CONTENTS

FOREWORD

This manual contains a number of instructions and safety recommendations regarding driving, handling, lubrication, maintenance, inspection and adjustment of the excavator.
The manual is to promote safety maintenance and enhance machine performance.

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

If you sell the machine, be sure to give this manual to the new owners.

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.**

   Some actions involved in operation and maintenance of the machine can cause a serious accident, if they are not done in a manner described in this manual.

   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.

2. **Inspect** the jobsite and **follow** the safety recommendations in the **safety hints** section before operating the machine.

3. Use **genuine HD Hyundai Construction Equipment spare parts** for the replacement of parts.
   We expressly point out that 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)

HD Hyundai Construction Equipment shall have obligation under the EPA (Environmental Protection Agency) regulation of warranty about Emission-related components. This warranty shall exist for 3,000 hours or five years, whichever occurs first.
Naturally, this warranty does not cover to damage arising from accident, misuse or negligence, use of non-HD Hyundai Construction Equipment parts, or from 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

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

235F0SG10A

※ Please refer to the page 3-27 for the cluster.

EC REGULATION APPROVED

· Noise level (EN474-1 : 2006 and 2000/14/EC) are as followings.

LWA : 101dB (EU only)

LPA : 76dB

· The value of vibrations transmitted by the operator's seat are lower than standard value of (EN474-1 : 2006 and 2002/44/EC)

CE

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

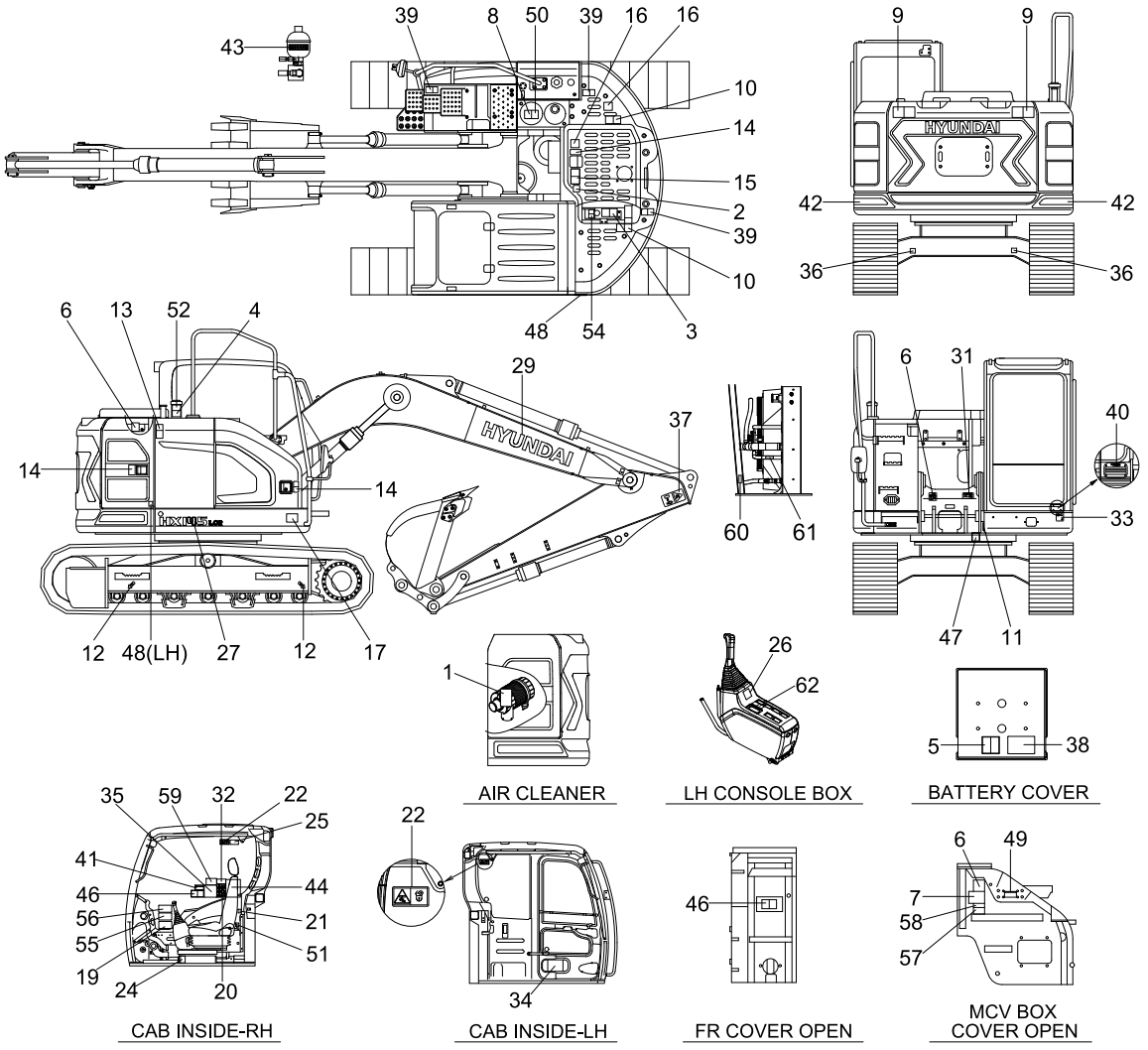
TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

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	

SAFETY LABELS

1. LOCATION

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



145ZF0SL01A

1	Air cleaner filter	21	Hammer	42	Reflecting
2	Turbocharger cover	22	Safety front window	43	Accumulator
3	Radiator cap	23	Safety rear window	44	Machine control cab
4	Fueling	24	Air conditioner filter	46	M/control pattern change-w/o valve
5	Battery accident	25	ROPS plate	47	Swing bearing grease
6	High pressure hose	26	Console box tilting	48	Battery position
7	Hydraulic oil level	27	Model name	49	Lubrication oil
8	Hydraulic oil lub	29	Trade mark (boom)	50	Fuel shut off
9	Keep clear-rear	31	Reduction gear grease	51	MCU/ECM connector
10	Lifting eye	32	Clamp locking	52	Ultra low sulfur diesel
11	Name plate	33	Noise level LWA	54	Surge tank
12	Slinging ideogram	34	Service instruction	55	Key off caution
13	Keep clear-side	35	Lifting chart	56	RCV lever
14	Stay fix	36	Tie	57	Diesel exhaust fluid
15	Engine hood shearing	37	Keep clear-boom/arm	58	DEF/AdBlue® fill-up
16	No step	38	Electric welding	59	Control RCV
17	Transporting	39	Falling	60	Refrigerant
19	M/control pattern	40	FOPS FOG plate	61	Use handrail
20	Ref operator's manual	41	Caution (water separator, turbocharger)	62	Control ideogram-dozer

2. DESCRIPTION

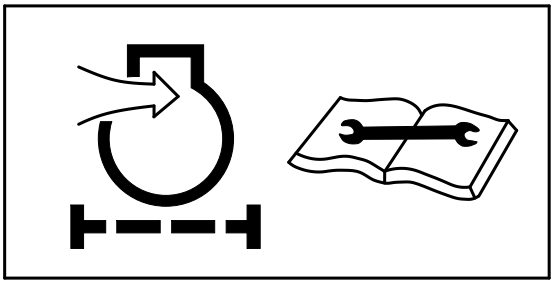
There are several specific warning labels on this machine please become familiarized with all warning labels.

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

1) **AIR CLEANER FILTER** (item 1)

This warning label is positioned on the left side of the rear support.

※ **Periodic and proper inspection, cleaning and change of elements prolong engine life time and maintain the good performance of engine.**



21070FW01

2) **TURBOCHARGER COVER** (item 2)

This warning label is positioned on the turbocharger cover.

⚠ **Do not touch turbocharger or it may cause severe burn. When the engine is running or immediately after engine shut down.**

21070FW02

3) **RADIATOR CAP** (item 3)

This warning label is positioned on the radiator.

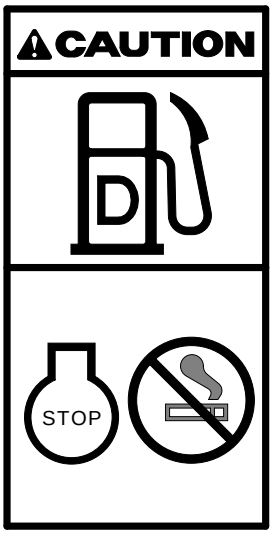
⚠ **Never open the filler cap while engine running or at high coolant temperature. Hot coolant can cause serious burns, injury or death.**

14070FW03

4) **FUELING** (item 4)

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

⚠ **Stop the engine when refueling. All lights or flames shall be kept at a safe distance while refueling.**



290F0FW02

5) BATTERY ACCIDENT (item 5)

This warning label is positioned on the battery cover.

⚠ Electrolyte containing sulfuric acid cause severe burns. Avoid being in contact with skin, eyes or clothes. In the event of accident flush with sufficient water, call a physician immediately.

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

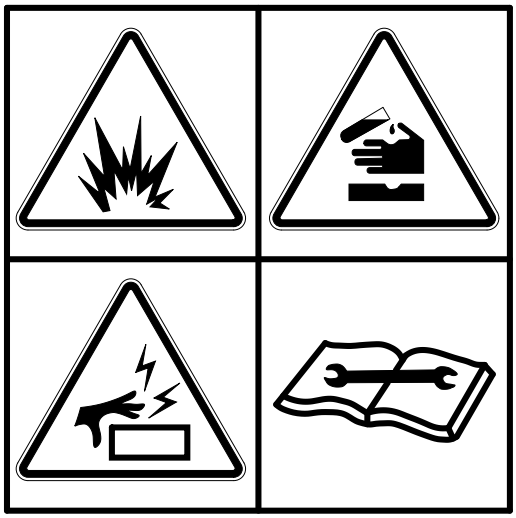
With electrolyte at proper level, less space may cause the gases to be accumulated in the battery.

⚠ Extinguish all smoking materials and open flames before checking the battery.

⚠ Do not use matches, lighters or torches as a light source near the battery for the probable presence of explosive gas.

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

⚠ For safety from electric shock, do not battery terminal with a wet hand.



36070FW05

6) HIGH PRESSURE HOSE (item 6)

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

⚠ Escaping fluid under pressure can penetrate the skin causing serious injury.

⚠ Avoid the hazard by relieving pressure before disconnecting hydraulic lines or other lines.

※ See the maintenance section for details.

