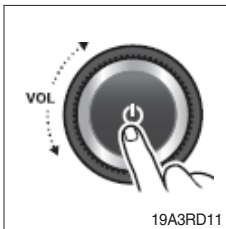
- ① Turn the starting switch to ON position.



- ② Press the POWER button to turn the power on.

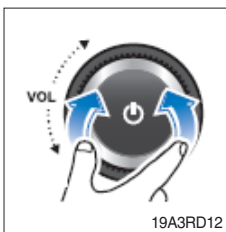
- If the source is ready, playback also starts.
- To turn on the power directly.

By connecting an USB into the USB port or pressing the BAND, MODE (while the USB is connected), you can also turn on the power and the unit then plays.



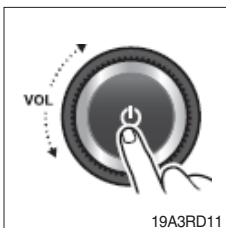
- ③ When power is on, press and hold the POWER button to turn power off.

(2) Adjusting volume directly



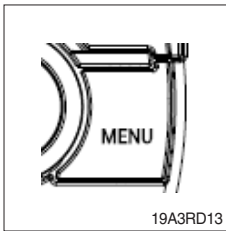
- ① Turn the VOLUME dial to control volume.
 - Available volume range : 00 (mute)~41.

(3) Muting the sound quickly

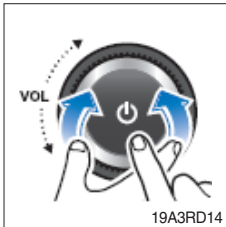


- ① Press the MUTE button to turn mute on.
 - "MUTE" will flash on the display and mute the sound.
 - Press the MUTE button again or turn VOLUME dial to restore sound.

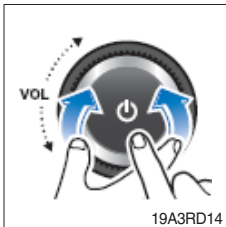
(4) Setting the sound



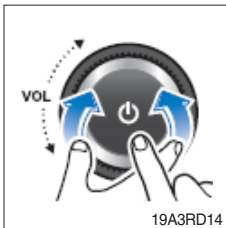
- ① Press MENU button to enter the Settings menu mode.
 - After entering MENU mode, press MENU button to return to the previous item.



- ② Turn VOLUME dial to select the "SOUND" or "EQUALIZER" as below, then press this dial.
 - SOUND : sets the sound mode.
 - EQUALIZER : selects the equalizer style.

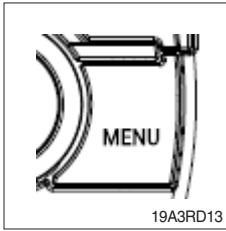


- ③ Turn VOLUME dial to select the desired Sound setting mode, then press this dial.
 - BASS : sets the bass sound level (-5~+5).
 - MIDDLE : sets the middle sound level (-5~+5).
 - TREBLE : sets the treble sound level (-5~+5).
 - BALANCE : sets the sound balance between the right and left speakers (LEFT 15~RIGHT 15).
 - EQUALIZER : selects the one of the 7 EQ styles (EQ OFF, POP, ROCK, COUNTRY, VOICE, JAZZ, CLASSIC).
 - PREVIOUS : Return to previous menu screen.



- ④ Turn VOLUME dial to adjust the value of the level, balance or style, then press this dial.

(5) Setting the system functions



① Press MENU button to enter the Settings menu mode. Turn VOLUME dial to select "SYSTEM" as below, then press this dial.



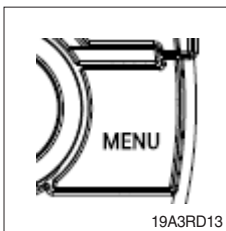
② Turn the VOLUME dial to select the "BT ON/OFF", "SCROLL", "LOUD" or "BEEP" then press this dial.

- BT (Bluetooth) ON/OFF : activate (On) or deactivate (Off) the Bluetooth function. – (only ARA-9010HB).
- SCROLL : activate (On) or deactivate (Off) the text scroll feature for LCD display screen.
- LOUD : activate (On) or deactivate (Off) the loudness sound effect.
- BEEP : activate (On) or deactivate (Off) the beep sound feature.
- PREVIOUS : Return to previous menu screen.



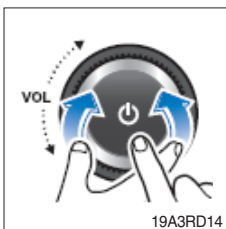
③ Turn VOLUME dial to select ON or OFF, then press this dial.

(6) Setting the region



① Press MENU button to enter the Settings menu mode. Turn VOLUME dial to select "AREA" as below, then press this dial.

- AREA : sets the region for radio.



② Turn the VOLUME dial to select the desired area as below, then press this dial.

- If the region setting is not selected correctly to your country or region, the radio reception can not be received. Retry the setting the region of radio reception correctly.
- The region setting is required only for the first time.

· **ASIA/M.East**

FM : 87.5~108.0 MHz (100 kHz step)

AM : 531~1,602 kHz (9 kHz step)

· **AMERICA**

FM : 87.5~107.9 MHz (200 kHz step)

AM : 530~1,710 kHz (10 kHz step)

· **LATIN**

FM : 87.5~108.0 MHz (100 kHz step)

AM : 530~1,710 kHz (10 kHz step)

· **EUROPE**

FM : 87.5~108.0 MHz (50 kHz step)

AM : 531~1,620 kHz (9 kHz step)

· **JAPAN**

FM : 76~90 MHz (100 kHz step)

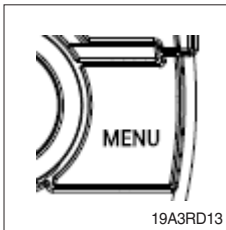
AM : 522~1,629 kHz (9 kHz step)

· **Russia (OIRT)**

FM : 65.0~74.0 MHz (30 kHz step)

AM : 522~1,602 kHz (9 kHz step)

(7) Checking/updating the system Software

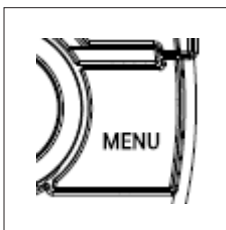


- ① Press MENU button to enter the Settings menu mode. Turn VOLUME dial to select "SOFTWARE" as below, then press this dial.
 - SOFTWARE : check/update the system software.

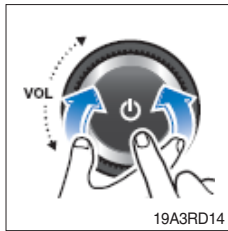


- ② To check the system software, turn the VOLUME dial to select the "VERSION CHECK", then press this dial.
- ③ To update the system software, turn the VOLUME dial to select the "UPDATE", then press this dial.
 - Download the latest system software to a USB device for update to this unit, then open the cover and plug the USB device to the USB port.
 - Perform update with the start switch "ON" when the battery is sufficiently charged by driving the vehicle. When the battery is discharged while updating, the system may get damaged with the update stopped.

(8) Setting the Bluetooth mode (only ARA-9010HB)



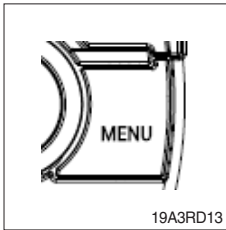
- ① Press MENU button to enter the Settings menu mode. Turn VOLUME dial to select "BLUETOOTH" as below, then press this dial.
 - Bluetooth: Bluetooth setting mode.



- ② Turn VOLUME dial to select the desired Bluetooth setting mode, then press this dial.
- PAIR : register a Bluetooth device.
 - SELECT : selects/connects a device from registered Bluetooth devices.
 - DELETE : removes a device from registered Bluetooth device.
 - MIC VOL : adjusts the Bluetooth microphone.
 - H/F VOL : adjusts the Bluetooth hands-free volume.
 - Phone Book : activates/deactivates the phone book download feature from connected device.
 - BT INFO : shows the Bluetooth information of this system.
 - PREVIOUS : returns to previous menu screen.
- ③ To change the connected Bluetooth device, turn the VOLUME dial to select the "SELECT", then press this dial. Turn the VOLUME dial to select the desired device list, then press this dial.
- ④ To delete the Bluetooth device, turn the VOLUME dial to select the "DELETE", then press this dial. Turn the VOLUME dial to select the desired device list, then press this dial.
- If the currently connected device is delete, this unit attempts to connect with the following priority Bluetooth device automatically.
- ⑤ To adjust the Bluetooth microphone initial volume, turn the VOLUME dial to select the "MIC VOL", then press this dial. Turn the VOLUME dial to set desired Bluetooth microphone initial volume level, then press this dial.
- The default setting is 3, the volume range is 1~5.
- ⑥ To adjust the Bluetooth hands-free initial volume, turn the VOLUME dial to select the "H/F VOL", then press this dial. Turn the VOLUME dial to set desired Bluetooth hands-free initial volume level, then press this dial.
- The default setting is 15, the volume range is 6~32.
- ⑦ To download the phone book, turn the VOLUME dial to select the "phone book", then press this dial. Turn the VOLUME dial to select the "ENABLE", then press this dial.
- The phone book can download up to 1,000 phone numbers.




■ BLUETOOTH

(1) Pairing/Connecting your device



- ① Firstly, set up the Bluetooth device to be connected from the Bluetooth settings menu to enable other devices to search for the Bluetooth device.
Press MENU button to enter the Menu settings mode.



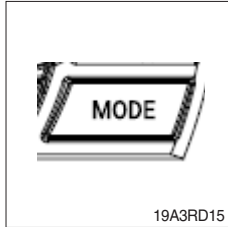
- ② Turn VOLUME dial to select the "BLUETOOTH" as below, then press this dial.
- ③ Turn the VOLUME dial to select the "PAIR", then press this dial.
 - When you first register, appear the "BT Pairing" on the display window, then search the Bluetooth devices for connection.
 - If a Bluetooth device is not connected, press and hold the  button to enter the pairing mode directly.
- ④ Search and select device "Device Name" in your Bluetooth device, then confirm.
 - The Bluetooth registration standby proceeds for 1 minute. If the registration is failed during 1minute, restart over from the beginning.
 - After a while, the Bluetooth device is automatically registered. When pairing is successful, the "Connected" and "Device name" will be displayed 3 seconds.
 - When your Bluetooth device is connected,  appear on the display.
If the Bluetooth device is disconnected,  disappear.
- ⑤ Repeat items 1~4 to register to add another Bluetooth device.
 - Up to 5 devices can be paired to this unit.
 - The last device connected to this unit is set to automatically connect to the highest priority.


(2) Playing the Bluetooth music

To play Bluetooth music

※ **A2DP (Advanced Audio Distribution Profile)** : This function only operates with Bluetooth devices that support A2DP version 1.2 or above.

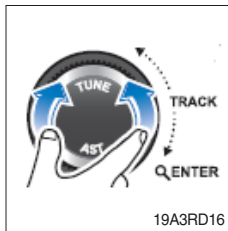
※ Should be set to Stereo Headset in Bluetooth device type menu of your device



① Press the MODE button repeatedly to select the BT Audio mode. Appears  on display window and start playback.

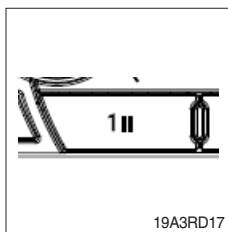
- If a Bluetooth device is not connected, you can not select.
- If music is not yet playing from your mobile device after switching to Bluetooth Music (streaming audio) mode or after pressing Play on the mobile device itself, try to start music playback by pressing the Play button again.
- The output music playback from Bluetooth devices with this unit.
- There will be music playback automatically play upon entering since once played. It stops automatically when you exit from the music.
- You can also phone or Bluetooth device other than the home screen mode, Bluetooth music play mode when entering and exiting, the device does not play automatically.

(3) Controlling the playback



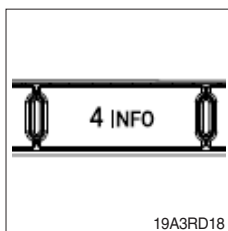
① While playing, turn the TUNE/TRACK dial to moves to the previous or next track.

- Clockwise : move to the next file.
- Counter-clockwise : move to beginning of the current file or previous file.



② While playing, press the [1 II] button to pause the track with "PAUSE" indicator.

- Press this button again to play the current track.

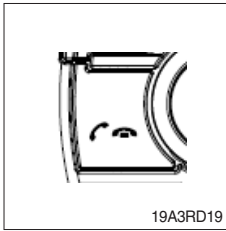




③ Press the [4 INFO] button to check the information of current connected device.

- About the music files are not displayed.
- During Bluetooth music playback, do not operate the music changes too quickly. Allow enough time for the machine-to-machine communication.

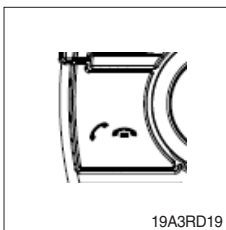
(4) Answering a call


- ※ When a call comes in, the audio source is muted, and display the call information with ring tone.
- ※ If the phonebook is not downloaded, only incoming phone number is displayed without the caller information.

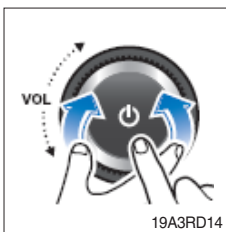



- ① To answer a call, press the  button or to reject a call press and hold the  button.
 - When a call comes in, the audio source is muted.
 - When a call is ended, this unit returns to the previous state media playback.

(5) Making a call from recent number

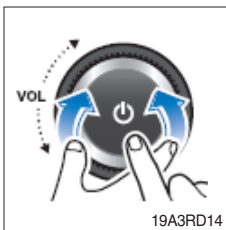


- ① To call the recent connected number, press the  button to display recent call number.
 - The recent calls list is displayed. Turn the VOLUME dial to select a recent call number, then press this dial to make a call.
 - The recent calls list displays up to 10.



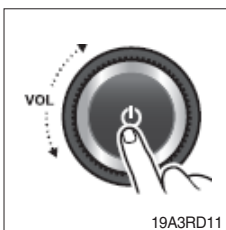
- ② To call the last connected number directly, press and hold the  button.



(6) During a call ...




- ① To adjust the a call volume, turn the VOLUME dial.
 - The call volume works with Bluetooth devices, and operates separately from the volume of this unit.

- ② To deactivate the microphone, press the POWER button.

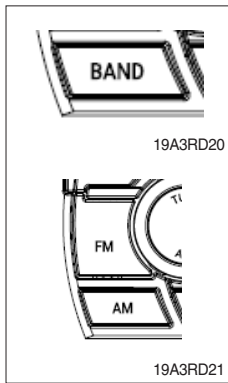


- ③ To switch from hands-free mode to the phone handset mode, press and hold the  button.
To returns the phone conversation to hands-free mode, press and hold the  button.

- ④ To end a call, press the  button.
 - End a call, then return to the playing state.

■ RADIO

(1) Tuning in a radio station

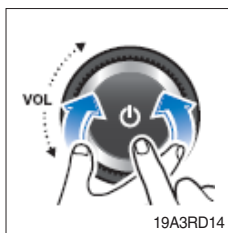


① Press the BAND or FM/AM button repeatedly to enter the radio band in order of FM1, FM2, FMA, AM1, AM2 or AMA.

- You can select the FM1, FM2, FMA or AM1, AM2, AMA radio band.

While the Auto Store stations (AST) are stored, you can select the AMA or FMA band by additional.

- The previously chosen broadcasting station will be received.

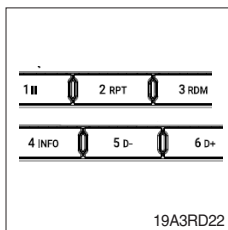


② Turn the TUNE/TRACK dial to select the station.

- Briefly turn this dial, plays previous/next frequency.
- Turn and hold this dial, automatically search for station with superior reception.
- Press this dial, starting from the current station, stations with superior reception are scanned for 5 seconds and the previous station is restored. During the seeking or scanning, if press or turn the dial left/right again, the selected station will begin playing.
- During the FM reception, the Stereo [ST] indicator is on.

(2) Saving radio stations manually

※ You can save up to 6 preset channels each for FM1, FM2, AM1, AM and AM2 band. If change the stations while driving, use preset button to prevent accidents.



① Press the BAND or FM/AM button repeatedly to select the band.

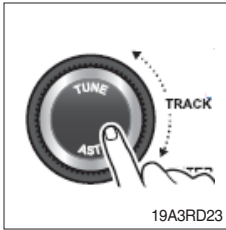
② After selecting the frequency, press and hold the PRESET [1II]~[6 D+] button.

③ The frequency is saved to the selected preset button.

- A total of 24 frequencies with 6 preset frequencies each for FM1/FM2/AM1/AM2 modes can be saved.

(3) Saving radio stations automatically

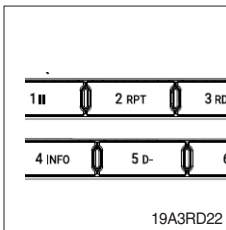
※ You can save up to 6 preset channels automatically each for FMA and AMA band.



- ① Press the BAND or FM/AM button repeatedly to enter the radio band.
 - The previously chosen broadcasting station will be received.
- ② Press and hold the AST button to automatically save receivable frequencies to Preset button.
 - Up to 6 stations can be stored in each of the FMA and AMA band.

(4) Listening to a preset station

- ① Press the BAND or FM/AM button repeatedly to enter the radio band in order of FM1, FM2, FMA, AM1, AM2 or AMA.
 - You can select the FM1, FM2, FMA or AM1, AM2, AMA radio band.
 - While the Auto Store stations(AST) are stored, you can select the AMA or FMA band by additional.
 - The previously chosen broadcasting station will be received.
- ② Press the PRESET [1II]~[6 D+] button.
 - From the 6 presets, select the frequency you want to listen to.

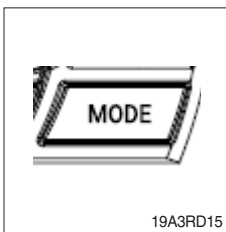


■ USB PLAYER

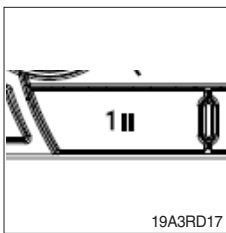
(1) Playing an USB device



- ① Open the cover, plug the USB device (including MP3/WMA media file) to the USB port.
 - Once a USB is connected, USB will automatically start playing from the first file within the USB.
 - If a previously played USB is reconnected, then the file after the most recently played file is played.
 - If a different USB is connected or the file information within the USB was changed, then the USB will start playing from the first song within the USB.

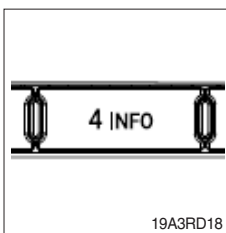


- ② When an USB device to be played is already connected, press the MODE button to play USB device.
 - The previously selected file is played.



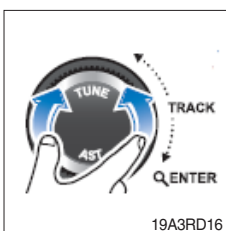
- ③ While playing, press the [1 II] button to pause the file.

(2) Changing the song information

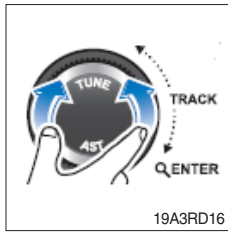


- ① Press the [4 INFO] button repeatedly to display information about the file being played.
 - The information displayed includes the file name, playing time, ID3 Tag or folder name information saved with the song.
 - If there is no information on the playing file, the unit will display "NO INFO", and then file name.

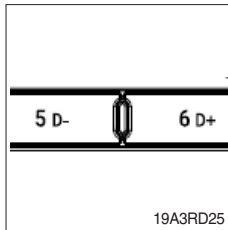
(3) Controlling the playback



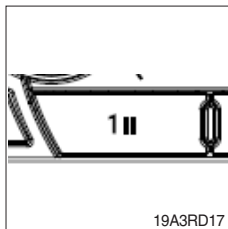
- ① While playing, turn the ►► | TRACK | ◀◀ dial left/right to move to the previous or next track.
 - Clockwise : move to the next file.
 - Counter-clockwise : move to the previous file.



- ② While the ►►| TRACK |◀◀ dial is being turned and held, the file will rewind or fast forward at high speed. Once released, the file will begin playing at normal speed.
- Clockwise : fast forward.
 - Counter-clockwise : fast rewind
 - The search function works but search speed is not constant. While fast forwarding or rewinding, the playback sound is not output.



- ③ Press the [5 D-] or [6 D+] button to moves to the previous or next folder.
- [5 D-] press : move to previous folder.
 - [6 D+] press : move to next folder.
 - While folder moving, the folder name will be displayed briefly.

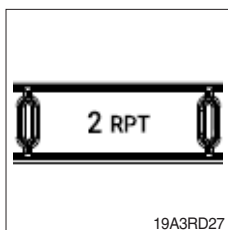


- ④ While playing, press the [1 II] button to pause the track.
- Press the button again to play the current track.

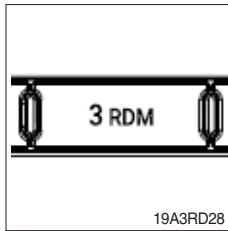





- ④ To find the song you want to play directly, press the Q (Search) button.
- Turn the ►►| TRACK |◀◀ dial to select the desired file name, then press this dial.

(4) Change the playback mode



- ① Press the [2 RPT] button to select the Repeat playback mode.
- On : The current file plays repeatedly.
 - On : The current folder plays repeatedly.
 - Off : Cancels repeat playback.



- ② Press the [3 RDM] button to select the Random playback mode.
-   On : All files of current folder play in random order.
 -  On : All files of USB device play in random order.
 - Off : Cancels random playback.

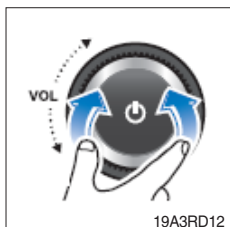
(5) Handling precautions for USB device

- The device will only recognize USB devices formatted in FAT 16/32. When formatting the external USB device, the device may not properly recognize a Byte/Sector selection other than 512 Bytes or 2,048 Bytes.
- The amount of time required to recognize the external USB device may differ depending on the type, size, or file formats stored on the USB. Such differences in the required time are not indications of malfunction. Please wait the period of time required to recognize the device.
- This unit can recognize maximum 9,999 files and 256 folders into the USB device.
- The device may not recognize the USB device if separately purchased USB hubs and extension cables are being used.
- The device may not support normal operation when using formats such as HDD Type, CF, or SD Memory.
- The device will not support files locked by DRM (Digital Rights Management).

■ AUX PLAYER

(1) Listening to auxiliary audio equipment

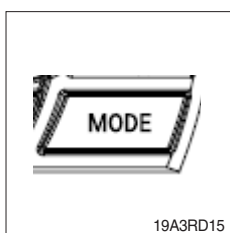
※ By connecting an optional portable audio device to the AUX input jack (stereo 3.5 pi) on the unit and then simply selecting the source, you can listen on your car speakers.



- ① Turn the VOLUME dial left to decrease the volume level.
 - The AUX volume can also be controlled separately through the connected device.



- ② Turn the external audio equipment off. Open the cover, connect the audio output of the external audio equipment to AUX input terminal on the unit.
- ③ Turn the external audio equipment on. Start playback of the external audio equipment at a moderate volume.



- ④ Press the MODE button repeatedly to select the AUX function.
- ⑤ Set your usual listening volume by turn the VOLUME dial left/right on the unit.
 - Once the connector is disconnected, the previous mode will be restored.
 - AUX mode can be used only when an external audio player has been connected.

3) JOG DIAL MODULE

The jog dial module consists of buttons, multimodal dial and USB port.

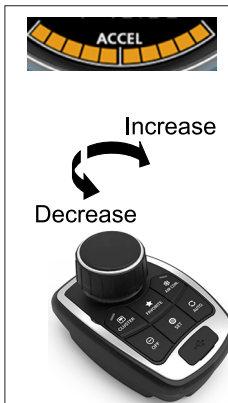


300A3CD150A

(1) Multimodal dial

- Cluster interlocked mode OFF

① Acceleration mode



300A3CD151

- There are 10 dial settings.
- Setting 1 is low idle and setting 10 is high idle.
 - By rotating the dial to right : Engine speed increases
 - By rotating the dial to left : Engine speed decreases
- ※ When the cluster button is clicked on the haptic panel, the engine rpm does not change even when the haptic dial is rotated.

(2) USB port



300A3CD152

- ① This port updates firmware using a dedicated cable.
- ② Jog dial module has a built-in charging circuit supply max 500 mA current.

(3) Cluster button



300A3CD153



160WA3CD02

- ① When you select this button, the pop-up appears to determine whether to use the cluster interlocked mode to prevent malfunctions.
 - If you press "OK" on the pop-up, the cluster interlocked mode will be turned on.
 - If you press "Cancel" on the pop-up, the Cluster interlocked mode will be turned off.
- ② In cluster interlocked mode, if you push the cluster button, jog dial module returns to previous mode.
- ③ Cluster interlocked mode ON : Blue lamp comes ON
Cluster interlocked mode OFF : Blue lamp turns OFF

(4) Air conditioner button



300A3CD154

- ① When you push this button, air conditioner system is operated.
- ② Determines whether or not to perform a cooling function of air conditioner.
 - Blue lamp ON : Air conditioner operation
 - Amber lamp ON : Fan only

(5) Set button



300A3CD155

- ① When you push this button, jog dial module executes air conditioner mode and displays air conditioner control mode in cluster.
- ② Air conditioner control mode will disappear when you push SET button again within 10 seconds or when you do not touch anything for more than 10 seconds.

(6) OFF button



300A3CD156

- ① You can only use this button when the air conditioner system is operating.
- ② This button is only for air conditioner system off.

(7) Auto button

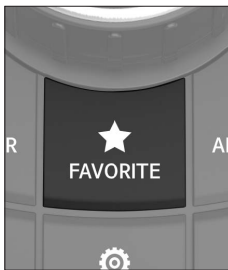


300A3CD157

① This button controls the auto function of air conditioner and heater system ON/OFF.

※ Refer to the page 3-46 for the auto switch of the air conditioner.

(8) Favorite button



300A3CD158

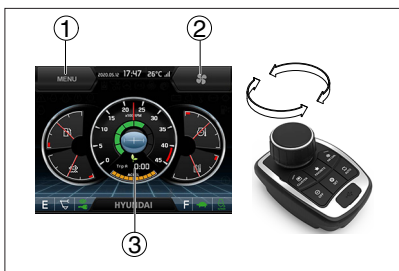
① When you push this button for 2 seconds, cluster screen is saved.

② Push this button, cluster screen that you saved is opened.

※ Saveable screen : Mode, Monitoring, Manage, Display, Utilities.

(9) Cluster interlocked mode ON

① Cluster main menu



140WA3CD180

- You can select the quick menu by rotating the dial as below.



- CW rotation : move to right direction

- CCW rotation : move to left direction

② Cluster menu move



140WA3CD181

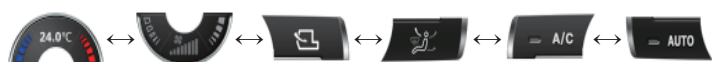
- You can move up and down the cluster sub menu.

③ Air conditioner menu



140WA3CD182

- You can move the menu of the air conditioner control mode.



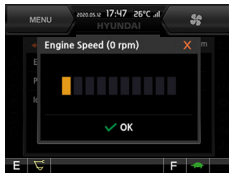
④ Slide choice menu



140WA3CD183

- You can increase or decrease the slide choice bar.

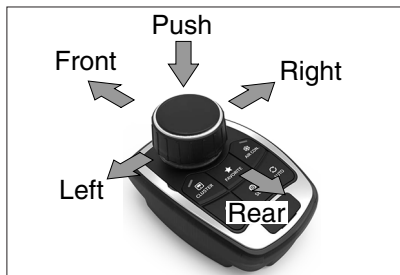
⑤ Level choice menu



140WA3CD184

- You can increase or decrease the level choice bar.

⑥ Push button



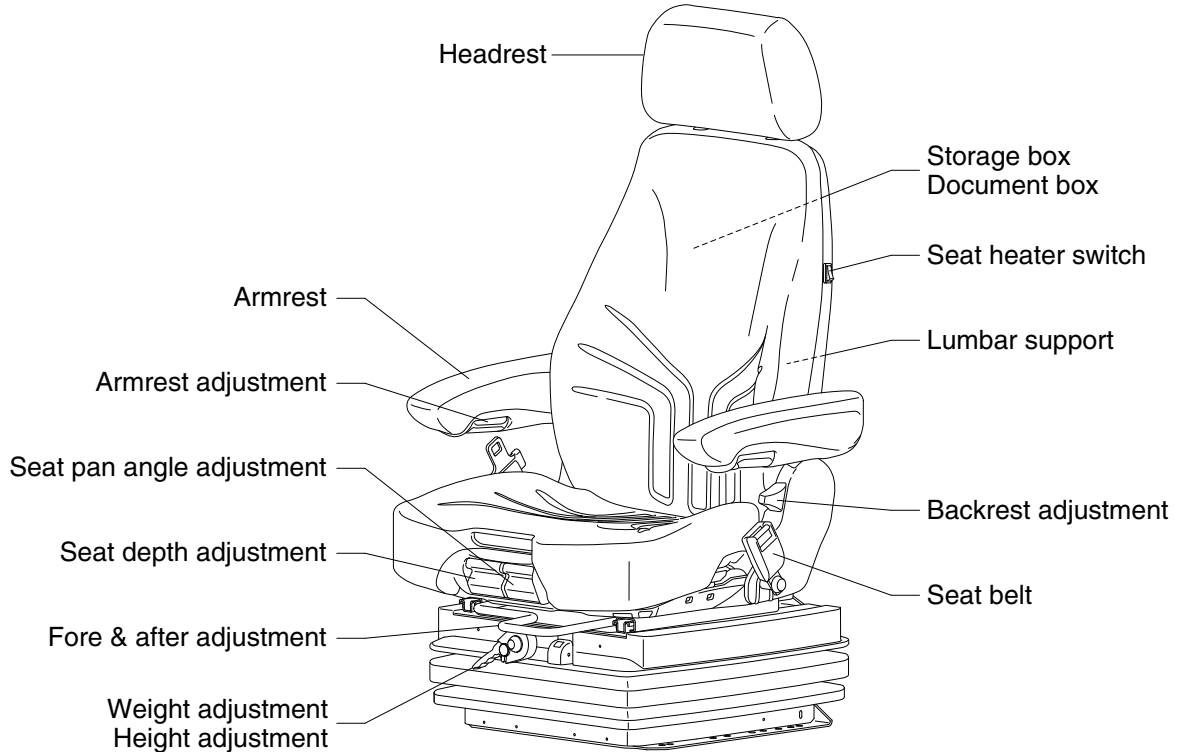
300A3CD165

- **Push** : Select the current menu or the pop-up warning lamp moves to the original position when warning lamp occurs
- **Left** : ESC
- **Right** : CAM
- **Front** : Cluster main menu
- **Rear** : Return to acceleration mode

4) SEAT (SUSPENSION, STD)

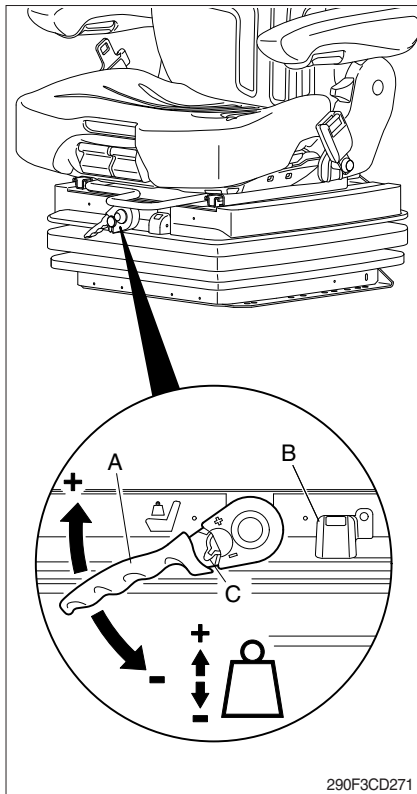
The seat is adjustable to fit the contours of the operator's body. It will reduce operator fatigue due to long work hours and enhance work efficiency.

※ The seat belt reminder warning lamp pops up and the buzzer sounds until seat belt is fastened.



290F3CD270

(1) Weight and height adjustment

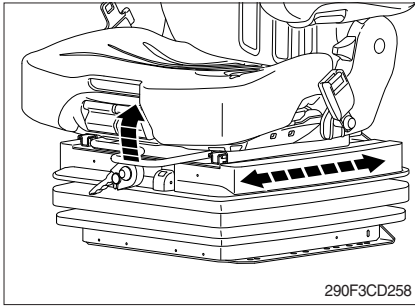


290F3CD271

With socket wrench (A) :

- ① The seat has to be adjusted for the operator's weight and height by tilting the handle (+) up or down (-) with the operator not sitting on the seat.
- ② The rotational direction is reversed by flipping the ratchet with the lever (C).
- ③ The operator's weight and the seat height are adjusted correctly when the green marking is completely visible in the indicator window (B) for weight and height.
- ④ The height can be adjusted individually as long as the green marking is visible.

(2) Fore/after adjustment



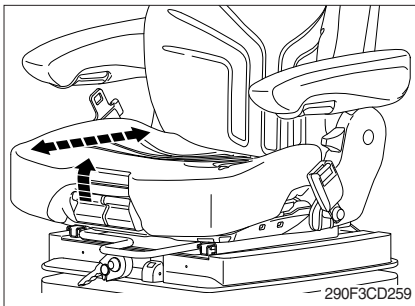
① The fore/after adjustment is released by lifting the locking lever.

▲ Do not operate the locking lever while operating the machine.

※ After the adjustment, the locking lever must latch into the desired position with an audible click. It should not be possible to move the operator's seat into another position when it is locked.

※ Do not lift the locking lever with your leg.

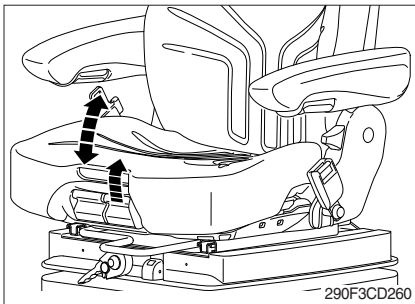
(3) Seat depth adjustment



① The depth of the seat pan can be individually adjusted.

② To adjust the depth of the seat cushion, pull the right handle upwards. By moving the seat pan backwards or forwards the desired seating position can be reached.

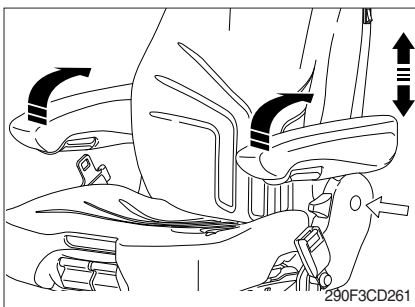
(4) Seat pan angle adjustment



① The angle of the seat pan can be individually adjusted.

② To adjust the angle of the seat pan, pull the left handle upwards. By exerting pressure on or off the front or rear part of the seat pan it can be moved to the desired position.

(5) Armrests

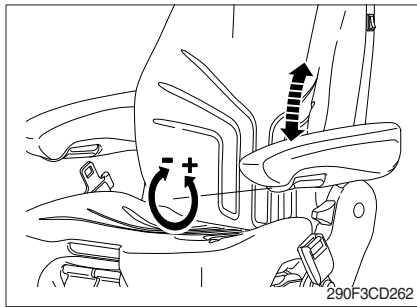


① The armrests can be folded up if desired and the height can be individually adjusted.

② To adjust the height of armrest, separate the round cap (see arrow) from the cover and loosen the hexagon nut (13 mm). Adjust the armrests to the desired position (5 steps) and retighten the nut. Reinstall the cap.

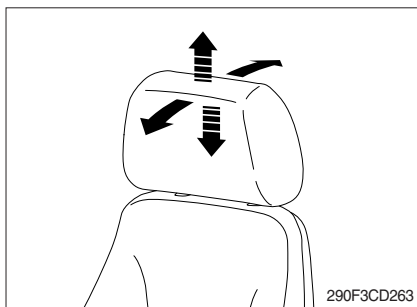
· Tightening torque : 2.6 kgf·m (18.8 kgf·m)

(6) Armrest adjustment



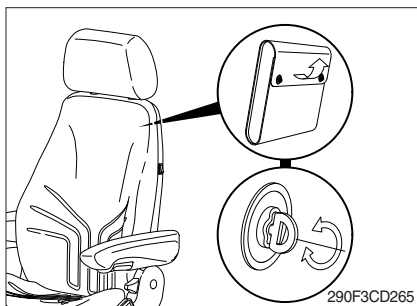
- ① The inclination of the armrest can be modified by turning the adjustment knob.
- ② When turning the knob to the outside (+), the front part of the armrest will be lifted; when turning the knob to the inside (-), it will be lowered.

(7) Headrest



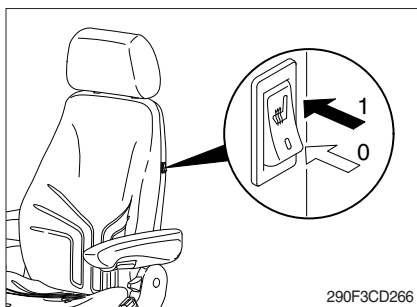
- ① The headrest can be individually adjusted for height by pulling it upward over the various increments up the end stop.
- ② By pushing forwards or rearwards the angle of the headrest can be adjusted individually.
- ③ To remove the headrest, pull it over the end stop.

(8) Document box



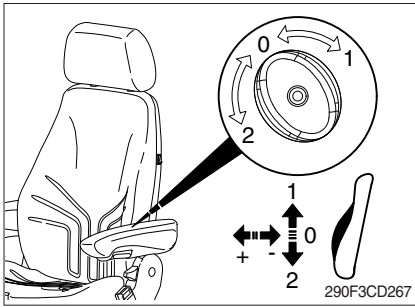
- ① The document box is placed on the rear side of the backrest.
- ② To open the document box, first twist the turn lock closures 90° to the left or the right and then fold the cover of the document box upwards.

(9) Seat heater switch



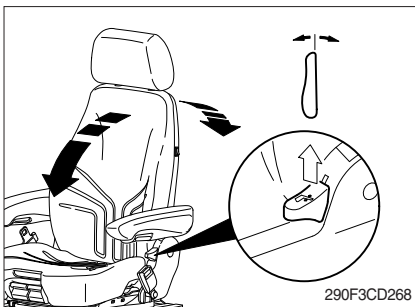
- ① The seat heater can be turned on/off by pressing the switch.

(10) Lumbar support



- ① By turning the adjustment knob to the left (2) or right (1), both the height and curvature of the backrest cushion can be individually adjusted.
- ② This increases both the seating comfort and should improve the performance of the operator.

(11) Backrest adjustment



- ① Pull up the locking lever to release the backrest catch. When releasing the backrest, do not load the backrest by pressing against it.
 - ② By exerting pressure on or off the front or rear part of the seat pan it can be moved to the desired position. Release the locking lever to lock the backrest.
- ※ It should not be possible to move the backrest into another position after it has been locked.

(12) Maintenance



Dirt can impair the function of the seat, so make sure you keep your seat clean.

Upholstery does not need to be removed from the seat frame for cleaning.

▲ Take care with the backrest - it may jerk forward and cause injury.

When cleaning the backrest cushion, the backrest must be held in place when operating the backrest lever.

※ Do not clean the seat with a pressure washer.

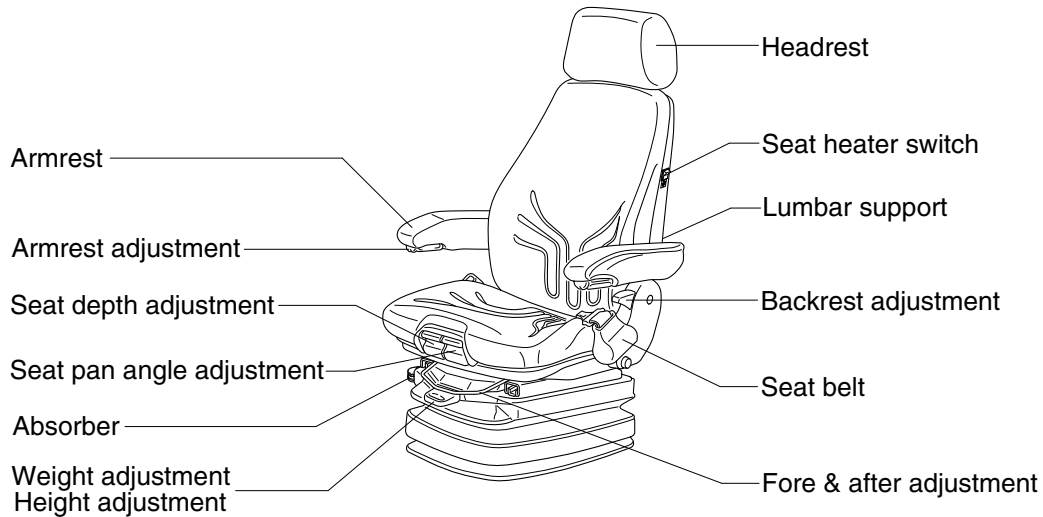
During cleaning, the upholstery should never be soaked.

Use standard commercially available upholstery or plastics cleaning agent. Test first for compatibility on a small, concealed area.

5) SEAT (AIR SUSPENSION, OPTION)

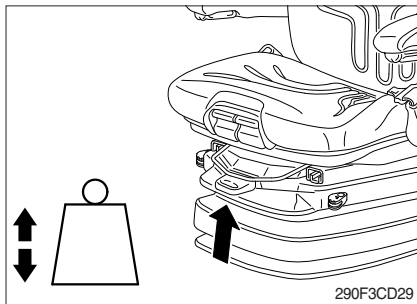
The seat is adjustable to fit the contours of the operator's body. It will reduce operator fatigue in the event of long work hours and it should enhance work efficiency.

※ The seat belt reminder warning lamp pops up and the buzzer sounds until the seat belt is fastened.



290F3CD28

(1) Weight adjustment

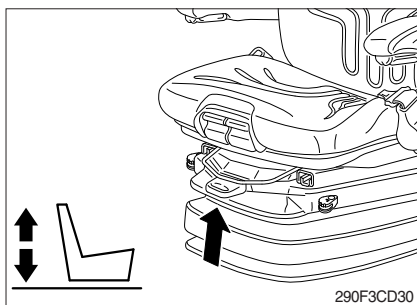


- ① The seat should be adjusted for the operator's weight by briefly pulling the actuator lever of the automatic weight and height adjuster (arrow) with the machine at a standstill and with the operator sitting on the seat.

The operator must sit absolutely still during adjustment.

- ※ Before adjusting the weight, adjust shock absorbers to the position "soft".
- ※ To prevent personal health, the setting for the operator's weight must be checked and adjusted before the machine is operated.

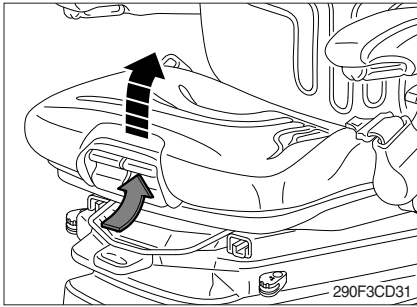
(2) Height adjustment



- ① The seat height can be set pneumatically and is continuously adjustable.
- ② The seat height can be altered by pulling or pressing the actuator lever fully out or in (arrow). If the adjustment reaches the top or bottom endstop, the height is adjusted automatically in order to provide minimum spring travel.

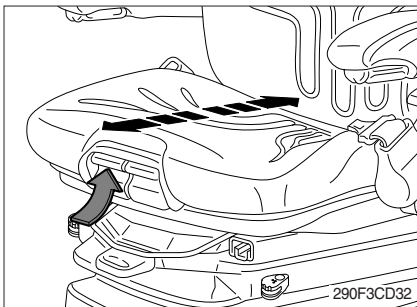
- ※ Before adjusting the weight, adjust shock absorbers to the position "soft".
- ※ In order to avoid damage, do not operate compressor for more than 1 minute.

(3) Seat pan angle adjustment



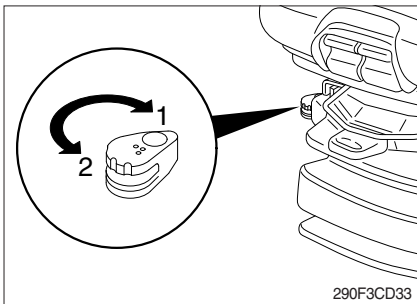
- ① The angle of the seat pan can be individually adjusted.
- ② To adjust the angle of the seat pan, lift the LH handle (see arrow). By exerting pressure on or off the seat pan it can be moved to the desired angled position.

(4) Seat depth adjustment



- ① The depth of the seat pan can be individually adjusted.
- ② To adjust the depth of the seat cushion, lift the RH handle (see arrow). Move the seat cushion backwards or forwards until the desired position is reached.

(5) Absorber

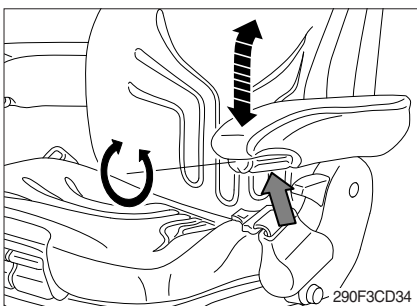


- ① The absorber setting of the seat can be varied to suit on and off-road working conditions. The cushioning effect can be individually adjusted for this purpose.

Turn the lever to the desired position and release.

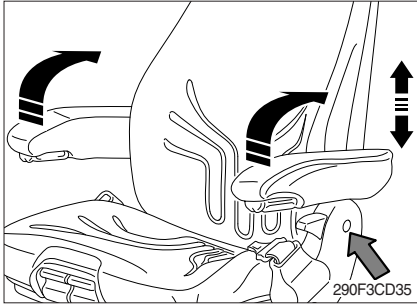
- 1 Soft
- 2 Hard

(6) Armrest adjustment



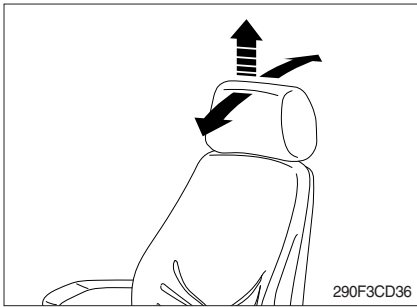
- ① The inclination of the armrests can be modified by turning the adjustment knob (arrow).

(7) Armrests



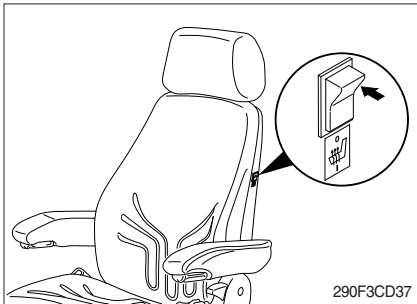
- ① The armrests can be folded up if desired and the height can be individually adjusted.
- ② To adjust the height of armrest, separate the round cap (see arrow) from the cover and loosen the hexagon nut (13 mm). Adjust the armrests to the desired position (5 steps) and retighten the nut. Reinstall the cap.
 - Tightening torque : 2.6 kgf·m (18.8 kgf·m)

(8) Headrest



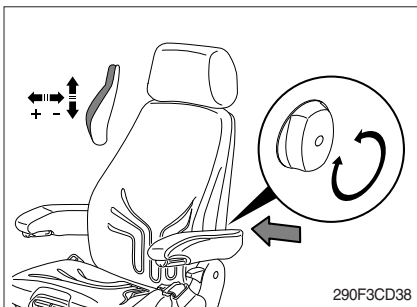
- ① The headrest can be individually adjusted for height by pulling it upward over the various increments up the end stops.
- ② By pushing forward or rearward the angle of the headrest can be adjusted individually.
- ③ To remove the headrest, pull it over the end stops.

(9) Seat heater switch



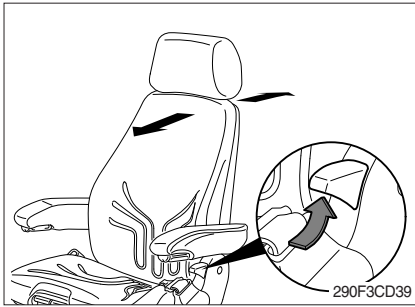
- ① The seat heater is turned on by pressing the switch.