14070FW29

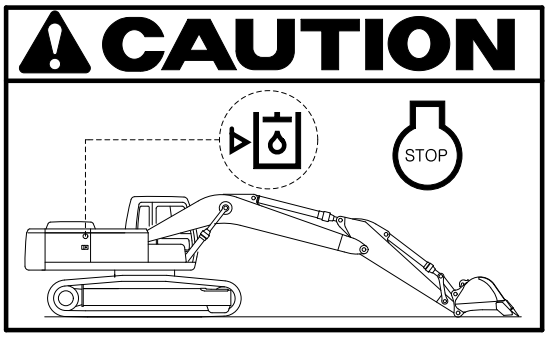
7) HYDRAULIC OIL LEVEL (item 7)

This warning label is positioned on the screen plate.

⚠ Place the bucket on the ground whenever servicing the hydraulic system.

※ Check oil level on the level gauge.

※ Refill the recommended hydraulic oil up to specified level if necessary.



21070FW07

8) HYDRAULIC OIL LUBRICATION (item 8)

This warning label is positioned on the top 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.

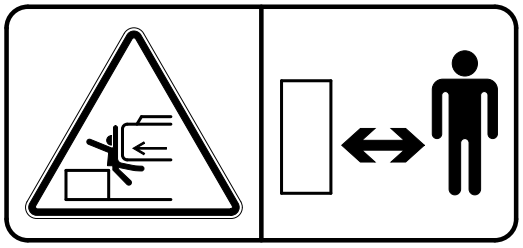
14070FW08

9) KEEP CLEAR-REAR (item 9)

This warning label is positioned on the rear of counterweight.

⚠ To prevent serious personal injury or death keep clear or machine swing radius.

⚠ Do not deface of remove this label from the machine.



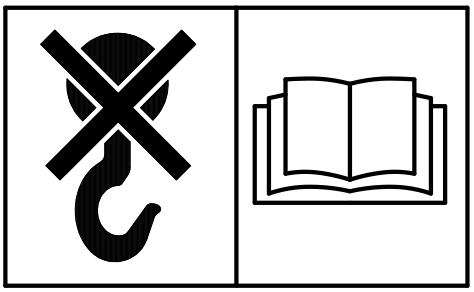
21090FW09

10) LIFTING EYE (item 10)

This warning label is positioned on the counterweight.

⚠ Do not lift the machine by using lifting eyes on the counterweight or the lifting eyes may be subject to overload causing its breaking and possible personal injury.

※ See page 5-9 for proper lifting method of the machine.



21070FW10

11) KEEP CLEAR-SIDE (item 13)

This warning label is positioned on the side of LH rear side cover.

⚠ To prevent serious personal injury or death keep clear of machine swing radius.

⚠ Do not deface or remove this label from the machine.

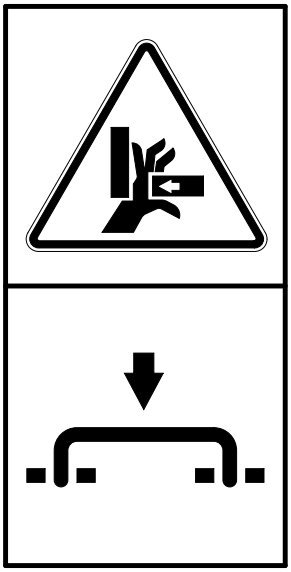
21070FW13

12) STAY FIX (item 14)

This warning label is positioned on the side cover.

⚠ Be sure to support the stay when the door needs to be opened.

⚠ Be careful that the opened door may be closed by the external or natural force like strong wind.



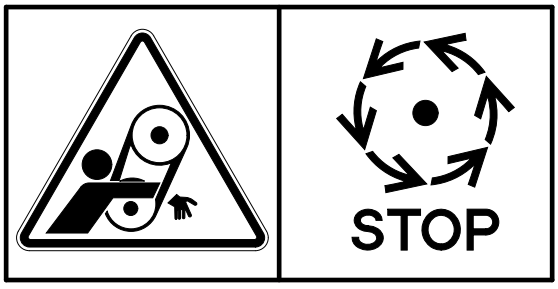
21070FW14

13) ENGINE HOOD SHEARING (item 15)

This warning label is positioned on the engine hood.

⚠ Don't open the engine hood during the engine's running. Stay clear of rotating parts.

⚠ Don't touch exhaust pipe or it may cause severe burn.



21070FW15

14) **NO STEP** (item 16)

This warning label is positioned on the engine hood and counterweight.

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

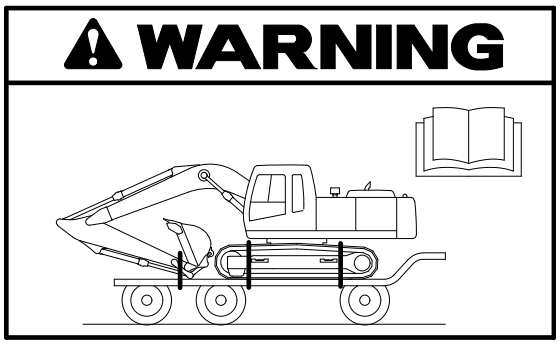
21070FW16

15) **TRANSPORTING** (item 17)

This warning label is positioned right side of upper frame.

⚠ **Study the operator's manual before transporting the machine, if provided and tie down arm and track to the carrier with lashing wire.**

See page 5-6 for details.



14070FW17

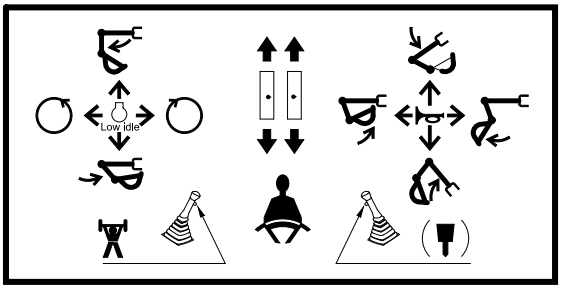
16) **MACHINE CONTROL PATTERN** (item 19)

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

⚠ **Check the machine control pattern for conformance to pattern on this label. If not, change label to match pattern before operating machine.**

⚠ **Failure to do so could result in injury or death.**

See page 4-12 for details.



36070FW19

17) REF OPERATOR'S MANUAL (item 20)

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

(1) Ref operator manual

⚠ Study the operator's manual before starting and operating machine.

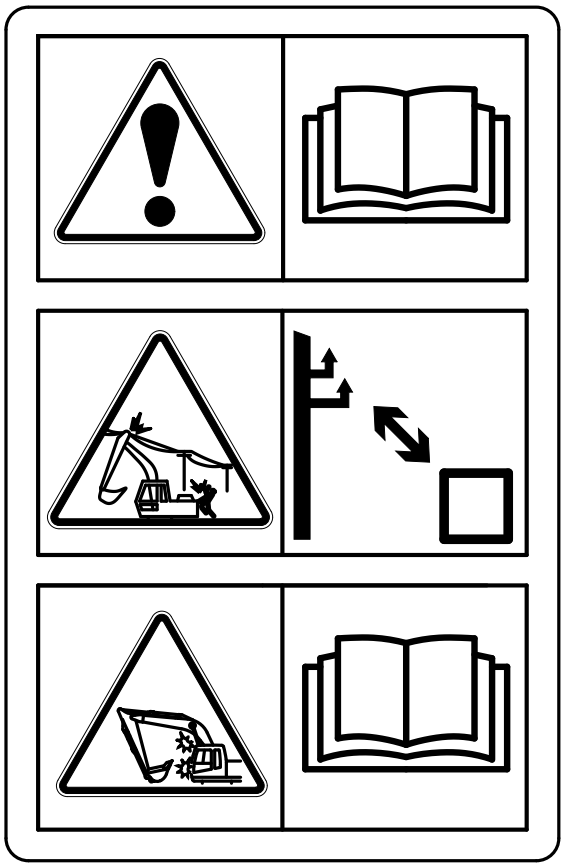
⚠ Do not operate this machine unless you have read and understand the instructions and warnings in this manual.
Failure to follow the instructions or warnings could result in injury or death.

(2) Max height

⚠ Serious injury or death can result from contact with electric lines.
An electric shock being received by merely coming into the vicinity of an electric lines, the minimum distance should be kept considering the supply voltage as page 1-7.

(3) Interference

⚠ Be careful to operate machine equipped with quick clamp or extensions.
Bucket may hit cab or boom, boom cylinders when it reached vicinity of them.



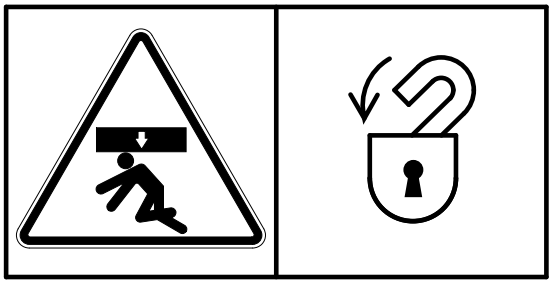
2609A0SL05

18) SAFETY FRONT WINDOW (item 22)

This warning label is positioned on the both side window of the cab.

⚠ Be careful that the front window may be promptly closed.

※ See page 3-65 for details.



21070FW24

19) **SAFETY REAR WINDOW** (item 23)

This warning label is positioned on the inside of rear window.

※ **The rear window serves as an alternate exit.**

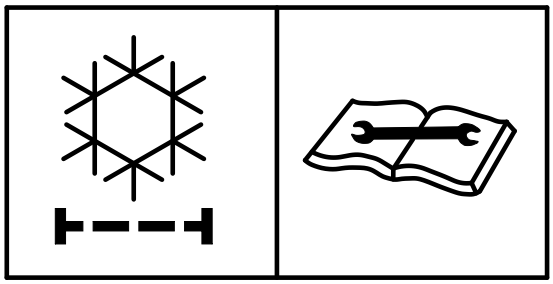
※ **To remove rear window, pull the ring and push out the glass.**

2609A0SL02

20) **AIR CONDITIONER FILTER** (item 24)

This warning label is positioned on the air conditioner cover.

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

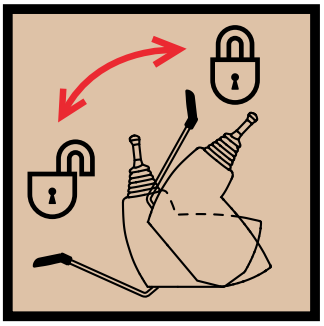


21070FW26

21) **CONSOLE BOX TILTING** (item 26)

This warning label is positioned on the LH console box.

※ **Before you get off the machine be sure to tilt the LH console box.**

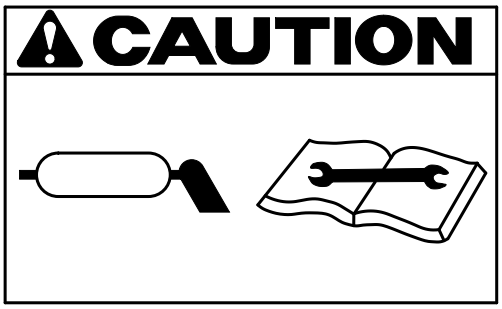


30007A1FW06

22) **REDUCTION GEAR GREASE** (item 31)

This warning label is positioned in the front of upper frame.

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



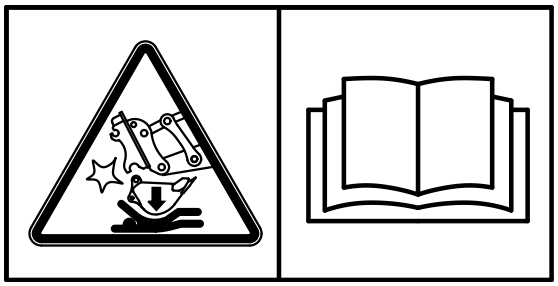
21070FW35

23) **CLAMP LOCKING** (item 32)

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

⚠ **Serious injury or death can result from dropping bucket.**

⚠ **Operating the machine with quick clamp switch unlocked or without safety pin of moving hook can cause the bucket to drop off.**



14070FW60

24) **TIE** (item 36)

This warning label is positioned on the lower frame.

⚠ **Never tow the machine using tie hole, because this may break.**

⚠ **See page 4-15 for detail.**

4507A0FW02

25) **KEEP CLEAR-BOOM/ARM** (item 37)

This warning label is positioned on both side of the arm.

⚠ **Serious injury or death can result from falling of the attachment.**

⚠ **To prevent serious injury or death, keep clear the underneath of attachment.**

14070FW31

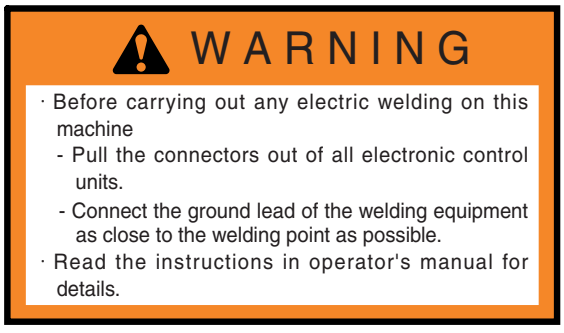
26) **ELECTRIC WELDING** (item 38)

This warning label is positioned on the battery cover.

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

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

※ **See page 6-44 for detail.**



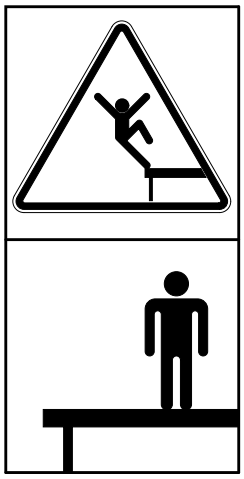
7807AFW20

27) **FALLING** (item 39)

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

⚠ **Falling is one of the major cause of personal injury.**

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



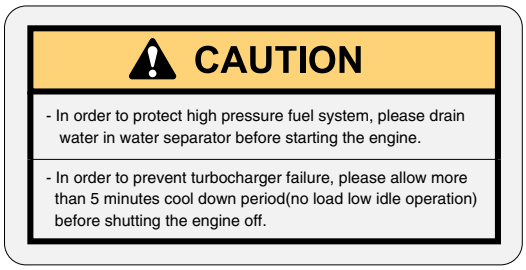
14070FW30

28) **CAUTION (W/SEPARATOR, TURBOCHARGER)** (item 41)

This warning label is positioned on the right window of 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

29) **REFLECTING** (item 42)

This warning label is positioned on the rear of counterweight.

⚠ **To prevent serious personal injury or death keep clear of machine swing radius.**

⚠ **Do not deface or remove this label from the machine.**

235F0FW01

30) **ACCUMULATOR** (item 43)

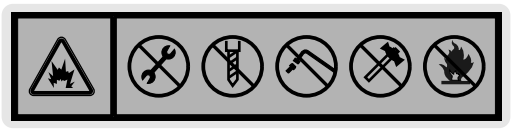
This warning label is positioned on the accumulator of the solenoid valve.

※ **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 hole in the accumulator expose it to 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.**



1107A0FW46

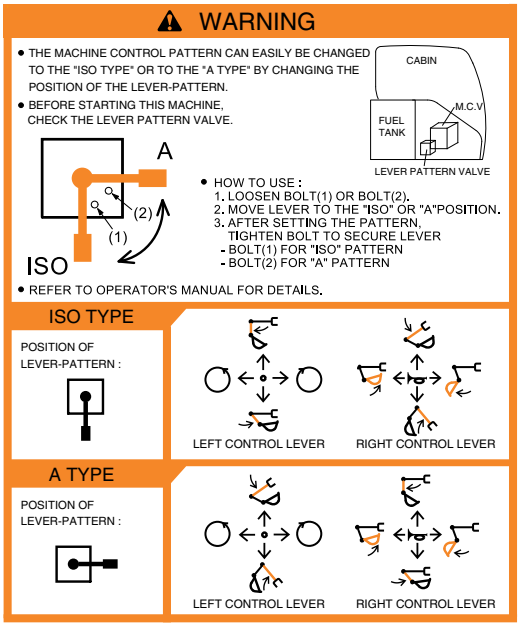
31) **MACHINE CONTROL CAB** (item 44)

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

⚠ **Check the machine control pattern for conformance to pattern on this label. If not, change label to match pattern before operating machine.**

⚠ **Failure to do so could result in injury or death.**

※ **See page 4-27 for details.**



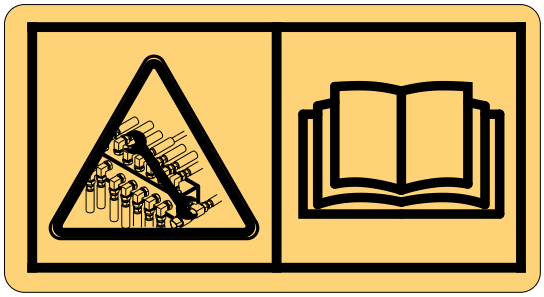
140Z90FW99

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

This warning label is positioned on the fuel tank side.

⚠ **Check the machine control pattern before starting this machine.**

※ **See page 4-26 for detail.**

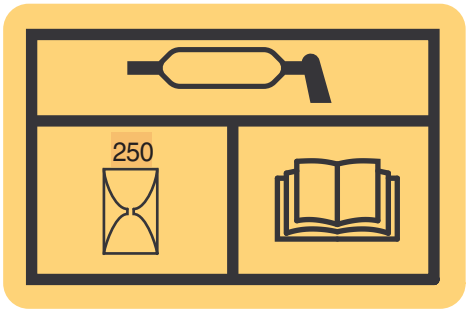


14W90FW47

33) **SWING BEARING GREASE** (item 47)

This warning label is positioned in the front of swing ring gear.

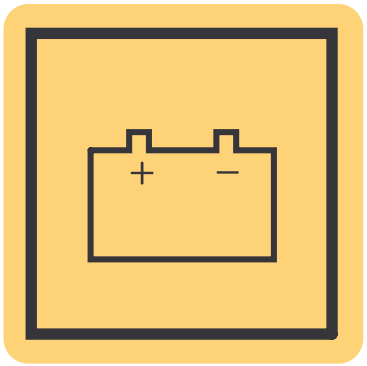
※ **See page 6-35 for details.**



38090FW02

34) **BATTERY POSITION** (item 48)

This warning label is positioned left inside of side cover.



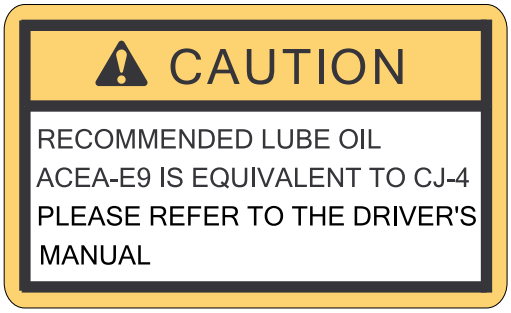
38090FW03

35) **LUBRICATION OIL** (item 49)

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

※ **Recommended lubrication oil ACEA-E9 is equivalent to API CJ-4.**

※ **See page 6-9 for details.**



290F0SL03

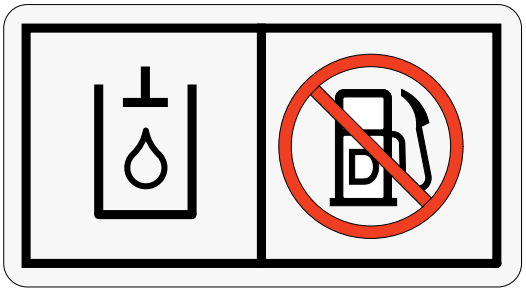
36) **FUEL SHUT OFF** (item 50)

This warning label is positioned on the left side of the hydraulic tank.

※ **Fill only the hydraulic oil.**

※ **Do not fill the diesel fuel.**

⚠ **Relieve tank pressure with the engine off by removing the cap slowly to prevent burns from hot oil.**



140WH90FW51

37) **MCU/ECM CONNECTOR** (item 51)

This warning label is positioned on the low cover of the air conditioner in the cab.