(10) Lumbar support



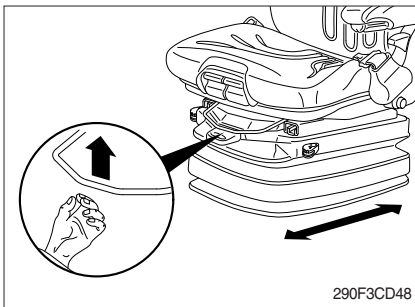
- ① By turning the adjustment knob to the left or right, both the height and curvature of the backrest cushion can be individually adjusted.
- ② This increases both the seating comfort and should help improve performance of operator.

(11) Backrest adjustment



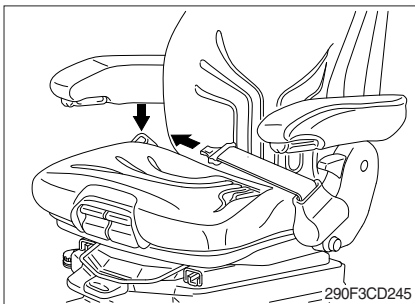
- ① The backrest is adjusted using the locking lever (arrow).
- ※ The locking lever must latch into the desired position. It should not be possible to move the backrest when it is locked.

(12) Fore & after adjustment



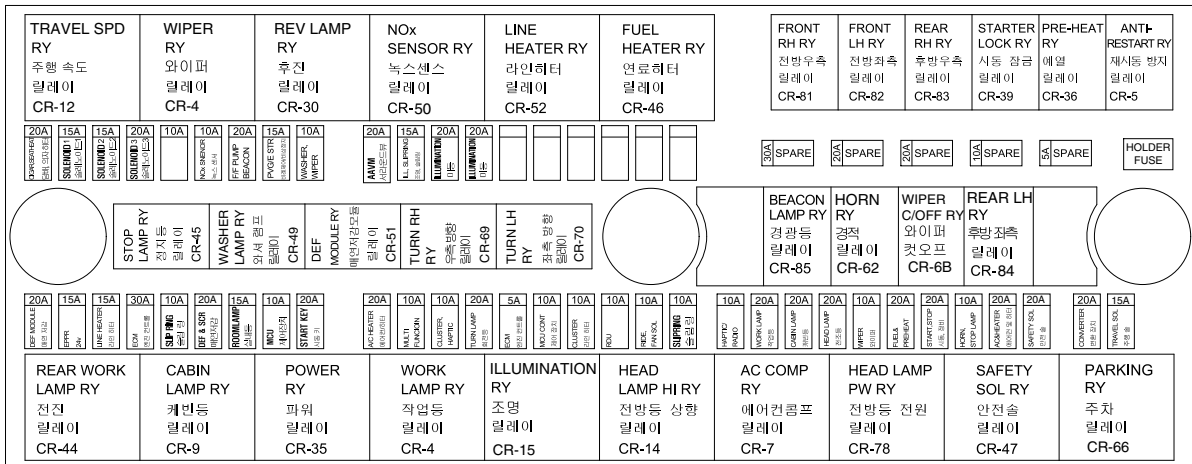
- ① The fore/after adjustment is released by lifting the locking lever.
- ※ The locking lever must latch into the desired position. It should not be possible to move the operator seat when it is locked.

(13) Seat belt



- ▲ Failure to wear a seat belt during machine operation may result in serious injury or death in the event of an accident or machine overturn.

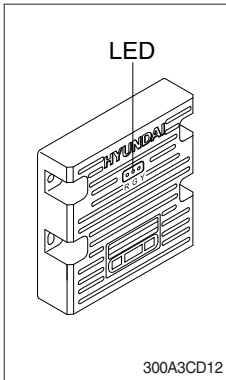
6) FUSE AND RELAY BOX



150WA3CD25

- (1) The fuses protect the electrical parts and wiring from burning out.
 - (2) The fuse box cover indicates the capacity of each fuse and which circuit it protects.
- ※ **When replacing a fuse or relay, always use one of the same capacity.**
- ▲ **Before replacing a fuse or relay, be sure to turn OFF the starting switch.**

7) MCU

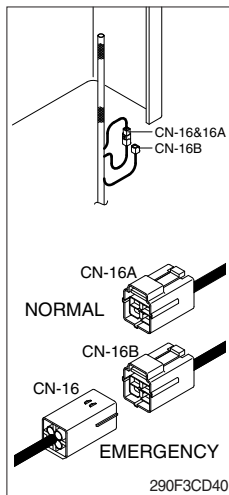


- (1) To match the pump absorption torque with the engine torque, MCU varies EPPR valve output pressure, which controls pump discharge volume whenever engine speed drops and provides feedback, under the reference rpm of each mode set.
- (2) Three LED lamps on the MCU display as below.

LED lamp	Trouble	Service
G is turned ON	Normal	-
G and R are turned ON	Trouble on MCU	· Change the MCU
G and Y are turned ON	Trouble on serial communication line	· Check if serial communication lines between controller and cluster are disconnected
Three LED's are turned OFF	Trouble on MCU power	· Check if the input power wire (24 V, GND) of controller is disconnected · Check the fuse

G : green, R : red, Y : yellow

8) EMERGENCY ENGINE SPEED CONTROL CONNECTOR

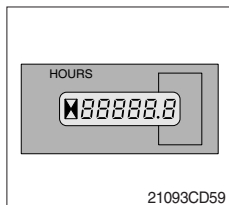


(1) When the CAN communication between the ECU and the MCU is abnormal due to malfunction, change the CN-16 connection from CN-16A to CN-16B and then control the engine speed by rotating the multimodal module of the jog dial module.

※ **Never connect connector CN-16 with CN-16B when MCU is in normal operation.**

※ **Make repair as soon as possible.**

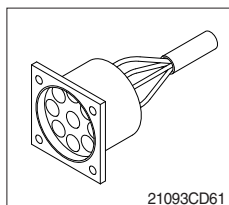
9) SERVICE METER



(1) This meter shows the total operation hours of the machine.

(2) Always ensure the operating condition of the meter during the machine operation. Inspect and service the machine based on hours as indicated in chapter 6, maintenance.

10) MCU/ECU CONNECTOR



(1) MCU communicates the machine data with Laptop computer through the connector.

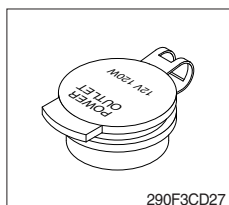
(2) ECU communicates the engine data with cummins INSITE adapter through the connector.

① ECU fault code check

② ECU program change

③ Engine data monitoring & test

11) 12V SOCKET



(1) Utilize the power of 12 V as you need and do not exceed 12 V, 30 W.






12) CAMERA MONITOR (OPTION)

- ※ The monitor's screen can be set by the camera monitor in case the camera option is rear camera only/mirror view/AAVM etc.
- ※ The monitor's screen can't be set by the camera monitor in case the camera option is CIC etc. Set the monitor's detail screen by the main cluster.


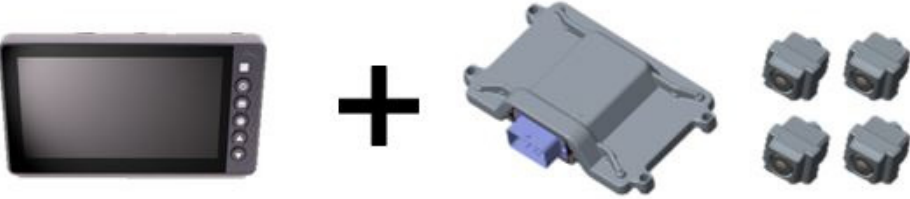




960A3CD65

(1) Front panel description

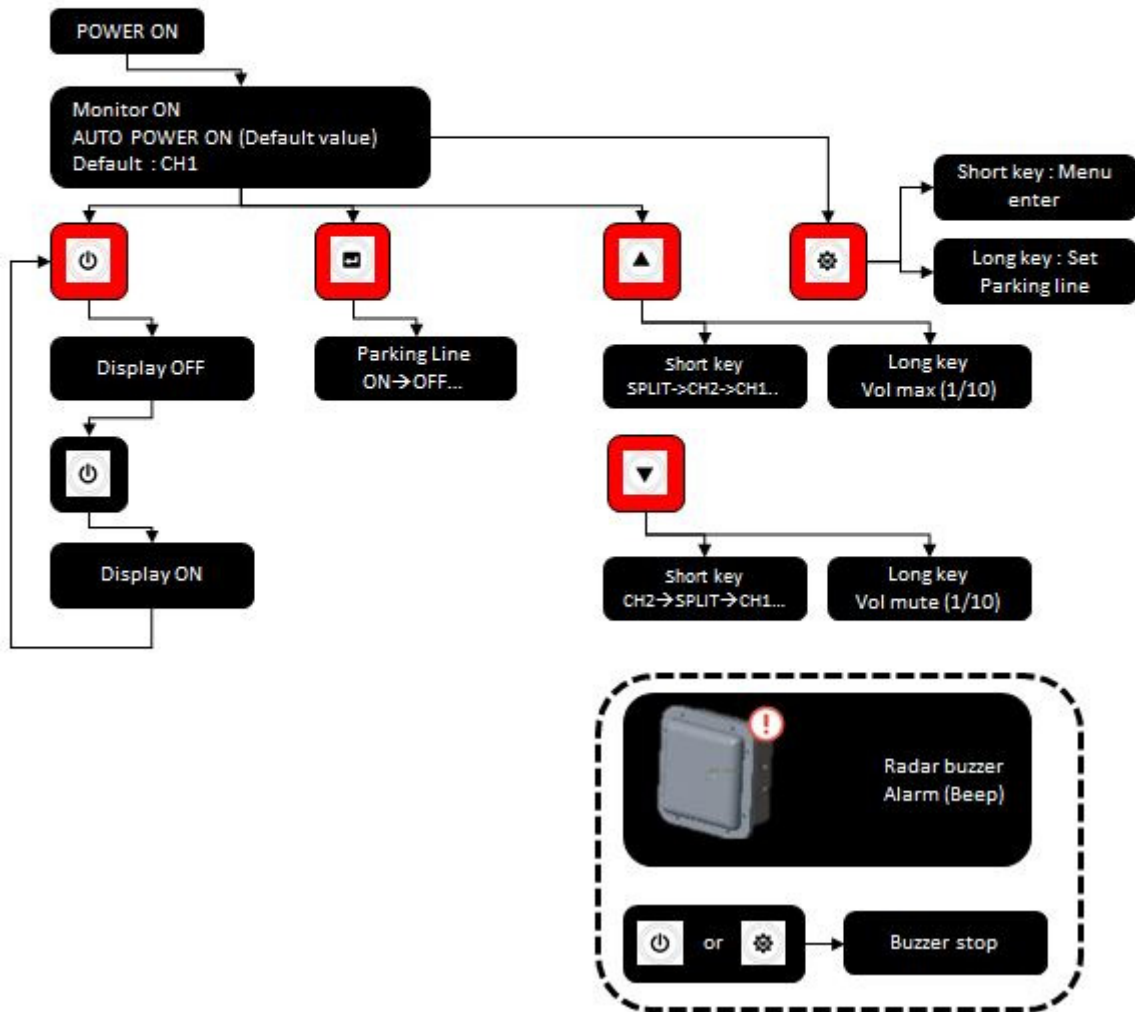
Button	Description	Single Cam mode	Function menu - Single Cam	AAVM mode	Function menu - AAVM
	POWER	- Beep stop - Display On / Off	- Beep stop - Display On / Off - Menu escape (save & exit)	- Beep stop * - Display On / Off	- Beep stop - Display On / Off - Menu escape (save & exit)
	SELECT	Parking guide line On / Off	- Menu select - Adjust menu escape	Favorite view (menu preset)	- Menu select - Adjust menu escape
	MENU	- Menu enter - Parking guide line adjust (long key/2 sec)	Menu next page	Menu enter	Menu next page
	UP	- Previous view (short key) - Adjust to the volumn set in the menu (long key)	- Menu Up - Menu Adjust Up	- Previous view (short key) - Adjust to the volumn set in the menu (long key)	- Menu up - Menu adjust up
	DOWN	Next view	- Menu Down - Menu Adjust down	Next view	- Menu down - Menu adjust down

(2) Interlocked with other devices

CASE 1	
	Monitor + Rear cam
CASE 2	
	Monitor + AAVM
CASE 3	
	Monitor + Rear cam + Radar
CASE 4	
	Monitor + AAVM + Radar

960A3CD71

(3) Operation scenario (Single camera mode)

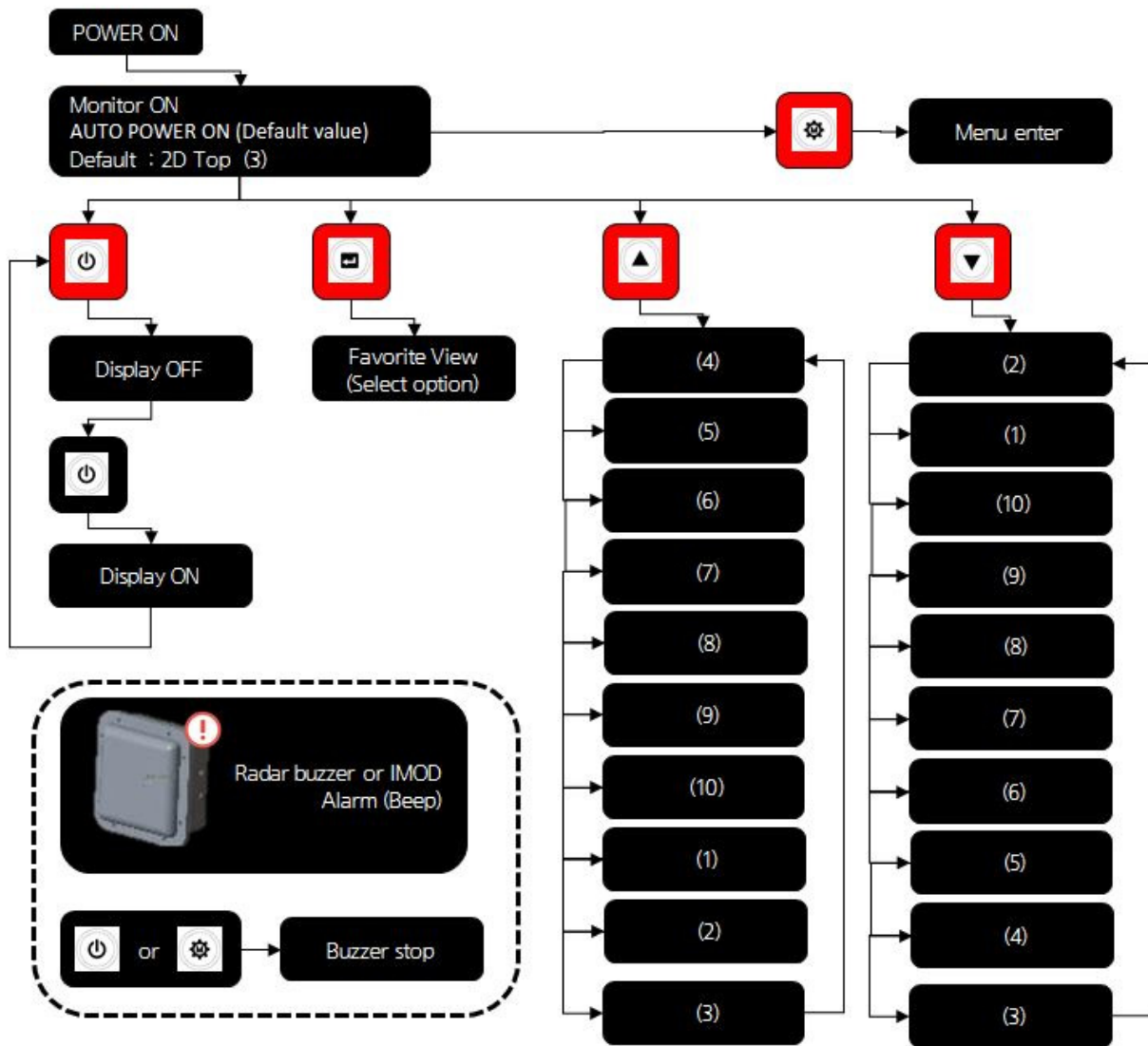


960A3CD72

(4) Operation scenario (AAVM mode)



	POWER
	ENTER
	MENU
	UP
	DOWN



960A3CD73

(5) AAVM view mode type

NO	Name
1	3D TOP
2	3D Rear
3	2D TOP
4	3D LEFT
5	3D RIGHT
6	4CH
7	RIGHT
8	LEFT
9	REAR
10	FRONT

UP & DOWN KEY ORDER

- UP : 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 10
- DOWN : 10 → 9 → 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1

960A3CD74

(6) Function menu tree (Single cam mode)


SHORT KEY					
NO	MENU	Pop-up menu	Background video	SETTING VALUE	비고
1	SCREEN COLOR SETTING	<ul style="list-style-type: none"> ■ SCREEN COLOR SETTING ▣ BRIGHT : 20 ▣ CONTRAST : 33 ▣ COLOR : 30 ▣ SHARPNESS : 30 ▣ TINT : 30 	Previous view	BRIGHT : 0~60 / 1STEP	Default : 20
				CONTRAST : 0~60 / 1STEP	Default : 33
				COLOR : 0~60 / 1STEP	Default : 30
				SHARPNESS : 0~60 / 1STEP	Default : 30
				TINT : 0~60 / 1STEP	Default : 30
2	CAMERA1 SETTING	<ul style="list-style-type: none"> ■ CAMERA1 SETTING ▣ MIRROR : OFF ▣ UPSIDE DOWN : OFF ▣ TRIGGER ENABLE : ON ▣ TRIGGER SUSTAIN : 02sec ▣ MARKER DISPLAY : OFF ▣ MARKER TYPE : TypeA ▣ MARKER POSITION : Enter 	CAMERA 1	MIRROR : ON/OFF	
				UPSIDE DOWN : ON / OFF	
				TRIGGER ENABLE : ON / OFF	
				TRIGGER SUSTAIN : 1~20 sec / 1sec	
				MARKER DISPLAY : ALWAYS / TRIGGER / OFF	
				MARKER TYPE : TYPE A / TYPE B	
				MARKER POSITION : ENTER	MARKR WIDTH / HIGHT ADJUST
3	CAMERA2 SETTING	<ul style="list-style-type: none"> ■ CAMERA2 SETTING ▣ MIRROR : OFF ▣ UPSIDE DOWN : OFF ▣ TRIGGER ENABLE : ON ▣ TRIGGER SUSTAIN : 02sec ▣ MARKER DISPLAY : OFF ▣ MARKER TYPE : TypeA ▣ MARKER POSITION : Enter 	CAMERA 2	MIRROR : ON/OFF	
				UPSIDE DOWN : ON/OFF	
				TRIGGER ENABLE : ON/OFF	
				TRIGGER SUSTAIN : 1~20 sec / 1sec	
				MARKER DISPLAY : ALWAYS / TRIGGER / OFF	
				MARKER TYPE : TYPE A / TYPE B	
				MARKER POSITION : ENTER	MARKR WIDTH / HIGHT ADJUST
4	SPLIT1 SETTING	<ul style="list-style-type: none"> ■ SPLIT1 SETTING ▣ SPLIT TYPE : TypeA ▣ CH1 : CAM1 ▣ CH2 : CAM2 	SPLIT VIEW	SPLIT TYPE : TYPE A / TYPE B	
				CH1 : CAM1/CAM2	
				CH2 : CAM1/CAM2	
5	SYSTEM CONFIG	<ul style="list-style-type: none"> ■ SYSTEM CONFIG ▣ AUTO POWER : AUTO ▣ AUTO DIMMER : OFF ▣ BEEP VOLUME : 05 ▣ LANGUAGE : ENGLISH ▣ FACTORY RESET : Ver0.55/1.33 	SPLIT VIEW	AUTO POWER : AUTO / ON / OFF	
				AUTO DIMMER : ON / OFF	
				BEEP VOLUME : 0~10 / 1 STEP	Default : 5
				LANGUAGE : 한국어 / ENGLISH	Default : ENGLISH
				FACTORY RESET : Version	

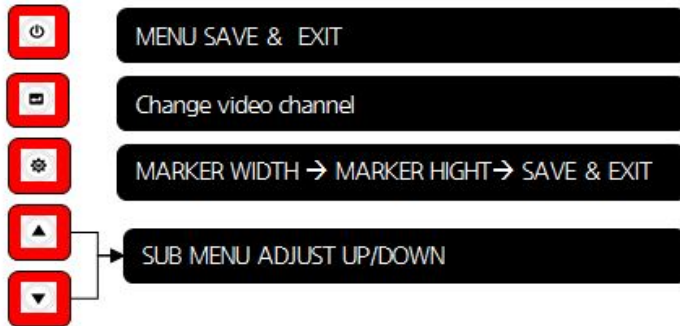
(7) Function menu tree (AAVM mode)

SHORT KEY					
NO	MENU	Pop-up menu	Background video	SETTING VALUE	비고
1	SCREEN COLOR SETTING		Previous view	BRIGHT : 0~60 / 1STEP	Default : 20
				CONTRAST : 0~60 / 1STEP	Default : 33
				COLOR : 0~60 / 1STEP	Default : 30
				SHARPNESS : 0~60 / 1STEP	Default : 30
				TINT : 0~60 / 1STEP	Default : 30
3	SYSTEM CONFIG		Previous view	AUTO POWER : AUTO / ON / OFF	
				AUTO DIMMER : ON / OFF	
				BEEP VOLUME : 0~10 / 1 STEP	Default : 5
				LANGUAGE : 한국어 / ENGLISH	Default : ENGLISH
				FACTORY RESET : Version	
				Favorite view : [Click]AAVM View mode	Displayed when AAVM is installed Default : 4ch (6)
4	RADAR SETTING		Previous view	RADAR DISPLAY : ON/OFF	Enable menu when radar mounted
				RADAR AUTO TRIGGER : ON / OFF	<ul style="list-style-type: none"> •Activate menu with radar and AAVM •Non-adjustable when radar is not installed* •Can not be set when Radar Display off* •Default : ON

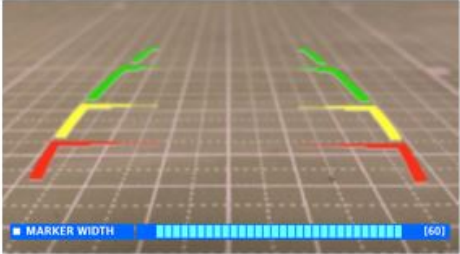
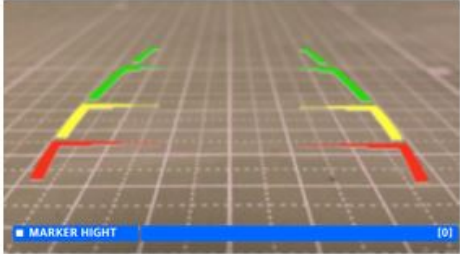
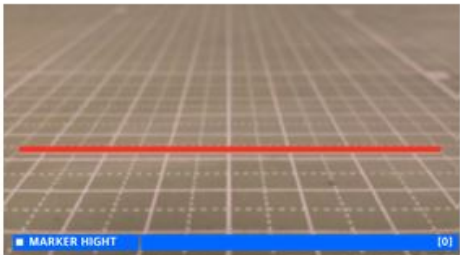
(8) Parking guide line adjust

❖ How to Enter

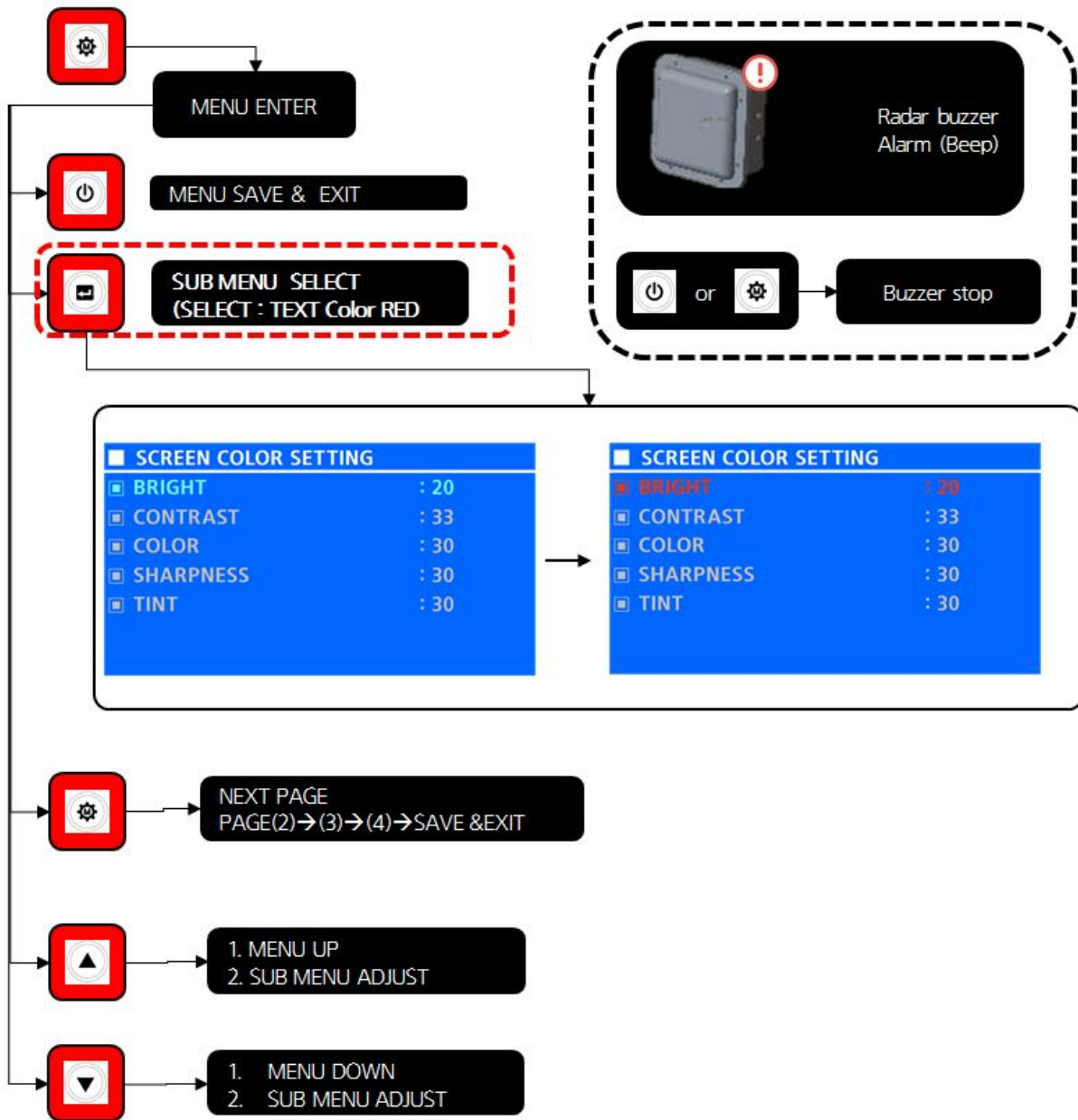
 → LONG KEY (2sec)	<table border="1"> <thead> <tr> <th colspan="2">CAMERA1 SETTING</th> <th colspan="2">CAMERA2 SETTING</th> </tr> </thead> <tbody> <tr> <td>▪ MIRROR</td> <td>: OFF</td> <td>▪ MIRROR</td> <td>: OFF</td> </tr> <tr> <td>▪ UPSIDE DOWN</td> <td>: OFF</td> <td>▪ UPSIDE DOWN</td> <td>: OFF</td> </tr> <tr> <td>▪ TRIGGER ENABLE</td> <td>: ON</td> <td>▪ TRIGGER ENABLE</td> <td>: ON</td> </tr> <tr> <td>▪ TRIGGER SUSTAIN</td> <td>: 02sec</td> <td>▪ TRIGGER SUSTAIN</td> <td>: 02sec</td> </tr> <tr> <td>▪ MARKER DISPLAY</td> <td>: OFF</td> <td>▪ MARKER DISPLAY</td> <td>: OFF</td> </tr> <tr> <td>▪ MARKER TYPE</td> <td>: TypeA</td> <td>▪ MARKER TYPE</td> <td>: TypeA</td> </tr> <tr> <td>▪ MARKER POSITION</td> <td>: Enter</td> <td>▪ MARKER POSITION</td> <td>: Enter</td> </tr> </tbody> </table>	CAMERA1 SETTING		CAMERA2 SETTING		▪ MIRROR	: OFF	▪ MIRROR	: OFF	▪ UPSIDE DOWN	: OFF	▪ UPSIDE DOWN	: OFF	▪ TRIGGER ENABLE	: ON	▪ TRIGGER ENABLE	: ON	▪ TRIGGER SUSTAIN	: 02sec	▪ TRIGGER SUSTAIN	: 02sec	▪ MARKER DISPLAY	: OFF	▪ MARKER DISPLAY	: OFF	▪ MARKER TYPE	: TypeA	▪ MARKER TYPE	: TypeA	▪ MARKER POSITION	: Enter	▪ MARKER POSITION	: Enter
CAMERA1 SETTING		CAMERA2 SETTING																															
▪ MIRROR	: OFF	▪ MIRROR	: OFF																														
▪ UPSIDE DOWN	: OFF	▪ UPSIDE DOWN	: OFF																														
▪ TRIGGER ENABLE	: ON	▪ TRIGGER ENABLE	: ON																														
▪ TRIGGER SUSTAIN	: 02sec	▪ TRIGGER SUSTAIN	: 02sec																														
▪ MARKER DISPLAY	: OFF	▪ MARKER DISPLAY	: OFF																														
▪ MARKER TYPE	: TypeA	▪ MARKER TYPE	: TypeA																														
▪ MARKER POSITION	: Enter	▪ MARKER POSITION	: Enter																														
Menu BUTTON LONG KEY Enter	CAMERA 1, 2 SETTING [MARKER POSITION] SELECT and Enter																																



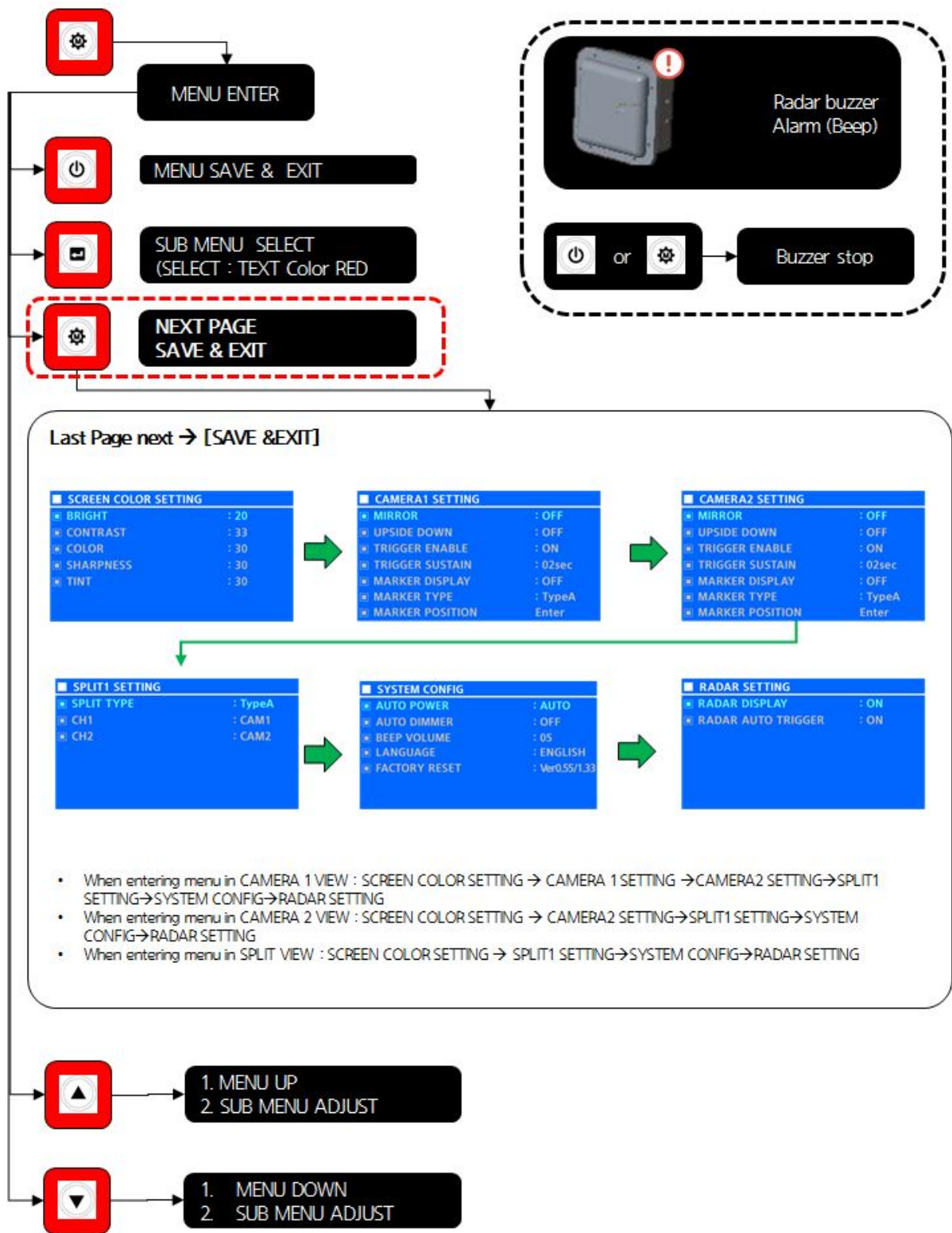
■ MARKER WIDTH		[60]
■ MARKER HIGHT		[0]

TYPE A		
TYPE B		
<ol style="list-style-type: none"> To set the parking line, [MARKER DISPLAY: ALWAYS or TRIGGER] must be set in Camera 1 or Camera 2 setting. In other modes, the parking line can not be set. [MARKER DISPLAY : OFF] <ol style="list-style-type: none"> The parking line positioning menu should not be selected. Do not enter LONG KEY with the menu button. 		

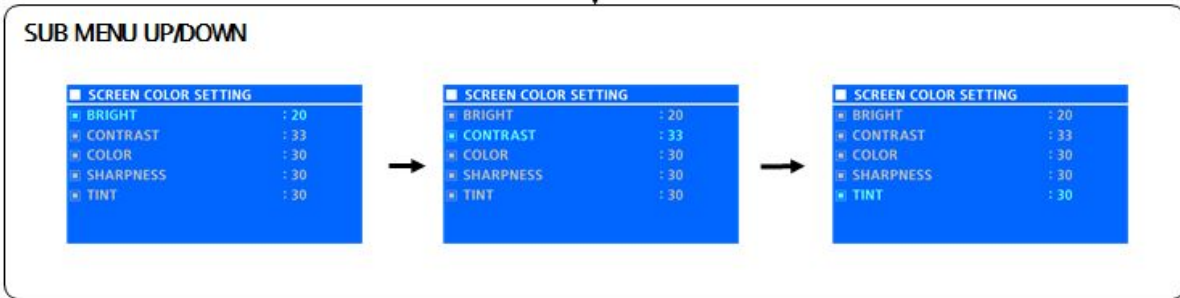
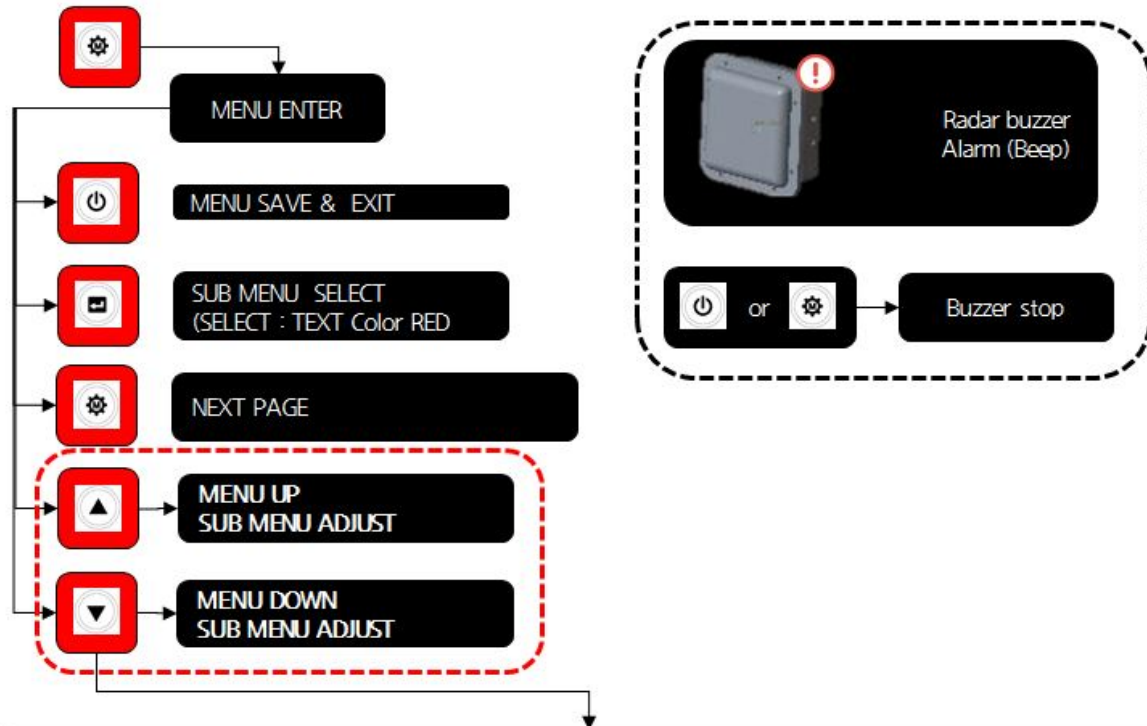
(9) How to set function menu






(10) Composition of menu screen








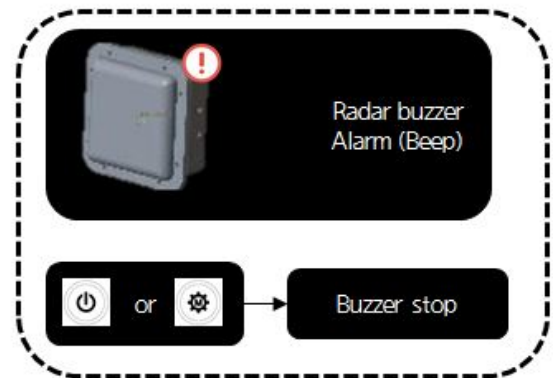
(11) Value adjustment



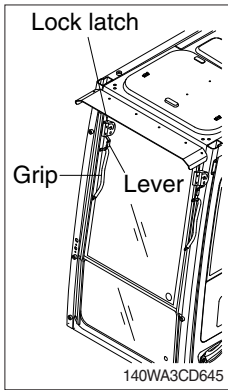
(12) When radar mounted, monitor display

ICON	Status
Not Display	Radar Off
	Radar On (Mode : Normal)
	Radar Error
	No detection for more than(30 min)

Distance Display	Status	Beep
	0~2 m Target	Alarm 200 millisecond
	2~4 m Target	Alarm 500 millisecond
	4~6 m Target	Alarm 500 millisecond
	6~8 m Target	Alarm 1000 millisecond
	8~10 m Target	Alarm 1000 millisecond
Not Display	Non Target	Not Beep



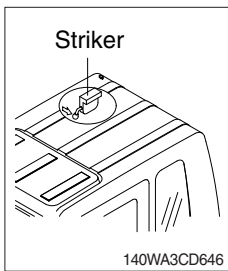
13) UPPER WINDSHIELD



(1) Perform the following procedure in order to open the upper windshield.

- ① Pull both levers on the lock latch and hold both grips that are located at the top of the windshield frame and push the windshield upward.
- ② Hold both grips and pull back into the lock position until the striker is engaged, then release the grips.

▲ When working, without having locked the windshield by the striker (by pushing the windshield to the rear until it's completely fixed), please be careful as it can cause personal injury if the windshield is not fixed or falls off.

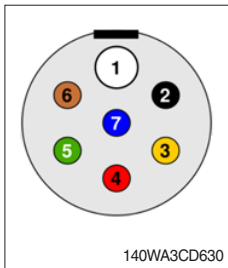


(2) Perform the following procedure in order to close the upper windshield.

- ① Pull the lever of the lock latch in order to release from the striker.
- ② Steps in the reverse order to close the upper windshield.

14) TRAILER CONNECTOR (OPTION)

(1) Specification : ISO 1185 type



No.	Signal	Color	Wire
1	Ground	White	1.50 mm ²
2	Tail lamps	Black	1.50 mm ²
3	Left turn signal	Yellow	1.50 mm ²
4	Stop lamp	Red	1.50 mm ²
5	Right turn signal	Green	1.50 mm ²
6	Tail lamps	Brown	1.50 mm ²
7	-	Blue	1.50 mm ²

▲ When using the electrical connector for trailer, it should be careful after checking the wiring.

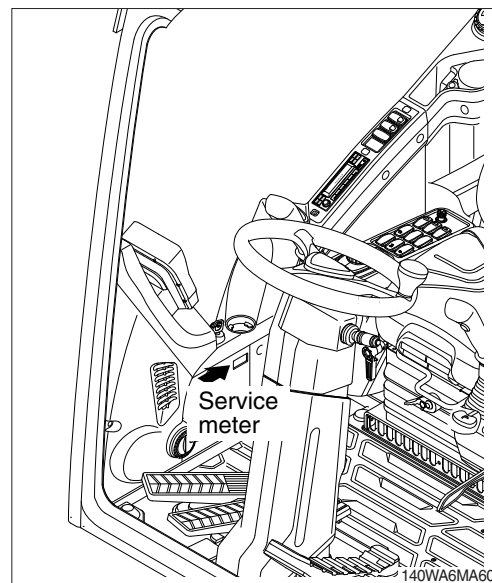
(2) The directional indicator in trailer shall use bulb type lamp of 24V and 21W.

(3) Other lamps (stop lamps and tail lamps in above table) in trailer shall use 24V and consider wire specification.

1. INSTRUCTION

1) INTERVAL OF MAINTENANCE

- (1) Inspect and service machine as described on page 4-10.
- (2) Shorten intervals of inspection and service depending on site conditions. (such as dusty area, quarry, sea shore and etc.)
- (3) Practice the entire related details at the same time when the service interval is doubled.
For example, in case of 100 hours, carry out all the maintenance 「Each 100 hours, each 50 hours and daily service」 at the same time.



2) PRECAUTION

- (1) Do not perform maintenance on the machine until you have read the operator's manual and are familiar with the machine.
- (2) Daily inspection should be performed according to section, Maintenance check list.
- (3) Engine and hydraulic components have been preset from the factory.
Do not allow unauthorized personnel to reset them.
- (4) Drain the used oil and coolant (always in separate containers). Handle and dispose of the waste per regulation of each province/country as well as any local laws.
- ▲ **Hot oil and hot components can cause serious injury or death. Do not allow hot oil or hot components to contact skin. Failure to comply may result in serious injury or death.**
- △ **Accumulated grease and oil on the machine is a fire hazard. Remove any coating/film of fuel, oil or grease by steam cleaning the machine with high pressure water. Perform this at minimum of 1000 hours.**
- △ **Inspect the engine compartment for any trash build up. Remove any trash build up from the engine compartment.**
- (5) Ask your local dealer or HD Hyundai Construction Equipment for the maintenance advice if unknown.

3) PROPER MAINTENANCE

(1) Replace and repair of parts

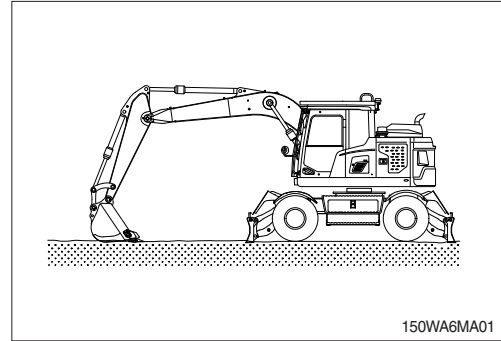
It is required to replace the wearable and consumable parts such as bucket tooth, side cutter, filter and etc., regularly. Replace damaged or worn parts before or at the required time to maintain machine performance.

- (2) Always use only HD Hyundai Construction Equipment genuine parts.
 - (3) Use the recommended oil.
 - (4) Do not perform repairs while the machine is running. Stop the engine when you fill the oil.
 - (5) Always wear protective goggles, protective gloves and other personal protective equipment.
 - (6) Clean around the inlet of oil tank before adding oil.
 - (7) Drain oil when the temperature of oil is warm.
 - (8) Relieve hydraulic system of pressure before repairing the hydraulic system.
 - (9) Confirm if cluster has any warnings present after completion of service.
 - (10) For more detail information of maintenance, please contact your local HD Hyundai Construction Equipment dealer.
- ※ **Read chapter 1 of this manual for safety instructions prior to performing any maintenance on the machine.**

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

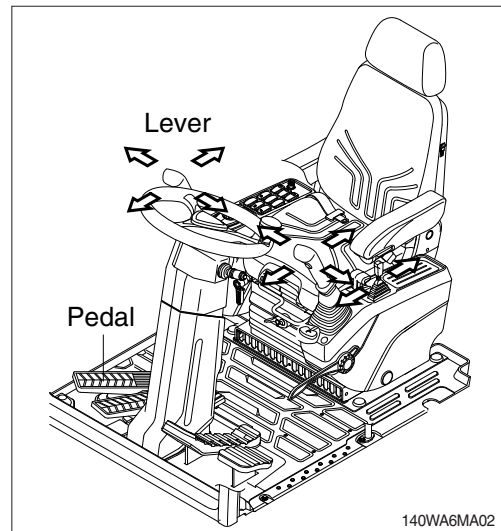
※ Spewing of oil can cause an severe personal injury. Before you loosen hydraulic cap or any hydraulic line on the machine, always make sure machine of off, cooled down and that pressure is relived of the hydraulic system.

- (1) Place machine in the position shown and stop engine.

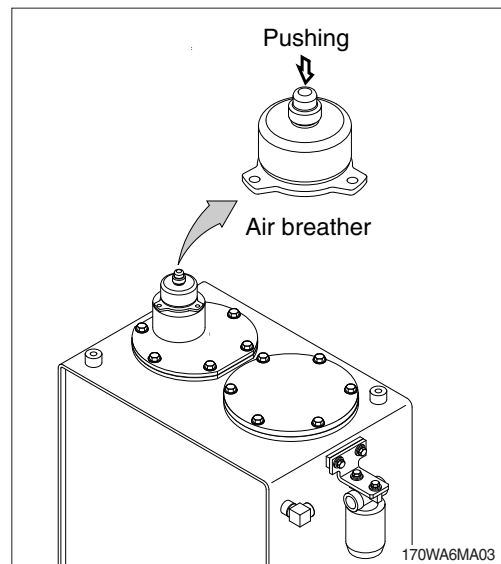


- (2) Set the safety knob completely in the UNLOCK position. Refer to section Levers and pedals. Operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ This does not completely release the pressure, so when servicing hydraulic component, loosen the connections slowly and do not stand in the direction where the oil may shoot out.



- (3) Relieve the pressure in the tank by pushing the top of the air breather.



5) PRECAUTION WHEN INSTALLING HYDRAULIC HOSES OR PIPES

- (1) Be particularly careful that the joint of hose, pipe and functioning item are not damaged.
Avoid contamination.
- (2) Assemble after cleaning the hose, pipe and joint of functioning item.
- (3) Use genuine parts.
- (4) Do not install hose in a twisted, bent or crimped way.
- (5) Always maintain the specified torque.

6) PERIODIC REPLACEMENT OF PARTS

- (1) Perform periodic maintenance of the machine to prolong its useful life. This will assure and allow you to use the machine safely for a long time.
It is recommended to replace any parts related to safety (as needed), not only for safety but in order to maintain performance as well.
- (2) These parts can shorten the life of the machine. The life span of such parts cannot be viewed visually and judged by the operator.
- (3) Repair or replace if any abnormality of these parts is found even before the recommended replacement interval.

Periodical replacement of safety parts		Interval	
Engine	Fuel hose (tank-engine)	Every 2 years	
	Heater hose (heater-engine)		
Hydraulic system	Main circuit	Pump suction hose	Every 2 years
		Pump delivery hose	
		Swing hose	
	Working device	Boom cylinder line hose	Every 2 years
		Arm cylinder line hose	
		Bucket cylinder line hose	
	Brake line	Service brake line hose	Every 2 years
		Parking brake line hose	
		Steering line hose	

※ **Replace O-ring and gasket at the same time when replacing the hose.**

Replace clamp at the same time if the hose clamp is cracked when checking and replacing the hose.