※ **MCU communicates the machine data with Laptop computer through RS232 service socket.**

※ **ECM communicates the engine data with cummins INSITE tool adapter through J1939 service socket.**

※ **See page 3-64 for details.**

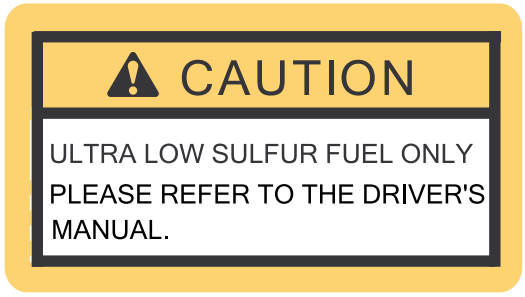
235Z90FW52

38) **ULTRA LOW SULFUR DIESEL** (item 52)

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

※ **Use ultra low sulfur fuel only.**

※ **Ultra low sulfur fuel**
sulfur content ≤ 15 ppm



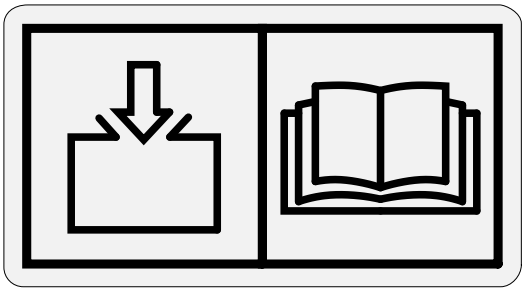
2609A0SL03

39) **SURGE TANK** (item 54)

This warning label is positioned on the top of the surge tank.

This system must be filled slowly to prevent air locks.

※ **Fill rate ≤ 11 lpm**

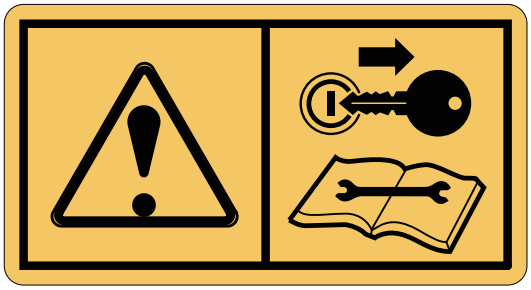


3009A0FW54

40) **KEY OFF CAUTION** (item 55)

This warning label is positioned on the right side window of 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

41) **RCV LEVER** (item 56)

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

※ **When you work by moving the seat to the front of cab, it is possible to take place interference between cluster and RCV lever at specific position.**
To prevent this interference, handle below works.

(1) Rotate cluster.
(2) Adjust seat position for up-and-downward using seat height adjuster knob in suspension.
(3) Lower the console box height using knob between RH console box and seat cushion.
(4) Push back console and seat position using seat and console box adjust knob between LH console box and seat cushion.

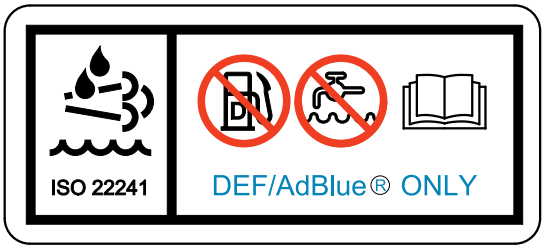
290F0FW04

42) **DIESEL EXHAUST FLUID** (item 57)

This warning label is positioned on the front of DEF/AdBlue® tank.

※ **Fill only the DEF/AdBlue® (Diesel Exhaust Fluid, standardised as ISO 22241).**
Aqueous urea solution made with 32.5% high-purity urea and 67.5% deionized water.

※ **Do not fill the diesel fuel.**



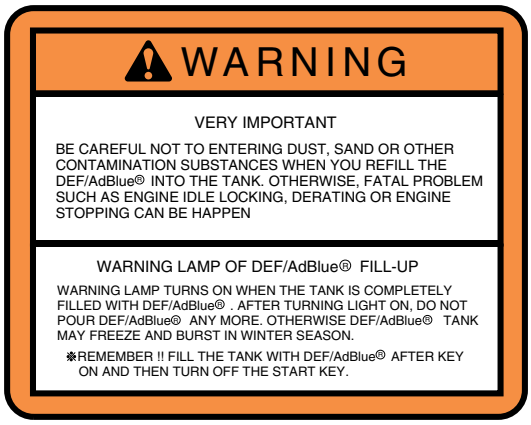
290F0SL04

43) DEF/AdBlue® FILL-UP (item 58)

This warning label is positioned on the front of DEF/AdBlue® tank.

※ **Warning lamp turns on when the tank is completely filled with DEF/AdBlue®.**
After turning light on, do not pour DEF/AdBlue® any more. Otherwise DEF/AdBlue® tank may freeze and burst in winter season.

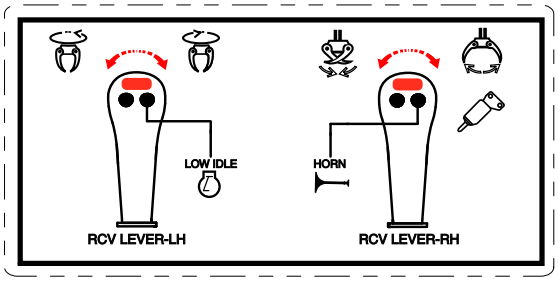
※ **Fill the tank with DEF/AdBlue® after key on and then turn off the start key.**



480F0SL06

44) CONTROL RCV (item 59)

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

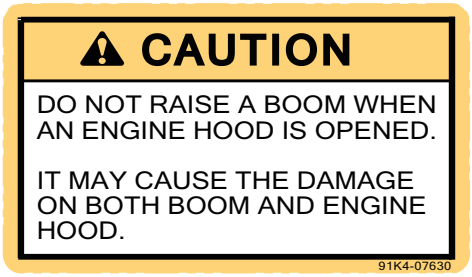


330F0SL05

45) CAUTION (HOOD, BOOM)

This warning label is positioned on the engine hood.

※ **Do not raise a boom when an engine hood is opened.**
It may cause the damage on both boom and engine hood.



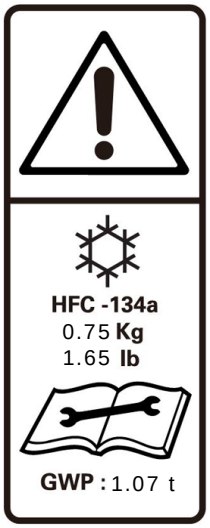
145ZF0SL02

46) **REFRIGERANT** (item 60)

This warning label is positioned on the right side of engine hood.

⚠ **Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.**

※ **Refer to the page 6-47.**



9650FW30

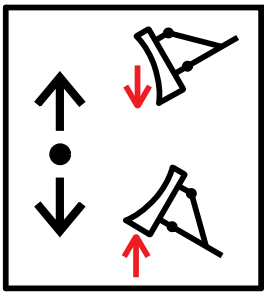
47) **CONTROL IDEOGRAM-DOZER** (item 62)

This warning label is positioned on the RH console box.

※ **See page 4-12 for details.**

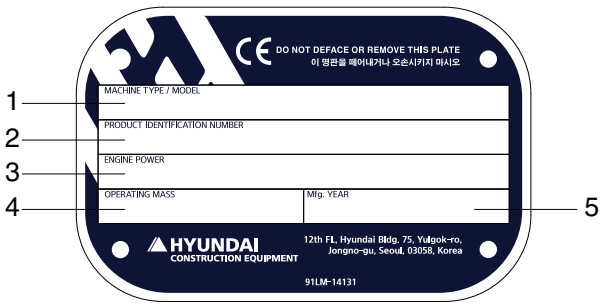
※ **Guidlines for using the general dozer blade.**

- **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.**



R25Z9A0FW06

MACHINE DATA PLATE



FOR EU ONLY

FOR FOPS/FOG

ROPS

290F0FW06

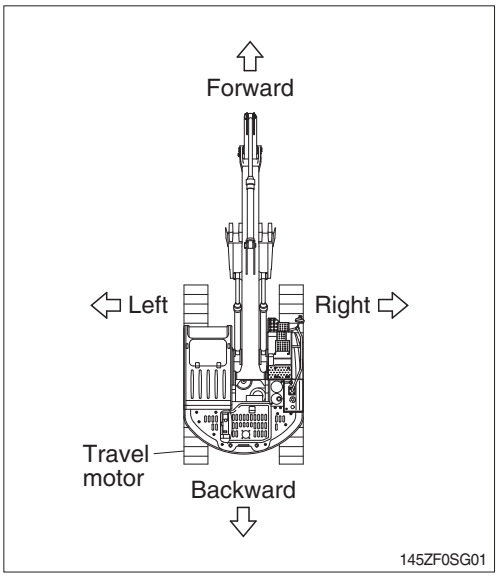
1	Machine type / model	2	Product identification number	3	Engine power
4	Operating mass	5	Manufacturing year	6	Maximum certified weight

※ The machine serial number assigned to this particular machine and 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.

GUIDE

1. DIRECTION

The direction of this manual indicate forward, backward, right and left on the standard of operator when the travel motor is in the rear and machine is on the traveling direction.

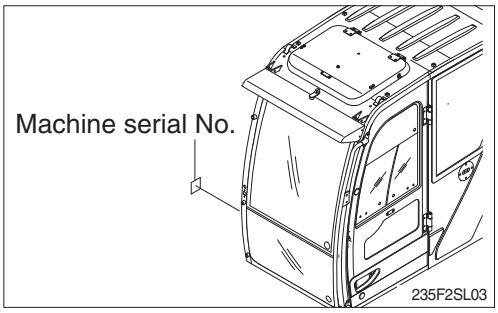


2. SERIAL NUMBER

Inform following when you order parts or the machine is out of order.

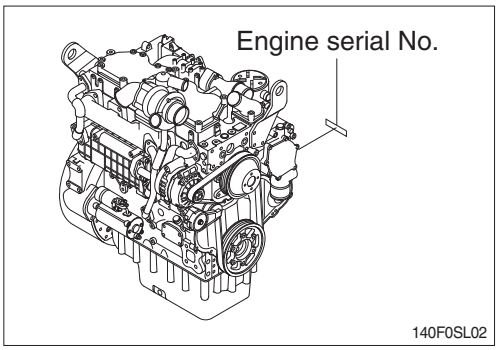
1) MACHINE SERIAL NUMBER

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.

- Digging work
- Loading work
- Smoothing work
- Ditching work

※ Please refer to the section 4 (efficient working method) further details.

4. SYMBOLS

⚠ Important safety hint.

△ It indicates matters which can cause the great loss on the machine or the surroundings.

※ It indicates the useful information for operator.

1. CALIFORNIA PROPOSITION 65

⚠ 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.

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.
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.
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 batte ry 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:

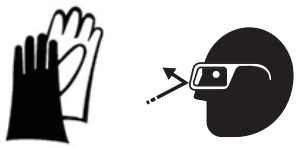
- Move the machine well away from any flammable materials (e.g., fuel, engine oil, clothes, and bits of wood) and adjacent buildings.
- If the engine is running, it may cause a persistent fire. Immediately stop the engine.
- In the event of an electric short, disconnect the batteries to eliminate the 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:

- 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.