2. TIGHTENING TORQUE

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6×1.0	0.8 ~ 1.2	5.8 ~ 8.6	1.2 ~ 1.8	8.7 ~ 13.0	1.5 ~ 2.1	10.9 ~ 15.1
M 8×1.25	2.0 ~ 3.0	14.5 ~ 21.6	2.8 ~ 4.2	20.3 ~ 30.4	3.4 ~ 5.0	24.6 ~ 36.1
M10×1.5	4.0 ~ 6.0	29.0 ~ 43.3	5.6 ~ 8.4	40.5 ~ 60.8	6.8 ~ 10.0	49.2 ~ 72.3
M12×1.75	6.8 ~ 10.2	50.0 ~ 73.7	9.6 ~ 14.4	69.5 ~ 104	12.3 ~ 16.5	89.0 ~ 119
M14×2.0	10.9 ~ 16.3	78.9 ~ 117	16.3 ~ 21.9	118 ~ 158	19.5 ~ 26.3	141 ~ 190
M16×2.0	17.9 ~ 24.1	130 ~ 174	25.1 ~ 33.9	182 ~ 245	30.2 ~ 40.8	141 ~ 295
M18×2.5	24.8 ~ 33.4	180 ~ 241	34.8 ~ 47.0	252 ~ 340	41.8 ~ 56.4	302 ~ 407
M20×2.5	34.9 ~ 47.1	253 ~ 340	49.1 ~ 66.3	355 ~ 479	58.9 ~ 79.5	426 ~ 575
M22×2.5	46.8 ~ 63.2	339 ~ 457	65.8 ~ 88.8	476 ~ 642	78.9 ~ 106	570 ~ 766
M24×3.0	60.2 ~ 81.4	436 ~ 588	84.6 ~ 114	612 ~ 824	102 ~ 137	738 ~ 991
M30×3.5	120 ~ 161	868 ~ 1164	168 ~ 227	1216 ~ 1641	202 ~ 272	1461 ~ 1967

(2) Fine thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8×1.0	2.1 ~ 3.1	15.2 ~ 22.4	3.0 ~ 4.4	21.7 ~ 31.8	3.6 ~ 5.4	26.1 ~ 39.0
M10×1.25	4.2 ~ 6.2	30.4 ~ 44.9	5.9 ~ 8.7	42.7 ~ 62.9	7.0 ~ 10.4	50.1 ~ 75.2
M12×1.25	7.3 ~ 10.9	52.8 ~ 78.8	10.3 ~ 15.3	74.5 ~ 110	13.1 ~ 17.7	94.8 ~ 128
M14×1.5	12.4 ~ 16.6	89.7 ~ 120	17.4 ~ 23.4	126 ~ 169	20.8 ~ 28.0	151 ~ 202
M16×1.5	18.7 ~ 25.3	136 ~ 182	26.3 ~ 35.5	191 ~ 256	31.6 ~ 42.6	229 ~ 308
M18×1.5	27.1 ~ 36.5	196 ~ 264	38.0 ~ 51.4	275 ~ 371	45.7 ~ 61.7	331 ~ 446
M20×1.5	37.7 ~ 50.9	273 ~ 368	53.1 ~ 71.7	384 ~ 518	63.6 ~ 86.0	460 ~ 622
M22×1.5	51.2 ~ 69.2	370 ~ 500	72.0 ~ 97.2	521 ~ 703	86.4 ~ 116	625 ~ 839
M24×2.0	64.1 ~ 86.5	464 ~ 625	90.1 ~ 121	652 ~ 875	108 ~ 146	782 ~ 1056
M30×2.0	129 ~ 174	933 ~ 1258	181 ~ 245	1310 ~ 1772	217 ~ 294	1570 ~ 2126

2) PIPE AND HOSE (FLARE type)

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE (ORFS type)

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

5) TIGHTENING TORQUE OF MAJOR COMPONENT

No.	Descriptions	Bolt size	Torque		
			kgf · m	lbf · ft	
1	Engine	Engine mounting bolt (bracket-frame, FR)	M16 × 2.0	29.7±3.0	215±32.5
2		Engine mounting bolt (bracket-frame, RR)	M16 × 2.0	29.7±3.0	215±32.5
3		Engine mounting bolt (engine-bracket)	M12 × 1.75	11.5±1.0	83.2±7.2
4		Radiator mounting bolt, nut	M16 × 2.0	29.7±4.5	215±32.5
5		Fuel tank mounting bolt	M20 × 2.5	57.9±5.8	419±42.0
6		Coupling mounting socket bolt	M16 × 2.0	22.0±1.0	159±7.2
7	Hydraulic system	Main pump housing mounting bolt	M10 × 1.5	6.5±0.7	47.0±5.1
8		Main pump mounting socket bolt	M20 × 2.5	57.9±8.7	419±62.9
9		Main control valve mounting bolt	M12 × 1.75	12.2±1.3	88.2±9.4
10		Travel motor mounting socket bolt	M16 × 2.0	29.6±3.2	214±23.1
11		Hydraulic oil tank mounting bolt	M20 × 2.5	57.9±5.8	419±42.0
12		Turning joint mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
13		Swing motor mounting bolt	M20 × 2.5	57.9±5.8	419±42.0
14	Power train system	Swing bearing upper mounting bolt	M20 × 2.5	57.9±6.0	419±43.4
15		Swing bearing lower mounting bolt	M20 × 2.5	57.9±6.0	419±43.4
16		Real axle mounting bolt, nut	M20 × 2.5	58.0±6.3	420±45.6
17		Transmission bracket mounting bolt	M20 × 2.5	58.0±6.3	420±45.6
18		Transmission mounting bolt	M20 × 2.5	39.0±4.2	282±30.4
19		Oscillating cylinder mounting bolt	M22 × 1.5	83.2±9.2	602±66.5
20		Oscillating cylinder support mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
21		Wheel nut	M22 × 1.5	60 ⁰ ₋₅	434 ⁰ _{-36.2}
22		Front drive shaft mounting bolt, nut	M10 × 1.0	5.9±0.6	42.7±4.3
23		Rear drive shaft mounting bolt, nut	M10 × 1.0	5.9±0.6	42.7±4.3
24	Fan & brake pump mounting bolt	M10 × 1.5	6.9±1.4	49.9±10.1	
25	Others	Counterweight mounting bolt	M36 × 3.0	308±46	2228±333
26		Cab mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
27		Operator's seat mounting bolt	M 8 × 1.25	4.05±0.8	29.3±5.8
28		Under cover mounting bolt	M12 × 1.75	12.8±3.0	92.6±21.7

※ For tightening torque of engine and hydraulic components, see engine maintenance guide and service manual.

3. FUEL, COOLANT AND LUBRICANTS

1) NEW MACHINE

New machine used and filled with following lubricants.

Description	Specification
Engine oil (API CK-4)	SAE 15W-40, ★SAE 5W-40
DEF/AdBlue®	ISO 22241 (32.5% high-purity urea and 67.5% deionized water)
Hydraulic oil	HD Hyundai Construction Equipment genuine long life (ISO VG 32, VG 46, VG 68) Conventional hydraulic oil (ISO VG 15★) HD Hyundai Construction Equipment Bio Hydraulic Oil (HBHO, ISO VG 46)
Transmission oil	SAE 10W-30 (API CF-4)
Axle oil	SAE 85W-90 LSD-Additive (API GL-5) or UTTO
Grease	Lithium base grease NLGI No. 2
Fuel	ASTM D975-No. 2, Ultra low sulfur diesel
Coolant (DCA4)	ASTM D6210 Mixture of 50% ethylene glycol base antifreeze and 50% water. Mixture of 60% ethylene glycol base antifreeze and 40% water. ★

SAE : Society of Automotive Engineers

API : American Petroleum Institute

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

DEF : Diesel Exhaust Fluid

DEF compatible with AdBlue®

DCA4 : Brand name of Chemical Additive

manufactured by the Cummins Fleetguard Co.

Ultra low sulfur diesel

- sulfur content ≤ 10 ppm

★ Cold region

Russia, CIS, Mongolia

※ Refer to the page 7-29 for further information of recommended oils.

4. MAINTENANCE CHECK LIST

1) DAILY SERVICE BEFORE STARTING

Check items	Service	Page
Visual check		
· Cooling fan	Check	4-27
· After treatment exhaust piping	Check	-
· Air intake piping	Check	-
· Air cleaner dust ejection valve	Check	-
· Crankcase breather tube	Check	-
Fuel tank	Check, Refill	4-29
Hydraulic oil level	Check, Add	4-45
Engine oil level	Check, Add	4-20
Radiator coolant level	Check, Add	4-23
Control panel & pilot lamp	Check, Clean	4-60
Fuel pre-filter element (water)	Check, Drain	4-30
Fan belt tension and damage	Check, Adjust	4-27, 28
DEF/AdBlue® tank	Check, Add	4-32
★ Attachment pin and bushing	Lubricate	4-51
· Boom cylinder tube end		
· Boom foot		
· Boom cylinder rod end		
· Arm cylinder tube end		
· Arm cylinder rod end		
· Boom + Arm connecting		
· Bucket cylinder tube end		

★ Lubricate every 10 hours or daily for initial 100 hours.

2) EVERY 50 HOURS SERVICE

Check items	Service	Page
Fuel tank (water, sediment)	Drain	4-29
Drive shaft grease (flange bearing)	Check, Add	4-49
Front axle pivot pin bushing	Check, Add	4-50
Wheel nuts	Check, Tighten	4-51
Tires (air pressure)	Check, Inflate	4-51
Bucket linkage, arm front and blade pin	Lubricate	4-58
· Bucket cylinder rod end		
· Bucket + Arm connecting		
· Bucket control link + Arm		
· Bucket control rod		
· Bucket link connecting		
· Dozer blade cylinder (rod end, tube end)		4-50
· Dozer blade pivot pin		4-50
· Outrigger (pivot pin, cylinder pin)		4-50

3) INITIAL 50 HOURS SERVICE

Check items	Service	Page
Bolts & nuts	Check, Tight	4-8
· Power train mounting bolts		
· Swing unit mounting bolts		
· Swing bearing mounting bolts		
· Engine mounting bolts		
· Counterweight mounting bolts		
· Turning joint locating bolts		
· Hydraulic pump mounting bolts		
· Under cover mounting bolts		

4) EVERY 100 HOURS SERVICE

Check items	Service	Page
Front axle steering oil	Add, Lubricate	4-50
Trailer hitch bracket and fixation pin	Lubricate	4-59

5) EVERY 200 HOURS SERVICE

Check items	Service	Page
★ Hydraulic oil return filter	Replace	4-47
★ Pilot line filter element	Replace	4-48
★ Drain filter	Replace	4-47

★ **Replace 3 filters for continuous hydraulic breaker operation only.**

6) INITIAL 250 HOURS SERVICE

Check items	Service	Page
Engine oil	Change	4-20, 21
Engine oil filter	Replace	4-20, 21
Fuel pre-filter element	Replace	4-30
Fuel filter element	Replace	4-31
Transmission oil	Change	4-54
Pilot line filter element	Replace	4-48
Hydraulic oil return filter	Replace	4-47
Drain filter	Replace	4-47
Brake supply valve filter	Clean	4-48

7) EVERY 250 HOURS SERVICE

Check items	Service	Page
Charge air piping	Check	4-31
Charge air cooler	Check	4-26
Battery (voltage), battery cable and connections	Check, Clean	4-60
Swing bearing grease	Lubricate	4-48
Front axle differential gear oil	Add, Lubricate	4-52
Rear axle differential gear oil	Add, Lubricate	4-52
Axle planetary gear oil	Add, Lubricate	4-52
Bolts & nuts	Check, Tight	4-8
· Power train mounting bolts		
· Swing unit mounting bolts		
· Swing bearing mounting bolts		
· Engine mounting bolts		
· Counterweight mounting bolts		
· Turning joint locating bolts		
· Hydraulic pump mounting bolts		
· Under cover mounting bolts		
Attachment pin and bushing	Lubricate	4-58
· Boom cylinder tube end		
· Boom foot		
· Boom cylinder rod end		
· Arm cylinder tube end		
· Arm cylinder rod end		
· Boom + Arm connecting		
· Bucket cylinder tube end		

8) INITIAL 500 HOURS SERVICE

Check items	Service	Page
Front axle differential gear oil	Change	4-53
Rear axle differential gear oil	Change	4-53
Axle planetary gear oil	Change	4-53

9) EVERY 500 HOURS SERVICE

Check items	Service	Page
Aircon and heater outer filter	Replace	4-63
Aircon and heater inner filter	Replace	4-63
Air cleaner element (primary) ★1	Check, Clean	4-29
Radiator, cooler fin and charge air cooler	Check, Clean	4-26

★1 When working in dusty environments, more frequent cleaning is highly recommended.

10) EVERY 800 HOURS SERVICE

Check items	Service	Page
Engine oil★	Change	4-20, 21
Engine oil filter★	Replace	4-20, 21`

★ Change oil and filter every 500 hours when using API CJ-4

11) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Fuel filter element	Replace	4-31
Fuel pre-filter element	Replace	4-30
Drive belt, cooling fan	Check	4-27
Cooling fan belt tensioner	Check	4-28
Swing gear and pinion grease	Change	4-49
Hydraulic oil return filter	Replace	4-47
Drain filter	Replace	4-47
Pilot line filter element	Replace	4-48
Hydraulic tank air breather element	Replace	4-47
Brake supply valve filter	Clean	4-48
Transmission oil	Change	4-54

12) EVERY 1500 HOURS SERVICE

Check items	Service	Page
Front axle differential gear oil	Change	4-53
Rear axle differential gear oil	Change	4-53
Axle planetary gear oil	Change	4-53

13) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Coolant, cooling system and antifreeze* ²	Change, Flush	4-23, 24, 25, 26
Engine cleaning	Clean	4-36
Vibration damper (rubber)	Check	4-37
Vibration damper (viscous)	Check	4-37
DEF/AdBlue® tank filter	Replace	4-32
Hydraulic oil* ²	Change	4-46
HBHO* ³	Change	4-46
Hydraulic tank suction strainer	Check, Clean	4-46
Air cleaner element (primary, safety)* ⁴	Replace	4-27
RCV lever	Check, Lubricate	4-49
Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-

*² Conventional

*³ If you do not want to change HBHO (HD Hyundai Construction Equipment Bio Hydarulic Oil, ISO VG 46) every 2000 hours, contact your local HD Hyundai Construction Equipment dealer and ask about SAMPLING.

*^{2,*3} Change hydraulic oil every 600 hours of continuous hydraulic breaker operation.

*⁴ When working in dusty environments, more frequent replacing is highly recommended.

14) EVERY 4500 HOURS SERVICE

Check items	Service	Page
DEF/AdBlue® supply module filter★	Replace	4-34

★ When working in dusty environments, inspection per 1500 hours is highly recommended.

15) EVERY 5000 HOURS SERVICE

Check items	Service	Page
Overhead set (shop inspection)	Adjust	4-38, 39, 40, 41, 42, 43
Hydraulic oil* ⁵	Change	4-46

*⁵ HD Hyundai Construction Equipment genuine long life

*⁵ Change hydraulic oil every 1000 hours of continuous hydraulic breaker operation.

16) EVERY 6000 HOURS SERVICE

Check items	Service	Page
Coolant, cooling system and antifreeze* ⁵	Change, Flush	4-23, 24, 25, 26

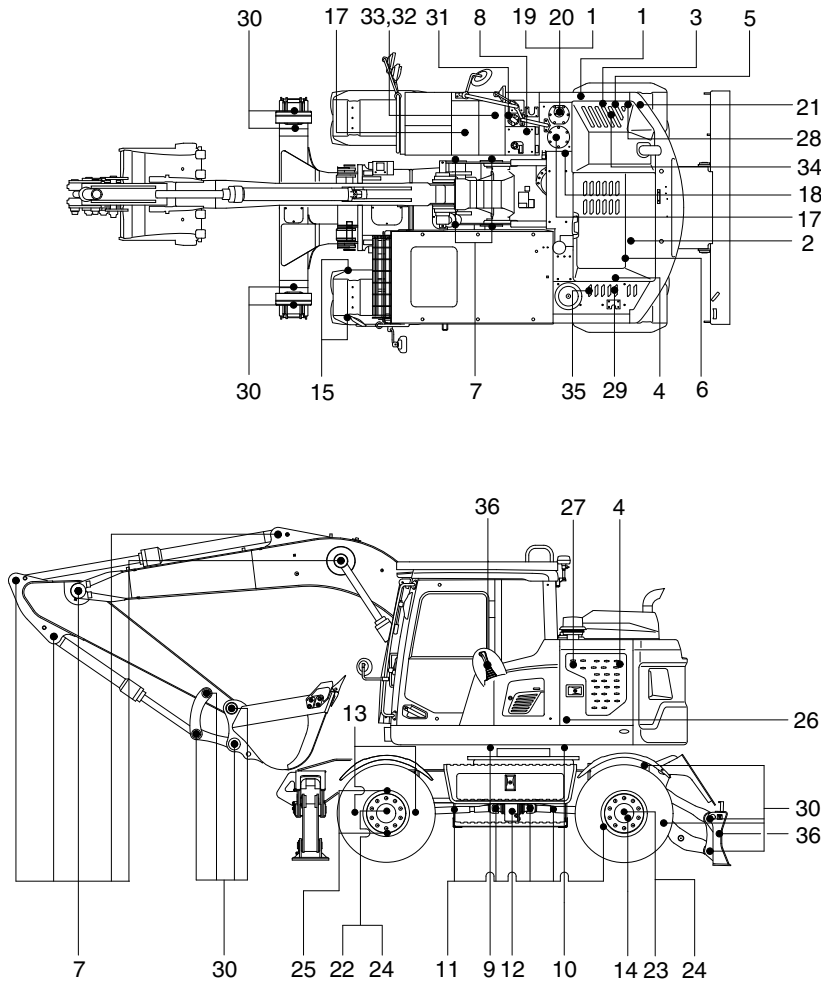
*⁵ HD Hyundai Construction Equipment genuine long life

17) WHEN REQUIRED

Whenever you have trouble with the machine, you must perform the service of related items, system by system.

Check items	Service	Page
Fuel system		
· Fuel tank	Drain or Clean	4-29
· Fuel pre-filter element	Drain or Replace	4-30
· Fuel filter element	Replace	4-31
· Fuel filler pump filter	Clean, Replace	4-44
Engine lubrication system		
· Engine oil	Change	4-20, 21
· Engine oil filter	Replace	4-20, 21
Engine cooling system		
· Radiator coolant	Add or Change	4-23, 24, 25, 26
· Radiator	Clean or Flush	4-23, 24, 25, 26
· Charge air cooler	Check, Clean	4-26
Engine air system		
· Air cleaner element (primary)	Clean or Replace	4-29
· Air cleaner element (safety)	Replace	4-29
Engine exhaust system		
· DEF/AdBlue® tank	Check, Add	4-32
· DEF/AdBlue® supply module filter	Replace	4-34
· DEF/AdBlue® tank filter	Replace	4-33
· DPF (diesel particulate filter)	Clean	4-36
Hydraulic system		
· Hydraulic oil	Add or Change	4-45, 46
· Hydraulic oil return filter	Replace	4-47
· Drain filter	Replace	4-47
· Pilot line filter element	Replace	4-48
· Hydraulic tank air breather element	Replace	4-47
· Hydraulic oil suction strainer	Clean	4-46
· RCV lever	Lubricate	4-46
Tire pressure	Check, Adjust	4-51
Bucket		
· Tooth	Replace	4-56
· Side cutter	Replace	4-56
· Linkage	Adjust	4-56
· Bucket assy	Replace	4-55
Air conditioner and heater		
· Outer filter	Replace	4-63
· Inner filter	Replace	4-63

5. MAINTENANCE CHART



94K5-10711

Caution

1. Service intervals are based on the hour meter reading.
2. The number of each item shows the lubrication point on the machine.
3. Stop engine while filling oil and do not allow any open flames near the machine.

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
10 Hours or daily	1	Hydraulic oil level	Check, Add	HO	103 (27.2)	1
	2	Engine oil level	Check, Add	EO	11.0 (2.9)	1
	4	Radiator coolant	Check, Add	C	19.5 (5.2)	1
	5	Fuel pre-filter element (water)	Check, Drain	-	-	1
	6	Fan belt tension and damage	Check, Adjust	-	-	1
	7	Attachment pin & bushing★	Check, Lubricate	PGL	-	11 (14*4)
	8	Fuel tank	Check, Refill	DF	200 (52.8)	1
	32	DEF/AdBlue® tank	Check, Add	DEF	48 (12.7)	1

★ Lubricate every 10 hours or daily for initial 100 hours. *4: 2-piece boom

※ Oil symbol

Please refer to the recommended lubricants for specification.

DF : Diesel fuel

GO : Gear oil

HO : Hydraulic oil

DEF : DEF/AdBlue®

C : Coolant

PGL : Grease

EO : Engine oil

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
50 Hours or weekly	8	Fuel tank (water, sediment)	Check, Drain	-	-	1
	11	Drive shaft grease (flange bearing)	Check, Add	PGL	-	6
	13	Front axle pivot pin bushing	Check, Add	PGL	-	2
	14	Wheel nuts	Check, Tighten	-	-	40
	15	Tire (air pressure)	Check, Add	PGL	-	8
	30	Bucket linkage, arm front pins	Check, Add	PGL	-	6
	30	Dozer blade pins (each)	Check, Add	PGL	-	12
	30	Outrigger blade pins (each)	Check, Add	PGL	-	8
100 Hours	25	Front axle steering oil	Add, Lubricate	PGL	-	4
	36	Trailer hitch bracket and fixation pin	Lubricate	PGL	-	2
250 Hours	4	Charge air cooler and piping	Check	-	-	1
	7	Attachment pins & bushing	Check, Add	PGL	-	11 (14 ^{*4})
	9	Swing bearing grease	Lubricate	PGL	-	3
	16	Battery (voltage), battery cable and connections	Check, Clean	-	-	1
	22	Front axle differential gear oil	Add, Lubricate	GO	10.5 (2.77)	1
	23	Rear axle differential gear oil	Add, Lubricate	GO	12.5 (3.30)	1
	24	Axle planetary gear oil	Add, Lubricate	GO	2.5 (0.66)	4
Initial 250 Hours	2	Engine oil	Change	EO	11.0 (2.9)	1
	3	Engine oil filter	Replace	-	-	1
	5	Fuel pre-filter element	Replace	-	-	1
	12	Transmission oil	Change	EO	2.5 (0.66)	1
	17	Hydraulic oil return filter	Replace	-	-	1
	18	Drain filter	Replace	-	-	1
	21	Pilot line filter element	Replace	-	-	1
	28	Fuel filter element	Replace	-	-	1
	35	Brake supply valve filter	Clean	-	-	1
500 Hours	27	Aircon and heater outer filter	Replace	-	-	1
	27	Aircon and heater Inner filter	Replace	-	-	1
	28	Air cleaner element (primary)	Check, Clean	-	-	1
	29	Radiator, oil cooler, charge air cooler	Check, Clean	-	-	3
Initial 500 Hours	22	Front axle differential gear oil	Change	GO	10.5 (2.77)	1
	23	Rear axle differential gear oil	Change	GO	12.5 (3.30)	1
	24	Axle planetary gear oil	Change	GO	2.5 (0.66)	4
800 Hours	2	Engine oil	Change	EO	11.0 (2.9)	1
	3	Engine oil filter	Replace	-	-	1

*4: 2-piece boom

※ Oil symbol

Please refer to the recommended lubricants for specification.

DF : Diesel fuel

GO : Gear oil

HO : Hydraulic oil

DEF : DEF/AdBlue®

C : Coolant

PGL : Grease

EO : Engine oil

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
1000 Hours	5	Fuel pre-filter element	Replace	-	-	1
	6	Drive belt, cooling fan	Check	-	-	2
	6	Cooling fan belt tensioner	Check	-	-	1
	10	Swing gear and pinion grease	Change	PGL	15.8 kg (34.8 lb)	1
	12	Transmission oil	Change	EO	2.5 (0.66)	1
	17	Hydraulic oil return filter	Replace	-	-	1
	18	Drain filter	Replace	-	-	1
	19	Hydraulic oil air breather element	Replace	-	-	1
	20	Pilot line filter element	Replace	-	-	1
	28	Fuel filter element	Replace	-	-	1
	35	Brake supply valve filter	Clean	-	-	1
1500 Hours	22	Front axle differential gear oil	Change	GO	10.5 (2.77)	1
	23	Rear axle differential gear oil	Change	GO	12.5 (3.30)	1
	24	Axle planetary gear oil	Change	GO	2.5 (0.66)	4
2000 Hours	1	Hydraulic oil* ¹	Change	HO	103 (27.2)	1
	1	Hydraulic oil (HBHO* ²)	Change	HBHO	103 (27.2)	1
	2	Engine cleaning	Clean	-	-	1
	2	Vibration damper (rubber)	Check	-	-	4
	2	Vibration damper (viscous)	Check	-	-	4
	4	Coolant, cooling system and antifreeze* ¹	Change, Flush	C	19.5 (5.2)	1
	20	Hydraulic oil suction strainer	Check, Clean	-	-	1
	27	Air cleaner element (primary, safety)	Replace	-	-	2
	33	DEF/AdBlue® tank filter	Replace	-	-	1
	37	RCV lever	Check, Lubricate	PGL	-	2
4500 Hours	31	DEF/AdBlue® supply module filter	Replace	-	-	1
5000 Hours	1	Hydraulic oil* ³	Change	HO	103 (27.2)	1
	2	Overhead set (shop inspection)	Adjust	-	-	1
6000 Hours	4	Coolant, cooling system and antifreeze* ³	Change, Flush	C	19.5 (5.2)	1
As required	26	Aircon & heater outer filter	Replace	-	-	1
	26	Aircon & heater Inner filter	Replace	-	-	1
	27	Air cleaner element (primary)	Clean, Replace	-	-	1
	27	Air cleaner element (safety)	Replace	-	-	1
	34	DPF (diesel particulate filter)	Clean	-	-	1
	38	Fuel filler pump filter	Clean, Replace	-	-	1

*¹ Conventional *² HD Hyundai Construction Equipment Bio Hydraulic Oil

*³ HD Hyundai Construction Equipment genuine long life

※ Oil symbol

Please refer to the recommended lubricants for specification.

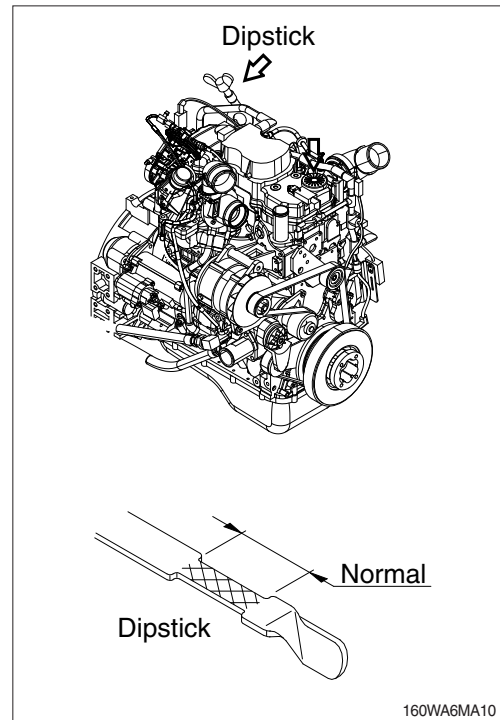
DF : Diesel fuel GO : Gear oil HO : Hydraulic oil DEF : DEF/AdBlue®
C : Coolant PGL : Grease EO : Engine oil

6. SERVICE INSTRUCTION

1) CHECK ENGINE OIL LEVEL

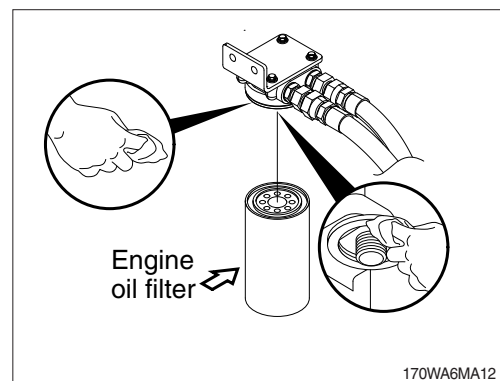
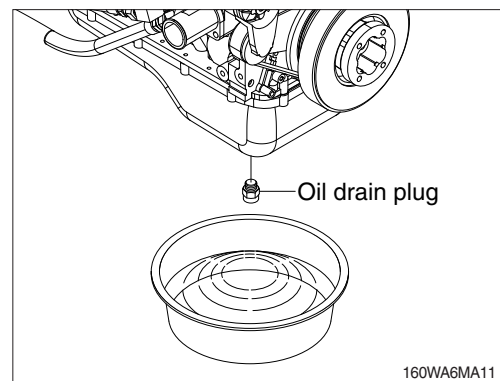
Check the oil level with the machine on flat ground before starting engine.

- (1) Pull out the dipstick and wipe with a clean cloth.
 - (2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.
 - (3) If oil level is LOW, add oil and then check again.
- ※ **If the oil is contaminated or diluted, change the oil regardless of the regular change interval.**
 - ※ **Check oil level after engine has been stopped for 15 minutes.**
 - ▲ **Do not operate unless the oil level is in the normal range.**
 - ※ **Keep all parts clean from contaminants. Contaminants may cause rapid wear and shortened component life.**

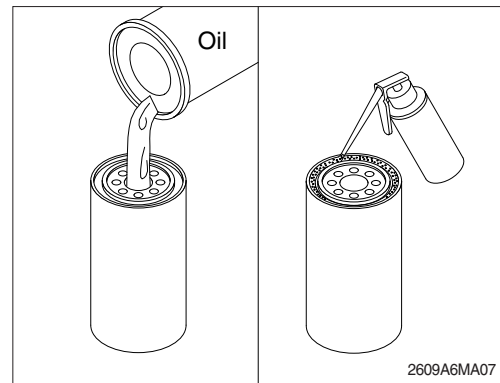


2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

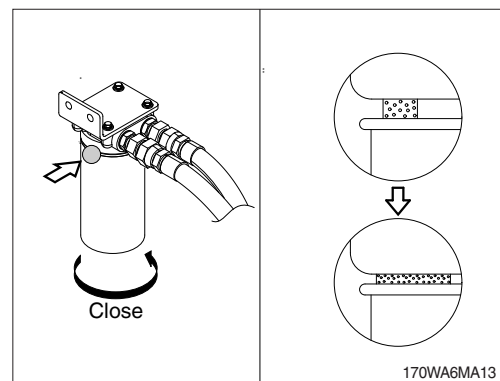
- (1) Operate the engine until the coolant temperature reaches 60°C (140°F). Shut off the engine.
 - (2) Remove the oil drain plug. Drain the oil immediately to be sure all the oil and suspended contaminants are removed from the engine.
- ※ **A drain pan with a capacity of 20 liters (5.3 U.S. gallons) will be adequate.**
 - ※ **Dispose of the waste oil in accordance with local regulations.**
- (3) Clean the area around the lubricating oil filter head.
 - (4) Use oil filter wrench to remove the oil filter.
 - (5) Clean the gasket surface of oil filter head.
- ※ **The O-ring can stick on the filter head. Be sure it is removed before installing the new filter.**



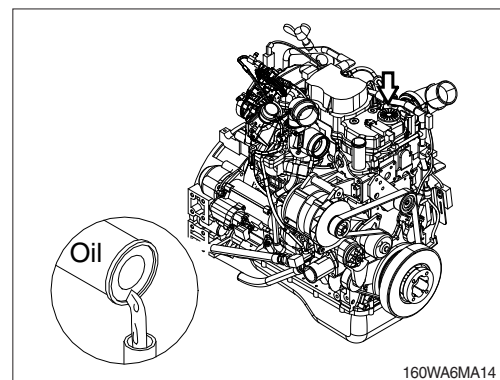
- (6) Apply a light film of lubricating oil to the gasket sealing surface before installing the filter.
 ※ **Fill the filter with clean lubricating oil.**



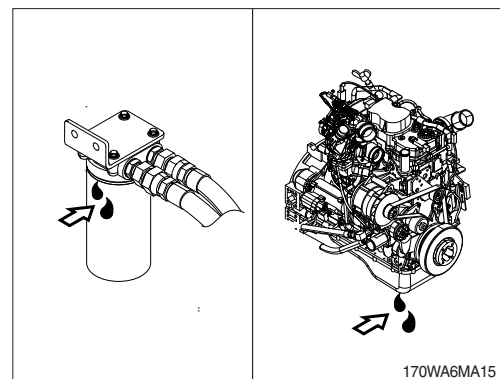
- (7) Install the filter to the filter head.
 Tighten the filter until the gasket contacts the filter head surface.
 Tighten 3/4 to 1 turn after the gasket makes contact with the filter head.
 ※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**



- (8) Clean and check the lubricating oil drain plug threads and sealing surface.
 Install the lubricating oil pan drain plug.
 (9) Fill the engine with clean oil to the proper level.
 · Quantity : 11 ℓ (2.9 U.S.gallons)



- (10) Operate the engine at low idle and inspect for leaks at the filters and the drain plug.
 Shut the engine off and check the oil level with the dipstick. Allow 15 minutes for oil to drain down before checking.



■ ENGINE OIL DISCOLORATION (darkened)

Even if the color of engine oil becomes dark (even black), the major function is able to be preserved for long.

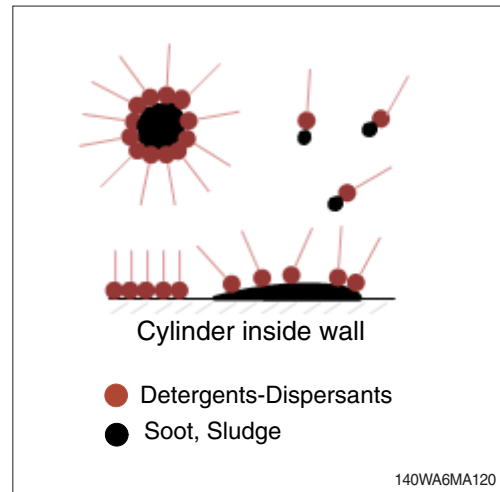
- There are several factors that engine oil becomes discolored such as deterioration, contamination, and characteristics of additives.
- If engine oil has proper viscosity, Detergents-Dispersants in engine oil may be one of main reasons of the color darkened.

※ Detergents-Dispersants

It is a kind of additives that deterge contaminants and oxides and inhibit sludge and soot from gathering, then disperse them into the oil.

As a result of this process, the oil contains soot and sludge dispersed, which makes oil color dark.

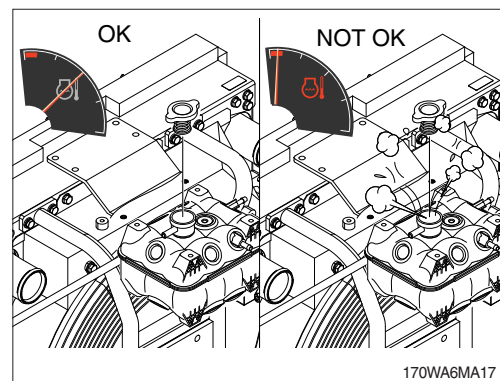
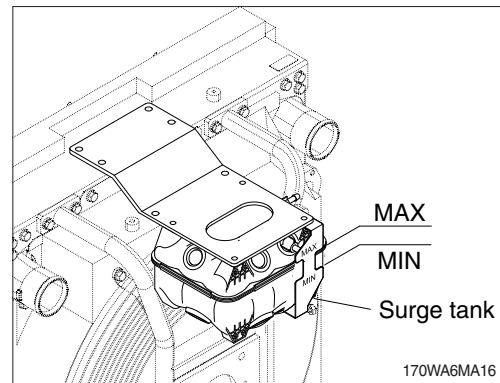
- Unlike to Gasoline engine, Diesel engine have more possibility to generate these by-products because of its combustion characteristic, which is able to accelerate discoloration.
- B4.5 engines have more possibility to be vulnerable to discoloration rather than B6.7 engines because of PM emission differences.



3) CHECK RADIATOR COOLANT

- (1) Check if the level of coolant in reservoir tank is between MAX and MIN
- (2) Add the mixture of antifreeze and water after removing the cap of the surge tank if coolant is not sufficient.
- (3) Replace gasket of surge tank when it is damaged.

- ▲ Hot coolant can spray out if surge tank cap is removed while engine is hot. Remove the cap after the engine has cooled down.
- ※ Do not add cold coolant to a hot engine ; engine castings can be damaged. Allow the engine to cool to below 50°C (120°F) before adding coolant.



4) FLUSHING AND REFILLING OF RADIATOR

- (1) Change radiator coolant

- ▲ Avoid prolonged and repeated skin contact with used antifreeze. Such prolonged and repeated contact can cause skin disorders or other bodily injury.

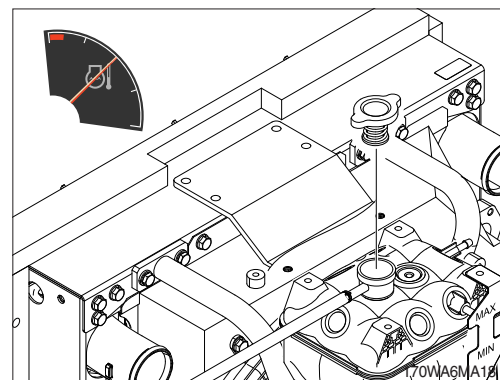
Avoid excessive contact-wash thoroughly after contact.

Keep out of reach of children.

- ※ Protect the environment : Handling and disposal of used antifreeze can be subject to federal, state, and local law regulation.

Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze.

If in doubt, contact your local authorities for guidance as to proper handling of used antifreeze.

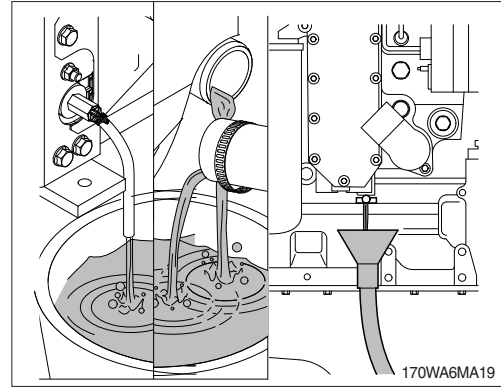


- ▲ Wait until the temperature is below 50 °C (122 °F) before removing the coolant system pressure cap.

Failure to do so can cause personal injury from heated coolant spray.

Drain the cooling system by opening the drain valve on the radiator and opening the drain valve on the bottom of the engine oil cooler housing.

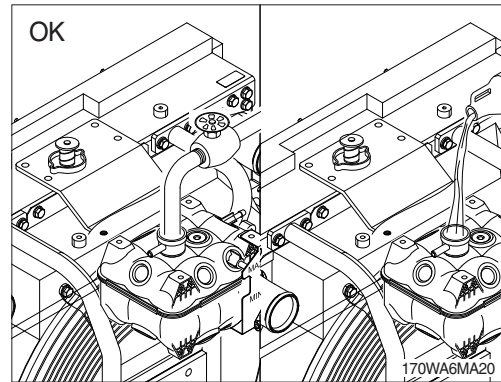
A drain pan with a capacity of 30 liters (7.9 U.S. gallons) will be adequate.



(2) Flushing of cooling system

- ① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

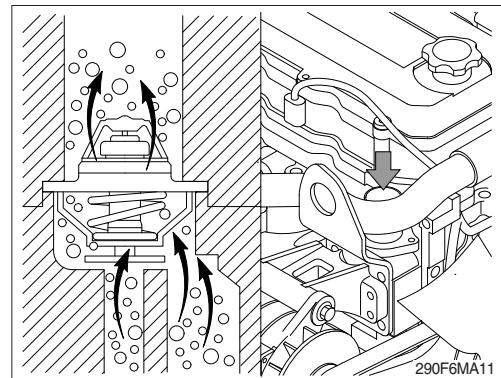
- ※ Use 0.5 kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.
- ※ Do not install the surge tank cap. The engine is to be operated without the cap for this process.



- ※ During filling, air must be vented from the engine coolant passages.

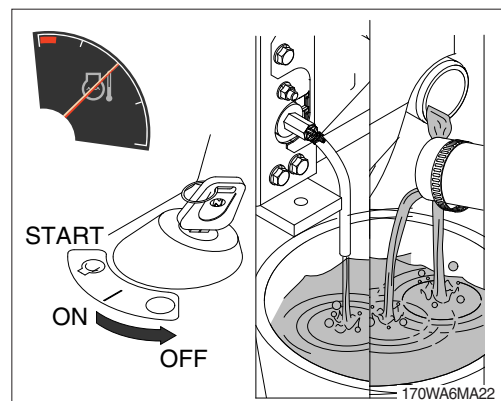
The system must be filled slowly to prevent air locks or serious engine damage can result. Wait 2 to 3 minutes to allow air to be vented, then add mixture to bring the level to the top.

- ※ This provides adequate venting for a fill rate of 19 liters (5.0 U.S. gallons) per minute.

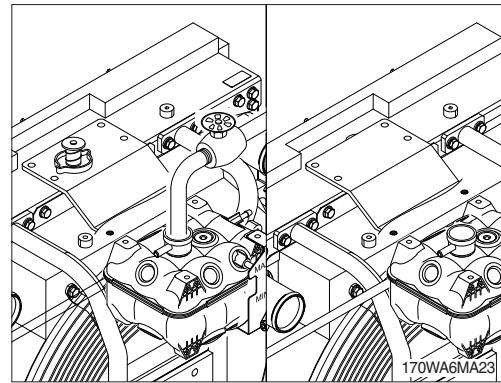


- ② Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F).

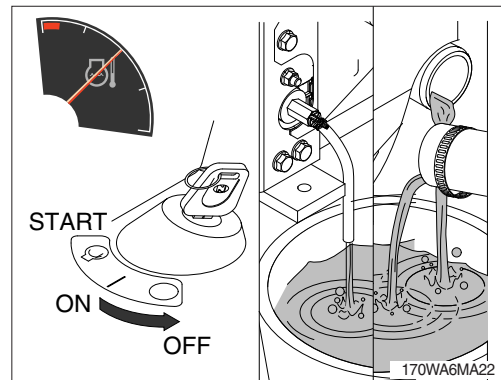
Shut the engine off, and drain the cooling system.



- ③ Fill the cooling system with clean water.
- ※ **Be sure to vent the engine and aftercooler for complete filling.**
- ※ **Do not install the surge tank cap or the new coolant filter.**

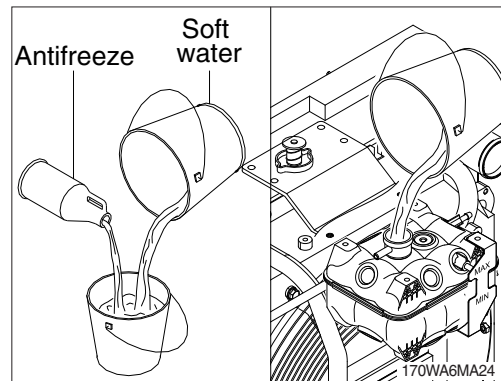


- ④ Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F). Shut the engine off, and drain the cooling system.
- ※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**

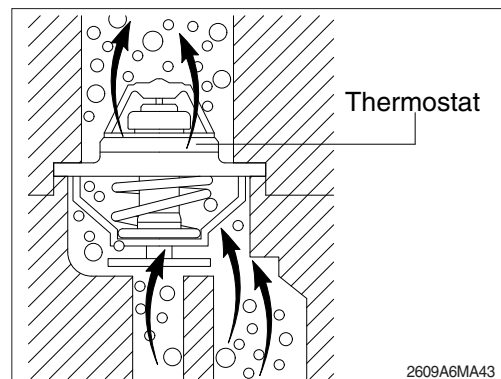


(3) Cooling system filling

- ① Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to page 7-17.
Coolant capacity : 19.5 l (5.2 U.S. gallons)
- ※ **Do not use hard water such as river water or well water.**



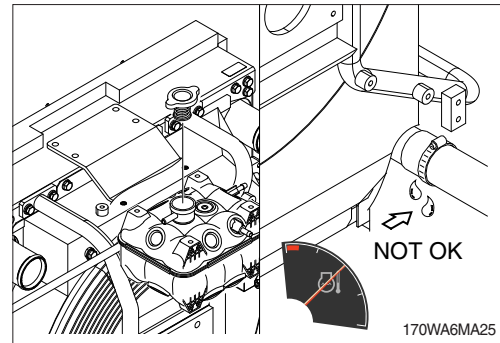
- ② The system has a maximum fill rate of 19 liters (5.0 U.S. gallons) per minute. Do not exceed this fill rate.
- ※ **The system must be filled slowly to prevent air locks.**
During filling, air must be vented from the engine coolant passage.



- ③ Install the pressure cap. Operate the engine until it reaches a temperature 80°C (176°F), and check for coolant leaks.

Check the coolant level again to make sure the system is full of coolant after allow engine to cool.

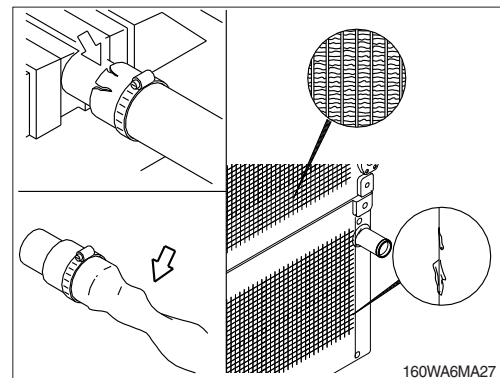
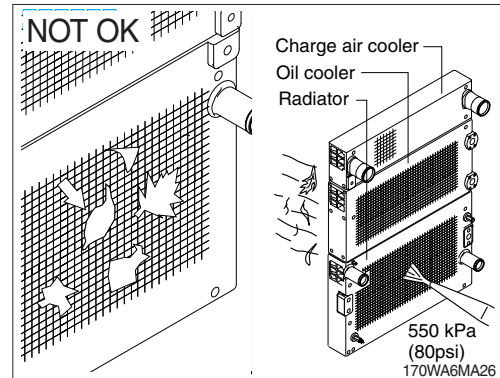
- ※ If the gasket of the surge tank cap is damaged, discard the old filler cap and install a new cap.



5) CLEAN RADIATOR AND OIL COOLER

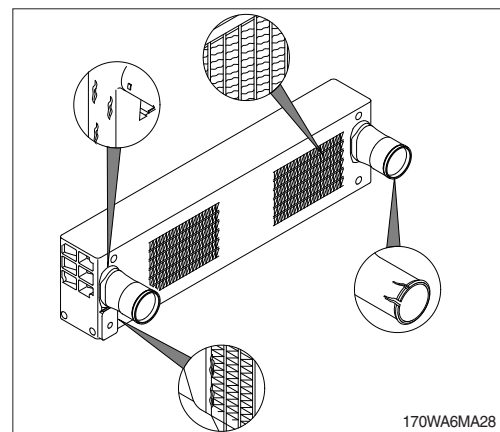
Check, and if necessary, clean and dry outside of radiator and oil cooler. After working in a dusty place, clean radiator more frequently.

- (1) Visually inspect the radiator for clogged radiator fins.
 - (2) Use 550 kPa (80 psi) air pressure to blow the dirt and debris from the fins.
 - (3) Visually inspect the radiator for bent or broken fins.
- ※ If the radiator must be replaced due to bent or broken fins which can cause the engine to overheat, refer to the manufacturer's replacement procedures.
- (4) Visually inspect the radiator for core leaks.



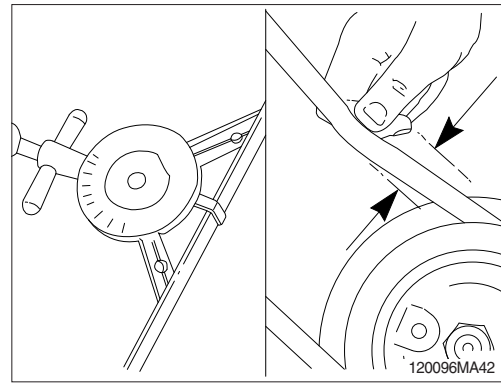
6) CHECK CHARGE AIR COOLER

Inspect the charge air cooler for dirt and debris blocking the fins. Check for cracks, holes, or other damage. If damage is found, please contact your local HD Hyundai Construction Equipment dealer.