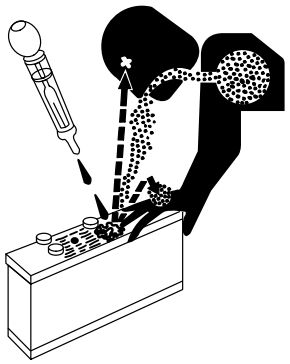
Health and safety instructions in hazardous environments

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

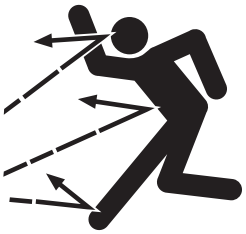
When handling coolants

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,

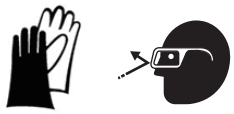
Always wear a safety helmet, protective goggles and safety shoes to prevent injury from airborne particles and thrown or falling objects. Earplugs or earmuffs may be necessary when working in a noisy place.



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.

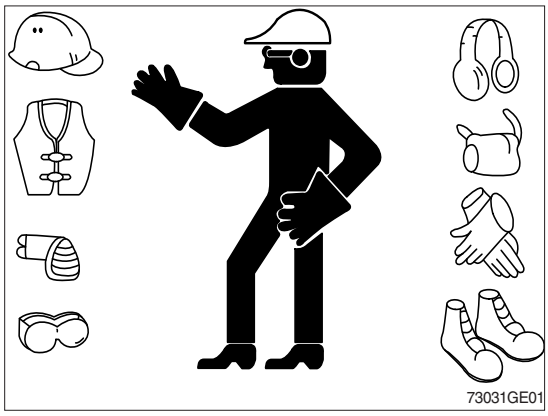
Personal protection gear for various situations

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	

WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.

- Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment.
- Do not wear oily clothes. They are highly flammable.
- Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required.
- While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended.



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 0.5m/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.

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 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 m/s^2 < A(8) $\leq$ 1.15 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 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 futher information, please contatct 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/s^2.**

ISO Reference table - Vibration level equivalent to whole body vibration emission of the excavator (Unit : m/s^2)

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.

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 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.

⑨ Take the following actions for optimal operator comfort and convenience:

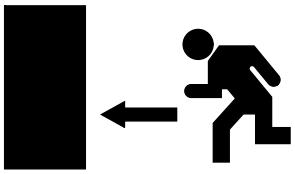
- Adjust the driver's seat adjustment device to allow a convenient posture.
- Adjust the angles of the mirrors to minimize awkward, compromised posture
- Avoid working for an excessively long time, and take regular breaks.
- Do not jump on or off the cabin.
- Minimize repeated handling of loads and lifting 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

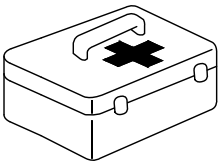
Noise level (EN 474-1:2018 and 2000/14/EC) are as follows :

- Sound pressure level (LpA) : See pages 0-3.
- Sound power level (LwA) : See pages 0-3.

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.

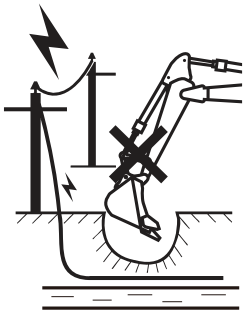
Safety Information on the Machines and Operation

Before Operating the Machine

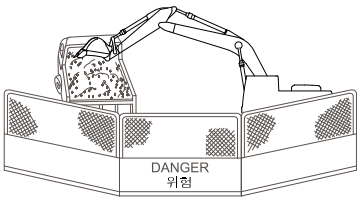
Carefully examine the following conditions and take any necessary actions to prevent risk factors before operating the machine:

Checking the worksite

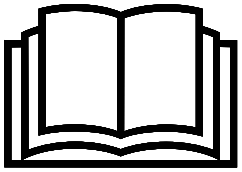
- Always be aware of weather conditions at your worksite. Fog or heavy rain may decrease visibility or render the machine inoperable. In the event of lightning, immediately put the bucket to the ground and evacuate to a safe place.
- Check the worksite for obstacles, and avoid collisions with such obstacles 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. If operation of the machine on such terrain is unavoidable, keep the track perpendicular to the end, place the driving motor at the rear to facilitate escape from the machine in the event of an emergency situation.
- 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.



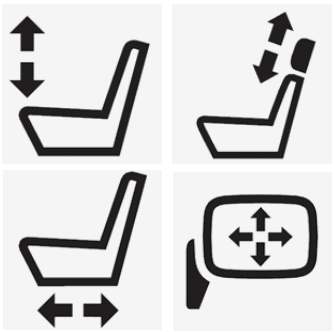
Instructions before operating the machine



- 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

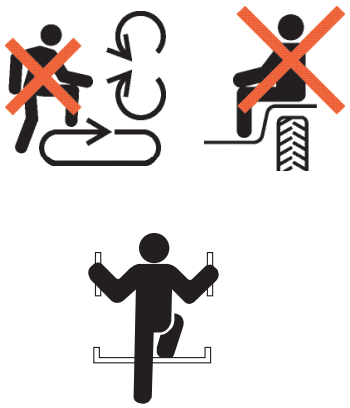
- Check the machine for abnormal noise, vibration or heat, and for the leakage of engine oil, hydraulic oil, fuel or refrigerant.
- Remove any foreign substances from the engine and the battery. The buildup of such substances may cause a fire.
- Do not operate a machine until any necessary repairs are 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

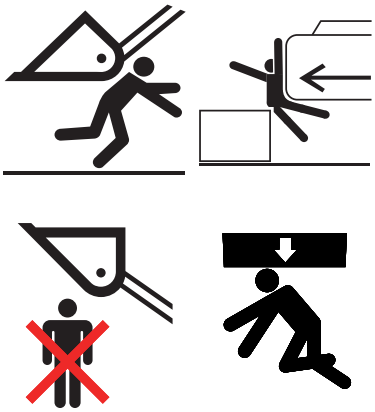


- Do not jump on or off the machine.
- Do not try to get on or off the machine while it is moving.
- Get on or off the machine using the handrail and step (or stepladder, if any). Always keep the handrail and step clean and free from mud or oil.
- Wear anti-slip shoes.
- Comply with the principle of 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.**

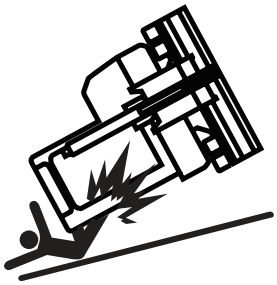
During operation

- 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.

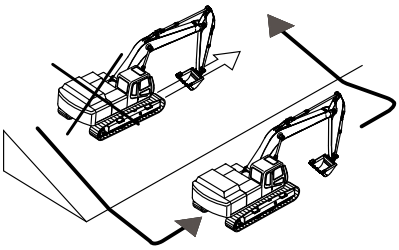


Operation on a slope

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.

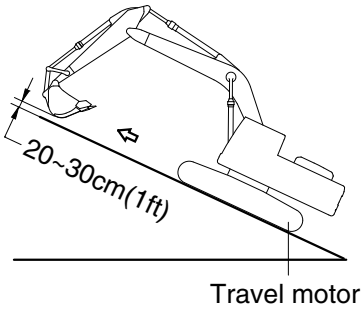


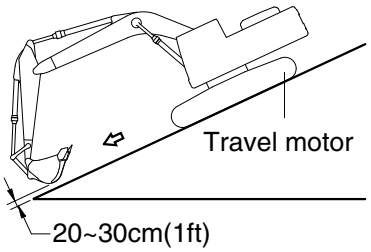
- Do not work on slopes of 10˚ or more.
- Do not exceed the maximum climbing angle of 30˚.
- If operation of the machine on a slope is unavoidable, perform the work after flattening the ground.
- When operating the machine laterally on a slope, there is a high risk of machine overturning or slipping. 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.
- When traveling down a slope, reduce the engine speed with the travel lever kept in the vicinity of the neutral position. 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.)



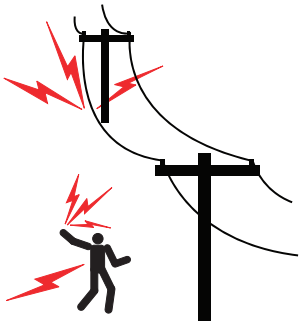


Operations to be avoided or prohibited

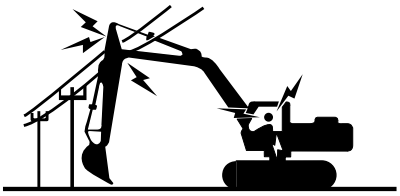
· Pay attention when operating the machine in an enclosed space as this may result in the risk of a buildup of hazardous gases.

· 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.

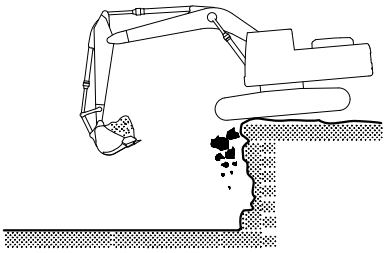
Voltage	Minimum safety distance
6.6 kV	3 m (10 ft)
33.0 kV	4 m (13 ft)
66.0 kV	5 m (16 ft)
154.0 kV	8 m (26 ft)
275.0 kV	10 m (33 ft)



· 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.

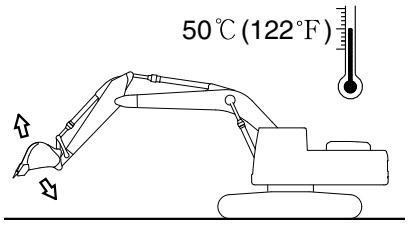


Cautions when operating in specific areas

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

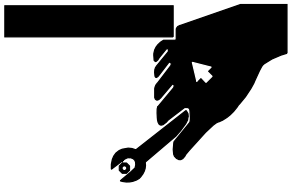
- Do not operate the machine in areas where there is heavy rainfall or thick fog.
- If operating the machine in such areas is unavoidable, perform operation after ensuring sufficient field of vision.
  - Use lighting devices such as the head lamp and working light.
  - Warn any workers within the radius 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

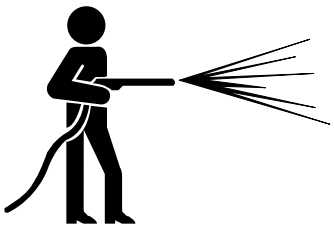
Tools



- 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.