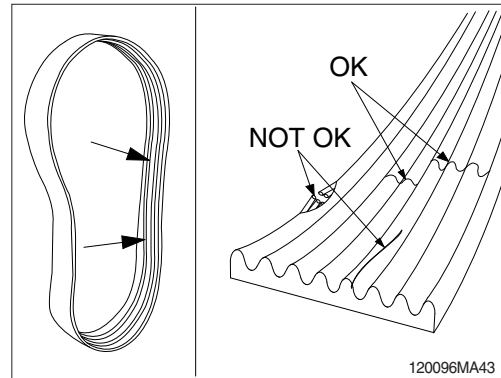
7) FAN BELT

- (1) A deflection method can be used to check belt tension by applying 11.3 kgf (25 lbf) of force between the pulleys on V-belts. If the deflection is more than one belt thickness per foot of pulley center distance, the belt tension must be adjusted.

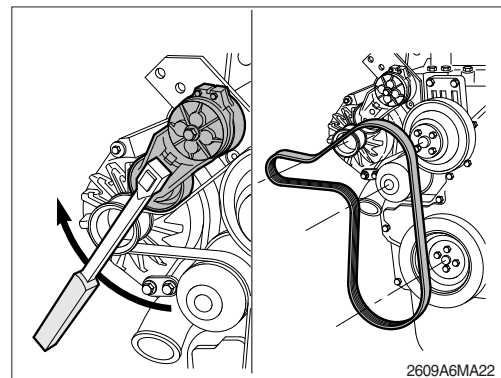


- (2) Inspect the fan belt for damage.

- ① Transverse (across the belt) cracks are acceptable.
- ② Longitudinal (direction of belt ribs) cracks that intersect with transverse cracks are not acceptable.
- ③ Replace the belt if it is frayed or has pieces of material missing.



- (3) Inspect the idle and drive pulleys for wear or cracks.



8) INSPECTION OF COOLING FAN

▲ Serious injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade and cause fan failure.

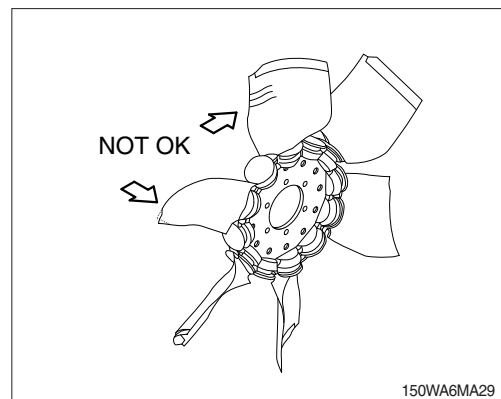
※ Rotate the crankshaft by using the engine bearing gear.

※ A visual inspection of the cooling fan is required daily.

Check for cracks, loose rivets, and bent or loose blades.

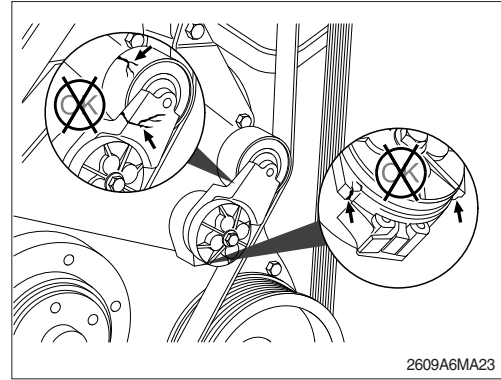
Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary.

Replace any fan that is damaged.



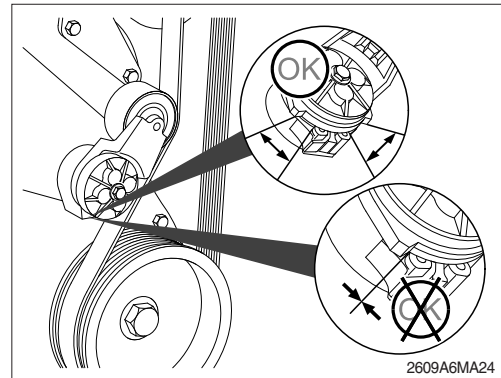
9) FAN BELT TENSIONER

- (1) With the engine stopped, check the tensioner arm, pulley, and stops for cracks. If any cracks are found, the tensioner must be replaced.

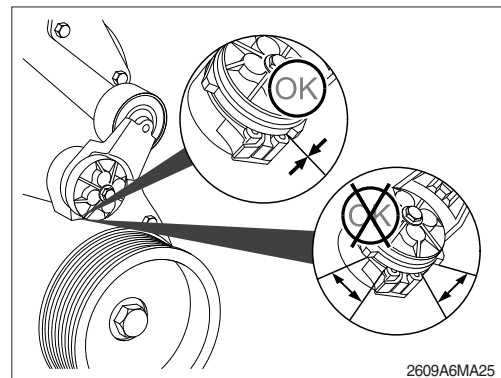


- (2) With the belt installed, verify that neither tensioner arm stop is in contact with the spring case stop.

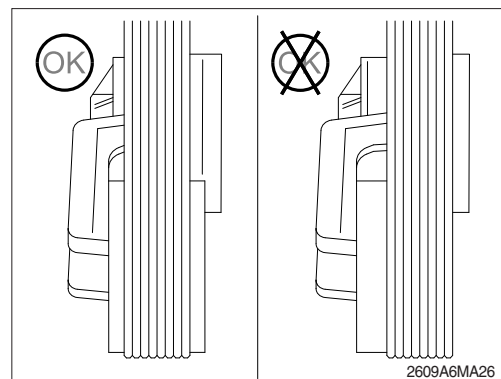
After replacing the belt, if the tensioner arm stops are still in contact with the spring case stop, replace the tensioner.



- (3) With the belt removed, verify that the tensioner arm stop is in contact with the spring case stop. If these two are not touching, the tensioner must be replaced.



- (4) Check the location of the drive belt on the belt tensioner pulley. The belt should be centered on, or close to the middle of the pulley. Misaligned belts, either too far forward or backward, can cause belt wear, belt roll-offs, or increase uneven tensioner bushing wear.



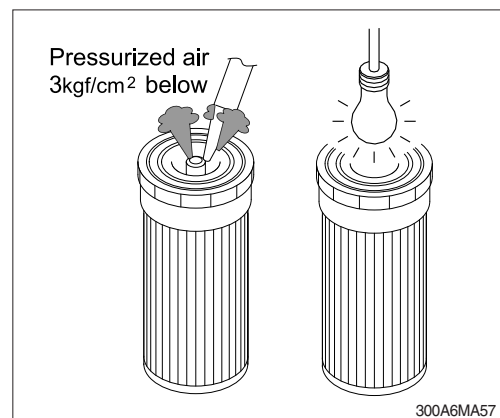
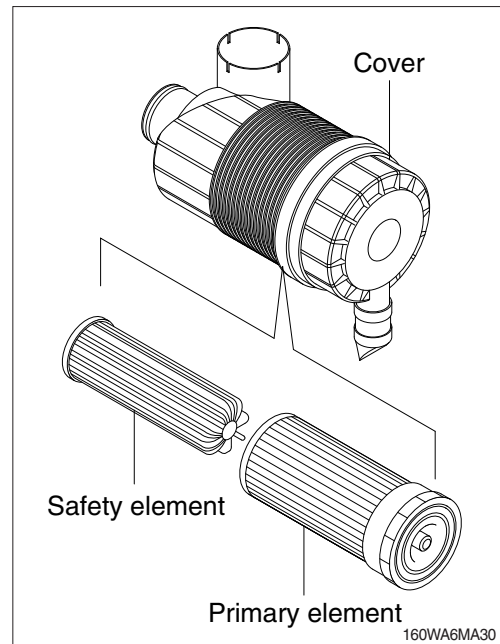
10) CLEANING OF AIR CLEANER ELEMENT

(1) Primary element

- ① Loosen the cover and remove the element.
 - ② Clean the inside of the body.
 - ③ Clean the element with pressurized air.
 - Remove the dust inside of the element by the pressurized air (below 3 kgf/cm², 40 psi) forward and backward equally.
 - ④ Inspect for cracks or damage of element by putting a light bulb inside of the cover.
 - ⑤ Insert element and tighten the cover.
- ※ **Replace the primary element after 4 cleanings.**

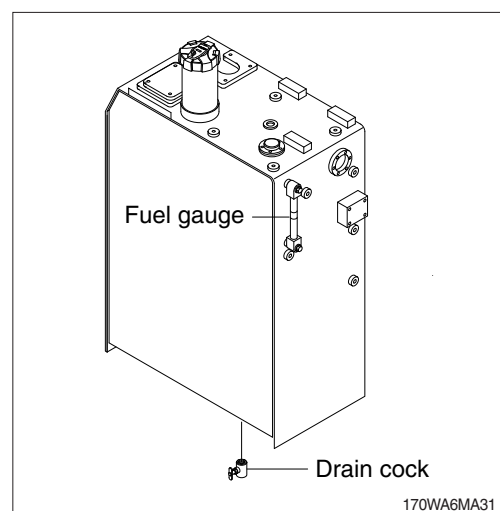
(2) Safety element

- ※ **Replace the safety element only when the primary element is cleaned 4 times.**
- △ **Always replace the safety element. Never attempt to reuse the safety element by cleaning the element.**



11) FUEL TANK

- ※ **Remove the strainer of the fuel tank and clean it if contaminated.**
- (1) Fill fuel tank fully to minimize water condensation and check the fuel gauge level or fuel level gauge before starting the machine.
 - (2) Drain the water and sediment in the fuel tank by opening the drain cock.
- ※ **Be sure to LOCK the cap of fuel tank.**
- ▲ **Stop the engine when refueling.**
All lights and flames shall be kept at a safe distance while refueling.



12) FUEL PRE-FILTER ELEMENT

※ Inspect or drain the collected water daily and replace the element every 1000hours.

(1) Drain water

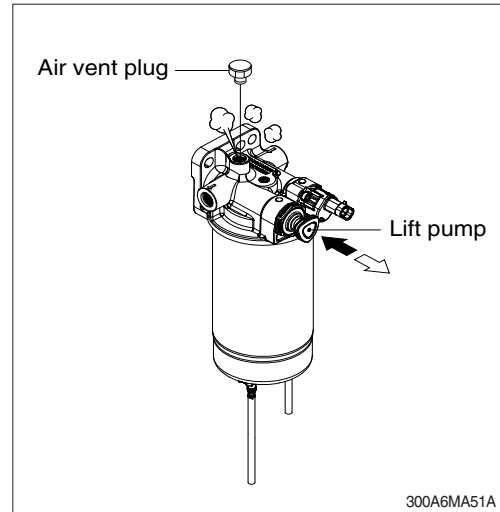
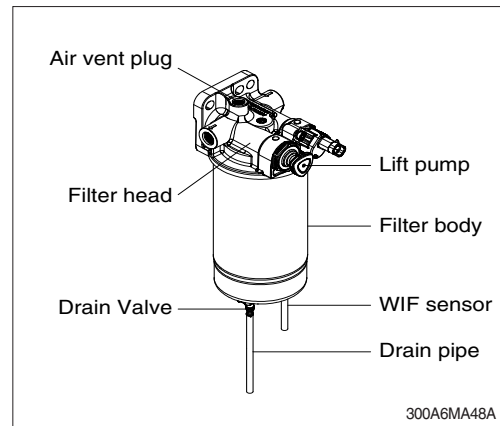
- ① Open the drain valve to evacuate water for 10 seconds.
 - ② Close drain valve.
- ※ Do not use tools.
※ Do not overtighten drain valve.

(2) Replace element

- ① Loosen the air vent plug and drain the unit of fuel. Follow "Drain water" instructions above.
- ② Remove the drain pipe and WIF sensor from filter body.
- ③ Remove the filter body from filter head.
- ④ Pre-fill a new filter body with fuel and lubricate gasket on the new filter body.
- ⑤ Install the filter on the filter head. Tighten the filter until the gasket contacts the filter head surface. Tighten the prefilter an additional 3/4 turn.
- ⑥ Connect the drain pipe and WIF sensor to filter body.

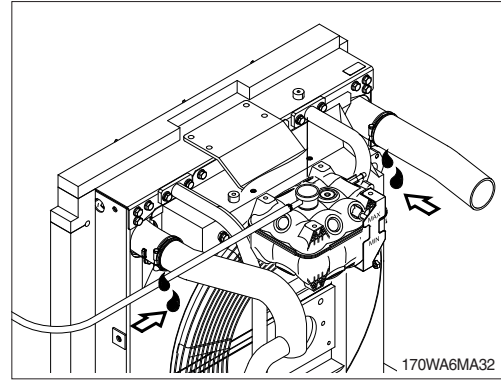
(3) Air bleeding

- ① Hand-prime the lift pump repeatedly until air bubbles comes out from air vent hole completely.
 - ② Tighten the air vent plug.
- ▲ The fuel pump, high-pressure fuel lines, and fuel rail contain very high-pressure fuel. Do not loosen any fittings while the engine is running. Failure to comply may result in serious injury or death. Wait at least 10 minutes after shutting down the engine before loosening any fittings in the high-pressure fuel system to allow pressure to decrease.



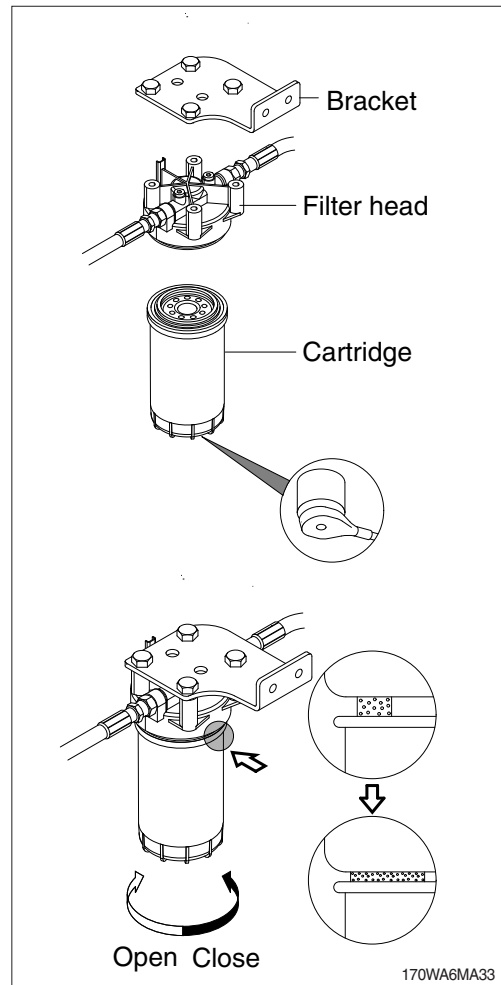
13) CHARGE AIR PIPING

- (1) Inspect the charge air piping and hoses for leaks, holes, cracks, or loose connections.
- (2) Tighten the hose clamps if necessary.



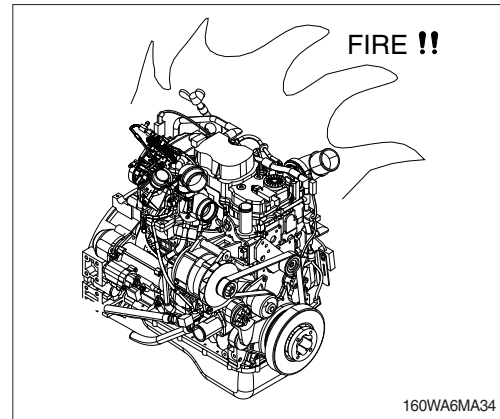
14) REPLACEMENT OF FUEL FILTER ELEMENT

- (1) Use 1" wrench, loosen and remove the element and clean the gasket surface.
 - ※ **Make sure O-ring does not stick to filter head. Remove O-ring with screwdriver if necessary.**
- (2) Lubricate the O-ring of a new element with clean lubricating oil.
- (3) Install the new element on the filter head. Tighten the new element until the gasket contacts the filter head surface. Tighten the new element an additional 3/4 turn after contact.
 - ※ **Mechanical overtightening can distort the threads or damage the filter element seal.**
- (4) Relieve the air after mounting.
 - ※ **Do not pre-fill the new element with fuel. The system must be primed after the new element is installed. Pre-filling the new element can result in debris entering the fuel system and damaging fuel system components.**
 - ※ **Check for fuel leakage after the engine starts. If air is in the fuel system, the engine will not start. Start engine after bleeding the air according to the method of bleeding air.**



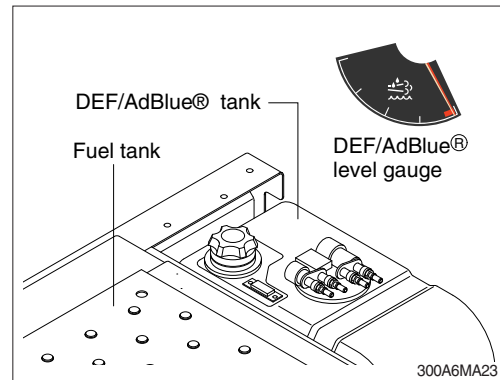
15) LEAKAGE OF FUEL

- ▲ Use care when cleaning the fuel hose, injection pump, fuel filter and other connections as the leakage from these parts can cause fire.

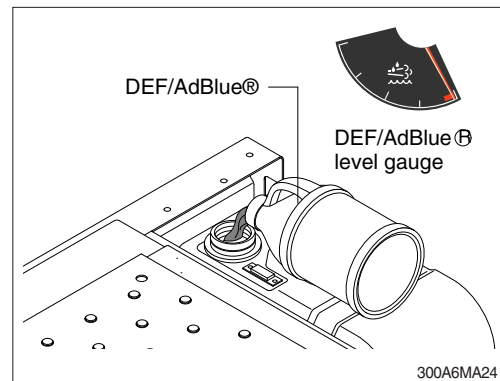


16) DEF/AdBlue® TANK

- (1) The DEF/AdBlue® tank level must be checked daily with DEF/AdBlue® level gauge.
- (2) If the DEF/AdBlue® level gauge is low, DEF/AdBlue® must be added.
 - ▲ It is unlawful to tamper with or remove any component of the aftertreatment system. It is also unlawful to use a catalyst solution that does not meet the specifications provided or operate the machine with no catalytic solution.

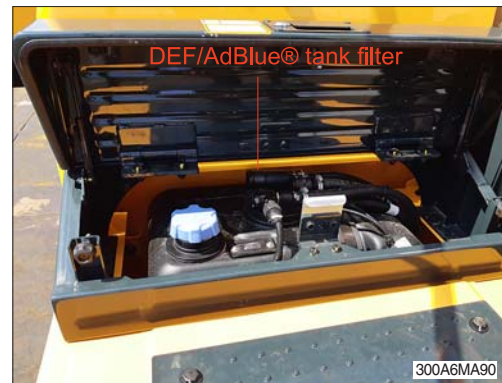


- (3) Do not pour DEF/AdBlue® overfull.
 - ※ Fill the tank with DEF/AdBlue® with key in the start position.
 - ※ Be careful when filling or refilling DEF/AdBlue® tank. Do not allow dust, sand or other contaminants to enter into the tank. Failure to comply could result in engine idle locking, derating, or engine stopping.



17) DEF/AdBlue® TANK FILTER

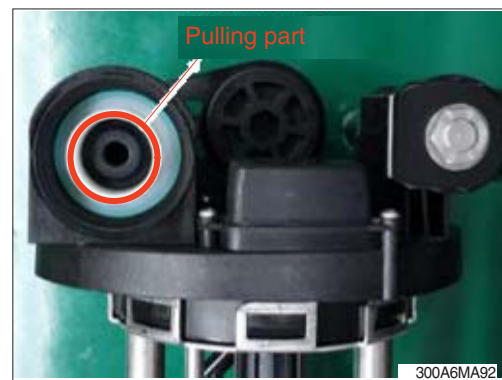
- (1) The filter is located on the top side of the tank cover.



- (2) Insert a hex wrench into the filter cover, rotate it anti-clockwise and remove the filter cover.



- (3) Pull out the filter by using a long nose pliers.



- (4) Replace with new filter.



(5) Place the filter cover and rotate the cover clockwise by using hex wrench.

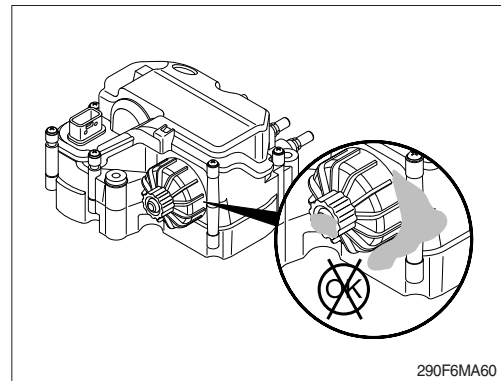
- ※ Replace the filter every 2000 hours.
- ※ If the filter is reused, take care not to damage the thread part of the filter with long nose pliers. Use protection material such as a cloth etc to grip part of the filter by the long nose pliers.
- ※ Be careful not to cross-thread during reassembly.



18) DEF/AdBlue® SUPPLY MODULE FILTER

(1) Inspect the area around the seal and vent of DEF/AdBlue® supply module filter cap for signs of leakage.

- ※ Turn DEF/AdBlue® the master switch mounted electric box.



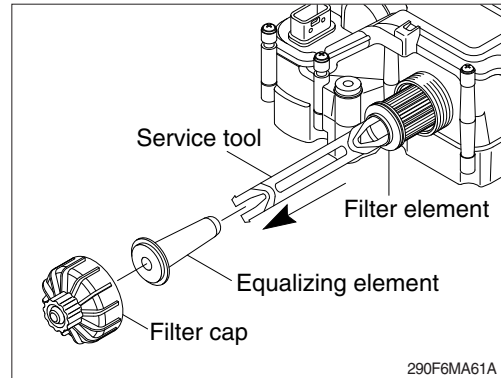
(2) Unscrew the DEF/AdBlue® supply module filter cap.
A 27 mm wrench can be used on the cap to aid in removal.

(3) Remove the filter equalizing element.

(4) Remove the old filter element.
A disposable service tool is included with the filter to aid in filter removal. Use the appropriate end of the tool, depending on the color of the plastic on the filter.

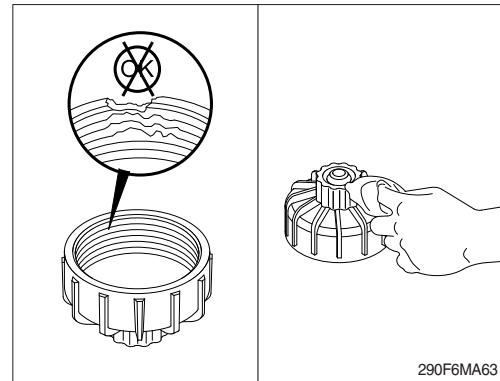
When inserting the tool a "click" sound can be heard which indicates proper engagement with the filter.

- ※ If the filter element and equalizing element are removed from the aftertreatment DEF/AdBlue® tank, they must be discarded and replaced; regardless of condition.



(5) Clean and inspect the filter cap

- ① Clean the aftertreatment DEF/AdBlue® tank cap and threads on the DEF/AdBlue® tank with warm water and a clean cloth.
- ② Check the condition of the threads on the filter cap, if the threads are damaged, replace the filter cap.

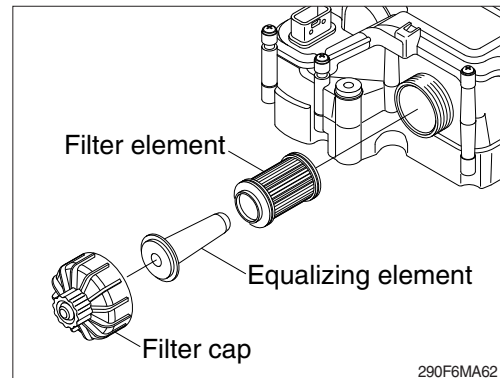


(6) Slide the filter equalizing element in to the new filter element.

(7) Insert the assembly into the aftertreatment DEF/AdBlue® supply module.

(8) Install and tighten the filter cap.

- Tightening torque : 2.0 kgf · m (14.5 lbf · ft)



19) ENGINE CLEANING

⚠ When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

- ※ Turn OFF the master switch mounted electric box.
- ※ Spraying high pressure steam near or into electrical components can cause damage.

- (1) Steam is the recommended method of cleaning a dirty engine or a piece of equipment.
- (2) Protect all electrical components, openings, and wiring from the full force of the spray nozzle.
- (3) Components to protect include, but are not limited to the following:
 - Electrical components and connectors
 - Wiring harnesses
 - Electronic control unit (ECU) and connectors.
 - Belts and hoses
 - Bearings (ball or taper roller)

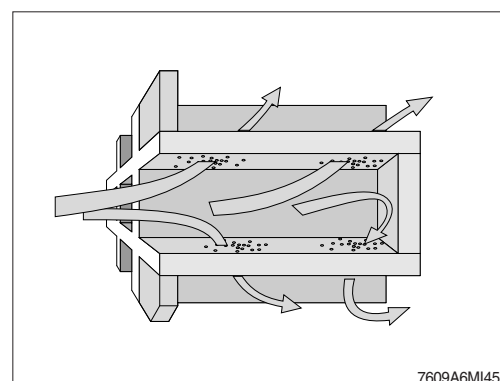
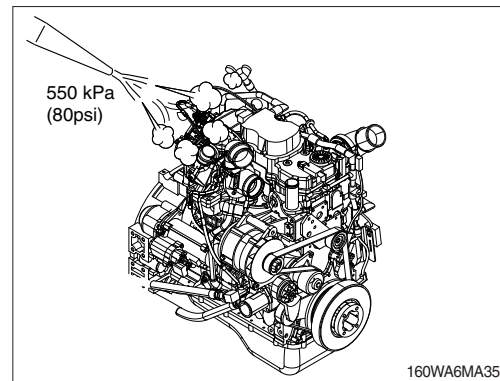
△ Soap, solvent, or water ingress into air intake system can cause engine damage.

△ Do not directly spray or allow soap, solvent, or water to enter any passages, ports, or cowlings that lead to the engine air intake system.

20) DPF (diesel particulate filter) CLEANING

- (1) The diesel particulate filter can not be cleaned for maintenance purpose using conventional tools.
- (2) The diesel particulate filter needs to be cleaned and checked using an approved cleaning machine at a authorized service center.

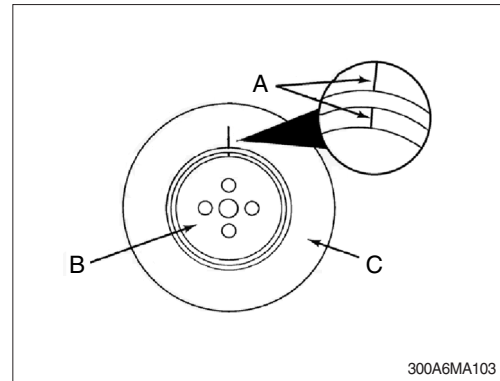
- ※ Please contact your HD Hyundai Construction Equipment service center or your local HD Hyundai Construction Equipment dealer.



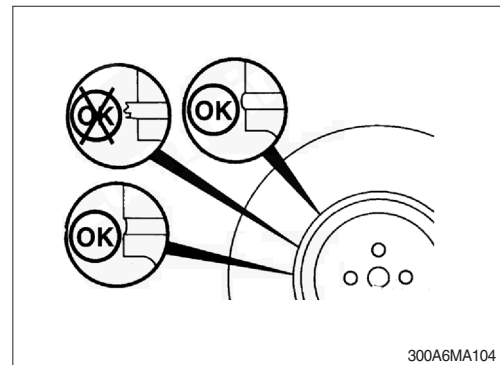
21) VIBRATION DAMPER

(1) Rubber

- ① Check the index lines (A) in the vibration damper hub (B) and the inertia member (C). If the lines are more than 1.59 mm (1/16 in) out of alignment, replace the vibration damper.



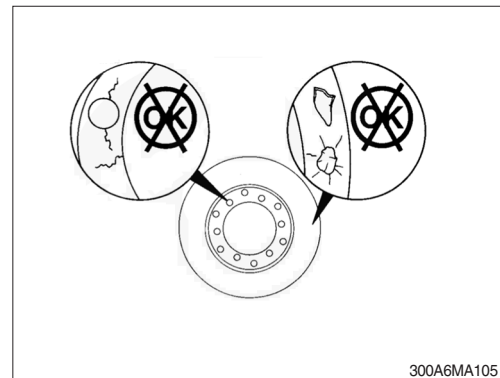
- ② Inspect the rubber member for deterioration. If pieces of rubber are missing or if the elastic member is more than 3.18 mm (1/8 in) below the metal surface, replace the damper.
- ③ Look for forward movement of the damper ring on the hub. Replace the vibration damper if any movement is detected.



(2) Viscous

※ **The silicone fluid in the vibration damper will become solid after extended service and will make the damper inoperative. An inoperative vibration damper can cause major engine or drivetrain failures.**

- ① Check the vibration damper for evidence of fluid loss, dents, and wobble. Inspect the vibration damper thickness for any deformation or raising of the damper cover plate.
- ② If any of these conditions are identified, contact your local HD Hyundai Construction Equipment dealer to replace the vibration damper when movement is detected.



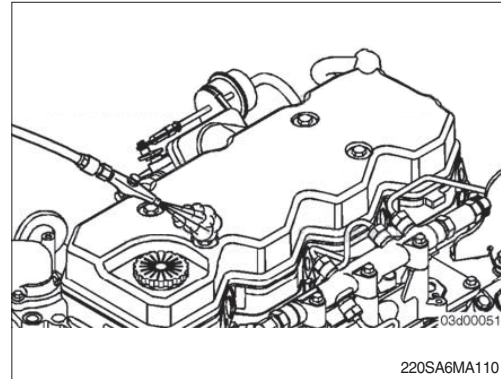
22) OVERHEAD SET ADJUSTMENT

This procedures are perform the repair shop.

※ Service tools

- Cummins barring tool, p/no. 3824591
- Feeler gauge

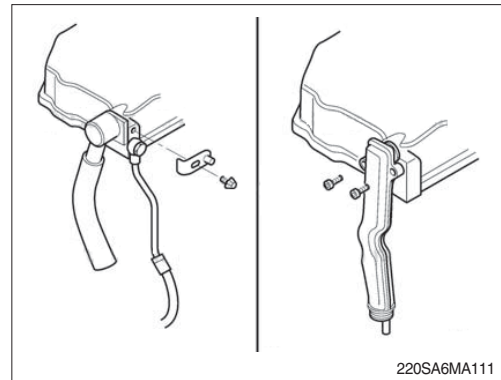
- (1) Prior to removing any components, use compressed air to remove any loose debris from around the mounting fasteners and sealing joints.



- (2) Disconnect the breather tube connection at the back of the rocker lever cover.

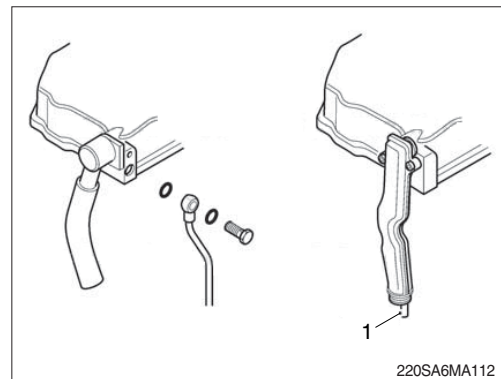
In general, two types of breather tube connections are used at the rocker lever cover.

- A clamping plate and capscrew hole the breather tube connection to the rocker lever cover. Remove the capscrew and clamping plate to disconnect the breather tube connection from the rocker lever cover.
- One or two capscrew(s) directly mount the breather tube connection to the rocker lever cover. Remove the capscrew(s) to disconnect the breather tube connection from the rocker lever cover.



- (3) If equipped, at the rear of the rocker lever, remove the banjo bolt and sealing washers connecting the breather oil drain line to the rocker lever cover.

※ Some engine the breather oil drain line is internal to the breathe connection tube (1).

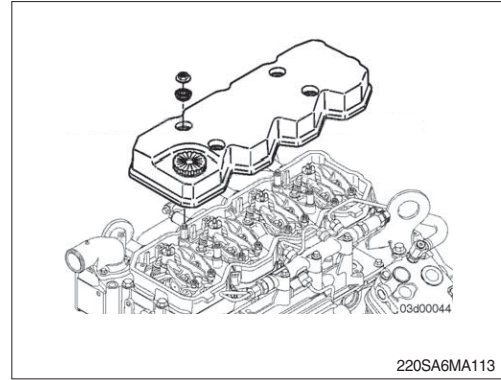


※ Do not remove the rocker lever gasket on engines in which the rocker lever cover gasket is fit into a groove at the base of the rocker lever cover. The gasket is reusable. Once the gasket is removed from the rocker lever cover, it must be replaced.

(4) Remove the mounting nuts and isolators from the rocker lever cover.

※ If equipped, it may be necessary to gently pry the breather tube connection from the back of the rocker lever cover while removing.

(5) Remove the rocker lever cover.

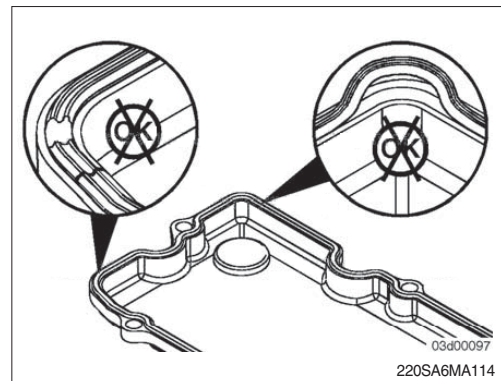


※ Check the gasket while it is installed in the valve cover. Once the gasket is removed from the cover it must be replaced.

(6) Check the gasket for cracks on the sealing surface.

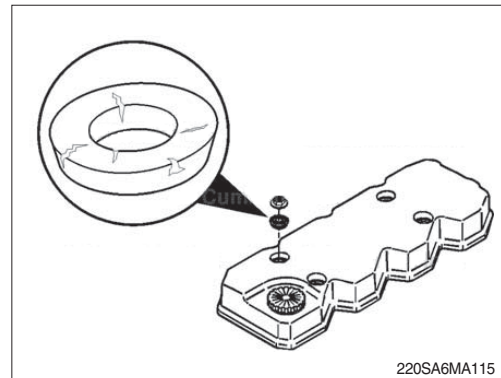
Replace the gasket if damage is present.

Replace the gasket if it is removed from the groove in the rocker lever cover.



(7) Inspect the rubber isolators for cracks.

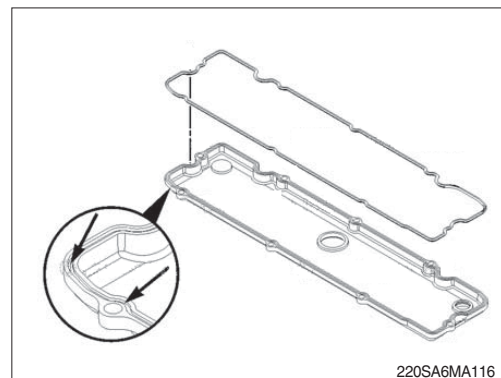
Replace if cracked or broken.



※ If the gasket has been removed from the rocker lever cover, a new gasket must be used.

(8) If replacing the press-in rocker lever gasket, the following installation procedure must be used.

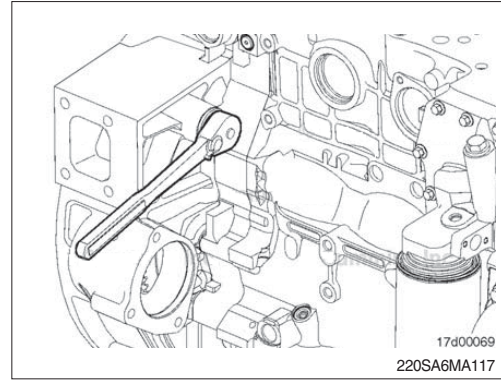
- Press the molded gasket into the corners of the rocker lever cover.
- Press the rest of the gasket into the rocker lever cover.



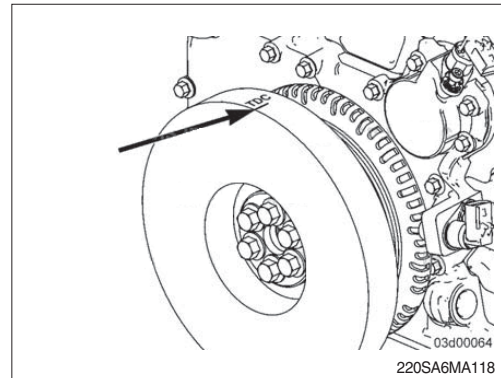
※ Engine coolant temperature must be less than 60 °C (140 °F).

(9) Use the barring tool, to rotate the crankshaft until the number is at TDC.

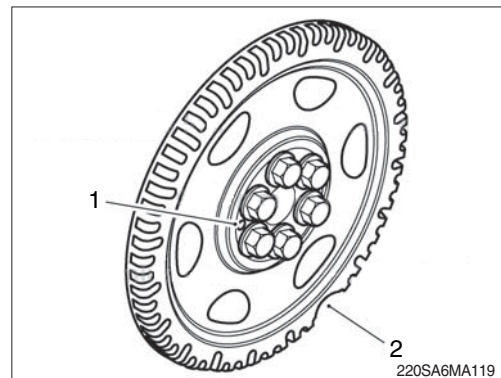
TDC can be determined by the following method.



(10) Align the vibration damper/crankshaft speed indicator ring so the TDC indicator is at the 12 o'clock position. If both number 1 cylinder rocker levers are loose, move to the following steps. If both number 1 cylinder rocker levers are not loose, rotate the crankshaft 360 degrees.



※ If no TDC mark is present on either the vibration damper or the crankshaft speed indicator ring, align the large gap in the crankshaft speed indicator ring to the 5 o'clock position (2). The dowel pin will be visible in the 9 o'clock position (1). Check that both number 1 cylinder rocker levers are loose. If they are not loose, rotate the crankshaft 360 degrees and check again.

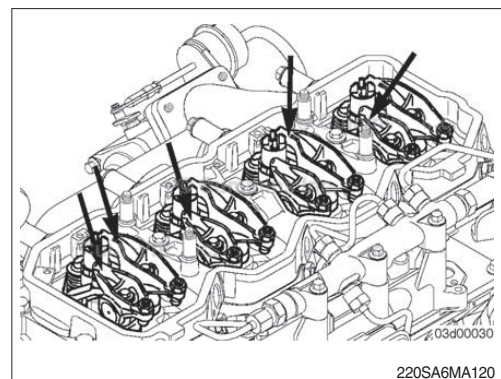


(11) With the engine in this position, lash can be checked on the following rocker arms.

(E=exhaust, I=Intake)

Four-cylinder 1I, 1E, 2I and 3E)

Six-cylinder 1I, 1E, 2I, 3E, 4I and 5E)



※ **Lash check limits**

Item		mm	inch
Intake	Min	0.152	0.006
	Max	0.381	0.015
Exhaust	Min	0.381	0.015
	Max	0.762	0.030

※ **Checking the overhead setting is usually performed as part of a troubleshooting procedure, and resetting is not required during checks, as long as the lash measurements are within the above ranges.**

※ **The clearance is correct when some resistance is "felt" when the feeler gauge is slipped between the crosshead and the rocker lever socket.**

(12) Measure lash by inserting a feeler gauge between the crosshead and the rocker lever socket. If the lash measurement is out of specification, loosen the locknut, and adjust the lash to nominal specifications.

Lash specifications

Item	mm	inch
Intake	0.254	0.010
Exhaust	0.508	0.020

(13) Tighten the locknut.

Tightening torque : 2.4 kgf · m (17.4 lbf · ft)

(14) Use the barring tool, to rotate the crankshaft 360 degrees.

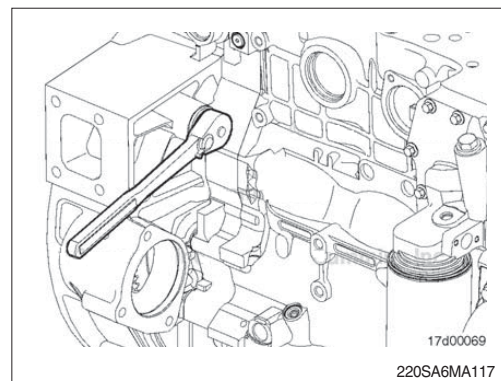
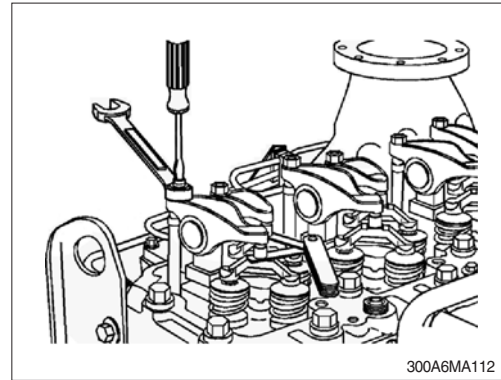
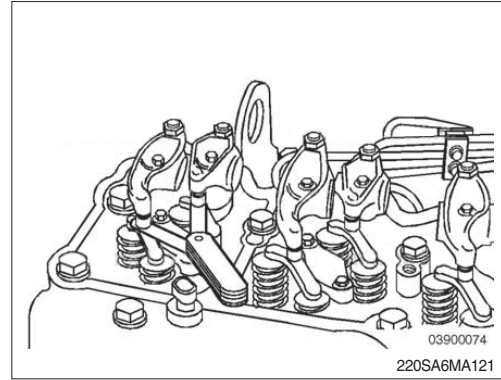
Following the same steps and specifications as previously stated, measure lash for the following rockers.

(E=exhaust, I=Intake)

Four-cylinder 2E, 3I, 4E and 4I)

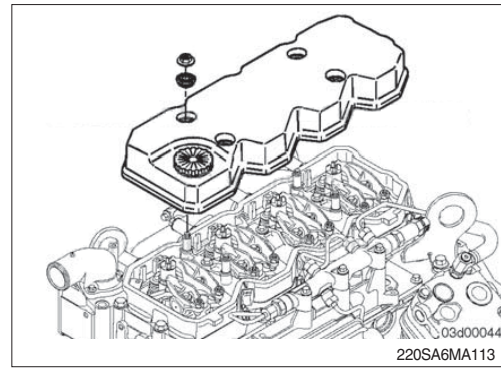
Six-cylinder 2E, 3I, 4E, 5I, 6I and 6E)

Reset if out of specification.



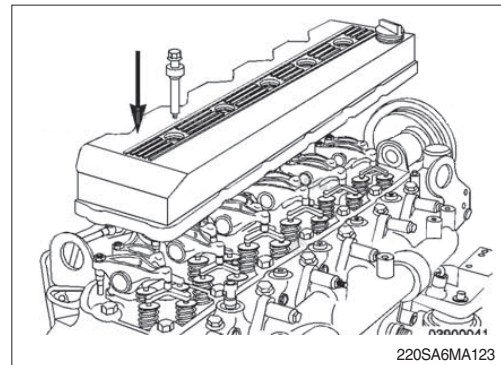
(15) Stud mounted rocker lever cover

- ① Install the rocker lever cover over the mounting capscrews.
- ② Install the isolators and mounting nuts.
- ③ Tighten the mounting nuts.
Tightening torque : 2.4 kgf · m (17.4 lbf · ft)



(16) Capscrew mounted rocker lever cover

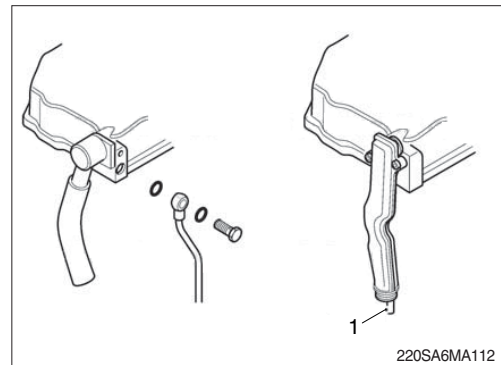
- ① Install the rocker lever cover.
- ② Install the mounting capscrews and isolators.
- ③ Tighten the mounting capscrews.
Tightening torque : 2.4 kgf · m (17.4 lbf · ft)



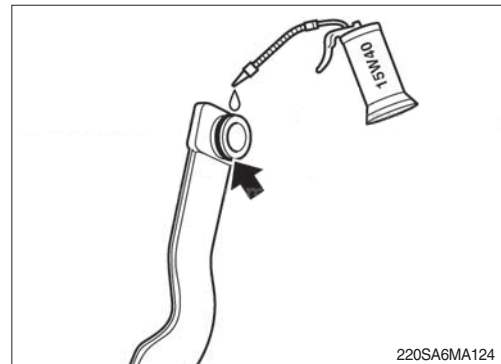
- (17) If equipped, at the rear of the rocker lever cover, install the banjo bolt and sealing washers connecting the breather oil drain line to the rocker lever cover.

Tightening torque : 1.2 kgf · m (8.7 lbf · ft)

- ※ **Some engine the breather oil drain line is internal to the breathe connection tube (1).**



- (18) Prior to connecting the breather connection tube to the rocker lever cover, apply clean engine oil to the O-ring located on the breather tube connection.



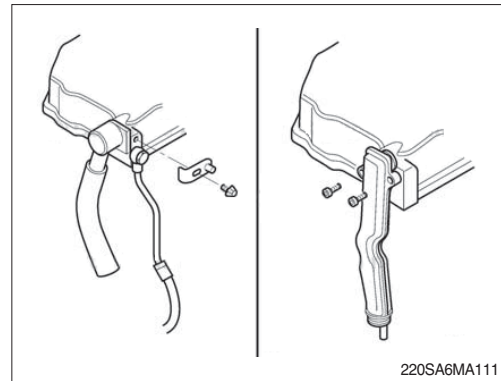
(19) Connect the breather tube connection to the rocker lever cover.

In general, two types of breather tube connections are used at the rocker lever cover.

- A clamping plate and capscrew hole the breather tube connection to the rocker lever cover. Remove the capscrew and clamping plate to disconnect the breather tube connection from the rocker lever cover.
- One or two capscrew(s) directly mount the breather tube connection to the rocker lever cover. Remove the capscrew(s) to disconnect the breather tube connection from the rocker lever cover.

(20) Tighten the capscrew(s).

Tightening torque : 1.0 kgf · m (7.2 lbf · ft)



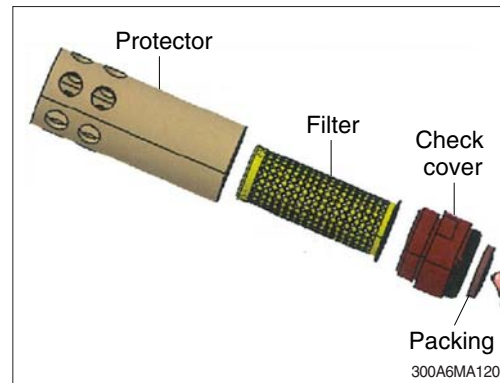
23) FUEL FILLER PUMP FILTER

Clean the filter periodically as followings.

- (1) Clean the filter when it is required by visual inspection.
- (2) Replace the filter when it is permanently damaged.

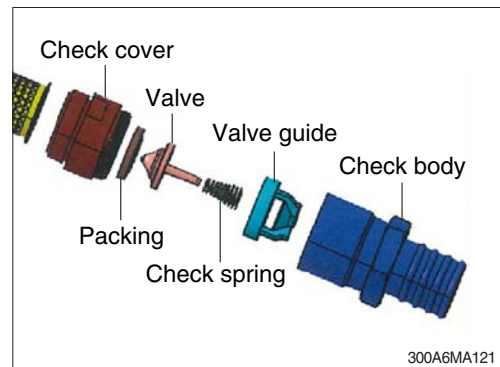
※ Clean with fuel or compressed, water should not be mixed.

※ The structure can be loosened by hand.



(3) Check valve

- ① Except for maintenance, the check valve must have been equipped to the hose at all times.
- ② Clean or replace check valve when foreign material is found in valve.

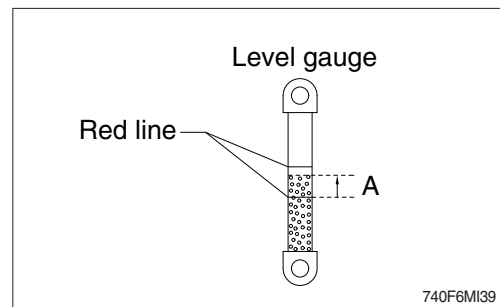
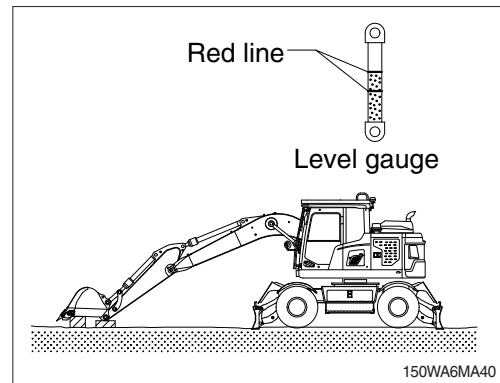


24) HYDRAULIC OIL CHECK

- (1) Position the machine as shown in the illustration on the right. Please stop the engine and wait for about 5 minutes.
- (2) Check the oil level at the level gauge of hydraulic oil tank.
- (3) The oil level is normal if the oil is between the red lines. The oil level depends on the temperature of the hydraulic oil. Refer to the height (A) in the below table to check the level gauge.

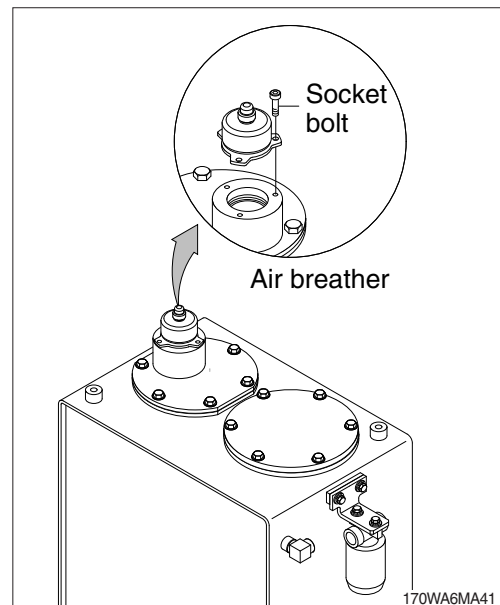
Temperature (°C)		Height A (mm)	
°C	mm	°F	inch
0	32	15	0.6
10	50	25	1.0
20	68	30	1.2
30	86	35	1.4
40	104	40	1.6

- ※ Refer to page 3-32 for checking the temperature of the hydraulic oil.
- ※ Add the hydraulic oil, if necessary.



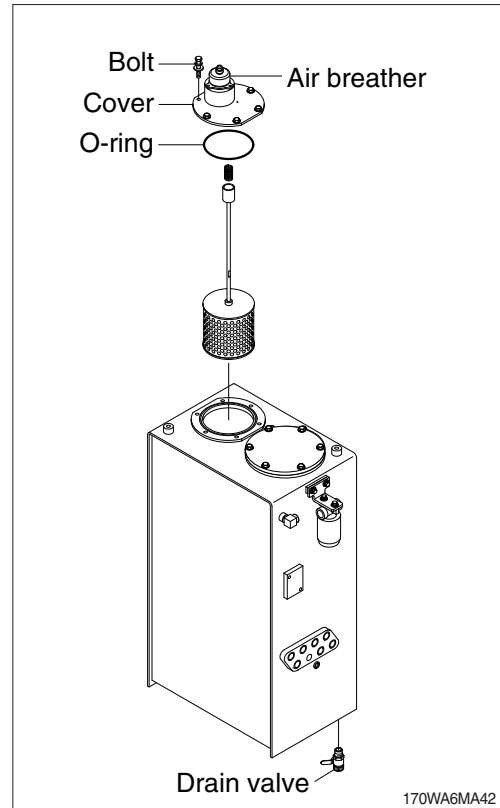
25) FILLING HYDRAULIC OIL

- (1) Position the machine like the hydraulic oil check. Then stop engine.
- (2) Relieve the pressure in the tank by pushing the top of the air breather.
- (3) Loosen the socket bolts and remove the air breather on the top of oil tank and fill the oil to the specified level.
 - Tightening torque : $4.05 \pm 0.8 \text{ kgf} \cdot \text{m}$
($29.3 \pm 5.8 \text{ lbf} \cdot \text{ft}$)
- (4) Start engine after filling and operate the work equipment several times.
- (5) Check the oil level at the level check position after engine stops.



26) CHANGE HYDRAULIC OIL

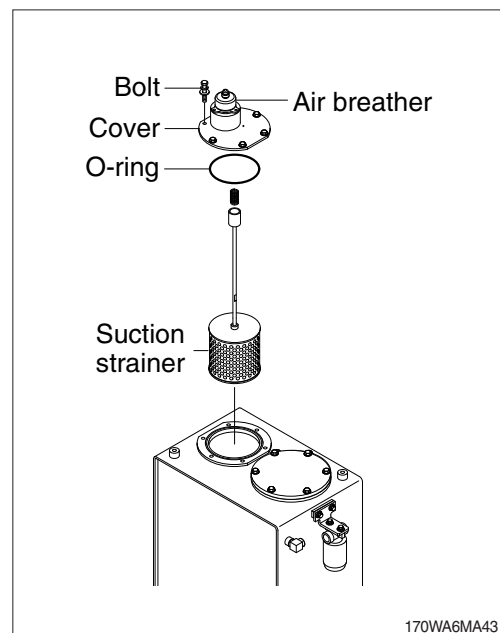
- (1) Position the machine like the hydraulic oil check. Then stop engine.
 - (2) Relieve the pressure in the tank by pushing the top of the air breather.
 - (3) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
 - (4) Prepare a suitable container with a capacity of 250 l (66 U.S. gal).
 - (5) To drain the oil open the drain valve at the bottom of the oil tank.
 - (6) Close the drain valve and fill proper amount of recommended oil.
 - (7) Put the breather in the right position.
 - (8) To bleed air from hydraulic pump loosen the air breather at top of hydraulic pump assembly.
 - (9) Start engine and run continually. Release the air by full stroke of each control lever.
- ※ In case of injecting HBHO (HD Hyundai Construction Equipment Bio Hydraulic Oil) to machines that have formerly used different hydraulic oil, the proportion of residual oil must not exceed 2 %
- ※ Do not mix any other Bio oil, use only HBHO as bio oil. If changing to Bio oil, contact your local HD Hyundai Construction Equipment dealer.



27) CLEAN SUCTION STRAINER

Clean suction stainer as follows.

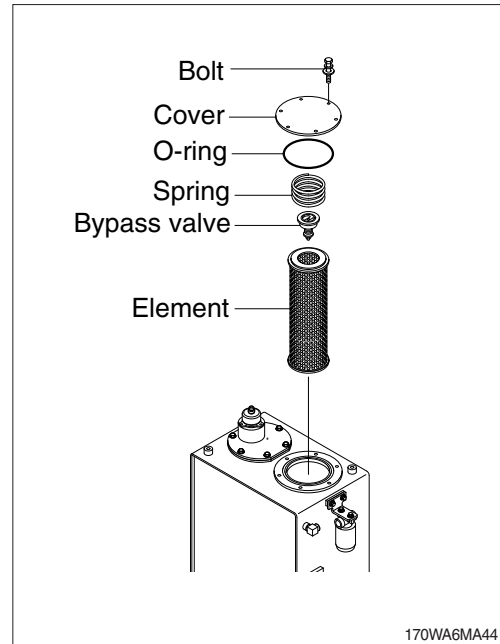
- (1) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
 - (2) Pull out the strainer in the tank.
 - (3) Wash the suction strainer with gasoline or cleaning oil (mineral spirits).
 - (4) Replace the suction strainer if it is damaged.
 - (5) Assemble with reverse order of disassembly. Be sure to install a new O-ring.
- ※ Loosen bolts on the cover slowly as the cover has spring force applied. This will prevent cover from popping off without notice.



28) REPLACEMENT OF RETURN FILTER

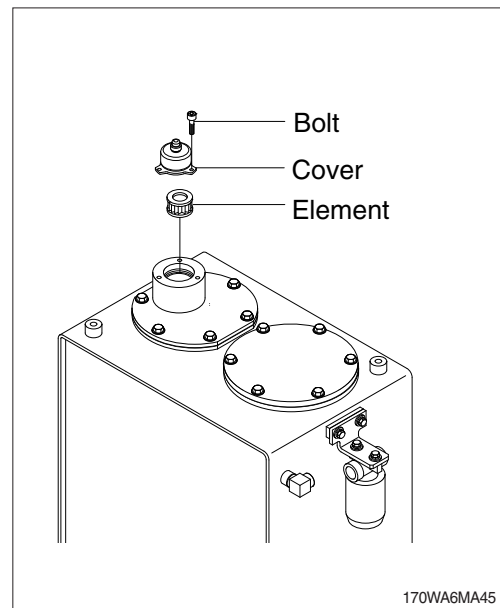
Replace return filter as follows.

- (1) Remove the cover.
- (2) Remove the spring, by-pass valve and return filter in the tank.
- (3) Replace the return filter with a new one.
- (4) Reassemble by reverse order of disassembly.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)



29) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

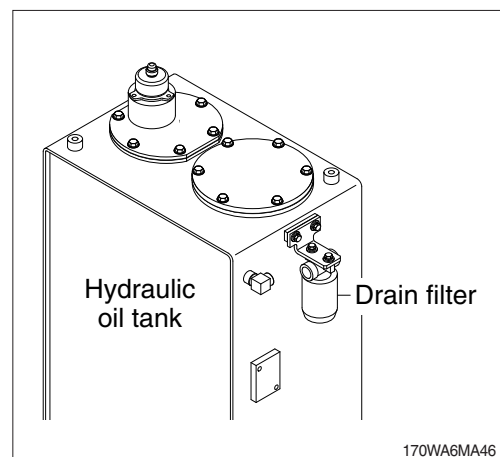
- (1) Relieve the pressure in the tank by pushing the top of the air breather.
- (2) Loosen the bolt and remove the cover.
- (3) Pull out the air breather element.
- (4) Replace the air breather element with a new one.
- (5) Reassemble by reverse order of disassembly.
 - Tightening torque : $0.8 \sim 1.0 \text{ kgf} \cdot \text{m}$
($5.9 \sim 7.4 \text{ lbf} \cdot \text{ft}$)



30) REPLACEMENT OF DRAIN FILTER

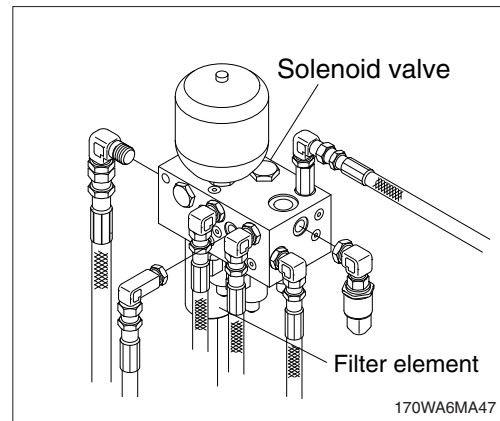
Clean the dust around filter and replace with new one after removing the cartridge.

- ※ Tighten about 2/3 turn more after the gasket of cartridge contacts seal side of filter body.
- ※ Change drain filter after initial 250 hours of operation. Thereafter, change drain filter every 1000 hours.



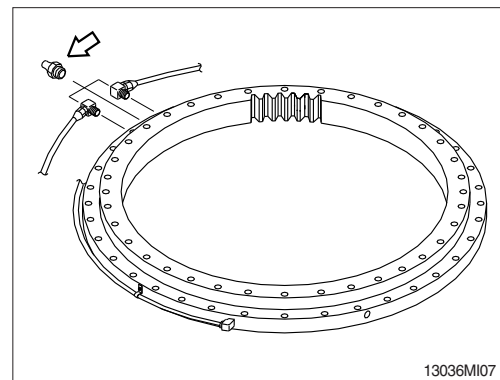
31) REPLACEMENT OF PILOT LINE FILTER

- (1) Loosen the nut positioned on the filter body.
 - (2) Pull out the filter element and clean filter housing.
 - (3) Install the new element and tighten using specified torque.
 - Tightening torque : 2.5 kgf·m (18.1 lbf·ft)
- ※ **Change the element after initial 250 hours of operation. Thereafter, change the element every 1000 hours.**



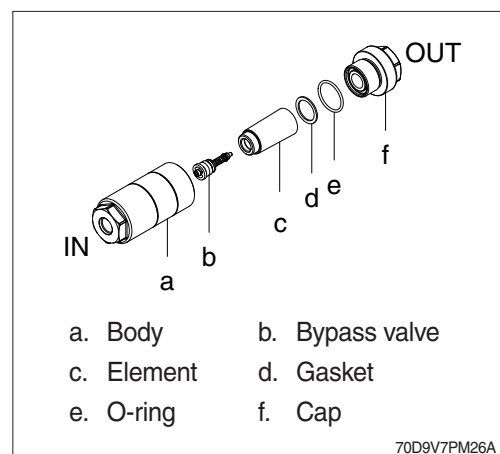
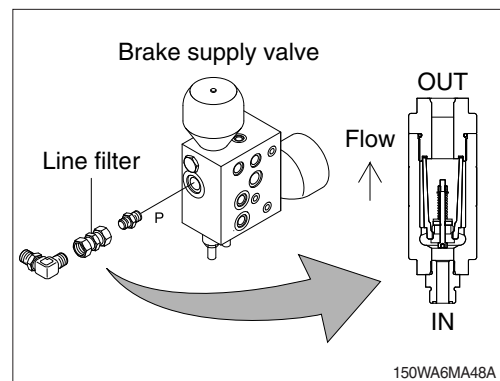
32) LUBRICATE SWING BEARING

- (1) Grease at the 3 fittings shown in the photo.
- ※ **Lubricate every 250 hours.**



33) CLEANING BSV LINE FILTER

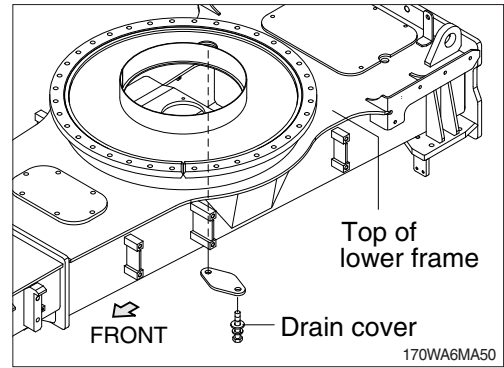
- (1) To release the brake system pressure, operate the brake pedal 2 ~ 3 times while the key is ON.
 - (2) Loosen the line filter on connectors.
 - (3) Unscrew the cap (f).
 - (4) Remove the element (c).
 - (5) Clean the element in hydraulic oil and use compressed air.
- ※ **If the O-ring or the gasket is damaged, replace the part with the new one.**
- (6) In case of replacement, insert the new element after cleaning with hydraulic oil and compressed air.
 - (7) Screw the cap.
 - Tightening torque : 15.3 kgf·m (110 lbf·ft)
 - (8) Tighten the line filter to connectors.
 - Tightening torque : 6 kgf·m (43.4 lbf·ft)
 - (9) Start the engine for a few minutes. Make sure there are no leaks.



34) SWING GEAR AND PINION

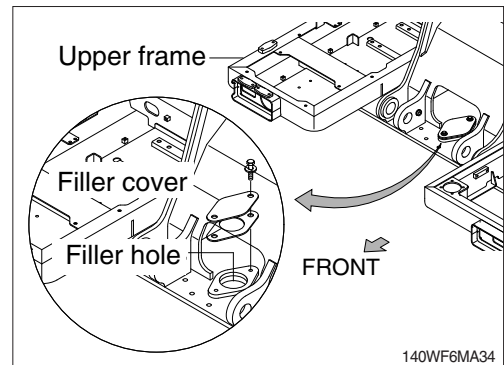
(1) Drain old grease

- ① Remove under cover of lower frame.
- ② Remove drain cover of lower frame.
- ③ Remove filler cover of upper frame.
- ④ Operate full turn (360°) of swing several times.



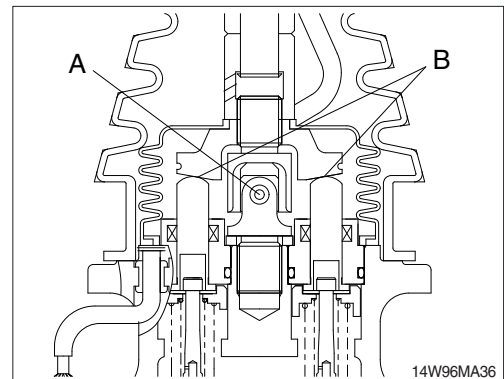
(2) Refill new grease

- ① Install drain cover.
 - ② Fill with new grease.
 - ③ Install filler cover.
- Capacity : 15.8 kg (34.8 lb)



35) LUBRICATE RCV LEVER

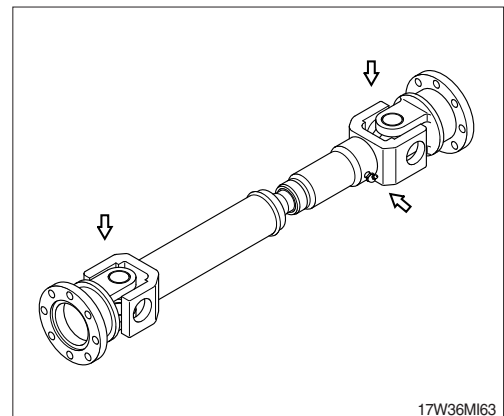
Remove the bellows and with a grease gun grease the joint part (A) and sliding parts (B).



36) LUBRICATE

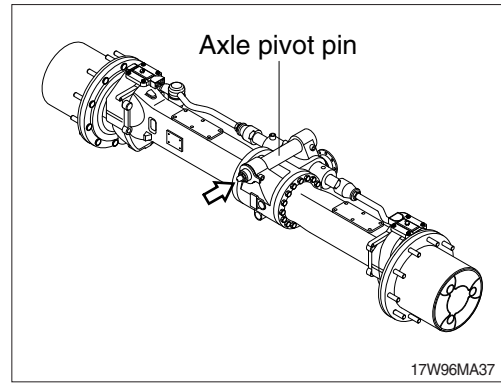
(1) Drive shaft

- ① Front drive shaft : 3 point
- ② Rear drive shaft : 3 point

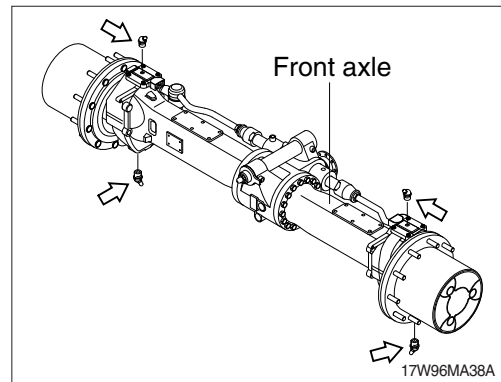


(2) Axle

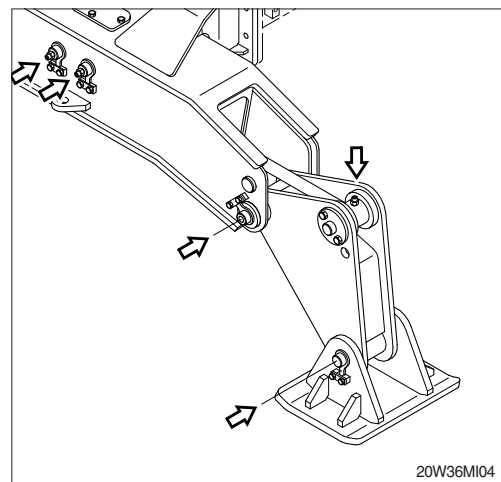
- ① Front axle : 1 point



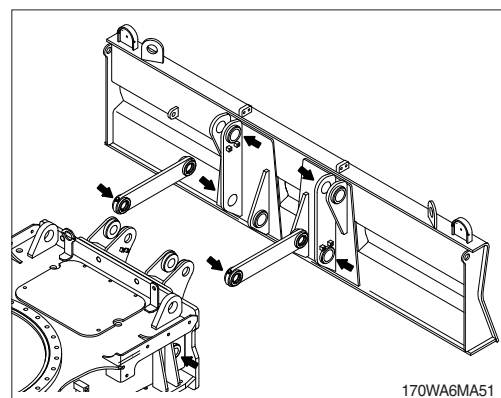
(3) Steering case : 4 point



(4) Outrigger : 8 point



(5) Dozer blade : 12 point



37) TIRE

(1) Air pressure

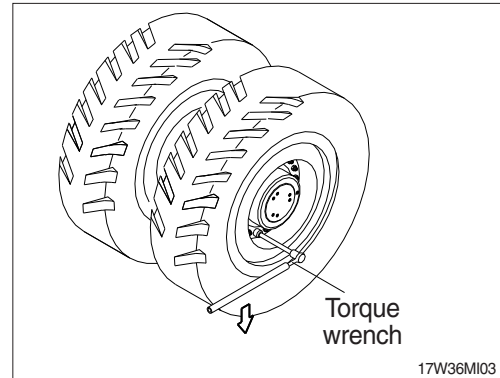
It is important to keep air pressure properly for maximizing tire life. Both excessive and insufficient air pressure of tires should be avoided not to damage tires.

Specification : 7.0 kgf/cm² (100 psi)

(2) Handling of tire

① Removal of tire

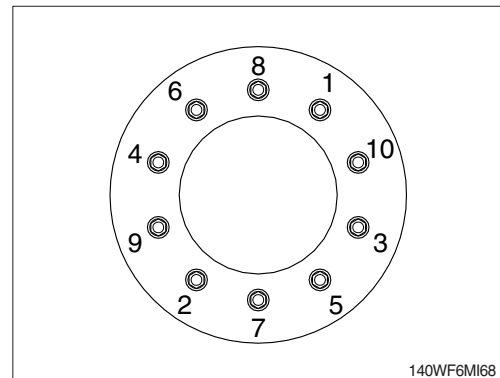
- Lift the main body until a tire separate from the ground, and place the block under front and rear axle.
- Loosen wheel nut with torque wrench and remove tire.



② Installation of tire

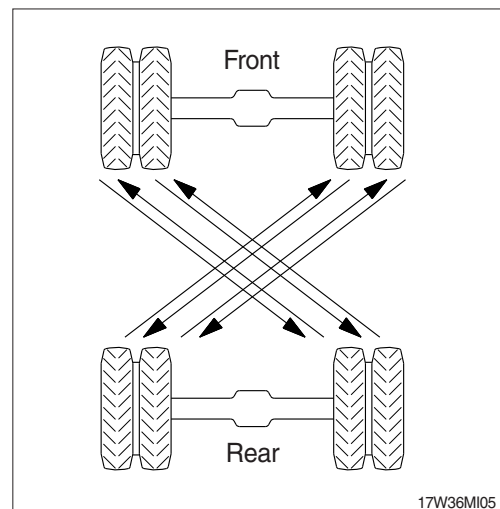
- Coat some grease on wheel stud and nut screw.
- Install the tires and tighten a nut slightly and get down a tire on the ground, and then tighten the torque in the order as figure.
- Tightening torque : 60 ⁺⁰/_{-5.0} kgf · m

(433 ⁺⁰/_{-36.2} lbf · ft)



③ Position change of tire

- Tire is worn out differently part by part according to installing position, so change position regularly as figure.
- ※ **Keep air pressure at standard.**
- ※ **Use same pattern of groove and same maker's tire.**
- ※ **Always check the tire before operation.**

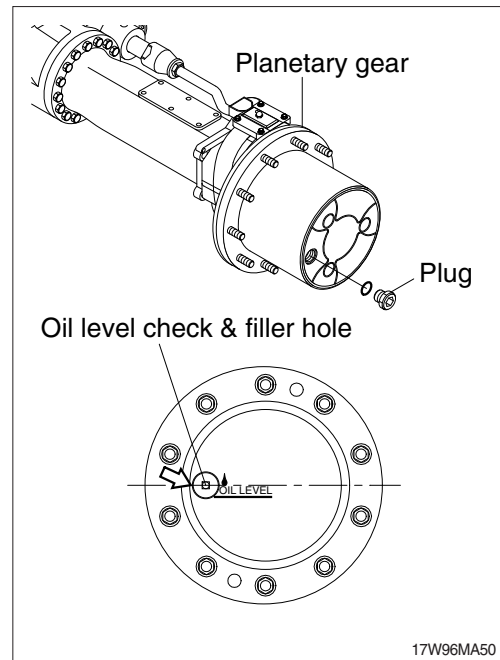


(3) Tire size

Specification : 10.00×20 - 14PR

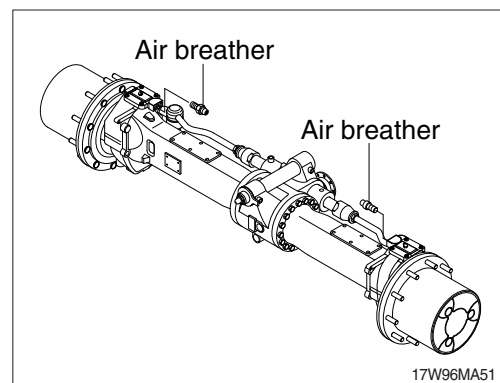
38) CHECK AND SUPPLYING AXLE PLANETARY GEAR OIL

- (1) Park the machine on the flat ground.
- (2) Remove the plug and check the oil amount.
※ **Set the oil level check line of planetary gear in parallel to the around.**
- (3) If the oil level is below the plug hole, supply oil through plug hole.
- (4) After checking, install plug.

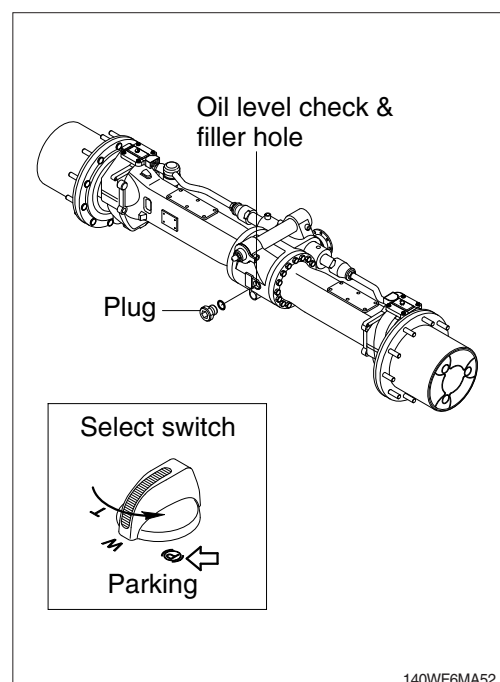


39) CHECK AND SUPPLYING AXLE DIFFERENTIAL GEAR OIL

- (1) Park the machine on the flat ground.
- (2) Open the axle air breather to relieve internal air pressure.



- (3) Remove the plug and check the oil amount.
If the oil level is at the hole of the plug, it is normal.
 - (4) If the oil level is below the plug hole, supply oil through plug hole.
- ▲ **When checking the oil level, set the select switch to parking position.**
- ▲ **As the machine is hot after operation, wait until the oil temperature has dropped.**

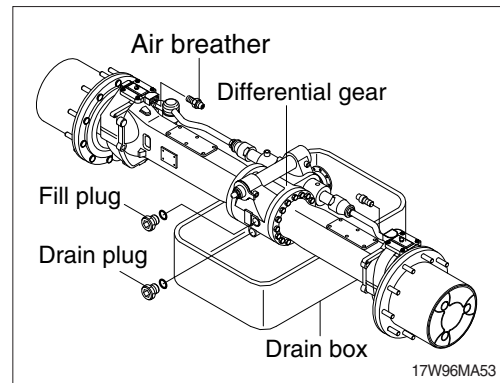


40) CHANGE THE AXLE OIL

- (1) Place a drain box under drain plug to catch oil.
- (2) Remove the air breather to relieve internal pressure.

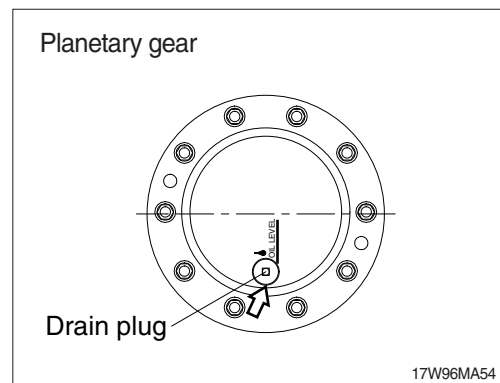
(3) Drain oil the differential gear oil

- ① Remove the filling plug and remove the drain plug to drain oil off.
- ② Wash drain plug and install it.



(4) Drain planetary gear oil

- ① Drain oil by removing drain plug.
- ※ The drain plug should be facing the ground.



- (5) Supply oil into the differential gear and the planetary gear.

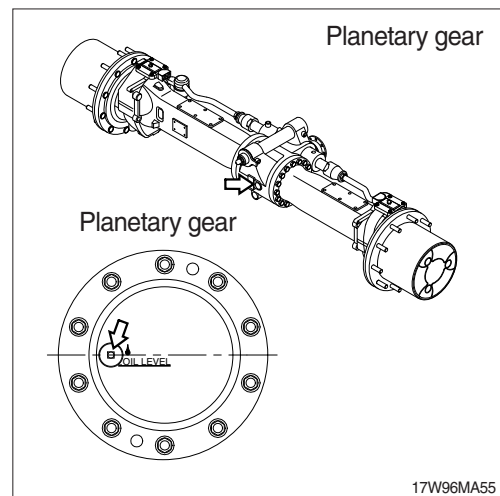
· Oil amount

Description	Capacity
Front axle differential gear oil	10.5 ℓ (2.77 U.S. gal)
Rear axle differential gear oil	12.5 ℓ (3.30 U.S. gal)
Axle planetary gear oil	2.5 ℓ (0.66 U.S. gal)

- (6) Supply oil until it overflows from the oil filler, then install the plug.

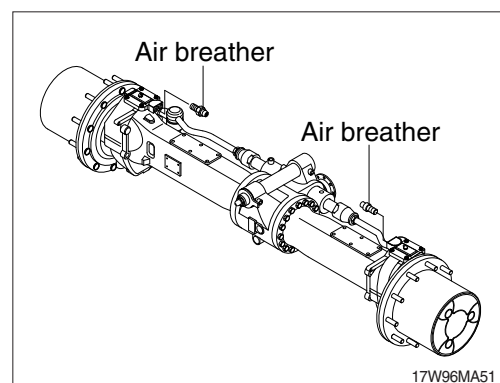
▲ As the machine is hot after operation, wait until the temperature has dropped.

- ※ If a work requires frequent use of brake, replace it earlier than normal change interval.



41) CLEANING AXLE BREATHER

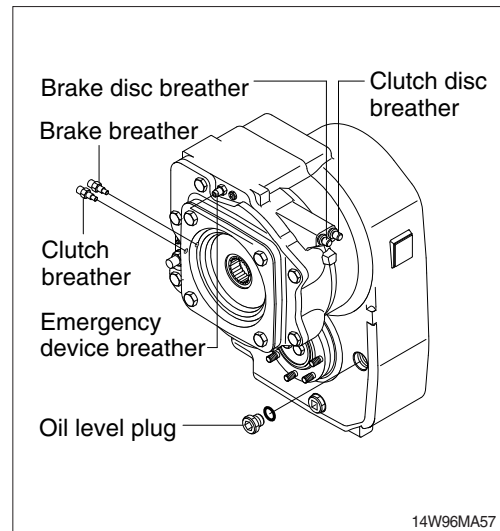
- (1) Remove dust or debris around the breather.
- (2) Remove the breather and wash it with cleaning oil.



42) CHECK AND SUPPLYING TRANSMISSION OIL

- (1) Park the machine on the flat ground.
- (2) Open the transmission air breather to relieve internal air pressure.
- (3) Remove the plug and check the oil amount.
If the oil level is at the hole of the plug, it is normal.
- (4) If the oil level is below the plug hole, supply oil through a plug hole.

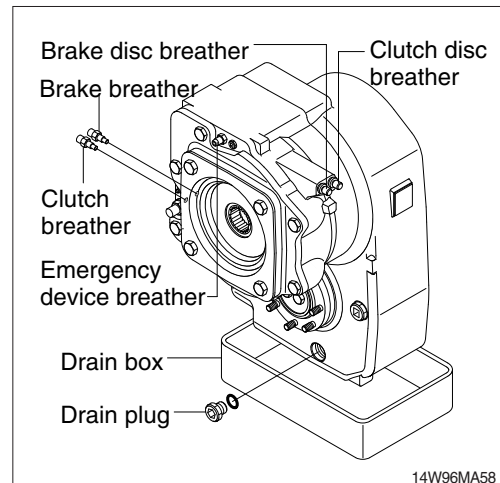
▲ As the machine is hot after operation, wait until the oil temperature has dropped.



43) CHANGE THE TRANSMISSION OIL

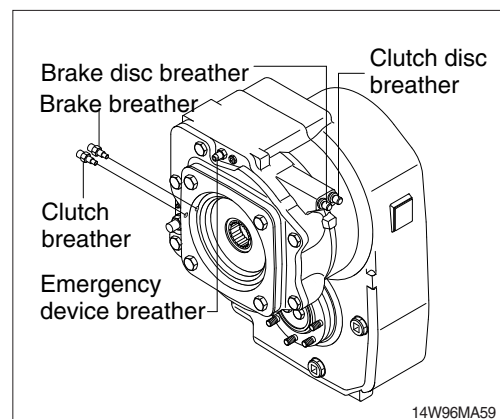
- (1) Prepare a suitable container under drain plug to catch oil.
- (2) Open the transmission air breather to relieve internal air pressure.
- (3) Remove the drain plug to drain oil.
- (4) Wash drain plug and install it.
- (5) Supply oil into the transmission case.
· Oil amount : 2.5 ℓ (0.66 U.S. gal)

▲ As the machine is hot after operation, wait until the temperature has dropped.



44) CLEANING TRANSMISSION AIR BREATHER

- (1) Remove dust or debris around the air breather.
- (2) Remove the air breather and wash it with cleaning oil.



45) REPLACEMENT OF BUCKET

△ When knocking the pin in with a hammer, metal particles may fly and cause serious injury, particularly if they get into your eyes. When carrying out this operation, always wear goggles, helmet, gloves, and other protective equipment.

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

※ When performing joint work, make sure to signal clearly to each other and work carefully to avoid serious injury.

(1) Lower the bucket on the ground as shown in the illustration on the top right.

(2) Lock the safety knob to the LOCK position and stop the engine.

(3) Remove the stopper bolts (1) and nuts (2), then remove pins (3, 4) and remove the bucket.

※ When removing the pins, place the bucket so that it is in light contact with the ground.

※ If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

※ After removing the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushings on both sides do not become damaged.

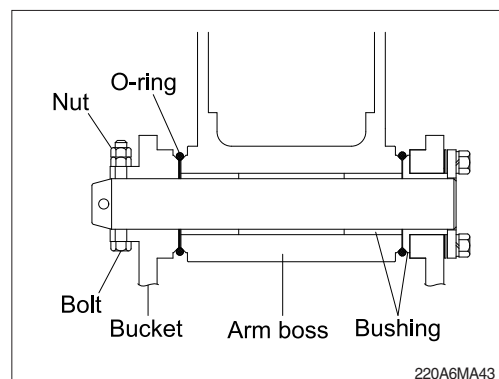
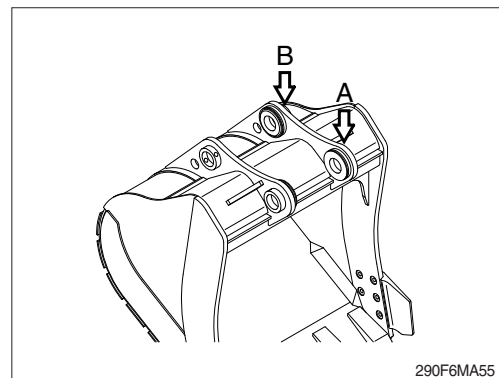
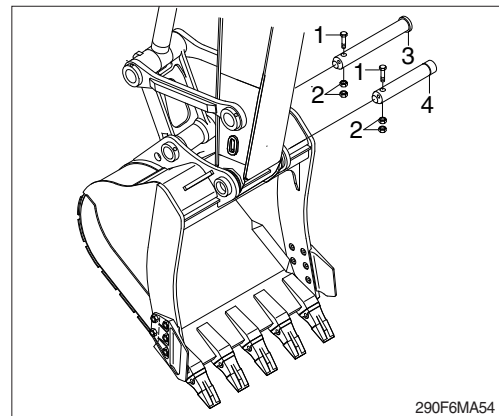
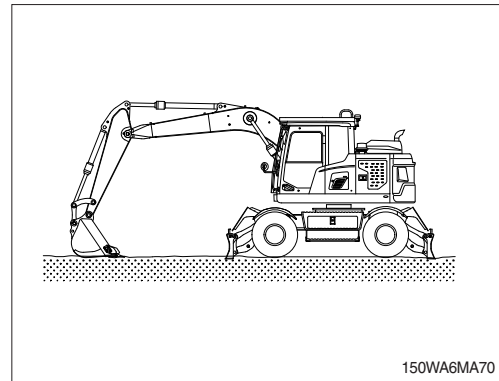
(4) Align the arm with holes (A) and the link with holes (B), then coat with grease and install pins (3, 4)

※ When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the bucket as shown in the picture.

After hitting the pin, move the O-ring down to the regular groove.

(5) Install the stopper bolt (1) and nuts (2) for each pin, then grease the pin.

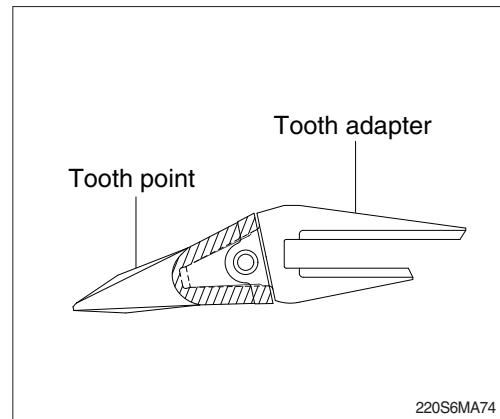
- Tightening torque : $29.7 \pm 4.5 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)



46) REPLACEMENT OF BUCKET TOOTH

(1) Timing of replacement

- ① Check wearing condition as shown in the illustration and replace tooth point before adapter starts to wear.
- ② In case of excessive use and tooth adapter has worn excessively, replacement may become impossible.



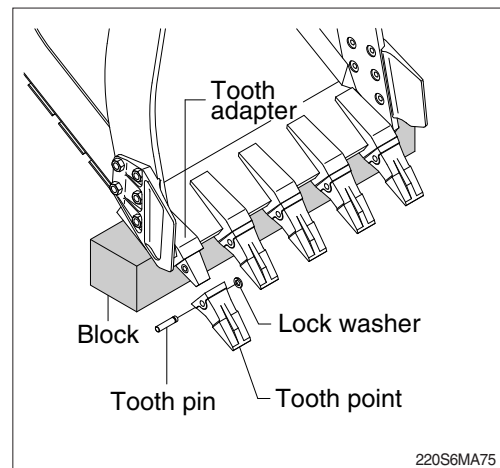
(2) Instructions for replacement

- ① Pull out pin by striking pin with punch or hammer, avoiding damage to lock washer.
- ② Remove dust and mud from surface of tooth adapter by using knife.
- ③ Place lock washer in its proper place, and fit tooth point to adapter.
- ④ Insert pin until lock washer is positioned at tooth pin groove.

▲ Serious injury or death can result from bucket falling.

▲ Block the bucket before changing tooth points or side cutters.

▲ The operator should wear clothes and personal protection gear that are appropriate for the work environment. Protects the eyes from dust, particles and airborne materials with a protection gear like goggle.



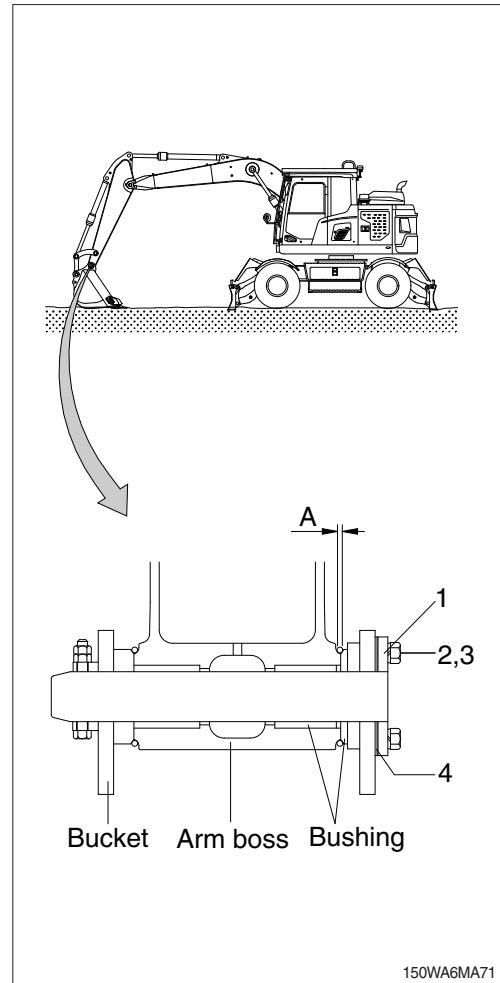
47) ADJUSTMENT OF BUCKET CLEARANCE

- (1) Lower the bucket on the ground as shown in the illustration.
- (2) Swing to the left and keep arm boss in contact with the left bucket ear.
- (3) Lock the safety knob to the LOCK position and stop the engine.
- (4) Measure the clearance (A) between bucket and arm boss. This is the total clearance.

(5) Adjusting

- ① Loosen bolt (2), and remove washer (3), plate (1) and shim (4).
- ② Remove the shim equivalent value with measuring value.
- ③ Assemble the parts in the reverse order of removal.
 - Tightening torque : $29.6 \pm 3.2 \text{ kgf} \cdot \text{m}$
($214.0 \pm 23.1 \text{ lbf} \cdot \text{ft}$)
 - Normal clearance : $0.5 \sim 1.0 \text{ mm}$
($0.02 \sim 0.04 \text{ in}$)

※ If the bucket is not adjusted correctly, noise and vibration will occur. This will also cause damage to O-ring and bushings prematurely.



48) LUBRICATE PIN AND BUSHING

(1) Lubricate to each pin of working device

Lubricate the grease to the grease nipple according to the lubricating interval.

No.	Description	Qty
1	Lubrication manifold at boom	6
2	Boom cylinder pin	2
3	Boom and arm connection pin	1
4	Arm cylinder pin (Rod side)	1
5	Bucket cylinder pin (Head, rod)	2
	Bucket link (Control rod)	3
	Arm and control link connection pin	1
	Arm and bucket connection pin	1
6	Boom rear bearing center	1
7	Dozer blade connection pin	12
8	Outrigger connection pin	8

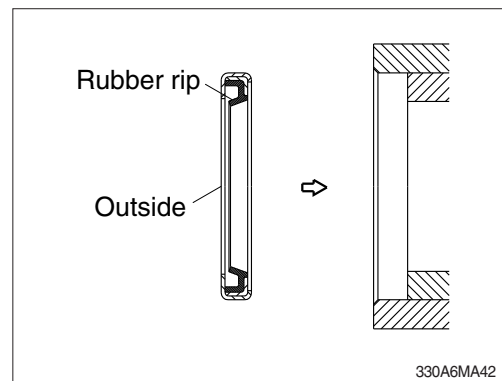
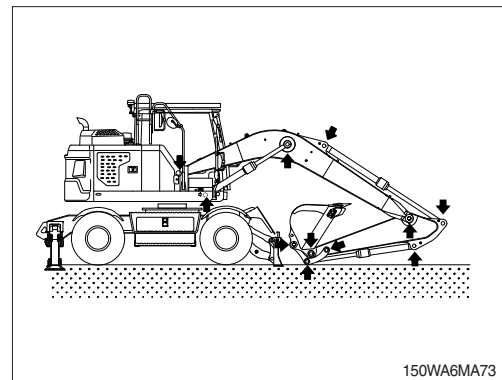
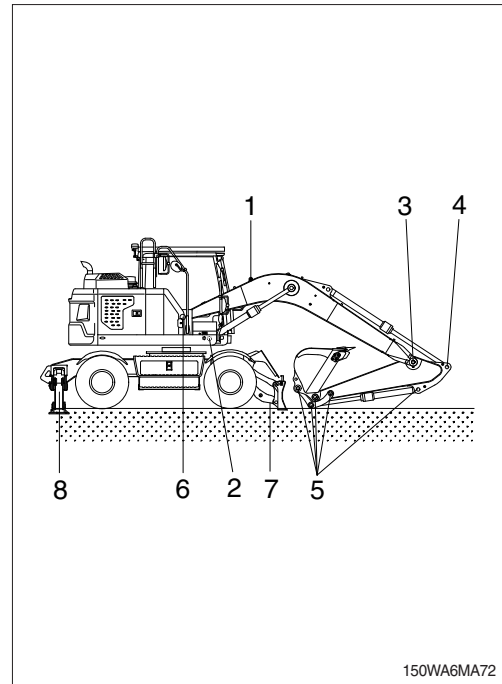
※ Shorten lubricating interval when working in water or dusty place.

(2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

※ Mount the lip so it is facing outside when replace dust seal.

※ If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.

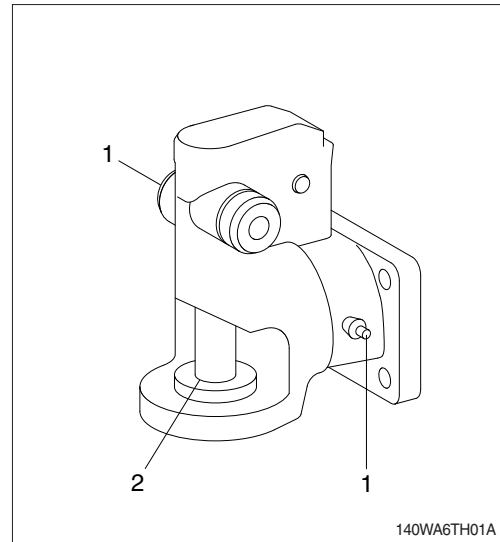
※ Install seal in the same manner as shown in the illustration. Use a plastic hammer to lightly and evenly tap the seal into place.



49) TRAILER HITCH GREASING

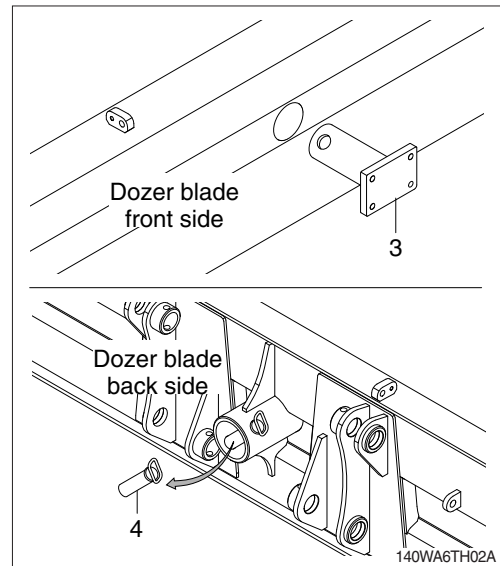
- ※ If a removable trailer towing hitch is installed on your machine as an option on the blade it must be greased regularly.
- ※ Lubricate as the manual of an installed hitch.

(1) Grease the lubrication nipples (1) and the draw-bar eye seat (2) in regular intervals according to the condition of use and after each cleaning with pressurized air.



(2) If the trailer hitch is mounted on the blade, grease the trailer hitch bracket (3) and the fixation pin (4) on the back of the blade.

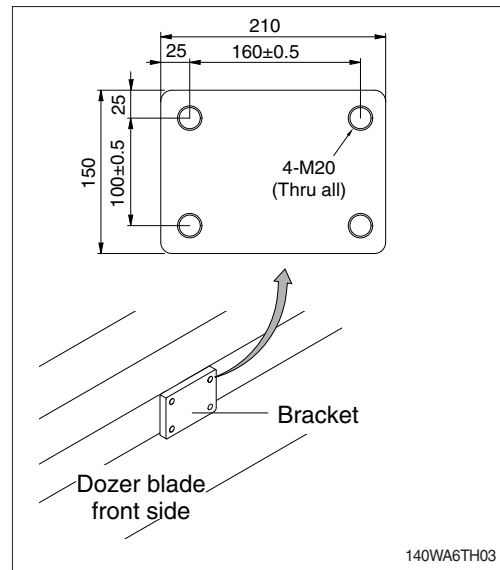
- ※ Lubricate every 100 hours.