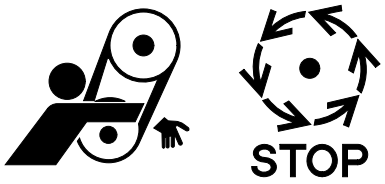
- Use proper lighting devices when operating the machine in a dark area.
- Use lighting devices that are explosion-proof when handling flammable materials such as fuel and hydraulic oil.
- Never attempt to use a direct flame such as a cigarette lighter in lieu of the lighting device.

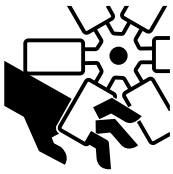
- Check the level of the cooling water after stopping and sufficiently cooling down the engine.
- Sufficiently relieve the inside pressure before opening the cooling water cap.
- The cooling system contains basic components. Use caution to prevent the skin or eyes from coming into contact with the basic 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

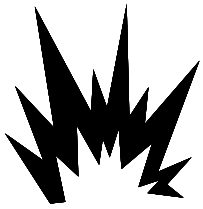
- Never perform a maintenance while the engine is running.
- Never open or remove the engine hood while the machine is in operation.
- If an inspection is required while the engine is running, two or more workers must perform the inspection.
- Keep areas in the vicinity of rotating or moving parts clean.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





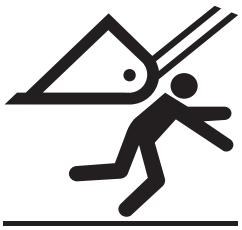
Preventing fire and explosion

- 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.

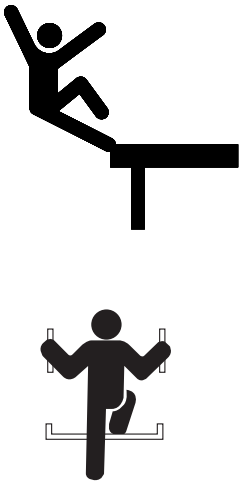


Repair by welding

- 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.

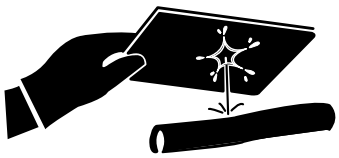
Precautions to take when working on the machine

- 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

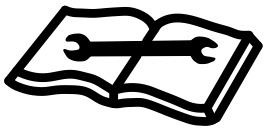
- Make sure that the internal pressure is released before replacing or checking the high-pressure line or hose.
- If the internal pressure is not released, serious injury may result.
- Take the following precautions to avoid serious injury or death:
  - Always check to make sure a working fire extinguisher 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.



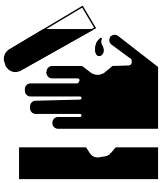
Cautions on inspecting the counterweight

- 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

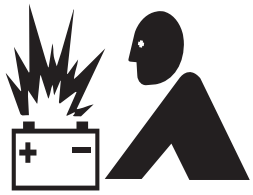


- The battery contains flammable materials.
- Never smoke in the vicinity of the battery.
- The battery electrolyte is strong acid. Pay attention to prevent the skin and eyes from coming into contact with the electrolyte.



- 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.

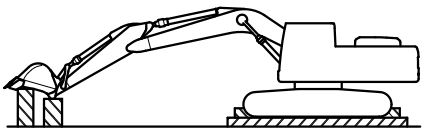
Parking and Storage

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.
- 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

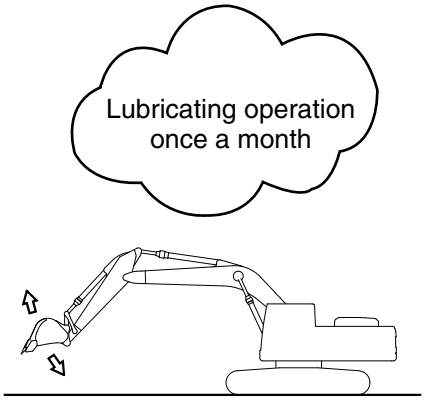
- Park the machine in accordance to any state and local laws.
- When storing the machine for a month or longer, follow these instructions to prevent deterioration of the machine performance :



  - 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 tracks 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.



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 Closed Circuit Television(CCTV), 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 rules and procedures that coordinates machines and people that work together in the same area.

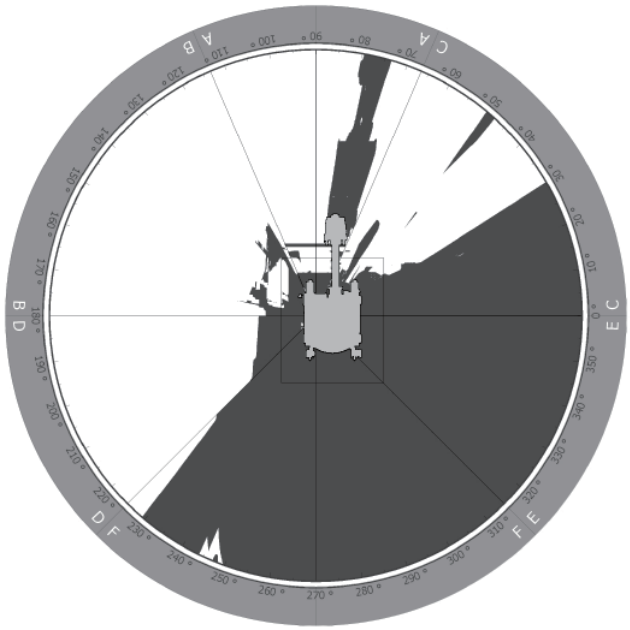
Examples of job site organization include the following:

- 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 shall be performed according to ISO 5006:2017.

Restricted Visibility

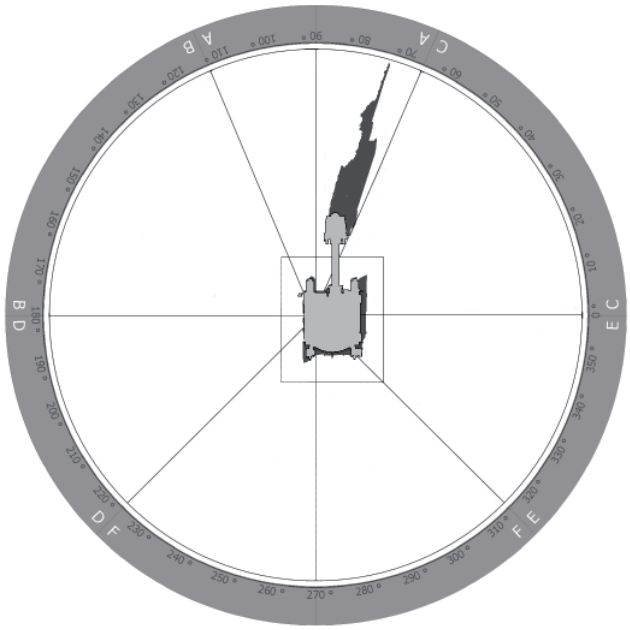
The size and the configuration of this machine may result in areas that can not be seen when the operator is seated. The following illustration of visual map provides an approximate visual indication of areas of significant restricted visibility. This illustration indicates restricted visibility areas at ground level inside a radius of 12.00m (40 ft) from the operator on a machine only with the use of right side mirror and left side mirror installed. (without the use of optional visual aids.) This illustration provide areas of restricted visibility for distances outside a radius of 12.00m (40 ft).
This machine may be equipped with optional visual aids (CCTV or AAVM) that may provide visibility to some of the restricted visibility areas. For areas that are not covered by the optional visual aids, the job site organization must be utilized to minimize hazards of this restricted visibility.



< Top view of the machine at ground level visibility without use of optional visual aids >

※ The shaded areas indicate the approximate location of areas with significant restricted visibility. (Radius = 12 m / 34 ft)

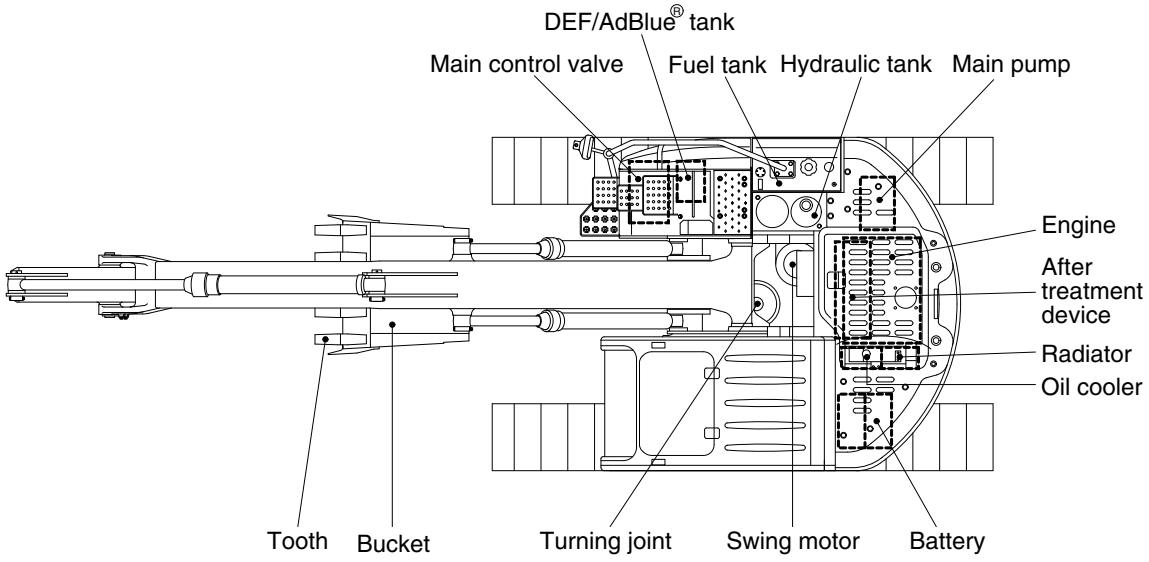
There is restricted visibility to the area directly behind the machine with no optional visual aids. Failure to make sure the area is clear could result in serious injury or death. Make sure that the area is clear with the other person on the ground before you start the reverse movement.