- ※ When a towing hitch is installed, the regularly inspection for wear on the towing hitch must be performed by a service technician as the instruction of the towing hitch manufacturer.

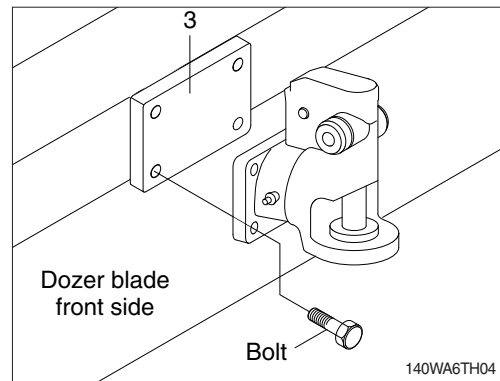
49-1) INSTALL AND REMOVAL OF THE TRAILER HITCH

(1) Mounting dimensions of the bracket.



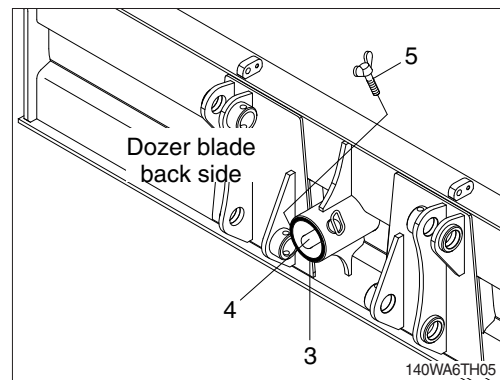
(2) Install

Fix the trailer hitch on the bracket (3) with bolts (M20, 4EA).



(3) Removal

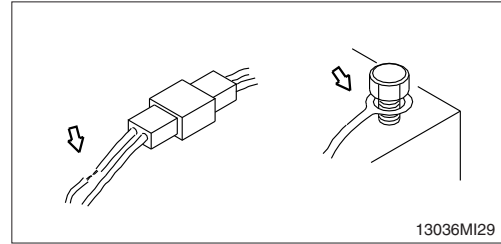
- Loosen the wing nut (5) and remove the fixation pin (4).
- Remove the trailer hitch bracket (3).



7. ELECTRICAL SYSTEM

1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



2) BATTERY

(1) Clean

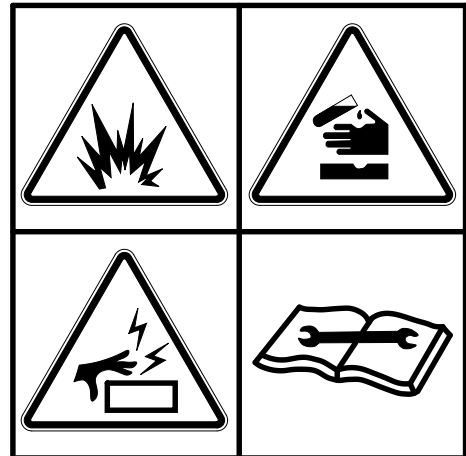
① Wash the terminal with hot water if it is contaminated, and apply grease to the terminals after washing.

⚠ Battery gas can explode. Keep sparks and flames away from batteries.

⚠ Always wear protective glasses when working with batteries.

⚠ Do not stain clothes or skin with electrolyte as it is acid.

Be careful not to get the electrolyte in eyes. If eyes are affected, flush with clean water or eye solution and seek immediate medical attention.



(2) Recycle

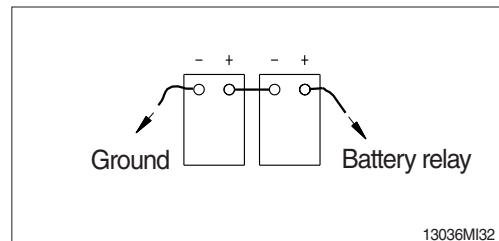
Never discard a battery.

Always return used batteries to one of the following locations.

- A battery supplier
- An authorized battery collection facility
- Recycling facility

(3) Method of removing the battery cable

Remove the cable from the ground connection first (⊖ terminal side) and reconnect it last when reassembling.



3) STARTING THE ENGINE WITH A BOOSTER CABLE

Follow these procedures when starting.

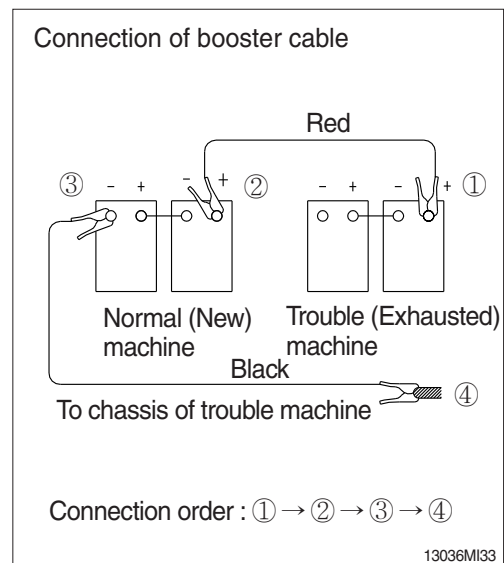
(1) Connection of booster cable

※ Use the same capacity of battery for starting.

- ① Make sure that the starting switches of the normal machine and trouble machine are both in the OFF position.
- ② Connect the red terminal of booster cable to the battery (+) terminal between exhausted and new battery.
- ③ Connect the black terminal of the booster cable between new battery (-) terminal and chassis of trouble machine.

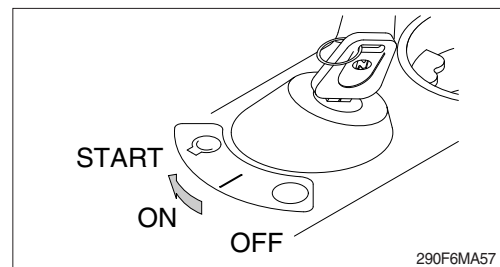
※ Make and maintain a firm connection.

※ Sparks will occur slightly when making the final connection.



(2) Starting the engine

- ① Start the engine of the normal machine and keep it running at high idle.
- ② Start engine of the troubled machine with starting switch.
- ③ If you can not start it with the first attempt, try again after 2 minutes.



(3) Taking off the booster cable

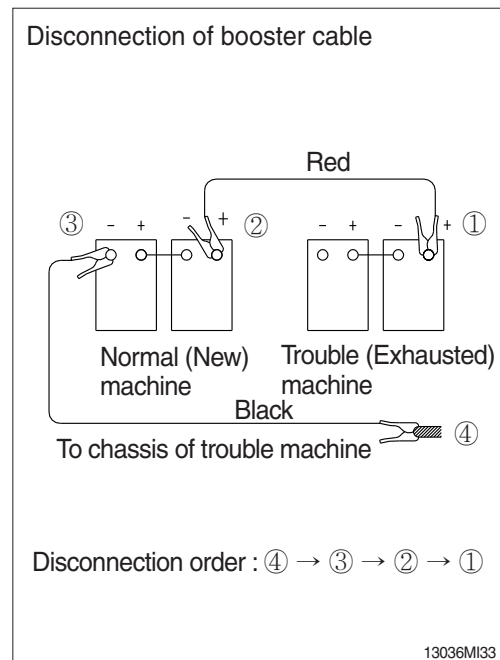
- ① Take off the booster cable (black).
- ② Take off the booster cable (red) connected to the (+) terminal.
- ③ Run engine at high idle until charging of the exhausted battery is complete.

▲ Explosive gas is generated while using the battery or charging it. Keep any flames away and be careful not to cause a spark.

※ Charge the battery in a well ventilated area.

※ Place the machine on the earth or concrete. Avoid charging the machine on any steel or steel plates.

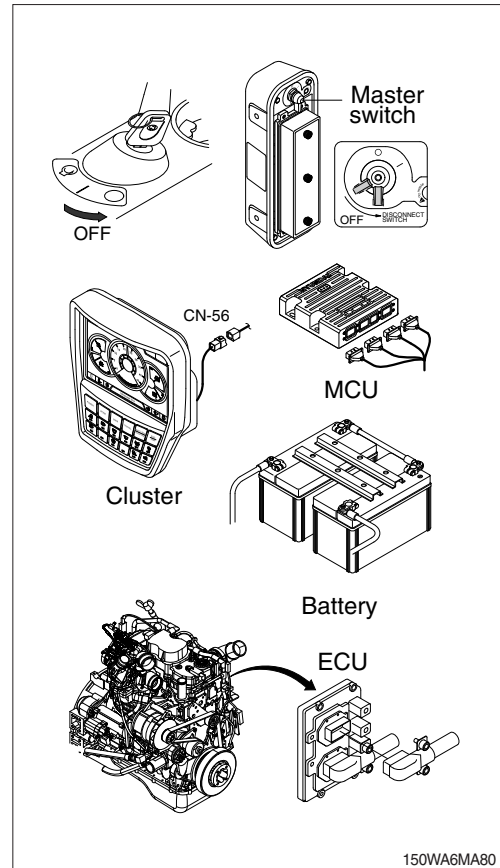
※ Do not connect (+) terminal and (-) terminal when connecting booster cable because it will be shorted.



4) WELDING REPAIR

Before welding, follow the below procedure.

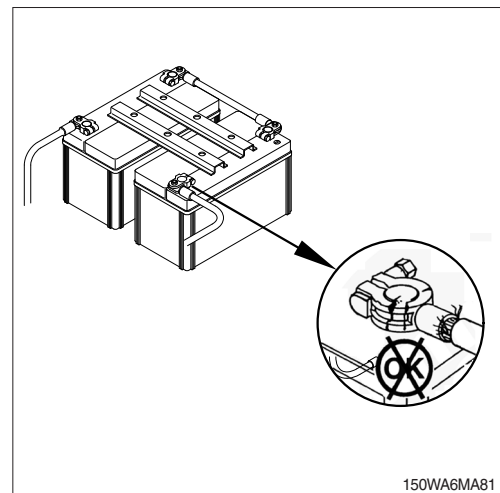
- (1) Shut off the engine and remove the key.
 - (2) Disconnect ground cable from battery by master switch.
 - (3) Before carrying out any electric welding on the machine, the battery cables should be disconnected and the connectors pulled out of the electronic control units (MCU, ECU, cluster etc).
 - (4) Connect the earth (ground) lead of the welding equipment as close to the welding point as possible.
- ※ Remove all paint to ensure a solid ground is achieved.
 - ※ Do not weld or use cutting torch on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or cutting on them.
- ▲ Do not attempt to weld before carrying out the above.
If not, it will cause serious damage to electric system.



5) BATTERY CABLE AND CONNECTIONS

▲ Batteries can emit explosive gases. To reduce the possibility of personal injury, always ventilate the compartment before servicing the batteries.

- (1) Remove and inspect the battery cables and connections for cracks or corrosion.
- (2) Replace broken terminals, connectors, or cables.
- (3) If the connections are corroded, use a battery brush or wire brush to clean the connections.
- (4) Make sure all debris are removed from the connecting surfaces.
- (5) Install the cables and tighten the battery connections.
- (6) Coat the terminals with grease to prevent corrosion.

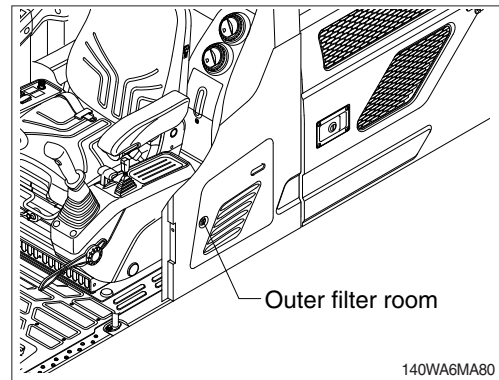


8. AIR CONDITIONER AND HEATER

1) CLEANING AND REPLACEMENT OF OUTER FILTER

※ **Always stop the engine before servicing.**

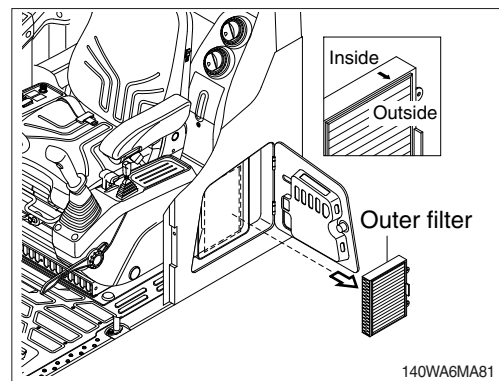
- (1) Open the outer filter room.



- (2) Remove the outer filter.

※ **When installing a filter, be careful not to install the filter in the wrong direction**

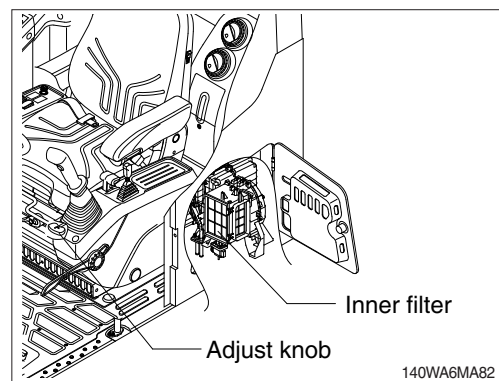
- (3) If the filter is damaged or badly contaminated, use a new filter.



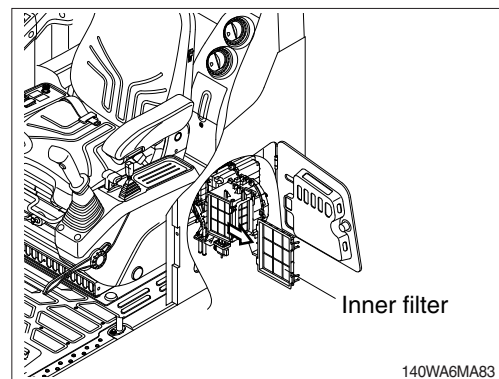
2) CLEANING AND REPLACEMENT OF INNER FILTER

※ **Always stop the engine before servicing.**

- (1) Move seat and console box forward by using the adjust knob.



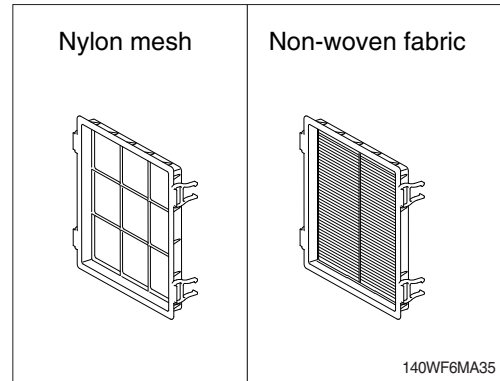
- (2) Remove the inner filter.



(3) Check the inner filter type.

(4) Non-woven fabric type

- If the filter is damaged or badly contaminated, use a new filter.



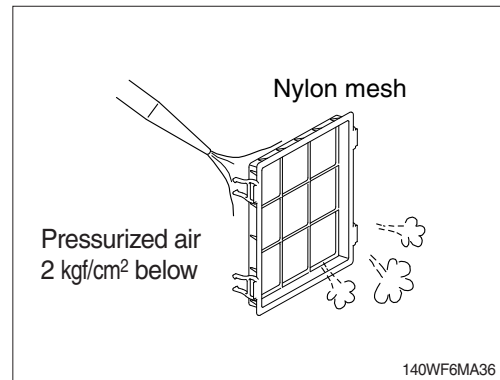
(5) Nylon mesh type

- Clean the inner filter using a pressurized air (below 2 kgf/cm², 28 psi) or washing with water.

△ **When using pressurized air, be sure to wear safety glasses.**

※ **Dry off after washing with water.**

(6) Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.



3) PRECAUTIONS FOR USING AIR CONDITIONER

- (1) When using the air conditioner for a long time, open the window once every one hour or ventilate by using the fresh air function.
- (2) Be careful not to overcool the cab.
- (3) The cab is properly cooled if the operator feels cool when entering from outside (about 5°C lower than the outside temperature).
- (4) When cooling, change air occasionally.

4) CHECK DURING SEASON

Ask the service center for replenishment of refrigerant or other maintenance service so that the cooling performance does not wear prematurely.

5) CHECK DURING OFF-SEASON

Operate the air conditioner 2 or 3 times a month (each time for a few minutes) to avoid loss of oil film in the compressor.

6) REFRIGERANT

(1) Equipment contains fluorinated greenhouse gas.

Model	Type	Quantity	GWP : 1430
HW150A CR	HFC-134a	0.75 kg (1.65 lb)	CO ₂ eq. : 1.0725 t

※ GWP

Global warming potential (GWP) is a measure of how much heat a gas traps in the atmosphere relative to that of carbon dioxide (CO₂). GWP is calculated in terms of the 100-year warming potential of 1 kg of a greenhouse gas relative to 1 kg of CO₂.

(2) Environmental precautions

The air conditioning system of the machine is filled with HFC-134a refrigerant at the factory. HFC-134a refrigerant is a fluorinated greenhouse gas and contributes to global warming. Do not release refrigerant into the environment.

(3) Safety precautions

Work on the air conditioning system must only be performed by a qualified service technician. Do not attempt to perform work on the air conditioning system. Wear safety goggles, chemical resistant gloves and appropriate personal protective equipment to protect bare skin when there is a risk of contact with refrigerant.

(4) Action in case of exposure

- ① Eye contact / Limited skin contact
Rinse with warm water and apply a light bandage. Seek medical attention immediately.
- ② Extensive skin contact
Rinse with warm water and carefully heat the area with warm water or warm clothing. Seek medical attention immediately.
- ③ Inhalation
Leave the area and find fresh air. Seek medical attention immediately.

1. ROAD TRAVELING

As this machine can run at the maximum speed of 35 km/h (21.7 mph), it is not necessary to transport the machine on trailer in a short distance.

But the transportation by the trailer is convenient in a long distance.

If it is necessary to travel on a road, observe the followings.

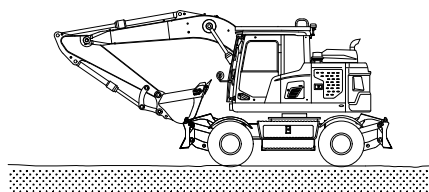
- 1) Comply with regulations regarding this machine for the sake of safety.
- 2) Perform daily inspection before starting the machine.
- 3) Cross the bridge after checking that it will safely support the machine weight. If the bridge can not support, a detour must be prepared or the bridge must be reinforced.
- 4) When traveling for a long distance, stop every hour to allow tires and other components to cool down and check any abnormality.
- 5) Drive with the bucket empty.

※ Posing method for 2-piece boom (GRH regulation)

Cylinder open length

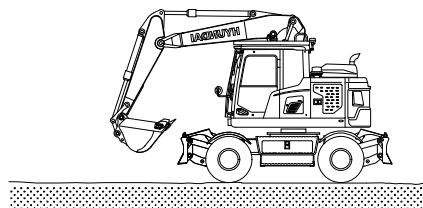
- Boom cylinder : 2494 mm
- Arm cylinder : 2121 mm
- Bucket cylinder : 2195 mm
- Adjust cylinder : 1145 mm

Mono boom



150WA5TA01

2-piece boom

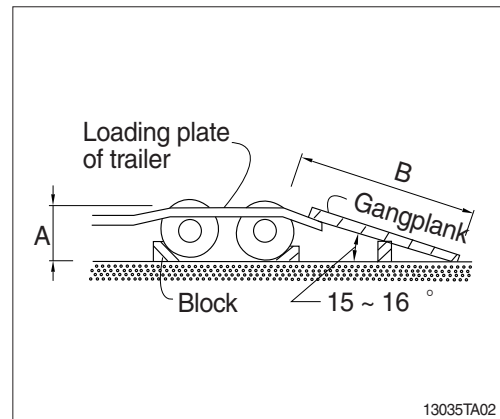
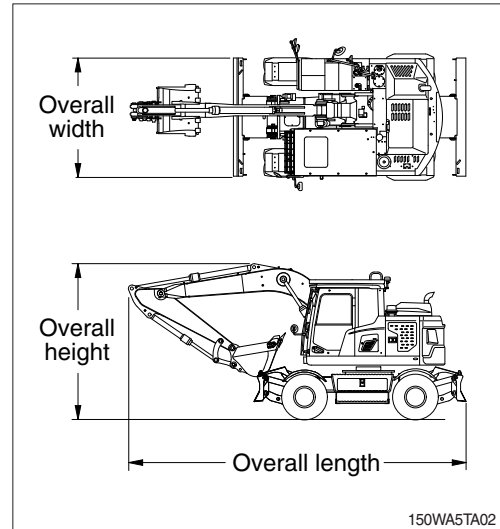


150WA5TA20

2. PREPARATION FOR TRANSPORTATION

- 1) When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc.
- 2) Select proper trailer after confirming the weight and dimension from the chapter 7, specification.
- 3) Check the whole route such as the road width, the height of bridge and limit of weight etc, which will be passed.
- 4) Get permission from the related authority if necessary.
- 5) Prepare suitable capacity of trailer to support the machine.
- 6) Prepare gangplank for safe loading referring to the below table and illustration.

A	B
1.0	3.65 ~ 3.85
1.1	4.00 ~ 4.25
1.2	4.35 ~ 4.60
1.3	4.75 ~ 5.00
1.4	5.10 ~ 5.40
1.5	5.50 ~ 5.75



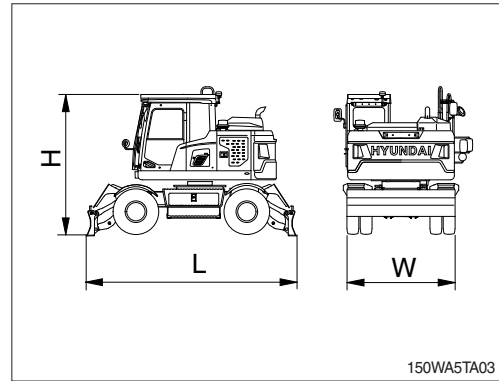
3. DIMENSION AND WEIGHT

1) BASE MACHINE

(1) With counterweight

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	4370 (14' 4")
H	Height	mm (ft-in)	3450 (11' 4")
W	Width	mm (ft-in)	2530 (8' 4")
Wt	Weight	kg (lb)	13970 (30800)

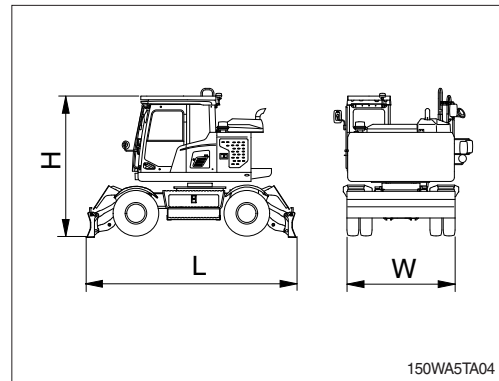
※ 3250 kg (7170 lb) counterweight.



(2) Without counterweight

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	4370 (14' 4")
H	Height	mm (ft-in)	3450 (11' 4")
W	Width	mm (ft-in)	2530 (8' 4")
Wt	Weight	kg (lb)	10700 (23590)

※ Without counterweight.

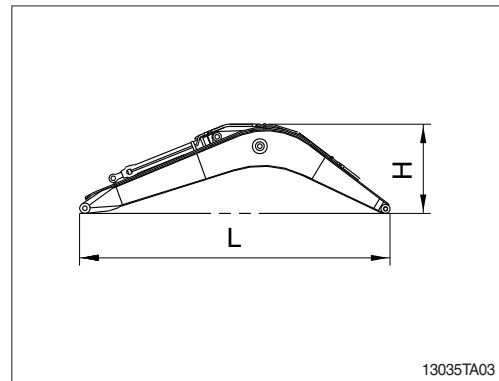


2) BOOM ASSEMBLY

(1) 4.6 m (15' 1") mono boom

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	4772 (15' 8")
H	Height	mm (ft-in)	1300 (4' 3")
W	Width	mm (ft-in)	550 (1' 10")
Wt	Weight	kg (lb)	987 (2180)

※ 4.6 m (15' 1") boom with arm cylinder (Including piping and pins).



(2) 2-piece boom

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	4892 (16' 1")
H	Height	mm (ft-in)	1084 (3' 7")
W	Width	mm (ft-in)	725 (2' 5")
Wt	Weight	kg (lb)	1109 (2440)

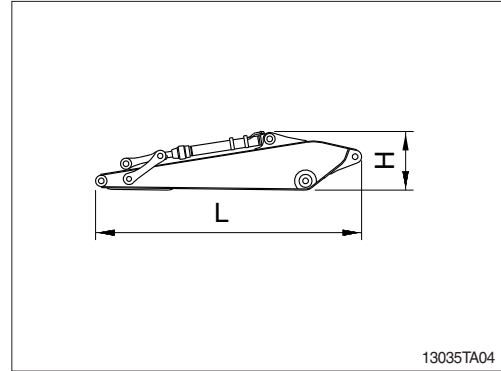
※ 2-piece boom with arm cylinder (Including piping and pins).

3) ARM ASSEMBLY

(1) 2.45 m (8' 0") arm

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	3181 (10' 7")
H	Height	mm (ft-in)	725 (2' 5")
W	Width	mm (ft-in)	310 (1' 0")
Wt	Weight	kg (lb)	480 (1060)

※ 2.45 m (8' 0") arm with bucket cylinder (Including piping and pins).



(2) 2.0 m (6' 7") arm

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	2740 (9' 0")
H	Height	mm (ft-in)	772 (2' 6")
W	Width	mm (ft-in)	310 (1' 0")
Wt	Weight	kg (lb)	421 (930)

※ 2.0 m (6' 7") arm with bucket cylinder (Including piping and pins).

(3) 2.6 m (8' 7") arm

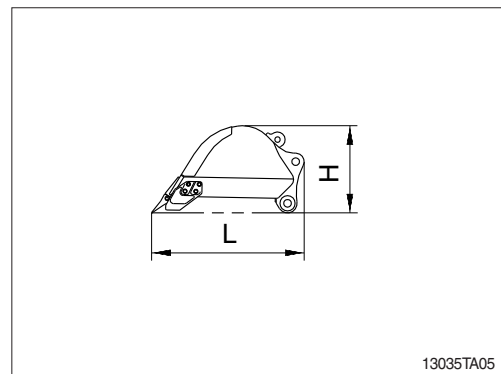
Mark	Description	Unit	Specification
L	Length	mm (ft-in)	3331 (10' 11")
H	Height	mm (ft-in)	726 (2' 5")
W	Width	mm (ft-in)	310 (1' 0")
Wt	Weight	kg (lb)	498 (1100)

※ 2.6 m (8' 6") arm with bucket cylinder (Including piping and pins).

4) BUCKET ASSEMBLY

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	1386 (4' 7")
H	Height	mm (ft-in)	884 (2' 11")
W	Width	mm (ft-in)	1108 (3' 8")
Wt	Weight	kg (lb)	484 (1070)

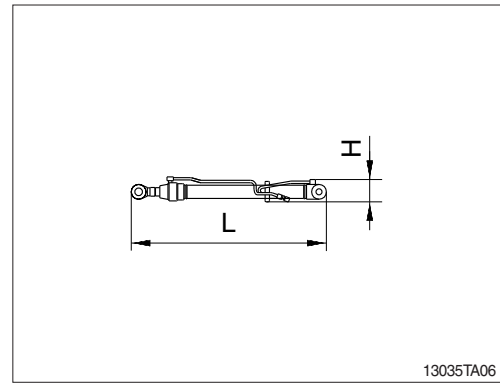
※ 0.58 m³ (0.76 yd³) SAE heaped bucket (Including tooth and side cutters).



(5) Boom cylinder (2 EA)

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	1715 (5' 8")
H	Height	mm (ft-in)	222 (0' 9")
W	Width	mm (ft-in)	201 (0' 8")
Wt	Weight	kg (lb)	119 (260)

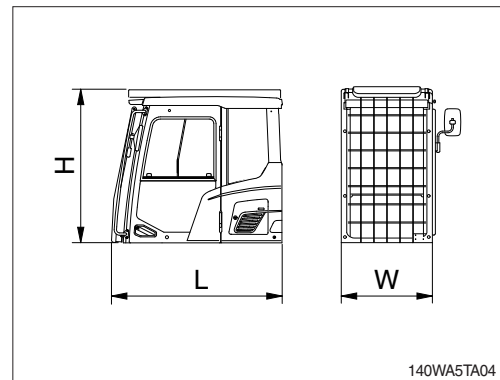
※ Including piping.



(6) Cab assembly

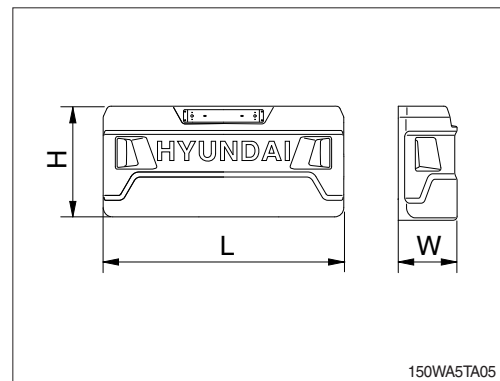
Mark	Description	Unit	Specification
L	Length	mm (ft-in)	1950 (6' 5") [2070 (6' 10")]
H	Height	mm (ft-in)	1780 (5' 10") [1822 (6')]
W	Width	mm (ft-in)	1104 (3' 7") [1126 (3' 8")]
Wt	Weight	kg (lb)	495 (1092) [650 (1433)]

[] : with FOG GUARD



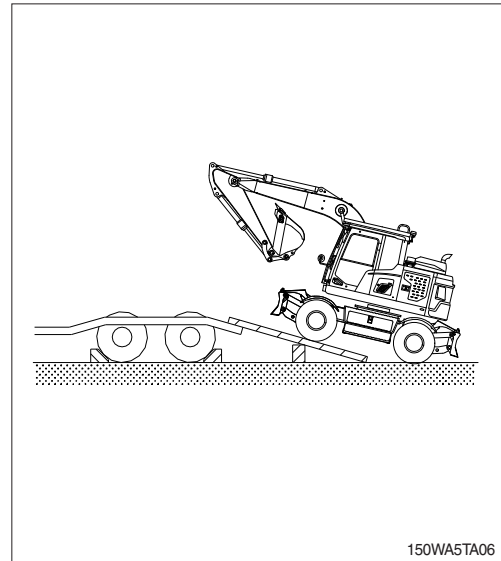
(7) Counterweight

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	2500 (8' 2")
H	Height	mm (ft-in)	1150 (3' 9")
W	Width	mm (ft-in)	581 (1' 11")
Wt	Weight	kg (lb)	3250 (7170)

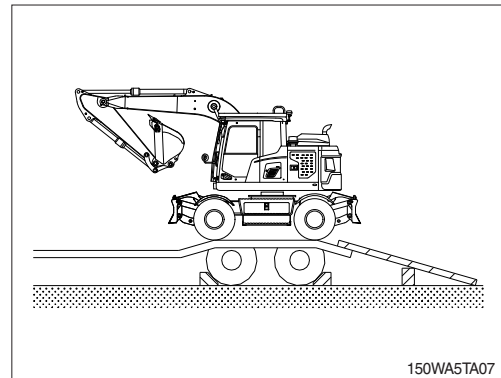


4. LOADING THE MACHINE

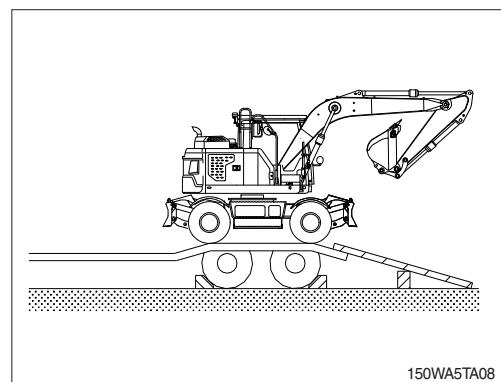
- 1) Load and unload the machine on flat ground.
- 2) Use the gangplank with sufficient length, width, thickness and gradient.
- 3) Place block tires of the truck and the trailer not to move the trailer.
- 4) Place the swing lock switch to the **LOCK** position before fixing the machine at the bed of trailer and confirm if the machine is parallel to the bed of trailer.
- 5) Drive straight and depress the acceleration pedal slowly on the gangplank with the two speed switch positioned as low speed.



- 6) Do the following after loading the machine to the trailer.
 - (1) Stop loading when the machine is located horizontally with the rear wheel of trailer.



- (2) Place the swing lock switch to the **LOCK** position after the swinging the machine 180°.



(3) Lower the working equipment gently after the location is determined.

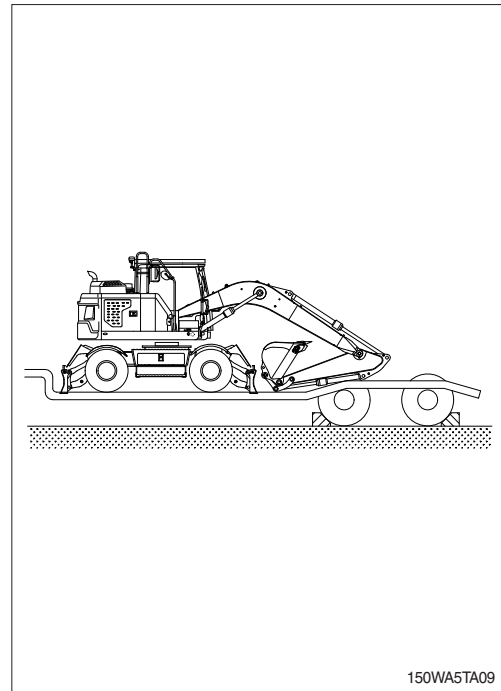
※ Place rectangular timber under the bucket cylinder to prevent the damage of it during transportation.

▲ Be sure to keep the travel speed switch on the low speed while loading and unloading the machine.

▲ Avoid using the working equipment for loading and unloading as it will be very dangerous.

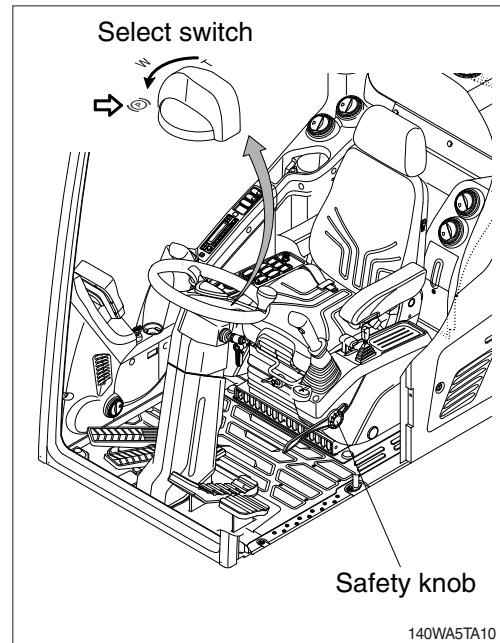
▲ Do not operate any other device when loading.

▲ Be careful as to the boundaries of loading plate or trailer as the balance of machine will abruptly change.

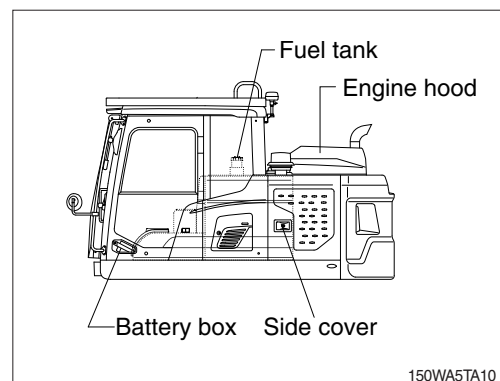


5. FIXING THE MACHINE

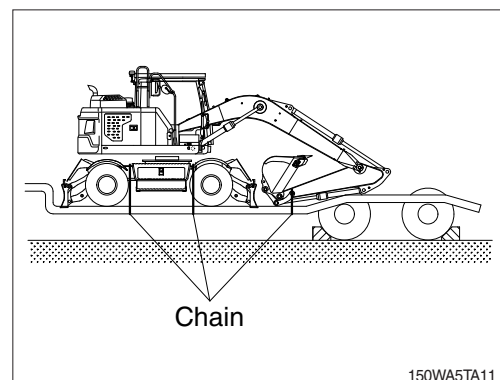
- 1) Place the swing lock switch to the LOCK position.
- 2) Place the select switch to the parking position.
- 3) Keep the safety knob in the LOCK position.
- 4) Turn OFF all the switches and remove the key.



- 5) Secure all locks.



- 6) Place timbers behind the tires, secure the machine to trailer with chains or straps which are in good condition and approved for the weight which they will be securing, to prevent the machine from moving in any direction.



6. LOADING AND UNLOADING BY CRANE

⚠ The wrong hoisting method or installation of lifting device can cause serious injury, death, or damage to the machine.

- 1) Check the weight, length, width and height of the machine referring to the chapter 7. Specification when you are going to hoist the machine.
- 2) Use approved lifting device and ensure distance between lifting device and machine to avoid contact between the two.
- 3) Place rubber plates at lifting points to avoid any damage to the machine.
- 4) Place crane in the proper place.
- 5) After the boom is raised to the maximum high, install approved lifting device as shown in the illustration.

⚠ Make sure wire rope is proper size.

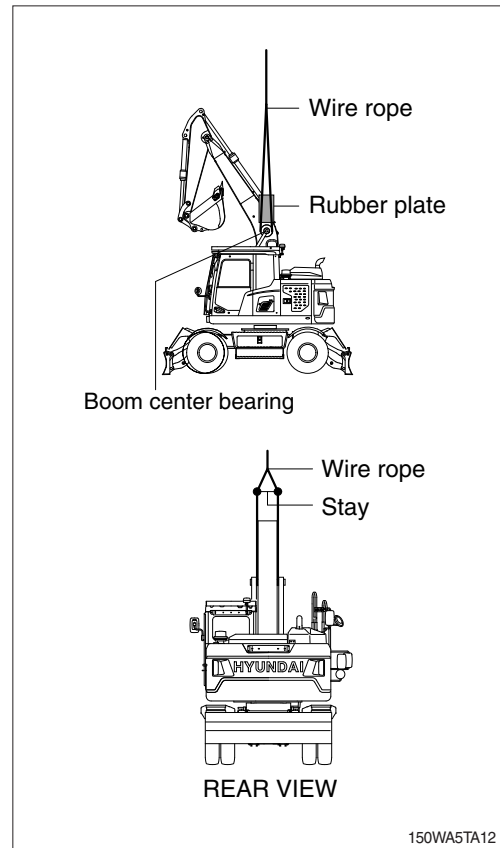
⚠ Place the safety knob to LOCK position to prevent the machine from moving when hoisting the machine.

⚠ Do not load abruptly.

⚠ Keep area clear of any and all personnel.

⚠ Recommend to manufacture the stays separately as per lifting conditions.

⚠ Do not use the counterweight lug or hole of the lower working attachment for lifting purpose.



TROUBLESHOOTING GUIDE

1. ENGINE

※ This guide is not intended to cover every condition, however many of the more common possibilities are listed.

Trouble	Service	Remark
The engine oil pressure lamp lights up when engine speed is raised after completion of warm up.	<ul style="list-style-type: none"> · Add the oil to the specified level. · Replace the oil filter cartridge. · Check oil leakage from the pipe or the joint. · Replace the monitor. 	
Steam is emitted from the top part of the radiator (the pressure valve). Coolant level warning lamp lights up.	<ul style="list-style-type: none"> · Supply coolant and check leakage. · Adjust fan belt tension. · Wash out inside of cooling system. · Clean or repair the radiator fin. · Check the thermostat. · Tighten the radiator cap firmly or replace the cap itself. · Replace the monitor. 	
The engine does not start when the starting motor is turned over.	<ul style="list-style-type: none"> · Confirm fuel supply. · Repair where air is leaking into fuel system. · Check the injection pump or the nozzle. · Check the valve clearance. · Check engine compression. · In cold weather, check if fuel warmer system is working normal. 	Refer to the pages 3-49 and 2-4.
Exhaust gas is white or blue.	<ul style="list-style-type: none"> · Adjust to specified oil quantity. · Replace with specified fuel. 	
Exhaust gas occasionally turns black.	<ul style="list-style-type: none"> · Clean or replace the air cleaner element. · Check the nozzle. · Check engine compression. · Clean or replace the turbocharger. 	
Combustion noise occasionally changes to breathing sound.	<ul style="list-style-type: none"> · Check the nozzle. 	
Unusual combustion noise or mechanical noise.	<ul style="list-style-type: none"> · Confirm fuel quality. · Check over-heating · Replace the muffler. · Adjust valve clearance. 	

2. ELECTRICAL SYSTEM

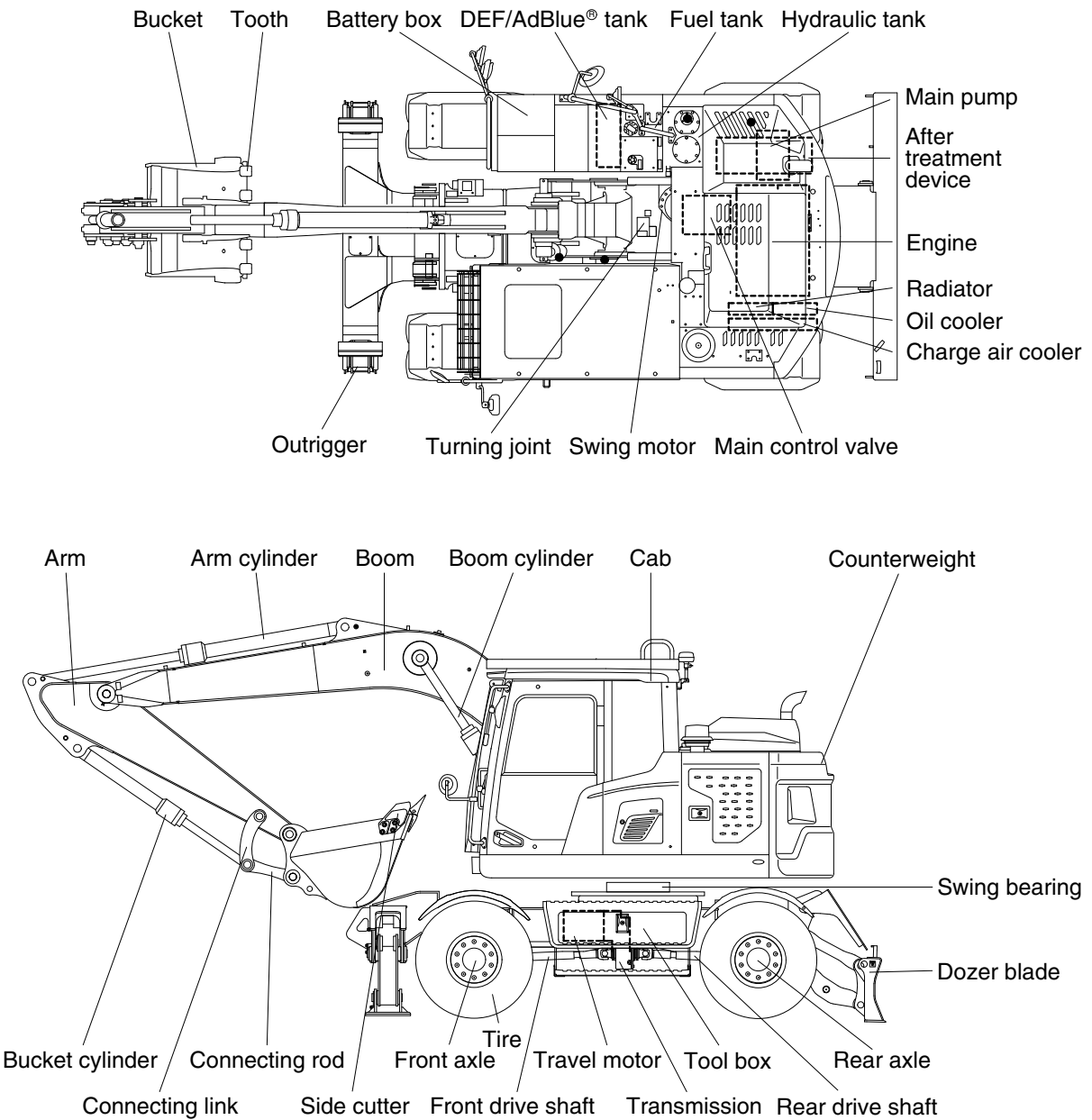
Trouble	Service	Remark
Work lamp does not glow brightly or flickers even when engine runs at high idle.	<ul style="list-style-type: none"> · Check for loose terminals and open-circuit wiring. · Adjust belt tension. 	
Battery charging lamp does not go out even when engine runs at high speed.	<ul style="list-style-type: none"> · Check the alternator. · Check and repair wiring. 	
Unusual noise is emitted from the alternator.	<ul style="list-style-type: none"> · Check the alternator. 	
Starting motor does not turn when starting switch is turned ON.	<ul style="list-style-type: none"> · Check and repair the wiring. · Charge the battery. · Check the starting motor. · Check the safety relay. 	
The pinion of the starting motor keeps going in and out.	<ul style="list-style-type: none"> · Charge the battery. · Check the safety relay. 	
Starting motor turns the engine sluggishly.	<ul style="list-style-type: none"> · Charge the battery. · Check the starting motor. 	
The starting motor disengages before the engine starts up.	<ul style="list-style-type: none"> · Check and repair the wiring. · Charge the battery. 	
The engine warming up lamp does not go ON.	<ul style="list-style-type: none"> · Check and repair wiring. · Check the monitor. 	
The engine oil pressure lamp does not light up when engine is stationary (when the starting switch is in ON position.)	<ul style="list-style-type: none"> · Check the monitor. · Check the caution lamp switch. 	
Battery charging lamp does not light up when the engine is stationary. (when the starting switch is in ON position.)	<ul style="list-style-type: none"> · Check the monitor. · Check and repair the wiring. 	

3. OTHERS

Trouble	Service	Remark
Bucket either rises slowly or not at all.	<ul style="list-style-type: none">· Add oil to specified level.	
Slow speed of travel, swing, boom, arm and bucket.	<ul style="list-style-type: none">· Add oil to specified level.	
Unusual noise emitted from pump.	<ul style="list-style-type: none">· Clean the hydraulic tank strainer.	
Excessive oil temperature rise of hydraulic oil.	<ul style="list-style-type: none">· Clean and check the oil cooler.· Adjust fan belt tension.· Add oil to specified level.	

SPECIFICATIONS

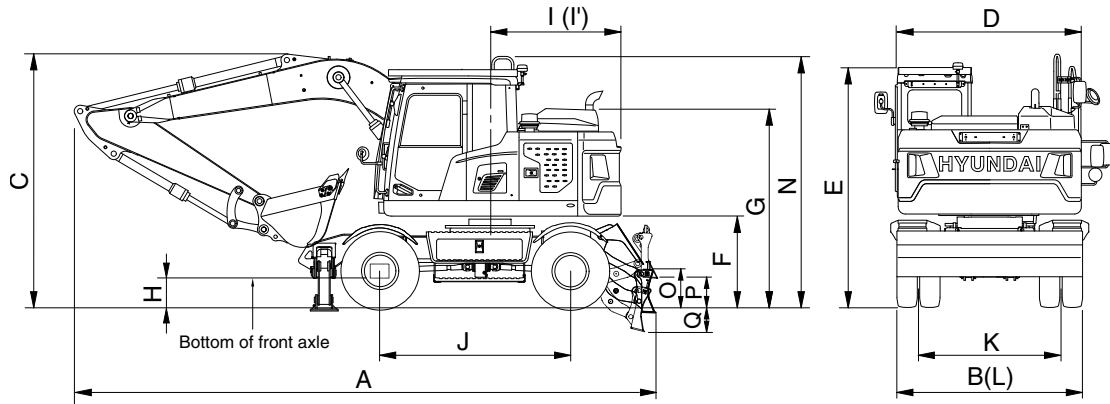
1. MAJOR COMPONENTS



150WA2SP01

2. SPECIFICATIONS

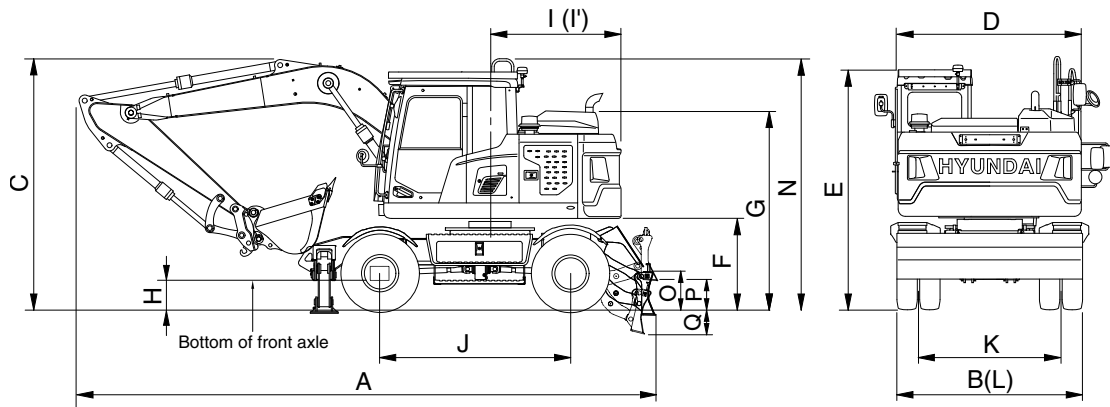
1) 4.6 m (15' 1") MONO BOOM, WITHOUT QUICK COUPLER



150WA2SP02

Description	Unit		Specification		
	m (ft-in)	Boom Arm	4.6 m (15' 1")		
Operating weight	kg (lb)		16870 (37190)	16810 (37060)	16890 (37240)
Bucket capacity (SAE heaped), standard	m ³ (yd ³)		0.58 (0.76)	0.58 (0.76)	0.58 (0.76)
Overall length (travel)	A	mm (ft-in)	7710 (25' 4")	7885 (25' 10")	7610 (25' 0")
Overall length (shipping)			7830 (25' 8")	7780 (25' 6")	7845 (25' 9")
Overall width	B		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of boom (travel)	C		3790 (12' 5")	3270 (10' 9")	3930 (12' 11")
Overall height of boom (shipping)			2990 (9' 10")	2820 (9' 3")	3110 (10' 2")
Overall width of upperstructure	D		2510 (8' 3")	2510 (8' 3")	2510 (8' 3")
Overall height of cab	E		3230 (10' 7")	3230 (10' 7")	3230 (10' 7")
Ground clearance of counterweight	F		1265 (4' 2")	1265 (4' 2")	1265 (4' 2")
Overall height of engine hood	G		2730 (8' 11")	2730 (8' 11")	2730 (8' 11")
Minimum ground clearance	H		370 (1' 3")	370 (1' 3")	370 (1' 3")
Rear-end distance	I		1790 (5' 10")	1790 (5' 10")	1790 (5' 10")
Rear-end swing radius	I'		1800 (5' 11")	1800 (5' 11")	1800 (5' 11")
Wheel base	J		2600 (8' 6")	2600 (8' 6")	2600 (8' 6")
Tread	K		1944 (6' 5")	1944 (6' 5")	1944 (6' 5")
Blade width	L		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of guardrail	N		3450 (11' 4")	3450 (11' 4")	3450 (11' 4")
Height of blade	O		625 (2' 1")	625 (2' 1")	625 (2' 1")
Ground clearance of blade up	P		405 (1' 4")	405 (1' 4")	405 (1' 4")
Depth of blade down	Q		170 (0' 7")	170 (0' 7")	170 (0' 7")
Travel speed	Low		km/hr (mph)	10 (6.2)	10 (6.2)
	High	35 (21.7)		35 (21.7)	35 (21.7)
	Creep	3 (1.9)		3 (1.9)	3 (1.9)
Swing speed	rpm	9.5	9.5	9.5	
Gradeability	Degree (%)	30 (58)	30 (58)	30 (58)	
Max traction force	kg (lb)	9234 (20360)	9234 (20360)	9234 (20360)	

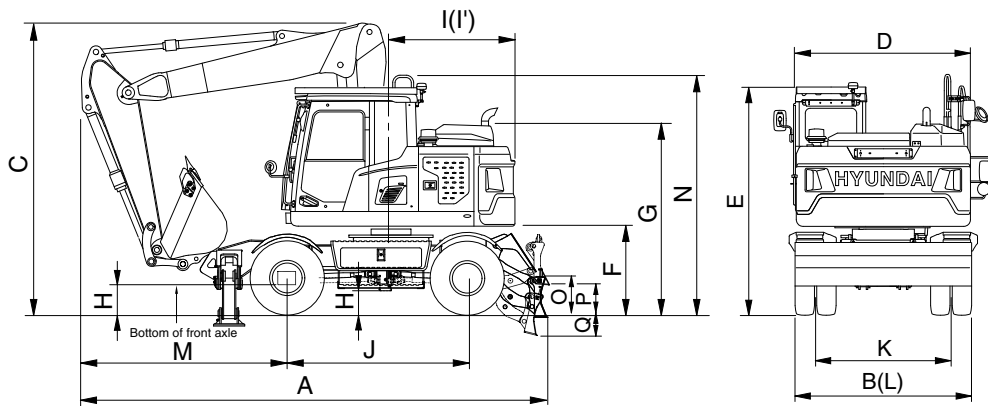
2) 4.6 m (15' 1") MONO BOOM, WITH QUICK COUPLER



150WA2SP03

Description	Unit		Specification		
	m (ft-in)	Boom Arm	4.6 m (15' 1")		
			2.45 (8' 0")	2.00 (6' 7")	2.60 (8' 6")
Operating weight	kg (lb)		17050 (37590)	16990 (37460)	17070 (37630)
Bucket capacity (SAE heaped), standard	m ³ (yd ³)		0.58 (0.76)	0.58 (0.76)	0.58 (0.76)
Overall length (travel)	A	mm (ft-in)	7640 (25' 1")	7800 (25' 7")	7580 (24' 10")
Overall length (shipping)			7840 (25' 9")	7780 (25' 6")	7810 (25' 7")
Overall width	B		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of boom (travel)	C		3870 (12' 8")	3650 (12' 0")	3930 (12' 11")
Overall height of boom (shipping)			3140 (10' 4")	2820 (9' 3")	3270 (10' 9")
Overall width of upperstructure	D		2510 (8' 3")	2510 (8' 3")	2510 (8' 3")
Overall height of cab	E		3230 (10' 7")	3230 (10' 7")	3230 (10' 7")
Ground clearance of counterweight	F		1265 (4' 2")	1265 (4' 2")	1265 (4' 2")
Overall height of engine hood	G		2730 (8' 11")	2730 (8' 11")	2730 (8' 11")
Minimum ground clearance	H		370 (1' 3")	370 (1' 3")	370 (1' 3")
Rear-end distance	I		1790 (5' 10")	1790 (5' 10")	1790 (5' 10")
Rear-end swing radius	I'		1800 (5' 11")	1800 (5' 11")	1800 (5' 11")
Wheel base	J		2600 (8' 6")	2600 (8' 6")	2600 (8' 6")
Tread	K		1944 (6' 5")	1944 (6' 5")	1944 (6' 5")
Blade width	L		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of guardrail	N		3450 (11' 4")	3450 (11' 4")	3450 (11' 4")
Height of blade	O		625 (2' 1")	625 (2' 1")	625 (2' 1")
Ground clearance of blade up	P		405 (1' 4")	405 (1' 4")	405 (1' 4")
Depth of blade down	Q		170 (0' 7")	170 (0' 7")	170 (0' 7")
Travel speed	Low		km/hr (mph)	10 (6.2)	10 (6.2)
	High	35 (21.7)		35 (21.7)	35 (21.7)
	Creep	3 (1.9)		3 (1.9)	3 (1.9)
Swing speed	rpm	9.5	9.5	9.5	
Gradeability	Degree (%)	30 (58)	30 (58)	30 (58)	
Max traction force	kg (lb)	9234 (20360)	9234 (20360)	9234 (20360)	

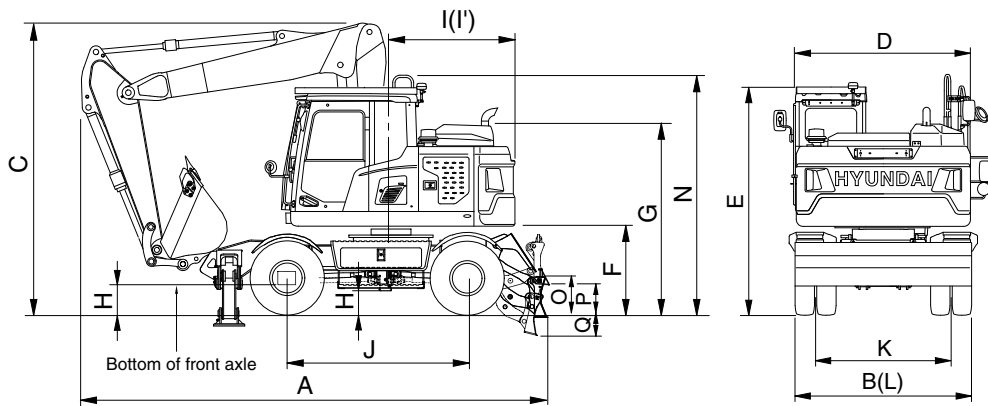
3) 2-PIECE BOOM, WITHOUT QUICK COUPLER



150WA2SP04

Description	Unit		Specification		
	m (ft-in)	Boom Arm	4.71 m (15' 5")		
			2.45 (8' 0")	2.00 (6' 7")	2.60 (8' 6")
Operating weight	kg (lb)		17170 (37850)	17110 (37720)	17190 (37900)
Bucket capacity (SAE heaped), standard	m ³ (yd ³)		0.58 (0.76)	0.58 (0.76)	0.58 (0.76)
Overall length (travel)	A	mm (ft-in)	5940 (19' 6")	5980 (19' 7")	5920 (19' 5")
Overall length (shipping)			7945 (26' 1")	7940 (26' 1")	7950 (26' 1")
Overall width	B		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of boom (travel)	C		3970 (13' 0")	3980 (13' 1")	3980 (13' 1")
Overall height of boom (shipping)			2990 (9' 10")	2940 (9' 8")	3040 (10' 0")
Overall width of upperstructure	D		2510 (8' 3")	2510 (8' 3")	2510 (8' 3")
Overall height of cab	E		3230 (10' 7")	3230 (10' 7")	3230 (10' 7")
Ground clearance of counterweight	F		1265 (4' 2")	1265 (4' 2")	1265 (4' 2")
Overall height of engine hood	G		2730 (8' 11")	2730 (8' 11")	2730 (8' 11")
Minimum ground clearance	H		370 (1' 3")	370 (1' 3")	370 (1' 3")
Rear-end distance	I		1790 (5' 10")	1790 (5' 10")	1790 (5' 10")
Rear-end swing radius	I'		1800 (5' 11")	1800 (5' 11")	1800 (5' 11")
Wheel base	J		2600 (8' 6")	2600 (8' 6")	2600 (8' 6")
Tread	K		1944 (6' 5")	1944 (6' 5")	1944 (6' 5")
Blade width	L		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
End of attachment to steering wheel	M		2665 (8' 9")	2695 (8' 10")	2635 (8' 8")
Overall height of guardrail	N		3450 (11' 4")	3450 (11' 4")	3450 (11' 4")
Height of blade	O		625 (2' 1")	625 (2' 1")	625 (2' 1")
Ground clearance of blade up	P		405 (1' 4")	405 (1' 4")	405 (1' 4")
Depth of blade down	Q		170 (0' 7")	170 (0' 7")	170 (0' 7")
Travel speed	Low	km/hr (mph)	10 (6.2)	10 (6.2)	10 (6.2)
	High		35 (21.7)	35 (21.7)	35 (21.7)
	Creep		3 (1.9)	3 (1.9)	3 (1.9)
Swing speed	rpm		9.5	9.5	9.5
Gradeability	Degree (%)		30 (58)	30 (58)	30 (58)
Max traction force	kg (lb)		9234 (20360)	9234 (20360)	9234 (20360)

4) 2-PIECE BOOM, WITH QUICK COUPLER

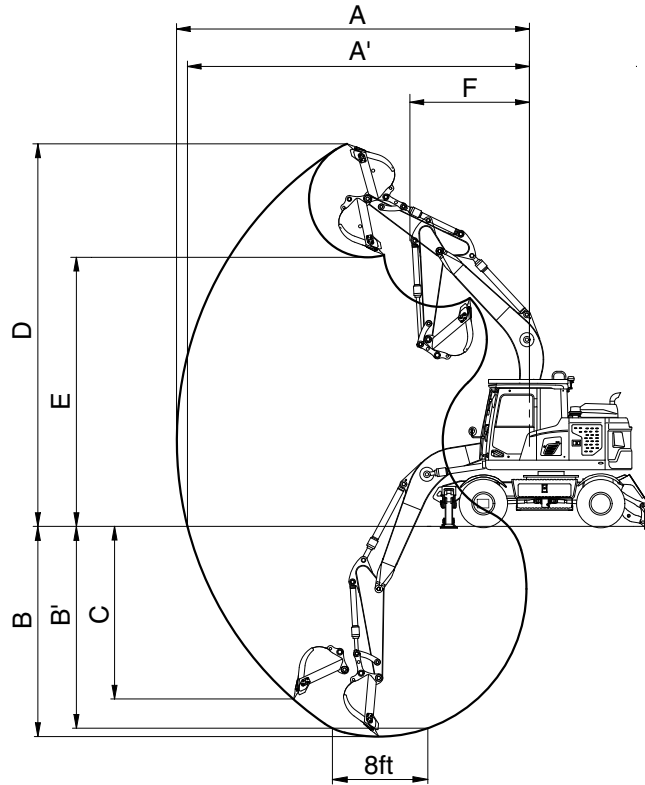


150WA2SP04

Description	Unit		Specification		
	m (ft-in)	Boom Arm	4.71 m (15' 5")		
Operating weight	kg (lb)		17350 (38250)	17290 (38120)	17370 (38290)
Bucket capacity (SAE heaped), standard	m ³ (yd ³)		0.58 (0.76)	0.58 (0.76)	0.58 (0.76)
Overall length (travel)	A	mm (ft-in)	5950 (19' 6")	5970 (19' 7")	5925 (19' 5")
Overall length (shipping)			7945 (26' 1")	7950 (26' 1")	7950 (26' 1")
Overall width	B		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of boom (travel)	C		3970 (13' 0")	3980 (13' 1")	3980 (13' 1")
Overall height of boom (shipping)			2990 (9' 10")	2990 (9' 10")	3140 (10' 4")
Overall width of upperstructure	D		2510 (8' 3")	2510 (8' 3")	2510 (8' 3")
Overall height of cab	E		3230 (10' 7")	3230 (10' 7")	3230 (10' 7")
Ground clearance of counterweight	F		1265 (4' 2")	1265 (4' 2")	1265 (4' 2")
Overall height of engine hood	G		2730 (8' 11")	2730 (8' 11")	2730 (8' 11")
Minimum ground clearance	H		370 (1' 3")	370 (1' 3")	370 (1' 3")
Rear-end distance	I		1790 (5' 10")	1790 (5' 10")	1790 (5' 10")
Rear-end swing radius	I'		1800 (5' 11")	1800 (5' 11")	1800 (5' 11")
Wheel base	J		2600 (8' 6")	2600 (8' 6")	2600 (8' 6")
Tread	K		1944 (6' 5")	1944 (6' 5")	1944 (6' 5")
Blade width	L		2530 (8' 4")	2530 (8' 4")	2530 (8' 4")
Overall height of guardrail	N		3450 (11' 4")	3450 (11' 4")	3450 (11' 4")
Height of blade	O		625 (2' 1")	625 (2' 1")	625 (2' 1")
Ground clearance of blade up	P		405 (1' 4")	405 (1' 4")	405 (1' 4")
Depth of blade down	Q		170 (0' 7")	170 (0' 7")	170 (0' 7")
Travel speed	Low		km/hr (mph)	10 (6.2)	10 (6.2)
	High	35 (21.7)		35 (21.7)	35 (21.7)
	Creep	3 (1.9)		3 (1.9)	3 (1.9)
Swing speed	rpm		9.5	9.5	9.5
Gradeability	Degree (%)		30 (58)	30 (58)	30 (58)
Max traction force	kg (lb)		9234 (20360)	9234 (20360)	9234 (20360)

3. WORKING RANGE AND WORKING RANGE

1) 4.6 m (15' 1") MONO BOOM, WITHOUT QUICK COUPLER

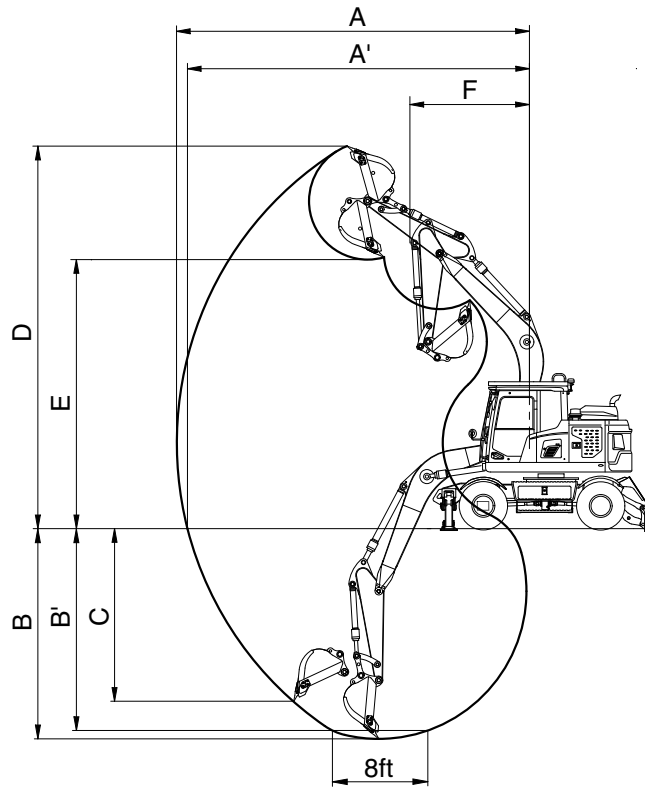


150WA2SP06

Description		m (ft-in)	2.45 (8' 0") Arm	2.00 (6' 7") Arm	2.60 (8' 6") Arm
Max digging reach	A	mm (ft-in)	8370 (27' 6")	7940 (26' 1")	8520 (27' 11")
Max digging reach on ground	A'		8150 (26' 9")	7710 (25' 4")	8300 (27' 3")
Max digging depth	B		5130 (16' 10")	4680 (15' 4")	5280 (17' 4")
Max digging depth (8 ft level)	B'		4920 (16' 2")	4425 (14' 6")	5070 (16' 8")
Max vertical wall digging depth	C		4675 (15' 4")	4220 (13' 10")	4820 (15' 10")
Max digging height	D		8830 (29' 0")	8520 (27' 11")	8920 (29' 3")
Max dumping height	E		6380 (20' 11")	6080 (19' 11")	6470 (21' 3")
Min swing radius	F		2740 (9' 0")	2650 (8' 8")	2755 (9' 0")
Bucket digging force	SAE	kN	87.9 [95.4]	87.8 [95.3]	87.9 [95.4]
		kgf	8961 [9730]	8957 [9720]	8961 [9730]
		lbf	19755 [21451]	19747 [21429]	19755 [21451]
	ISO	kN	102.9 [111.7]	102.9 [111.7]	102.9 [111.7]
		kgf	10494 [11390]	10489 [11390]	10494 [11390]
		lbf	23135 [25111]	23125 [25111]	23135 [25111]
Arm digging force	SAE	kN	63.6 [69.0]	74.2 [80.6]	61.1 [66.3]
		kgf	6485 [7040]	7569 [8220]	6230 [6760]
		lbf	14297 [15521]	16688 [18122]	13735 [14903]
	ISO	kN	66.3 [72.0]	77.9 [84.5]	63.6 [69.0]
		kgf	6764 [7340]	7942 [8620]	6486 [7040]
		lbf	14911 [16182]	17509 [19004]	14299 [15521]

[] : Power boost

2) 4.6 m (15' 1") MONO BOOM, WITH QUICK COUPLER

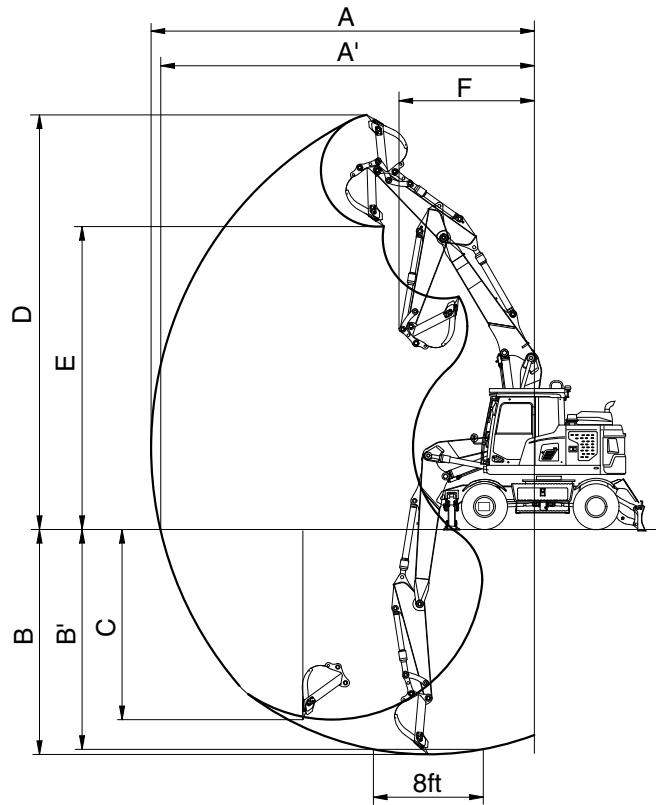


150WA2SP06

Description		m (ft-in)	2.45 (8' 0") Arm	2.00 (6' 7") Arm	2.60 (8' 6") Arm
Max digging reach	A	mm (ft-in)	8600 (28' 3")	8170 (26' 10")	8740 (28' 8")
Max digging reach on ground	A'		8390 (27' 6")	7940 (26' 1")	8530 (28' 0")
Max digging depth	B		5350 (17' 7")	4900 (16' 1")	5500 (18' 1")
Max digging depth (8 ft level)	B'		5160 (16' 11")	4680 (15' 4")	5320 (17' 5")
Max vertical wall digging depth	C		4500 (14' 9")	3950 (13' 0")	4650 (15' 3")
Max digging height	D		9060 (29' 9")	8750 (28' 8")	9150 (30' 0")
Max dumping height	E		6150 (20' 2")	5860 (19' 3")	6250 (20' 6")
Min swing radius	F		2740 (9' 0")	2735 (9' 0")	2755 (9' 0")
Bucket digging force	SAE	kN	76.5 [83.1]	76.5 [83.1]	76.5 [83.1]
		kgf	7801 [8470]	7797 [8470]	7801 [8470]
		lbf	17199 [18673]	17190 [18673]	17199 [18673]
	ISO	kN	85.8 [93.2]	85.7 [93.1]	85.8 [93.2]
		kgf	8748 [9500]	8743 [9490]	8748 [9500]
		lbf	19285 [20944]	19275 [20922]	19285 [20944]
Arm digging force	SAE	kN	59.8 [64.9]	69.2 [75.1]	57.5 [62.5]
		kgf	6094 [6620]	7053 [7660]	5868 [6370]
		lbf	13435 [14595]	15549 [16887]	12937 [14043]
	ISO	kN	61.9 [67.2]	71.9 [78.2]	59.5 [64.6]
		kgf	6311 [6850]	7336 [7970]	6068 [6590]
		lbf	13912 [15102]	16174 [17571]	13377 [14528]

[] : Power boost

3) 2-PIECE BOOM, WITHOUT QUICK COUPLER

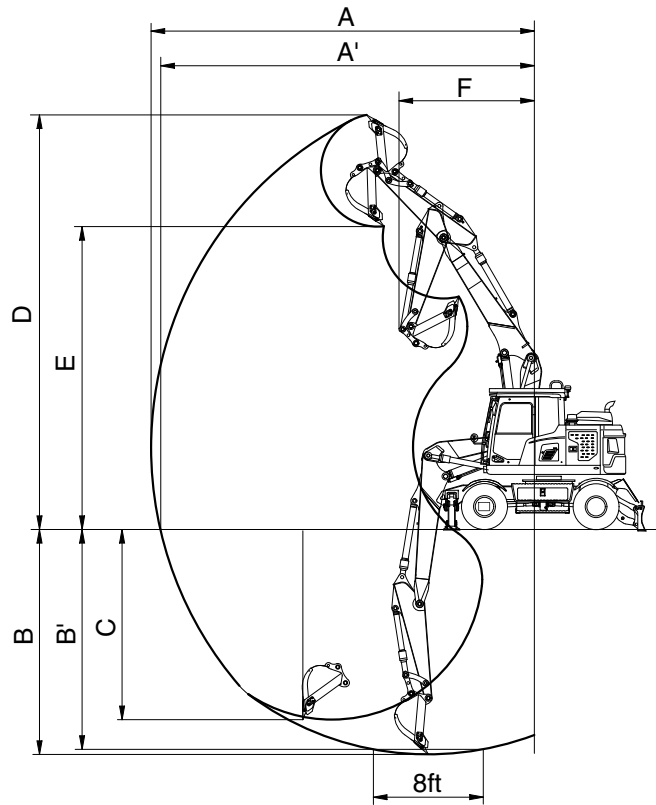


150WA2SP08

Description		m (ft-in)	2.45 (8' 0") Arm	2.00 (6' 7") Arm	2.60 (8' 6") Arm
Max digging reach	A	mm (ft-in)	8550 (28' 1")	8110 (26' 7")	8700 (28' 7")
Max digging reach on ground	A'		8340 (27' 4")	7890 (25' 11")	8490 (27' 10")
Max digging depth	B		5020 (16' 6")	4570 (15' 0")	5170 (17' 0")
Max digging depth (8 ft level)	B'		4910 (16' 1")	4450 (14' 7")	5060 (16' 7")
Max vertical wall digging depth	C		4430 (14' 6")	3950 (13' 0")	4575 (15' 0")
Max digging height	D		9460 (31' 0")	9110 (29' 11")	9580 (31' 5")
Max dumping height	E		6970 (22' 10")	6630 (21' 9")	7090 (23' 3")
Min swing radius	F		2670 (8' 9")	2660 (8' 9")	2710 (8' 11")
Bucket digging force	SAE	kN	87.9 [95.4]	87.8 [95.3]	87.9 [95.4]
		kgf	8961 [9730]	8957 [9720]	8961 [9730]
		lbf	19755 [21451]	19747 [21429]	19755 [21451]
	ISO	kN	102.9 [111.7]	102.9 [111.7]	102.9 [111.7]
		kgf	10494 [11390]	10489 [11390]	10494 [11390]
		lbf	23135 [25111]	23125 [25111]	23135 [25111]
Arm digging force	SAE	kN	63.6 [69.0]	74.2 [80.6]	61.1 [66.3]
		kgf	6485 [7040]	7569 [8220]	6230 [6760]
		lbf	14297 [15521]	16688 [18122]	13735 [14903]
	ISO	kN	66.3 [72.0]	77.9 [84.5]	63.6 [69.0]
		kgf	6764 [7340]	7942 [8620]	6486 [7040]
		lbf	14911 [16182]	17509 [19004]	14299 [15521]

[] : Power boost

4) 2-PIECE BOOM, WITH QUICK COUPLER



150WA2SP08

Description		m (ft-in)	2.45 (8' 0") Arm	2.00 (6' 7") Arm	2.60 (8' 6") Arm
Max digging reach	A	mm (ft-in)	8780 (28' 10")	8340 (27' 4")	8925 (29' 3")
Max digging reach on ground	A'		8570 (28' 1")	8120 (26' 8")	8719 (28' 7")
Max digging depth	B		5250 (17' 3")	4800 (15' 9")	5400 (17' 9")
Max digging depth (8 ft level)	B'		5140 (16' 10")	4680 (15' 4")	5290 (17' 4")
Max vertical wall digging depth	C		4240 (13' 11")	3750 (12' 4")	4380 (14' 4")
Max digging height	D		9690 (31' 9")	9340 (30' 8")	9810 (32' 2")
Max dumping height	E		6750 (22' 2")	6400 (21' 0")	6870 (22' 6")
Min swing radius	F		2670 (8' 9")	2660 (8' 9")	2710 (8' 11")
Bucket digging force	SAE	kN	76.5 [83.1]	76.5 [83.1]	76.5 [83.1]
		kgf	7801 [8470]	7797 [8470]	7801 [8470]
		lbf	17199 [18673]	17190 [18673]	17199 [18673]
	ISO	kN	85.8 [93.2]	85.7 [93.1]	85.8 [93.2]
		kgf	8748 [9500]	8743 [9490]	8748 [9500]
		lbf	19285 [20944]	19275 [20922]	19285 [20944]
Arm digging force	SAE	kN	59.8 [64.9]	69.2 [75.1]	57.5 [62.5]
		kgf	6094 [6620]	7053 [7660]	5868 [6370]
		lbf	13435 [14595]	15549 [16887]	12937 [14043]
	ISO	kN	61.9 [67.2]	71.9 [78.2]	59.5 [64.6]
		kgf	6311 [6850]	7336 [7970]	6068 [6590]
		lbf	13912 [15102]	16174 [17571]	13377 [14528]

[] : Power boost


4. WEIGHT

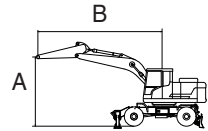
Item	Mono boom		2-piece boom	
	kg	lb	kg	lb
Upperstructure assembly				
· Main frame weld assembly	1220	2690	1220	2690
· Engine assembly	378	833	378	833
· Aftertreatment assembly	64	141	64	141
· Main pump assembly	91	201	91	201
· Main control valve assembly	145	319	145	319
· Swing motor assembly	148	326	148	326
· Hydraulic oil tank WA	156	344	156	344
· Hydraulic oil (max)	89	197	89	197
· Fuel oil tank WA	135	298	135	298
· Fuel oil (max)	170	375	170	375
· Counterweight (STD)	3250	7165	3250	7165
· Cab assembly	495	1091	495	1091
Lower chassis assembly				
· Lower frame weld assembly	1552	3422	1552	3422
· Swing bearing	260	573	260	573
· Travel motor assembly	80	176	80	176
· Turning joint	117	258	117	258
· Transmission assembly	135	298	135	298
· Front axle assembly	637	1404	637	1404
· Front axle assembly (wide)	655	1444	655	1444
· Rear axle assembly	534	1177	534	1177
· Rear axle assembly (wide)	547	1206	547	1206
· Dozer blade assembly (front)	771	1700	770	1698
· Dozer blade assembly (rear)	771	1700	770	1698
· Front outrigger assembly	982	2165	982	2165
· Rear outrigger assembly	982	2165	982	2165
Front attachment assembly (4.6 m boom, 2.45 m arm, 0.58 m ³ SAE heaped bucket)				
· 4.6 m boom assembly	822	1812	-	-
· 4.71 m 2PCS boom assembly	-	-	939	2070
· 2.45 m arm assembly	428	944	428	944
· 2.00 m arm assembly	371	818	371	818
· 2.60 m arm assembly	448	988	448	988
· 0.58 m ³ SAE heaped bucket assembly	484	1067	484	1067
· 0.52 m ³ SAE heaped bucket assembly	461	1016	461	1016
· 0.65 m ³ SAE heaped bucket assembly	513	1131	513	1131
· 0.71 m ³ SAE heaped bucket assembly	536	1182	536	1182
· 0.55 m ³ SAE heaped bucket assembly	585	1290	585	1290
· 0.45 m ³ SAE heaped bucket assembly	410	904	410	904
· 0.50 m ³ SAE heaped bucket assembly	439	968	439	968
· 0.61 m ³ SAE heaped bucket assembly	490	1080	490	1080
· Boom cylinder assembly (2EA)	119	262	-	-
· Arm cylinder assembly	145	320	145	320
· Bucket cylinder assembly	104	229	104	229
· 2-piece cylinder assembly (2EA)	-	-	123	271
· 2-piece adjust cylinder assembly	-	-	168	370
· Dozer cylinder assembly (2EA)	43	95	43	95
· Outrigger cylinder assembly (2EA)	91	202	91	282
· Bucket control link total	88	194	88	194











5. LIFTING CAPACITIES

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	MONO BOOM	4600	2000	3250	-	500	-	Down	-	-

·  : Rating over-front

·  : Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)								At max. reach			
	1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
											m (ft)	
6.0 m (19.7 ft)	kg					*4420	4350			*3340	*3340	5.19
	lb					*9740	9590			*7360	*7360	(17.0)
4.5 m (14.8 ft)	kg					*4810	4240	*3870	2710	*3120	2610	6.13
	lb					*10600	9350	*8530	5970	*6880	5750	(20.1)
3.0 m (9.8 ft)	kg					*5800	4020	4190	2640	*3150	2290	6.59
	lb					*12790	8860	9240	5820	*6940	5050	(21.6)
1.5 m (4.9 ft)	kg					6280	3800	4090	2550	*3380	2190	6.68
	lb					13850	8380	9020	5620	*7450	4830	(21.9)
0.0 m (0.0 ft)	kg			*6020	*6020	6150	3680	4030	2500	3670	2290	6.42
	lb			*13270	*13270	13560	8110	8880	5510	8090	5050	(21.0)
-1.5 m (-4.9 ft)	kg	*6310	*6310	*9650	6750	6150	3680			4310	2670	5.74
	lb	*13910	*13910	*21270	14880	13560	8110			9500	5890	(18.8)
-3.0 m (-9.8 ft)	kg			*7160	6940					*4610	3860	4.46
	lb			*15790	15300					*10160	8510	(14.6)

Note 1. Lifting capacity are based on ISO 10567.

2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.

3. The Lift-point is bucket pivot mounting pin on the arm (without bucket mass).

4. *Indicates load limited by hydraulic capacity.

※ Lifting capacities are based upon a standard machine conditions.

Lifting capacities will vary with different work tools, ground conditions and attachments.

The difference between the weight of a work tool attachment must be subtracted.

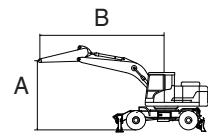
Consult with your local HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.











▲ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	MONO BOOM	4600	2000	3250	-	500	-	Up	-	-

·  : Rating over-front

·  : Rating over-side or 360 degree



Lift-point height (A)		Lift-point radius (B)								At max. reach		
		1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach
												m (ft)
6.0 m (19.7 ft)	kg lb					*4420 9740	3930 8660			*3340 7360	3100 6830	5.19 (17.0)
4.5 m (14.8 ft)	kg lb					*4810 10600	3830 8440	*3870 8530	2440 5380	*3120 6880	2350 5180	6.13 (20.1)
3.0 m (9.8 ft)	kg lb					*5800 12790	3610 7960	4190 9240	2380 5250	*3150 6940	2050 4520	6.59 (21.6)
1.5 m (4.9 ft)	kg lb					6280 13850	3390 7470	4090 9020	2290 5050	*3380 7450	1970 4340	6.68 (21.9)
0.0 m (0.0 ft)	kg lb			*6020 13270	5860 12920	6150 13560	3280 7230	4030 8880	2240 4940	3670 8090	2050 4520	6.42 (21.0)
-1.5 m (-4.9 ft)	kg lb	*6310 13910	*6310 13910	*9650 21270	5920 13050	6150 13560	3280 7230			4310 9500	2390 5270	5.74 (18.8)
-3.0 m (-9.8 ft)	kg lb			*7160 15790	6090 13430					*4610 10160	3450 7610	4.46 (14.6)

Note 1. Lifting capacity are based on ISO 10567.

2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.

3. The Lift-point is bucket pivot mounting pin on the arm (without bucket mass).

4. *Indicates load limited by hydraulic capacity.

※ **Lifting capacities are based upon a standard machine conditions.**

Lifting capacities will vary with different work tools, ground conditions and attachments.

The difference between the weight of a work tool attachment must be subtracted.

Consult with your local HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.

▲ **Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.**

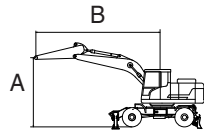
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	MONO BOOM	4600	2450	3250	-	500	-	Down	-	-



: Rating over-front



: Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)								At max. reach			
	1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
											m (ft)	
7.5 m (24.6 ft)	kg									*2900	*2900	4.19
	lb									*6390	*6390	(13.7)
6.0 m (19.7 ft)	kg									*2400	*2400	5.74
	lb									*5290	*5290	(18.8)
4.5 m (14.8 ft)	kg					*4340	4300	*3870	2740	*2250	*2250	6.60
	lb					*9570	9480	*8530	6040	*4960	*4960	(21.7)
3.0 m (9.8 ft)	kg			*8000	7500	*5370	4060	4200	2650	*2260	2060	7.03
	lb			*17640	16530	*11840	8950	9260	5840	*4980	4540	(23.1)
1.5 m (4.9 ft)	kg			*5100	*5100	6300	3810	4080	2540	*2410	1980	7.12
	lb			*11240	*11240	13890	8400	8990	5600	*5310	4370	(23.3)
0.0 m (0.0 ft)	kg			*6320	*6320	6130	3660	4000	2470	*2730	2050	6.87
	lb			*13930	*13930	13510	8070	8820	5450	*6020	4520	(22.5)
-1.5 m (-4.9 ft)	kg	*5450	*5450	*10200	6650	6090	3620	3990	2460	*3420	2340	6.24
	lb	*12020	*12020	*22490	14660	13430	7980	8800	5420	*7540	5160	(20.5)
-3.0 m (-9.8 ft)	kg			*8180	6800	*5500	3700			*4460	3140	5.10
	lb			*18030	14990	*12130	8160			*9830	6920	(16.7)

Note 1. Lifting capacity are based on ISO 10567.

2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.

3. The Lift-point is bucket pivot mounting pin on the arm (without bucket mass).

4. *Indicates load limited by hydraulic capacity.

※ Lifting capacities are based upon a standard machine conditions.

Lifting capacities will vary with different work tools, ground conditions and attachments.

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▲ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

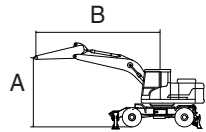
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	MONO BOOM	4600	2450	3250	-	500	-	Up	-	-



: Rating over-front



: Rating over-side or 360 degree



Lift-point height (A)		Lift-point radius (B)								At max. reach		
		1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach
												m (ft)
7.5 m (24.6 ft)	kg lb									*2900 *6390	*2900 *6390	4.19 (13.7)
6.0 m (19.7 ft)	kg lb									*2400 *5290	*2400 *5290	5.74 (18.8)
4.5 m (14.8 ft)	kg lb					*4340 *9570	3880 8550	*3870 *8530	2470 5450	*2250 *4960	2100 4630	6.60 (21.7)
3.0 m (9.8 ft)	kg lb			*8000 *17640	6630 14620	*5370 *11840	3640 8020	4200 9260	2380 5250	*2260 *4980	1850 4080	7.03 (23.1)
1.5 m (4.9 ft)	kg lb			*5100 *11240	*5100 *11240	6300 13890	3400 7500	4080 8990	2280 5030	*2410 *5310	1780 3920	7.12 (23.3)
0.0 m (0.0 ft)	kg lb			*6320 *13930	5800 12790	6130 13510	3260 7190	4000 8820	2200 4850	*2730 *6020	1840 4060	6.87 (22.5)
-1.5 m (-4.9 ft)	kg lb	*5450 *12020	*5450 *12020	*10200 *22490	5820 12830	6090 13430	3220 7100	3990 8800	2200 4850	*3420 *7540	2090 4610	6.24 (20.5)
-3.0 m (-9.8 ft)	kg lb			*8180 *18030	5960 13140	*5500 *12130	3300 7280			*4460 *9830	2810 6190	5.10 (16.7)

Note 1. Lifting capacity are based on ISO 10567.

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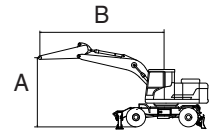
Consult with your local HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.











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Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	MONO BOOM	4600	2600	3250	-	500	-	Down	-	-

·  : Rating over-front

·  : Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)								At max. reach			
	1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
											m (ft)	
7.5 m (24.6 ft)	kg									*2670	*2670	4.43
	lb									*5890	*5890	(14.5)
6.0 m (19.7 ft)	kg									*2230	*2230	5.92
	lb									*4920	*4920	(19.4)
4.5 m (14.8 ft)	kg				*4190	*4190	*3770	2750	*2100	*2100	6.76	
	lb				*9240	*9240	*8310	6060	*4630	*4630	(22.2)	
3.0 m (9.8 ft)	kg		*7640	7570	*5230	4080	4210	2660	*2120	2000	7.18	
	lb		*16840	16690	*11530	8990	9280	5860	*4670	4410	(23.5)	
1.5 m (4.9 ft)	kg		*5810	*5810	6310	3820	4080	2540	*2250	1920	7.26	
	lb		*12810	*12810	13910	8420	8990	5600	*4960	4230	(23.8)	
0.0 m (0.0 ft)	kg		*6390	*6390	6130	3650	3990	2460	*2540	1990	7.01	
	lb		*14090	*14090	13510	8050	8800	5420	*5600	4390	(23.0)	
-1.5 m (-4.9 ft)	kg	*5220	*5220	*10050	6610	6070	3610	3970	2440	*3130	2250	6.40
	lb	*11510	*11510	*22160	14570	13380	7960	8750	5380	*6900	4960	(21.0)
-3.0 m (-9.8 ft)	kg	*9280	*9280	*8470	6750	*5700	3670			*4400	2960	5.30
	lb	*20460	*20460	*18670	14880	*12570	8090			*9700	6530	(17.4)

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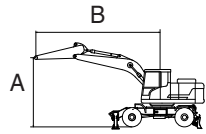
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	MONO BOOM	4600	2600	3250	-	500	-	Up	-	-



: Rating over-front



: Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)								At max. reach			
	1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
											m (ft)	
7.5 m (24.6 ft)	kg									*2670	*2670	4.43
	lb									*5890	*5890	(14.5)
6.0 m (19.7 ft)	kg									*2230	*2230	5.92
	lb									*4920	*4920	(19.4)
4.5 m (14.8 ft)	kg				*4190	3900	*3770	2480	*2100	2030		6.76
	lb				*9240	8600	*8310	5470	*4630	4480		(22.2)
3.0 m (9.8 ft)	kg		*7640	6690	*5230	3660	4210	2390	*2120	1800		7.18
	lb		*16840	14750	*11530	8070	9280	5270	*4670	3970		(23.5)
1.5 m (4.9 ft)	kg		*5810	*5810	6310	3410	4080	2280	*2250	1720		7.26
	lb		*12810	*12810	13910	7520	8990	5030	*4960	3790		(23.8)
0.0 m (0.0 ft)	kg		*6390	5780	6130	3250	3990	2200	*2540	1780		7.01
	lb		*14090	12740	13510	7170	8800	4850	*5600	3920		(23.0)
-1.5 m (-4.9 ft)	kg	*5220	*5220	*10050	5780	6070	3200	3970	2180	*3130	2010	6.40
	lb	*11510	*11510	*22160	12740	13380	7050	8750	4810	*6900	4430	(21.0)
-3.0 m (-9.8 ft)	kg	*9280	*9280	*8470	5910	*5700	3270			*4400	2650	5.30
	lb	*20460	*20460	*18670	13030	*12570	7210			*9700	5840	(17.4)

Note 1. Lifting capacity are based on ISO 10567.

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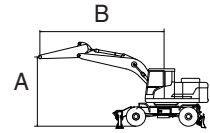
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






2) 2-PIECE BOOM

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
HW150A CR	2-PIECE BOOM	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		4710	2000	3250	-	500	-	Down	-	-

·  : Rating over-front

·  : Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)						At max. reach			
	3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
									m (ft)	
7.5 m (24.6 ft)	kg lb						*4440 *9790	*4440 *9790	3.71 (12.2)	
6.0 m (19.7 ft)	kg lb		*4210 *9280	*4210 *9280			*3480 *7670	3200 7050	5.41 (17.8)	
4.5 m (14.8 ft)	kg lb	*5850 *12900	*5850 *12900	*4650 *10250	4240 9350	*4240 *9350	2710 5970	*3210 *7080	2470 5450	6.32 (20.7)
3.0 m (9.8 ft)	kg lb			*5640 *12430	3990 8800	4190 9240	2630 5800	*3180 *7010	2180 4810	6.77 (22.2)
1.5 m (4.9 ft)	kg lb			6270 13820	3760 8290	4080 8990	2530 5580	*3350 *7390	2090 4610	6.86 (22.5)
0.0 m (0.0 ft)	kg lb			6140 13540	3640 8020	4020 8860	2470 5450	3530 7780	2190 4830	6.60 (21.6)
-1.5 m (-4.9 ft)	kg lb	*9690 *21360	6710 14790	6140 13540	3640 8020			4110 9060	2530 5580	5.94 (19.5)

Note 1. Lifting capacity are based on ISO 10567.