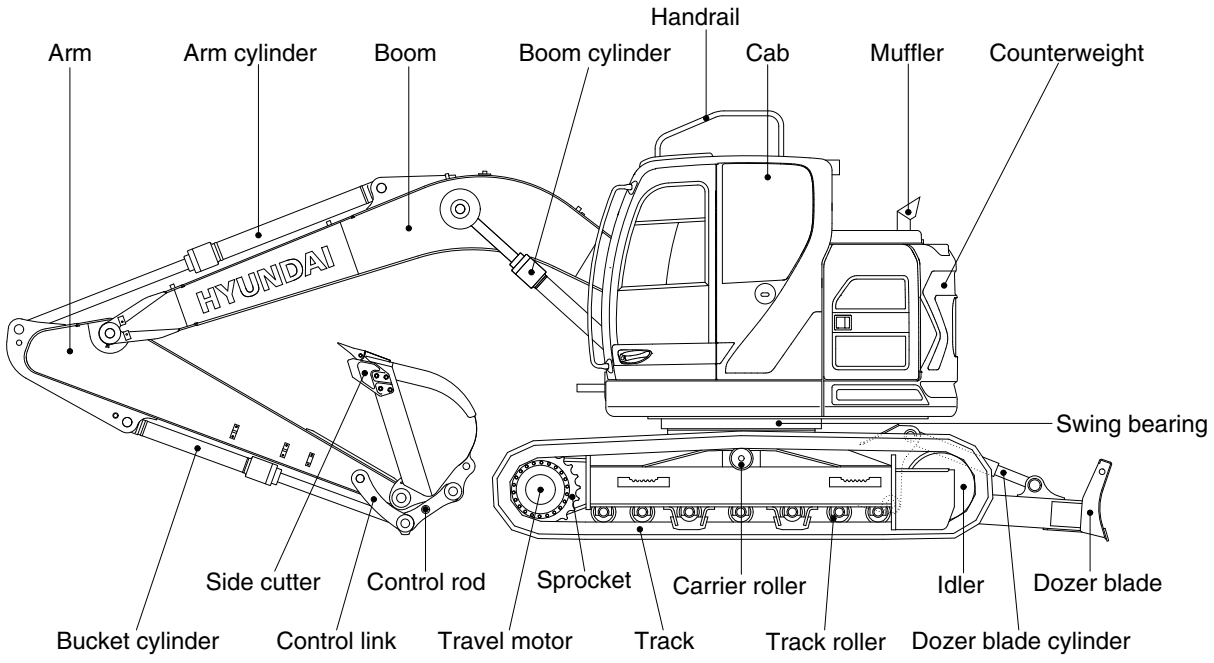


< Top view of the machine at ground level visibility with use of optional visual aids >

※ The shaded areas indicate the approximate location of areas with significant restricted visibility. (Radius = 12 m / 34 ft)

1. MAJOR COMPONENT



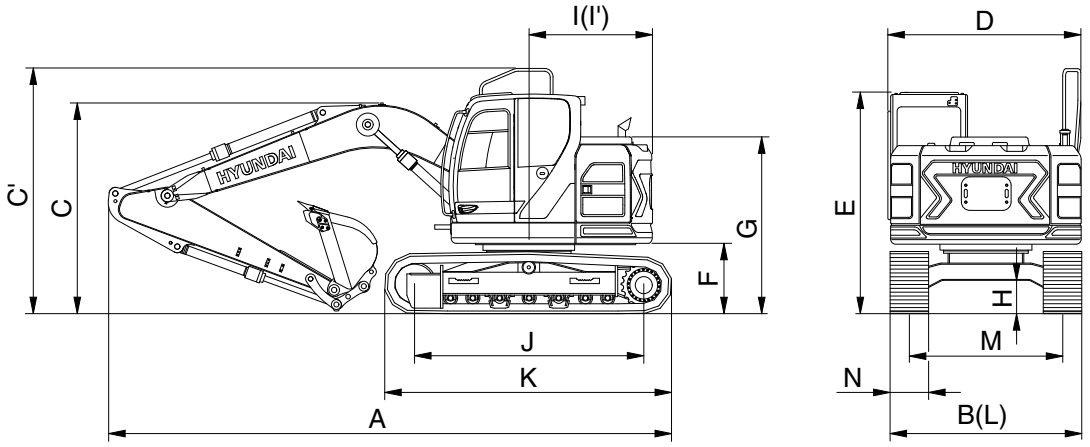


145ZF2SP01A

2. SPECIFICATIONS

1) HX145 CR

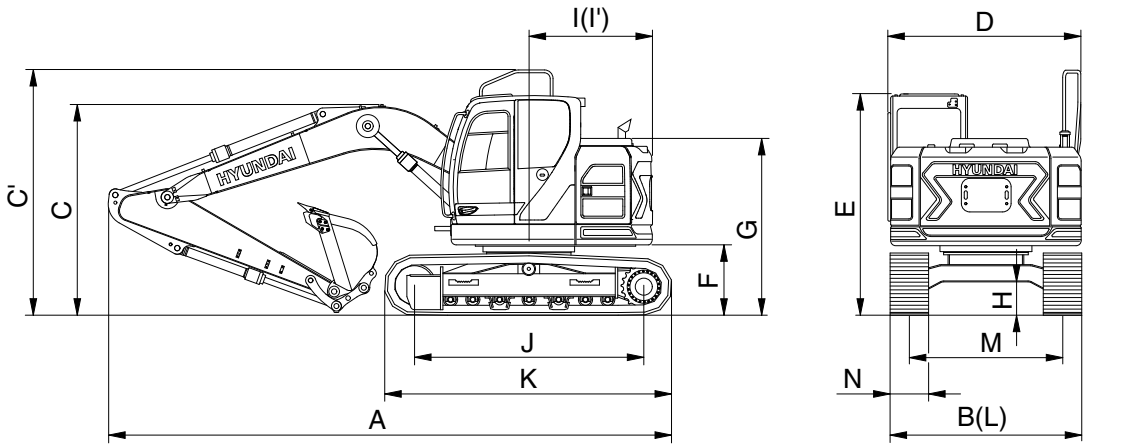
(1) 4.60 m (15' 1") boom and 1.9 m (6' 3"), 2.1 m (6' 11") arm



145ZF2SP02

Description		Unit	Specification	
			1.9 m (6' 3") arm	2.1 m (6' 11") arm
Operating weight		kg (lb)	15180 (33470)	15210 (33530)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7290 (23' 11")	7310 (24' 0")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2630 (8' 8")	2710 (8' 11")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		2910 (9' 7")	←
Undercarriage length	K		3618 (11' 8")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.40 (5.7)	0.40 (5.72)
Max traction force		kg (lb)	12000 (26455)	←

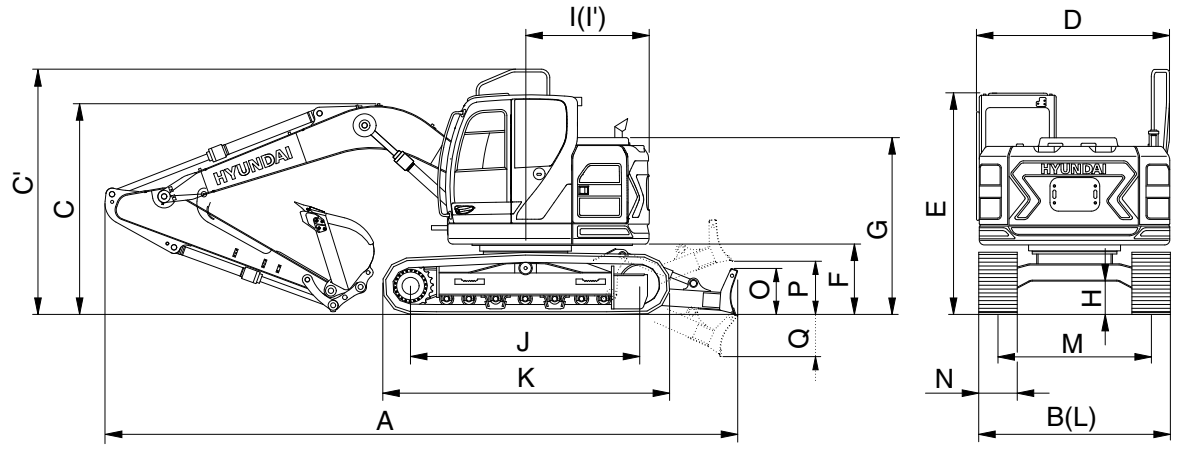
(2) 4.60 m (15' 1") boom and 2.50 m (8' 2"), 3.0 m (9' 10") arm



145ZF2SP02

Description		Unit	Specification	
			2.50 m (8' 2") arm	3.0 m (9' 10") arm
Operating weight		kg (lb)	15270 (33660)	15320 (33770)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7270 (23' 10")	7210 (23' 8")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2860 (9' 5")	3210 (10' 6")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		2910 (9' 7")	←
Undercarriage length	K		3618 (11' 8")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.40 (5.74)	0.40 (5.76)
Max traction force		kg (lb)	12000 (26455)	←

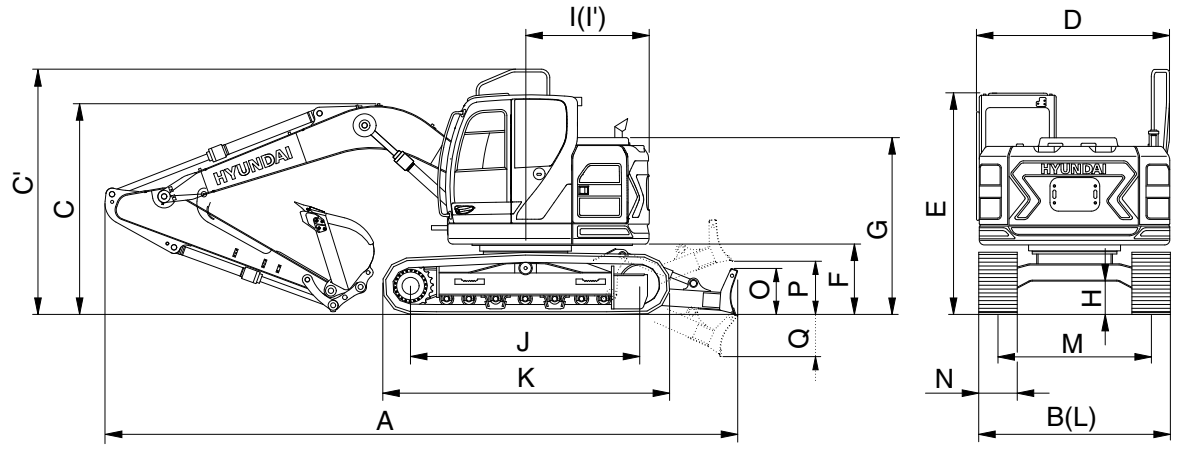
(3) 4.60 m (15' 1") boom and 1.9 m (6' 3"), 2.1 m (6' 11") arm with dozer