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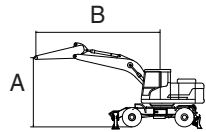
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	2-PIECE BOOM	4710	2000	3250	-	500	-	Up	-	-



: Rating over-front



: Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)						At max. reach			
	3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
									m (ft)	
7.5 m (24.6 ft)	kg						*4440	*4440	3.71	
	lb						*9790	*9790	(12.2)	
6.0 m (19.7 ft)	kg		*4210	3940			*3480	2880	5.41	
	lb		*9280	8690			*7670	6350	(17.8)	
4.5 m (14.8 ft)	kg	*5850	*5850	*4650	3820	*4240	2440	*3210	2220	6.32
	lb	*12900	*12900	*10250	8420	*9350	5380	*7080	4890	(20.7)
3.0 m (9.8 ft)	kg		*5640	3570	4190	2360	*3180	1950	6.77	
	lb		*12430	7870	9240	5200	*7010	4300	(22.2)	
1.5 m (4.9 ft)	kg		6270	3350	4080	2260	*3350	1870	6.86	
	lb		13820	7390	8990	4980	*7390	4120	(22.5)	
0.0 m (0.0 ft)	kg		6140	3240	4020	2210	3530	1950	6.60	
	lb		13540	7140	8860	4870	7780	4300	(21.6)	
-1.5 m (-4.9 ft)	kg	*9690	5860	6140	3240		4110	2260	5.94	
	lb	*21360	12920	13540	7140		9060	4980	(19.5)	

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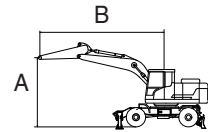
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	2-PIECE BOOM	4710	2450	3250	-	500	-	Down	-	-



: Rating over-front



: Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)						At max. reach			
	3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
									m (ft)	
7.5 m (24.6 ft)	kg						*3050	*3050	4.49	
	lb						*6720	*6720	(14.7)	
6.0 m (19.7 ft)	kg		*3710	*3710			*2510	*2510	5.97	
	lb		*8180	*8180			*5530	*5530	(19.6)	
4.5 m (14.8 ft)	kg		*4210	*4210	*3880	2730	*2330	2210	6.80	
	lb		*9280	*9280	*8550	6020	*5140	4870	(22.3)	
3.0 m (9.8 ft)	kg		*5230	4040	4200	2630	*2310	1970	7.21	
	lb		*11530	8910	9260	5800	*5090	4340	(23.7)	
1.5 m (4.9 ft)	kg		6290	3770	4080	2520	*2410	1890	7.30	
	lb		13870	8310	8990	5560	*5310	4170	(23.9)	
0.0 m (0.0 ft)	kg	*4890	*4890	6120	3620	3990	2440	*2670	1960	7.05
	lb	*10780	*10780	13490	7980	8800	5380	*5890	4320	(23.1)
-1.5 m (-4.9 ft)	kg	*8930	6600	6080	3590	3980	2430	*3210	2230	6.45
	lb	*19690	14550	13400	7910	8770	5360	*7080	4920	(21.1)

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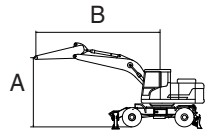
Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	2-PIECE BOOM	4710	2450	3250	-	500	-	Up	-	-



: Rating over-front



: Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)						At max. reach			
	3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
									m (ft)	
7.5 m (24.6 ft)	kg						*3050	*3050	4.49	
	lb						*6720	*6720	(14.7)	
6.0 m (19.7 ft)	kg		*3710	*3710			*2510	2480	5.97	
	lb		*8180	*8180			*5530	5470	(19.6)	
4.5 m (14.8 ft)	kg		*4210	3870	*3880	2460	*2330	1980	6.80	
	lb		*9280	8530	*8550	5420	*5140	4370	(22.3)	
3.0 m (9.8 ft)	kg		*5230	3620	4200	2360	*2310	1760	7.21	
	lb		*11530	7980	9260	5200	*5090	3880	(23.7)	
1.5 m (4.9 ft)	kg		6290	3360	4080	2250	*2410	1690	7.30	
	lb		13870	7410	8990	4960	*5310	3730	(23.9)	
0.0 m (0.0 ft)	kg	*4890	*4890	6120	3210	3990	2180	*2670	1750	7.05
	lb	*10780	*10780	13490	7080	8800	4810	*5890	3860	(23.1)
-1.5 m (-4.9 ft)	kg	*8930	5760	6080	3180	3980	2160	*3210	1980	6.45
	lb	*19690	12700	13400	7010	8770	4760	*7080	4370	(21.1)

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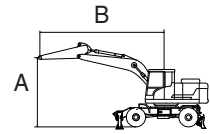
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


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Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	2-PIECE BOOM	4710	2600	3250	-	500	-	Down	-	-

·  : Rating over-front

·  : Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)						At max. reach			
	3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
									m (ft)	
7.5 m (24.6 ft)	kg			*3420	*3420			*2810	*2810	4.73
	lb			*7540	*7540			*6190	*6190	(15.5)
6.0 m (19.7 ft)	kg			*3560	*3560	*2880	2760	*2330	*2330	6.15
	lb			*7850	*7850	*6350	6080	*5140	*5140	(20.2)
4.5 m (14.8 ft)	kg			*4060	*4060	*3780	2750	*2170	2130	6.95
	lb			*8950	*8950	*8330	6060	*4780	4700	(22.8)
3.0 m (9.8 ft)	kg	*7590	7510	*5090	4060	*4180	2640	*2160	1910	7.36
	lb	*16730	16560	*11220	8950	*9220	5820	*4760	4210	(24.2)
1.5 m (4.9 ft)	kg			*6200	3780	4080	2520	*2250	1840	7.44
	lb			*13670	8330	8990	5560	*4960	4060	(24.4)
0.0 m (0.0 ft)	kg	*4980	*4980	6110	3610	3990	2430	*2480	1900	7.20
	lb	*10980	*10980	13470	7960	8800	5360	*5470	4190	(23.6)
-1.5 m (-4.9 ft)	kg	*8600	6560	6060	3570	3960	2420	*2960	2140	6.61
	lb	*18960	14460	13360	7870	8730	5340	*6530	4720	(21.7)
-3.0 m (-9.8 ft)	kg			*5860	3640					
	lb			*12920	8020					

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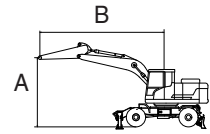
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


▲ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Shoe	Wheel	Dozer		Outrigger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HW150A CR	2-PIECE BOOM	4710	2600	3250	-	500	-	Up	-	-

·  : Rating over-front

·  : Rating over-side or 360 degree



Lift-point height (A)	Lift-point radius (B)						At max. reach			
	3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach	
									m (ft)	
7.5 m (24.6 ft)	kg			*3420	*3420			*2810	*2810	4.73
	lb			*7540	*7540			*6190	*6190	(15.5)
6.0 m (19.7 ft)	kg			*3560	*3560	*2880	2490	*2330	*2330	6.15
	lb			*7850	*7850	*6350	5490	*5140	*5140	(20.2)
4.5 m (14.8 ft)	kg			*4060	3900	*3780	2470	*2170	1910	6.95
	lb			*8950	8600	*8330	5450	*4780	4210	(22.8)
3.0 m (9.8 ft)	kg	*7590	6620	*5090	3640	*4180	2370	*2160	1710	7.36
	lb	*16730	14590	*11220	8020	*9220	5220	*4760	3770	(24.2)
1.5 m (4.9 ft)	kg			*6200	3370	4080	2250	*2250	1640	7.44
	lb			*13670	7430	8990	4960	*4960	3620	(24.4)
0.0 m (0.0 ft)	kg	*4980	*4980	6110	3200	3990	2170	*2480	1690	7.20
	lb	*10980	*10980	13470	7050	8800	4780	*5470	3730	(23.6)
-1.5 m (-4.9 ft)	kg	*8600	5720	6060	3160	3960	2150	*2960	1910	6.61
	lb	*18960	12610	13360	6970	8730	4740	*6530	4210	(21.7)
-3.0 m (-9.8 ft)	kg			*5860	3230					
	lb			*12920	7120					

Note 1. Lifting capacity are based on ISO 10567.

2. Lifting capacity of the HX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.

3. The Lift-point is bucket pivot mounting pin on the arm (without bucket mass).

4. *Indicates load limited by hydraulic capacity.

※ Lifting capacities are based upon a standard machine conditions.

Lifting capacities will vary with different work tools, ground conditions and attachments.

The difference between the weight of a work tool attachment must be subtracted.

Consult with your local HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.

▲ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

6. BUCKET SELECTION GUIDE

1) MONO BOOM, 3250 kg COUNTERWEIGHT



General bucket



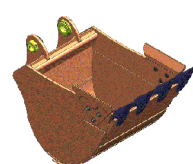
Heavy duty



Ditch cleaning



Slope finishing



Hammerless tooth

Type	Capacity		Width		Weight kg (lb)	Tooth EA	MONO			
	SAE Heaped	CECE heaped	Without side cutter	With side cutter			Recommendation		mm (ft-in)	
							4.6 m (15' 1") Boom			
	m ³ (yd ³)	m ³ (yd ³)	mm (in)	mm (in)			2.0 m (6' 7") Arm	2.45 m (8' 0") Arm	2.6 m (8' 6") Arm	
General bucket	0.58 (0.76)	0.50 (0.65)	950 (37.4")	1110 (43.7")	480 (1060)	5	●	◐	◑	
	0.52 (0.68)	0.45 (0.59)	870 (34.3")	1020 (40.2")	460 (1010)	5	●	●	●	
	0.65 (0.85)	0.55 (0.72)	1060 (41.7")	1210 (47.6")	513 (1130)	5	◐	■	■	
Heavy duty	0.71 (0.93)	0.60 (0.78)	1140 (44.9")	1300 (51.2")	536 (1180)	5	◐	■	■	
Ditch cleaning	0.45 (0.59)	0.40 (0.52)	1520 (59.8")	-	410 (900)	0	●	●	●	
Slope finishing	0.55 (0.72)	0.45 (0.59)	1800 (70.9")	-	585 (1290)	0	●	◐	◑	
Hammer- less tooth	0.50 (0.65)	0.45 (0.59)	762 (30.0")	821 (32.3")	439 (970)	4	●	●	●	
	0.61 (0.80)	0.54 (0.71)	914 (36.0")	974 (38.3")	490 (1080)	5	●	◐	◑	



Applicable for materials with density of 2100 kg/m³ (3500 lb/yd³) or less



Applicable for materials with density of 1800 kg/m³ (3000 lb/yd³) or less



Applicable for materials with density of 1500 kg/m³ (2500 lb/yd³) or less



Applicable for materials with density of 1200 kg/m³ (2000 lb/yd³) or less



Not recommended

※ These recommendations are for general conditions and average use.

Work tools and ground conditions have effects on machine performance.

Select an optimum combination according to the working conditions and the type of work that is being done.

Consult your HD Hyundai Construction Equipment dealer for information on selecting the correct boom–arm–bucket combination.

2) 2-PIECE BOOM, 3250 kg COUNTERWEIGHT



General bucket



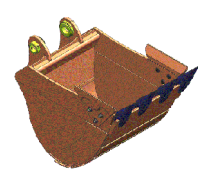
Heavy duty



Ditch cleaning



Slope finishing



Hammerless tooth

Type	Capacity		Width		Weight	Tooth	2-PIECE		
	SAE Heaped	CECE heaped	Without side cutter	With side cutter			Recommendation mm (ft-in)		
					4.71 m (15' 5") Boom				
	m ³ (yd ³)	m ³ (yd ³)	mm (in)	mm (in)	kg (lb)	EA	2.0 m (6' 7") Arm	2.45 m (8' 0") Arm	2.6 m (8' 6") Arm
General bucket	0.58 (0.76)	0.50 (0.65)	950 (37.4")	1110 (43.7")	480 (1060)	5	●	◐	■
	0.52 (0.68)	0.45 (0.59)	870 (34.3")	1020 (40.2")	460 (1010)	5	●	●	◐
	0.65 (0.85)	0.55 (0.72)	1060 (41.7")	1210 (47.6")	513 (1130)	5	◐	■	■
Heavy duty	0.71 (0.93)	0.60 (0.78)	1140 (44.9")	1300 (51.2")	536 (1180)	5	■	▲	▲
Ditch cleaning	0.45 (0.59)	0.40 (0.52)	1520 (59.8")	-	410 (900)	0	●	●	●
Slope finishing	0.55 (0.72)	0.45 (0.59)	1800 (70.9")	-	585 (1290)	0	●	◐	■
Hammerless tooth	0.50 (0.65)	0.45 (0.59)	762 (30.0")	821 (32.3")	439 (970)	4	●	●	●
	0.61 (0.80)	0.54 (0.71)	914 (36.0")	974 (38.3")	490 (1080)	5	◐	■	■

●	Applicable for materials with density of 2100 kg/m ³ (3500 lb/yd ³) or less
◐	Applicable for materials with density of 1800 kg/m ³ (3000 lb/yd ³) or less
■	Applicable for materials with density of 1500 kg/m ³ (2500 lb/yd ³) or less
▲	Applicable for materials with density of 1200 kg/m ³ (2000 lb/yd ³) or less
X	Not recommended

※ These recommendations are for general conditions and average use.

Work tools and ground conditions have effects on machine performance.

Select an optimum combination according to the working conditions and the type of work that is being done.

Consult your HD Hyundai Construction Equipment dealer for information on selecting the correct boom–arm–bucket combination.

7. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Maker / Model	CUMMINS / B4.5
Type	4-cycle, turbocharged, charge air cooled, electronic/mechanical controlled diesel engine
Cooling method	Water cooled
Number of cylinders and arrangement	4 cylinders, in-line
Firing order	1-3-2-4
Combustion chamber type	Direct injection type
Cylinder bore × stroke	107 × 124 mm (4.21" × 4.88")
Displacement	4.5 ℓ (275 cu in)
Compression ratio	17.2 : 1
Gross power	174 Hp (129 kW) at 2200 rpm
Net power	171 Hp (127 kW) at 2200 rpm
Max. power	174 Hp (129 kW) at 2200 rpm
Peak Torque	780 N · m (575 lb · ft) at 1500 rpm
Engine oil quantity	11 ℓ (2.9 U.S. gal)
Wet weight or Dry weight	378 kg (833 lb)
Starter motor	24 V-4.8 kW
Alternator	24 V-95 A
Battery	2 × 12 × 100 Ah

2) MAIN PUMP

Item	Specification
Type	Variable displacement piston pump
Capacity	145 cc/rev
Maximum pressure	350 kgf/cm ² (4980 psi)
Maximum pressure (power boost)	380 kgf/cm ² (5400 psi)
Rated oil flow	260 ℓ /min (68.7 U.S. gpm / 57.2 U.K. gpm)
Rated speed	1800 rpm

3) STEERING PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	35cc/rev
Maximum pressure	210 kgf/cm ² (2990 psi)
Rated oil flow	60 ℓ /min (15.9 U.S. gpm/13.2 U.K. gpm)

4) MAIN CONTROL VALVE

Item	Specification
Type	Section block
Operating method	Hydraulic pilot system
Main relief valve pressure	350 kgf/cm ² (4980 psi)
Main relief valve pressure (power boost)	380 kgf/cm ² (5400 psi)
Overload relief valve pressure	420 kgf/cm ² (5970 psi)

5) SWING UNIT

Item	Specification
Type	Fixed displacement radial piston motor
Capacity	1687 cc/rev
Relief pressure	270 kgf/cm ² (3840 psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	746 kgf · m (5394 lbf · ft)
Brake release pressure	15~40 kgf/cm ² (213~569 psi)
Reduction gear type	-

6) TRAVEL MOTOR

Item	Specification	
	Type 1	Type 2
Type	Variable displacement bent-axis axial piston motor	
Relief pressure	400 kgf/cm ² (5690 psi)	400 kgf/cm ² (5690 psi)
Counter balance valve	Applied	Applied
Capacity (max/min)	140/51.8 cc/rev	140/102 cc/rev

7) POWER TRAIN

Item	Description	Specification	
Transmission	Type	2 speed power shift transmission	
	Gear ratio	1st	4.87
		2nd	1.20
	Clutch pressure	30~35 kgf /cm ² (427~498 psi)	
Parking brake	Type	Multi disc brake integrated in transmission	
	Maximum braking torque	2466 kgf · m (17837 lbf · ft)	
Axle	Type	4 wheel drive with differential	
	Gear ratio	16.0	
	Brake	Multi disc brake	
	Brake pressure	81.6 kgf /cm ² (1160 psi)	
	Steering pressure	204 kgf /cm ² (2900 psi)	

8) POWER TRAIN GEAR PUMP

Item	Description
Capacity	Steering + brake : 19.4 + 11.9 cc / rev (Engine PTO)
Rated flow	Steering + brake : 34 + 21 lpm (Engine PTO) (9.0 + 5.5 U.S. gpm / 7.5 + 4.6 U.K. gpm)

9) REMOTE CONTROL VALVE

Item	Specification	
Type	Pressure reducing	
Operating pressure	Min	5 kgf /cm ² (80 psi)
	Max	40 kgf /cm ² (570 psi)
Single operation stroke	Lever (port 1, 3)	86 mm (3.4 in)
	Lever (port 2, 4)	109 mm (4.3 in)

10) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Stroke	Ø 105 × 1105 mm
	Cushion	Extend and retract
2-piece boom cylinder	Bore dia × Stroke	Ø 105 × 992 mm
	Cushion	Extend and retract
Adjust cylinder	Bore dia × Stroke	Ø 145 × 634 mm
	Cushion	Extend and retract
Arm cylinder	Bore dia × Stroke	Ø 115 × 1138 mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Stroke	Ø 100 × 850 mm
	Cushion	Extend only
Dozer cylinder	Bore dia × Stroke	Ø 110 × 235 mm
	Cushion	-
Outrigger cylinder	Bore dia × Stroke	Ø 125 × 463 mm
	Cushion	-

※ Discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

※ Discoloration does not cause any harmful effect on the cylinder performance.

8. RECOMMENDED OILS

HD Hyundai Construction Equipment genuine lubricating oils have been developed to offer the best performance and service life for your equipment. These oils have been tested according to the specifications of HD Hyundai Construction Equipment and, therefore, will meet the highest safety and quality requirements.

We recommend that you use only HD Hyundai Construction Equipment genuine lubricating oils and grease officially approved by HD Hyundai Construction Equipment.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature °C (°F)								
			-50 (-58)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)
Engine oil pan	Engine oil	11 (2.9)	★SAE 5W-40					SAE 30			
			SAE 10W								
Transmission case		2.5 (0.7)	SAE 10W-30								
			SAE 15W-40								
DEF/ AdBlue® tank	Mixture of urea and deionized water	48 (12.7)	ISO 22241, High-purity urea + deionized water (32.5:67.5)								
Front axle	Gear oil	Center : 10.5 (2.8) Hub : 2.5 × 2 (0.7 × 2)	SAE 85W-90 LSD or UTTO								
Rear axle		Center : 12.5 (3.1) Hub : 2.5 × 2 (0.7 × 2)									
Front wide axle		Center : 11.6 (3.1) Hub : 2.5 × 2 (0.7)									
Rear wide axle		Center : 14.0 (3.7) Hub : 2.5 × 2 (0.7)									
Hydraulic tank	Hydraulic oil	Tank: 103 (27.2)	★ISO VG 15								
		System: 187 (49.4)	ISO VG 32				ISO VG 46, HBHO★ ³				
Fuel tank	Diesel fuel★ ¹	200 (52.8)	★ASTM D975 NO.1					ASTM D975 NO.2			
Fitting (Grease nipple)	Grease	As required	★NLGI NO.1					NLGI NO.2			
Radiator (Reservoir tank)	Mixture of antifreeze and soft water★ ²	19.5 (5.2)	Ethylene glycol base permanent type (50 : 50)								
			★Ethylene glycol base permanent type (60 : 40)								

SAE : Society of Automotive Engineers

API : American Petroleum Institute

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

DEF : Diesel Exhaust Fluid, DEF compatible with AdBlue®

★ : Cold region (Russia, CIS, Mongolia)

★¹ : Ultra low sulfur diesel
- sulfur content ≤ 10 ppm

★² : Soft water
City water or distilled water

★³ : HD Hyundai Construction Equipment
Bio Hydraulic Oil

※ Using any lubricating oils other than HD Hyundai Construction Equipment genuine products may lead to a deterioration of performance and cause damage to major components.

※ Do not mix HD Hyundai Construction Equipment genuine oil with any other lubricating oil as it may result in damage to the systems of major components.

※ Do not use any engine oil other than that specified above, as it may clog the diesel particulate filter(DPF).

※ For HD Hyundai Construction Equipment genuine lubricating oils and grease for use in regions with extremely low temperatures, please contact your local HD Hyundai Construction Equipment dealers.

HYDRAULIC BREAKER AND QUICK COUPLER

1. SELECTING HYDRAULIC BREAKER

※ Read safety hints in this manual and breaker & quick coupler manuals in website (Dealer Portal) before using breaker and quick coupler.

- 1) Become familiar with the manual and select breakers suitable to machine specifications.
- 2) Make careful selection in consideration of oil quantity, pressure and striking force, to enable satisfied performance.
- 3) When apply a breaker to the machine, consult your local dealer of HD Hyundai Construction Equipment for further explanation.

2. CIRCUIT CONFIGURATION

- 1) As for breaker oil pressure line, use extra spool of main control valve.
- 2) Set proper breaker pressure on load relief valve.
 - ※ **The initial setting pressure of load relief valve for breaker is 200 bar.**
- 3) The pressure of the HW150A CR system is 280 kgf/cm² (3985 psi).

4) Adjusting oil quantity

- (1) Use the breaker mode from work tool of cluster. Use multimodal dial to control the oil flow quantity.
 - Setting oil quantity (100 lpm)

Flow set

- Max flow : Set the maximum flow for the attachment.

- (2) If the quantity of hydraulic oil is not controlled properly, it causes short lifecycle of the breaker and the machine by increased breaking force and count.

- 5) Change the arrow of the stop valve handle to STOP position to operate breaker.
 - Tightening torque : 1~2 kgf·m (7~14 lbf·ft)

- 6) The accumulator should be used to the breaker charging and return line. If the accumulator is not used, it can cause damage as the input wave is delivered.

※ **Keep the pressure pulsation of pump below 60 kgf/cm² (853 psi) by installing the accumulator.**

- 7) Do not connect the breaker return line to the main control, but connect to the return line in front of oil cooler.

- 8) Do not connect the breaker return line to drain lines, such as swing motor, travel motor or pump, otherwise they will be damaged.

- 9) One spool of the main control valve should be connected to the tank.

- 10) Select the size of pipe required considering the amount of back pressure.

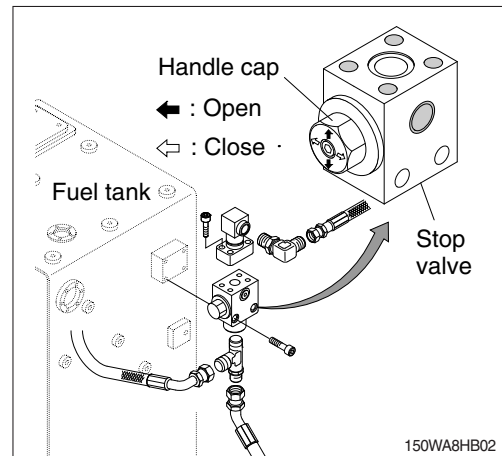
- 11) Shimless tube should be used for the piping. The hose and seal should be HD Hyundai Construction Equipment genuine parts.

- 12) Weld the bracket for pipe clamp to prevent damage caused by vibration.

Oil quantity setting



140WA8HB01



150WA8HB02

3. MAINTENANCE

1) MAINTENANCE OF HYDRAULIC OIL AND FILTER

- (1) A machine with hydraulic breaker can cause the hydraulic oil to become severely contaminated.
- (2) Therefore machine may go down if not maintained properly.
- (3) Inspect and maintain hydraulic oil, hydraulic oil return filter, pilot line filter element and drain filter.

2) RELEASING THE PRESSURE IN BREAKER CIRCUIT

When breaker operating is finished, stop engine and push pedal or switch for breaker to release pressure in breaker circuit.

If you allow pressure to remain on the system, the lifetime of the diaphragm in the accumulator will be shortened.

- 3) Be careful to prevent contamination by dust, sand etc.
If such pollution becomes mixed into the oil, the pump's moving parts will wear abnormally, shorten lifetime and become damaged. This could also contaminate the entire hydraulic system.
- 4) When operating breaker, bolts and nuts of main equipment may be loosened by vibration. Therefore, it must be inspected periodically.

Service interval unit : hours

Attachment	Operating rate	Hydraulic oil	Filter element
Breaker	100 %	600* ¹	200
		1000* ²	

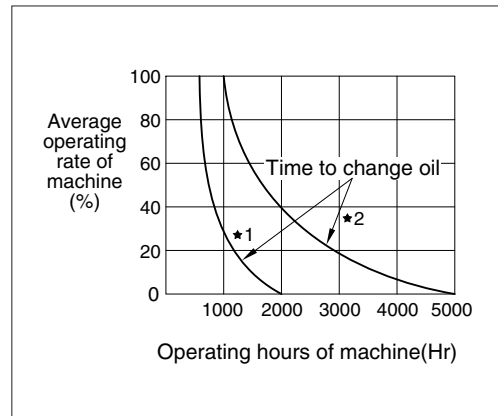
*¹: Conventional hydraulic oil

*²: HD Hyundai Construction Equipment genuine long life hydraulic oil

● Replace following filter at same time

- Hydraulic oil return filter : 1 EA
- Pilot line filter element : 1 EA
- Drain filter : 1 EA

Hyd oil change guide for hydraulic breaker



*¹: Conventional hydraulic oil

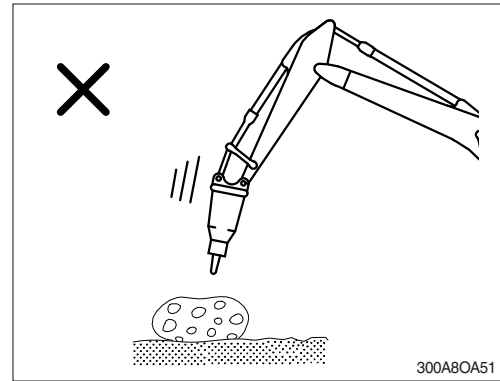
*²: HD Hyundai Construction Equipment genuine long life hydraulic oil

4. PRECAUTIONS WHILE OPERATING THE BREAKER

DO NOT BREAK ROCK WHILE LOWERING

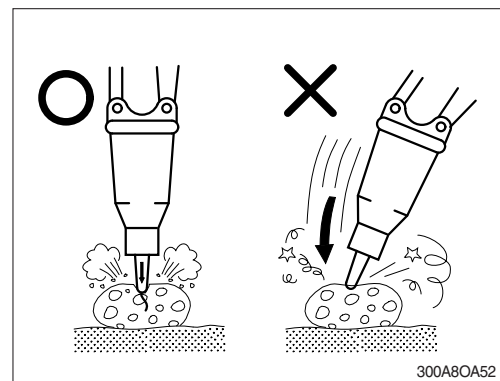
As the breaker is heavy in comparison with bucket, it must be operated slowly.

If breaker is rapidly pushed down, working device may be damaged.



DIRECTION OF THRUST

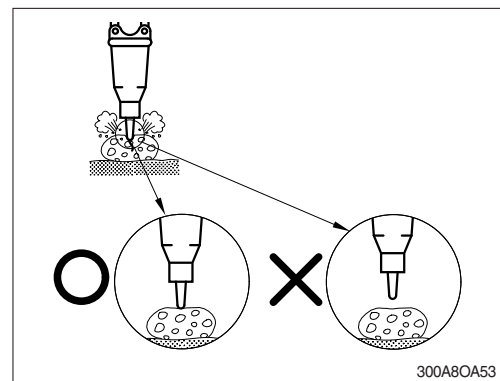
Apply a thrust in a straight line with the tool. Place the tool on a rock with the hammering side as vertically as possible. If the hammering side is oblique, the tool may slip during hammering, causing the chisel and piston to break, or seized. When breaking, select the point of a rock on which hammering can perform stably and fully stabilize the chisel to the hammer.



PROPER THRUST

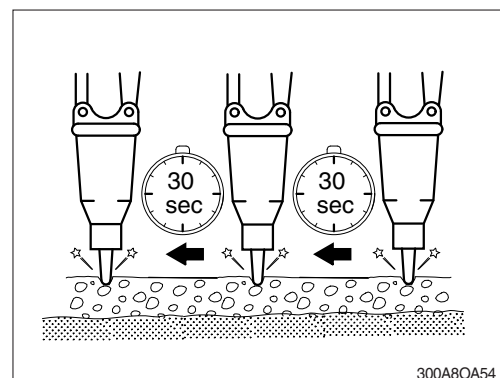
To break effectively, a proper thrust force must be applied to the breaker. If thrust is too low, impact energy of the piston may not be sufficient to break rocks.

Breaking force is transferred to the breaker body, arm and boom resulting in damage of those parts.



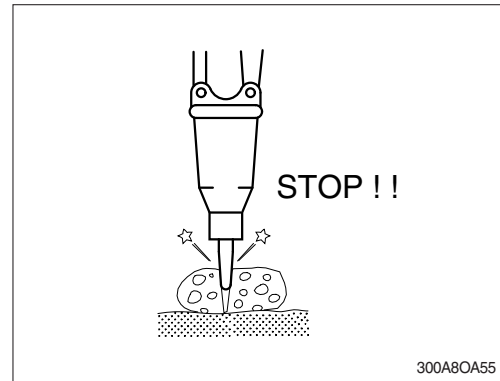
Move the impact point from the edge to the interior. Never try to break off a too large block, if the object has not broken within 30 seconds. The object should be broken up piece by piece in small blocks. Large distance steps will not improve working results.

Operating the breaker longer than 30 seconds may cause damage to the breaker.



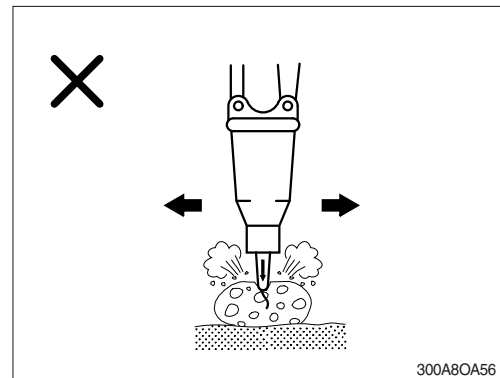
BLANKS THRUST

Blank blows, which are impact on the chisel without contact with the object, are very harmful for the breaker. Always press the chisel down onto the material before starting the breaker. And stop operation immediately as soon as the object has been broken. If operation is continued, blank blows could result in excessive wear to major components.



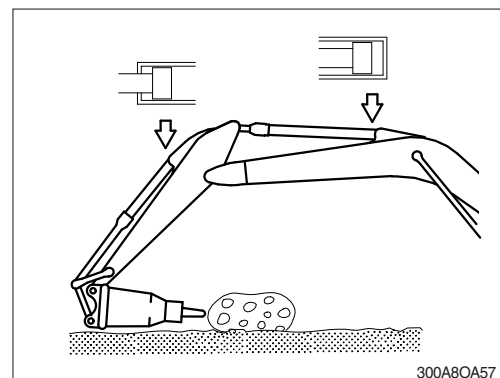
DO NOT MOVE MACHINE OR BREAKER WHILE STRIKING

Do not move hammer while striking. This will cause damage to the working device and the swing system.



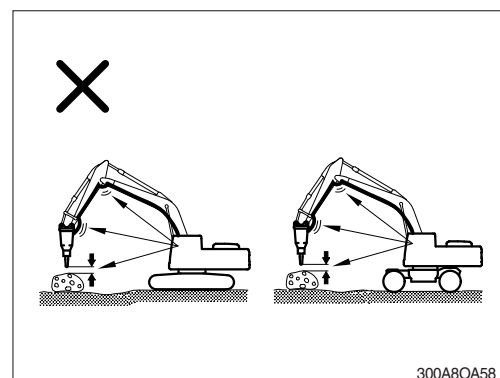
OPERATE BREAKER WITH A GAP IN EXCESS OF 100 mm (4 inches) FROM THE END OF THE STROKE TIP

If breaker is operated with the end tip, the cylinder may be damaged.



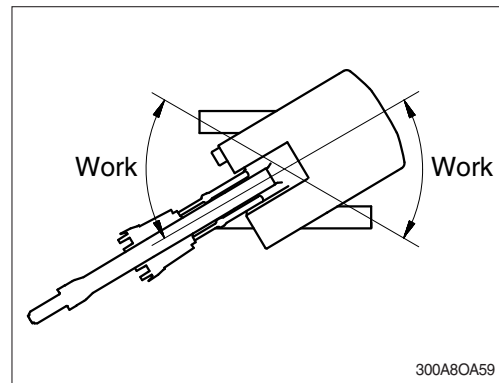
STOP THE OPERATION IMMEDIATELY IF HOSES VIBRATE EXCESSIVELY

Violent pulsations of the high / low pressure breaker hoses could indicate an accumulator fault. Check for oil leaks at the hose fitting points retightening as necessary. Should symptoms persist, contact the service shop appointed by the Hyundai dealer in your territory for repair. An excessive gap between tool and workpiece between strikes may indicate seizure of the tool in the front head. Disassemble the front head, inspect the components and repair or replace defective parts.

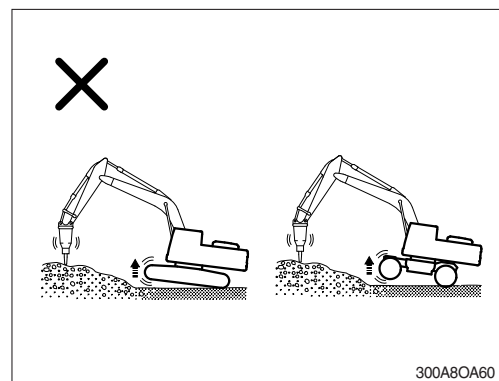


DO NOT WORK WHILE IN A SWING STATE

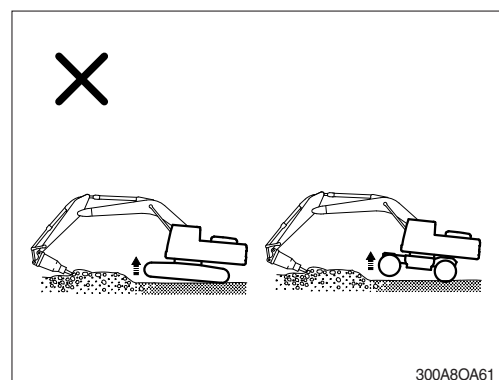
Do not work while swinging the upper structure. It cause oil leakage of the bend in the track shoe and rollers.



Conversely, if thrust is excessive or breaking is performed with boom of the lower chassis raised as shown, the machine may suddenly tip toward the movement. The breaker body may strike the broken rocks violently resulting in damage.

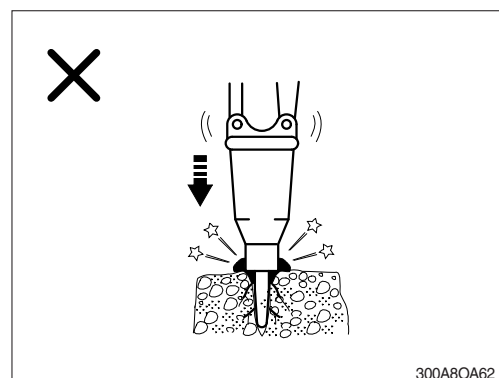


Do not extend the bucket cylinder fully and thrusting to raise the machine off the ground.



Excessive force as above may also result in vibrations being transmitted to the tracks causing damage.

Care is required to ensure adequate but not excessive force is applied to the breaker in operation.



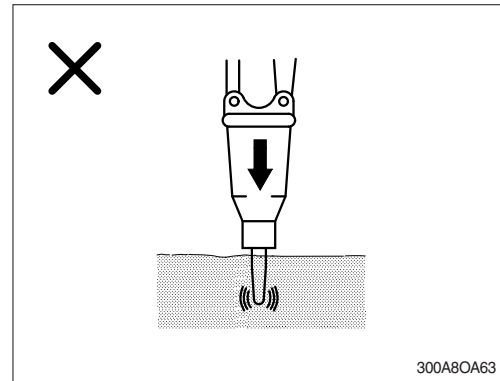
NEVER DRIVE THE CHISEL INTO THE GROUND

If the advance is too large and the chisel is not rocked to release the dust, the chisel will be driven into the material without breaking the material. This causes the chisel tip to glow red-hot and lose its hardness.

As a result, the chisel wears out more quickly. Operating in this way is not permitted.

Dust dampens impact power, when the chisel is inserted into the ground, and reduces the efficiency of the breaker. Tilt the breaker slightly backward and forward, not more than 5°, while operating so that the dust can escape.

Do not rock the breaker at angles greater than 5° or the chisel will be broken.

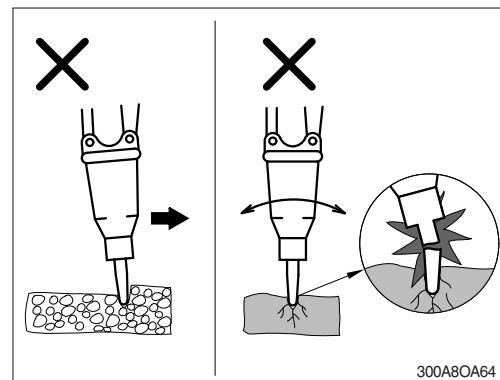


NEVER USE AS A LEVER

Do not use the chisel as a lever; e.g. crowbar, as this will cause the chisel to break.

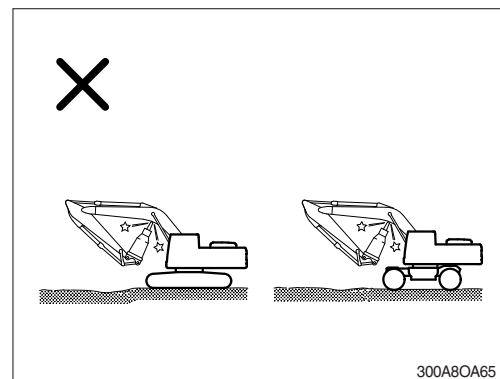
Under any circumstances, operating in this way is not permitted.

Most of bending failure of the chisel may be caused by lever action in stone that is inside hard or frozen ground. Be careful and stop operating if you feel sudden resistance under the chisel.



TAKE CARE OF CHISEL AND BOOM INTERFACE

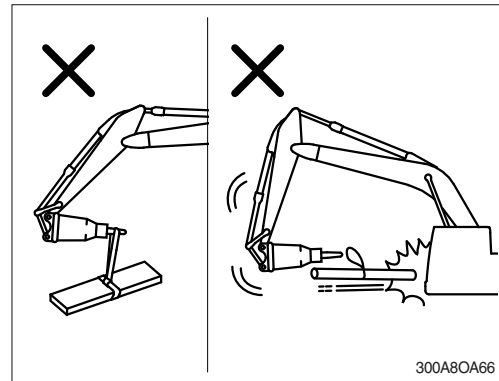
Be aware of clearance between breaker tip and the underside of boom as shown.



NEVER USE FOR LIFT OR TRANSPORT PURPOSES

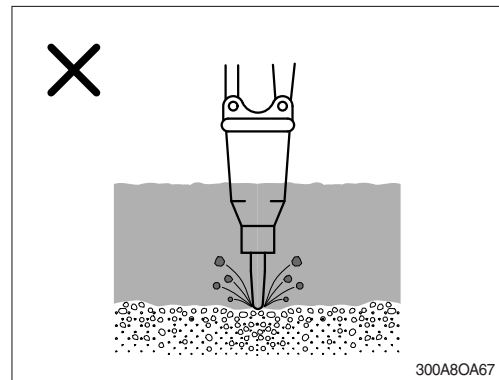
The hydraulic breaker is not designed to lift or transport loads. Never use the chisel as a lifting point.

This is dangerous and could damage the breaker or the chisel.



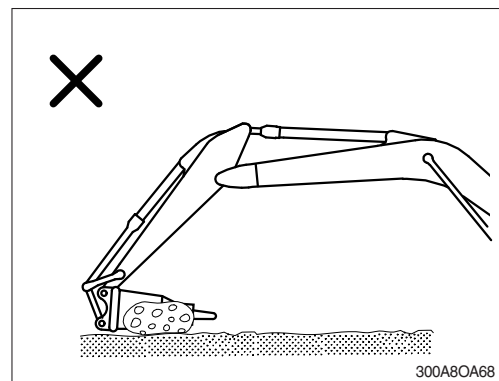
NEVER USE THE HYDRAULIC BREAKER UNDER WATER

The hydraulic breaker, as a standard assembly, never be used in or under water without prior conversion. If you use under water, water fills the impact chamber between the piston and the chisel, a strong hydraulic pressure wave is generated and will damage the seals in the breaker. And, in addition, corrosion, lack of lubrication or penetration of water could result in further damage to components of the breaker and the lower chassis. To operate the breaker under water, compressed air must be supplied into the breaker, into the impact chamber of the front-head, prior to use. Consult your HD Hyundai Construction Equipment dealer for the underwater kit.



DO NOT USE BREAKER TO CARRY BROKEN STONE OR ROCK BY SWING OPERATING

This may damage the operation device and swing system.

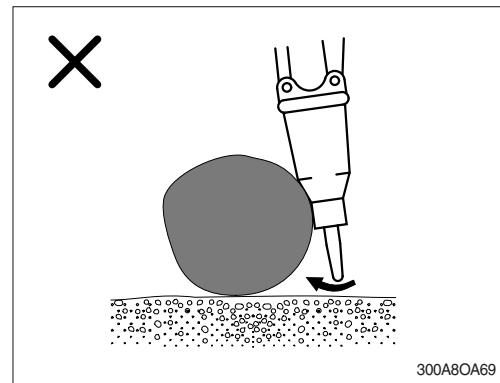


NEVER USE THE CHISEL OR HYDRAULIC BREAKER TO MOVE ROCKS OR OTHER OBJECTS

The hydraulic breaker is not designed for this usage.

Do not use the breaker or chisel to roll, push the object or reposition the lower chassis.

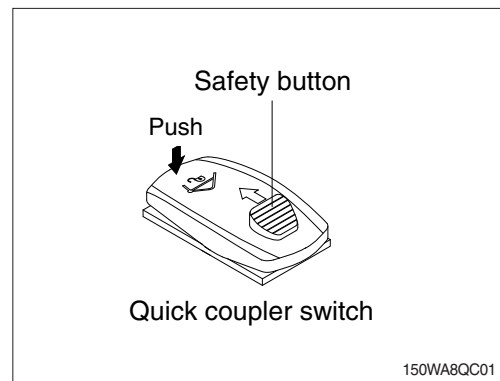
This may cause damage to the breaker and the lower chassis.



5. QUICK COUPLER

1) FIXING BUCKET WITH QUICK COUPLER

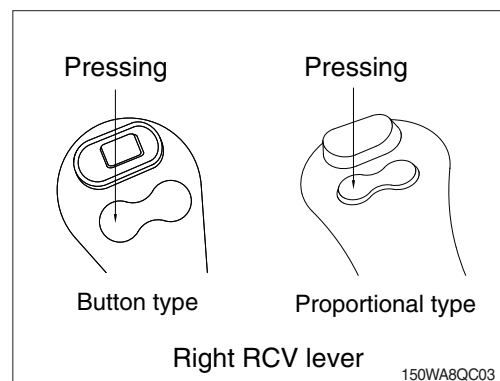
- (1) Park the excavator and attachment on firm and level ground.
- (2) After checking the safe environment conditions for installing/removing the quick coupler, perform the disengagement process.
- (3) To unlock the quick coupler switch, press the safety button forward and press the switch.



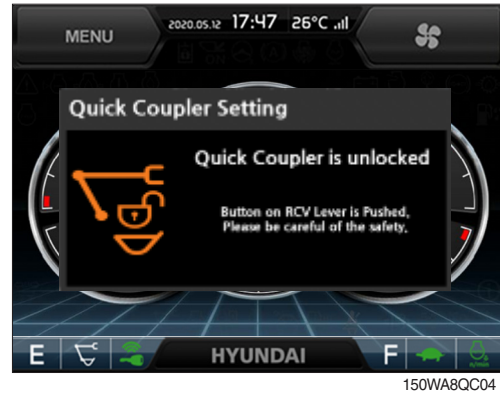
- (4) Quick coupler symbols and warning messages appear on the cluster screen, and warning buzzers sound.
- ※ The warning buzzer continues to operate up to step (12).



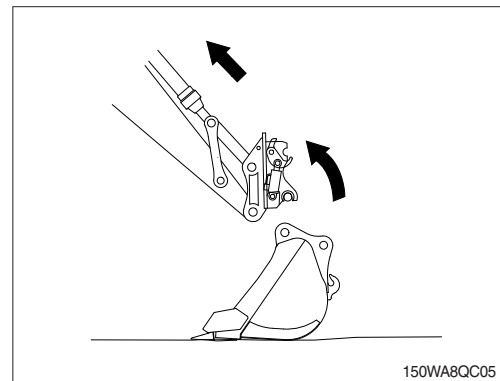
- (5) To unlock the quick coupler, press the quick coupler button on the right RCV lever. To maintain the unlock status of the quick coupler the operator must maintain pressing the coupler button.



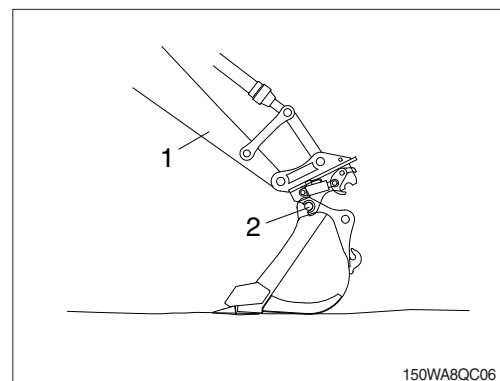
(6) The warning message in the cluster screen is changed, and the quick coupler lock is released.



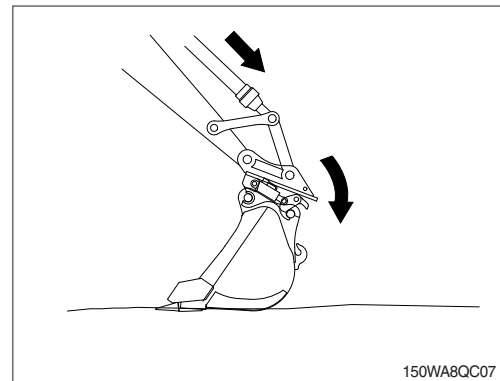
(7) Retract the bucket cylinder. Align the quick coupler with attachment mounting pins or interface.



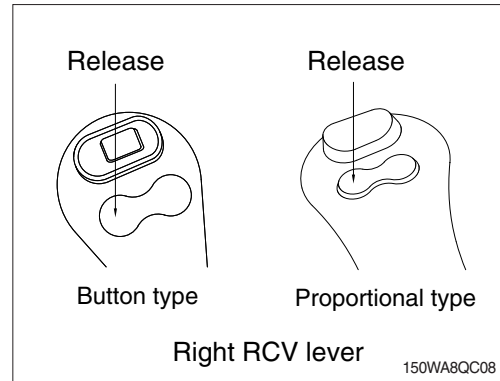
(8) Move the arm (1) and raise it until hook engages the upper (2) pin or interface of attachment.



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



(10) To engage the quick coupler, release the quick coupler button on the right RCV lever.



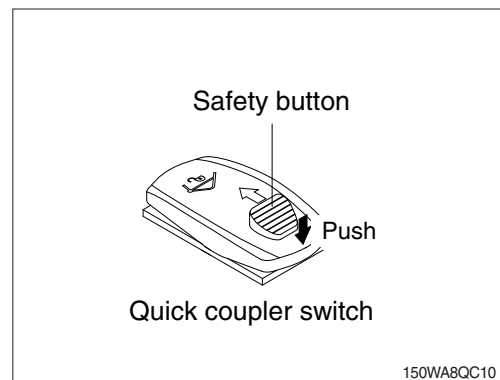
(11) The warning message in the cluster screen is changed, and the quick coupler lock is engaged.

※ After changing warning message, the quick coupler will be locked even if the operator presses the quick coupler button of the right RCV lever again. To unlock the quick coupler again the operator must repeat from the process (3).

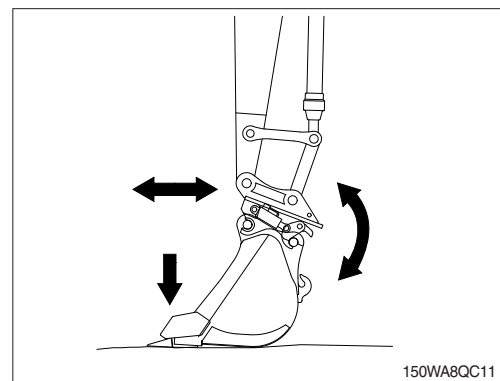


(12) To confirm the engagement of the quick coupler, release the safety button to its original position.

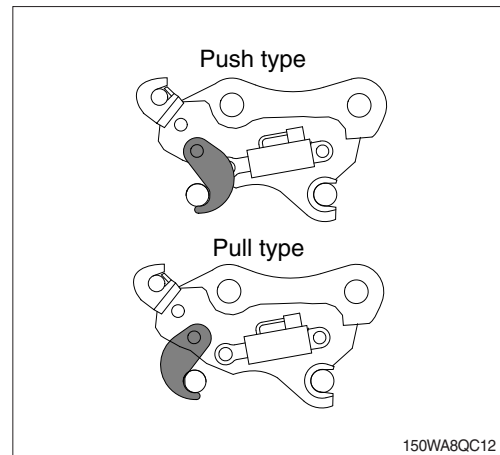
- The buzzer will stop activating.
- The warning message will disappear.



(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.

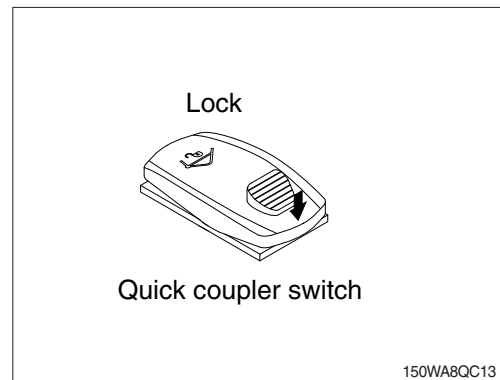


(14) Visually check that quick coupler is fully engaged and locked before operating the machine and attachment.

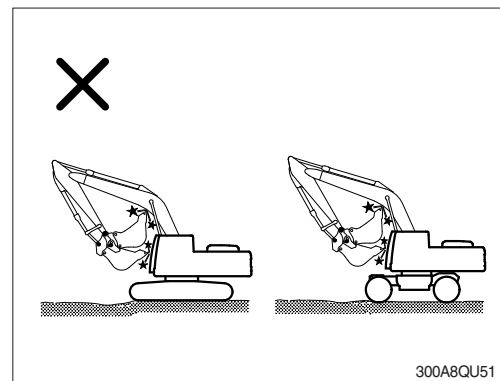


2) PRECAUTION OF USING QUICK COUPLER

- ⚠ When operating the machine with quick coupler, confirm that the quick coupler switch is in the LOCK position. Operating the machine with quick coupler switch unlocked can cause the bucket to drop off and could result in personal injury, death, machine damage or property damage.



- ⚠ Be careful of the operating the machine which is equipped with quick coupler. The bucket may hit cab, boom and boom cylinders when it reaches the vicinity of them as shown in the illustration. HD Hyundai Construction Equipment will not be responsible for any injury, death or damage in the event that the quick coupler and attachment are not installed correctly.



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