145ZF2SP03

Description		Unit	Specification	
			1.9 m (6' 3") arm	2.1 m (6' 11") arm
Operating weight		kg (lb)	16020 (35320)	16050 (35380)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7840 (25' 9")	7860 (25' 9")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2630 (8' 8")	2710 (8' 11")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		2910 (9' 7")	←
Undercarriage length	K		3618 (11' 8")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Height of blade	O		575 (1' 11")	←
Ground clearance of blade up	P		420 (1' 5")	←
Depth of blade down	Q		430 (1' 5")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.42 (6.02)	0.42 (6.03)
Max traction force		kg (lb)	12000 (26455)	←

(4) 4.60 m (15' 1") boom and 2.50 m (8' 2"), 3.0 m (9' 10") arm with dozer

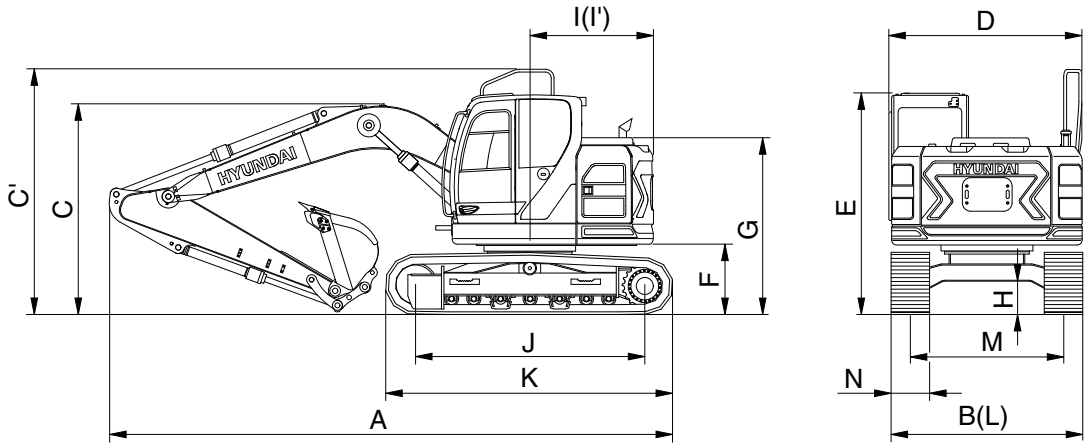


145ZF2SP03

Description		Unit	Specification	
			2.50 m (8' 2") arm	3.0 m (9' 10") arm
Operating weight		kg (lb)	16110 (35520)	16160 (35630)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7820 (25' 8")	7760 (25' 6")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2860 (9' 5")	3210 (10' 6")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		2910 (9' 7")	←
Undercarriage length	K		3618 (11' 8")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Height of blade	O		575 (1' 11")	←
Ground clearance of blade up	P		420 (1' 5")	←
Depth of blade down	Q		430 (1' 5")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.43 (6.05)	0.43 (6.07)
Max traction force		kg (lb)	12000 (26455)	←

2) HX145 LCR

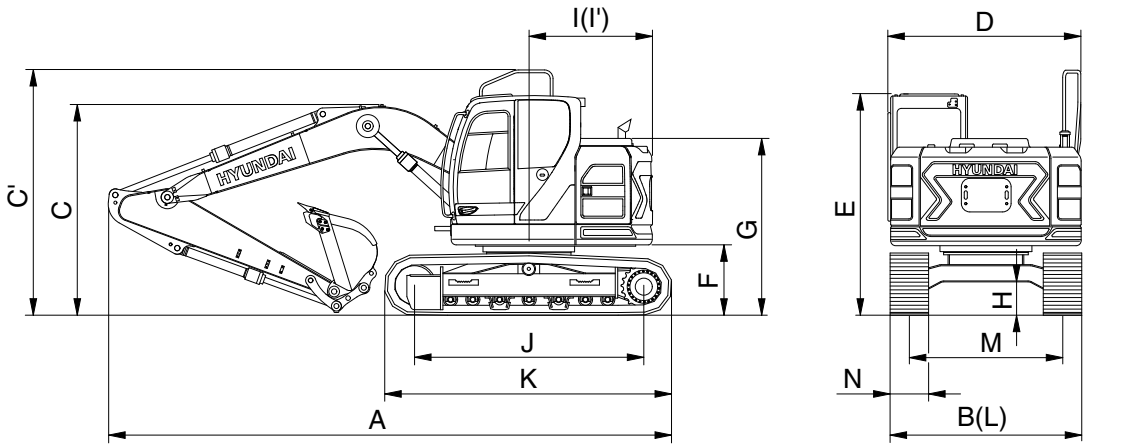
(1) 4.60 m (15' 1") boom and 1.9 m (6' 3"), 2.1 m (6' 11") arm



145ZF2SP02

Description		Unit	Specification	
			1.9 m (6' 3") arm	2.1 m (6' 11") arm
Operating weight		kg (lb)	15440 (34040)	15480 (34130)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7380 (24' 3")	7400 (24' 3")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2630 (8' 8")	2710 (8' 11")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		3090 (10' 2")	←
Undercarriage length	K		3798 (12' 6")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.39 (5.49)	0.39 (5.5)
Max traction force		kg (lb)	12000 (26455)	←

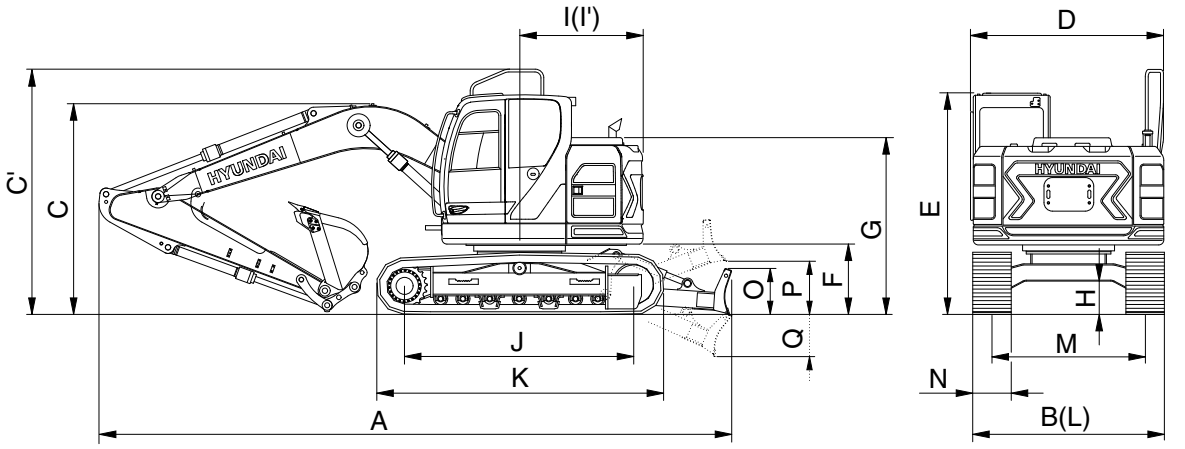
(2) 4.60 m (15' 1") boom and 2.50 m (8' 2"), 3.0 m (9' 10") arm



145ZF2SP02

Description		Unit	Specification	
			2.50 m (8' 2") arm	3.0 m (9' 10") arm
Operating weight		kg (lb)	15540 (34260)	15580 (34350)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7360 (24' 2")	7300 (23' 11")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2860 (9' 5")	3210 (10' 6")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		3090 (10' 2")	←
Undercarriage length	K		3798 (12' 6")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.39 (5.52)	0.39 (5.54)
Max traction force		kg (lb)	12000 (26455)	←

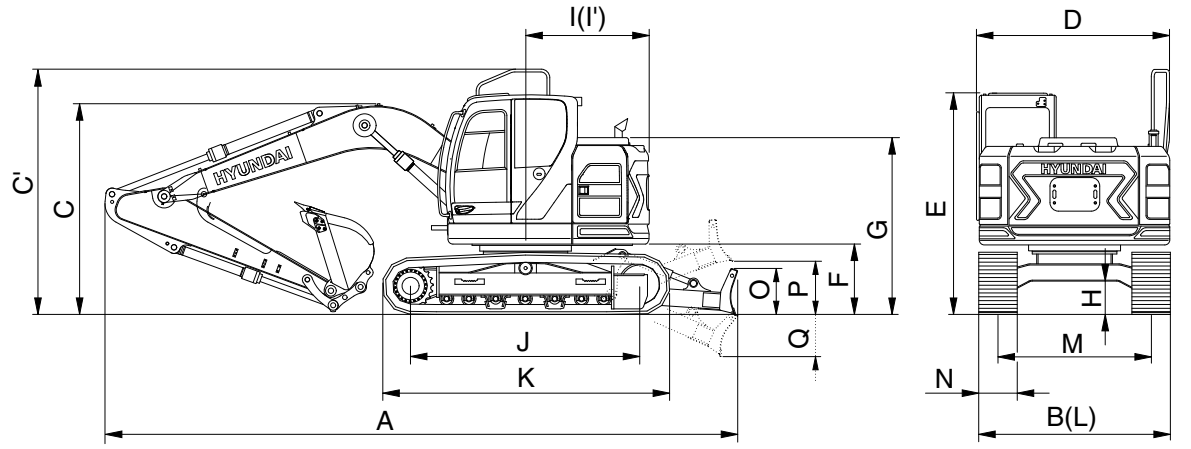
(3) 4.60 m (15' 1") boom and 1.9 m (6' 3"), 2.1 m (6' 11") arm with dozer



145ZF2SP03

Description		Unit	Specification	
			1.9 m (6' 3") arm	2.1 m (6' 11") arm
Operating weight		kg (lb)	16260 (35850)	16300 (35940)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7840 (25' 9")	7860 (25' 9")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2630 (8' 8")	2710 (8' 11")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		3090 (10' 2")	←
Undercarriage length	K		3798 (12' 6")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Height of blade	O		575 (1' 11")	←
Ground clearance of blade up	P		420 (1' 5")	←
Depth of blade down	Q		430 (1' 5")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.41 (5.78)	0.41 (5.79)
Max traction force		kg (lb)	12000 (26455)	←

(4) 4.60 m (15' 1") boom and 2.50 m (8' 2"), 3.0 m (9' 10") arm with dozer

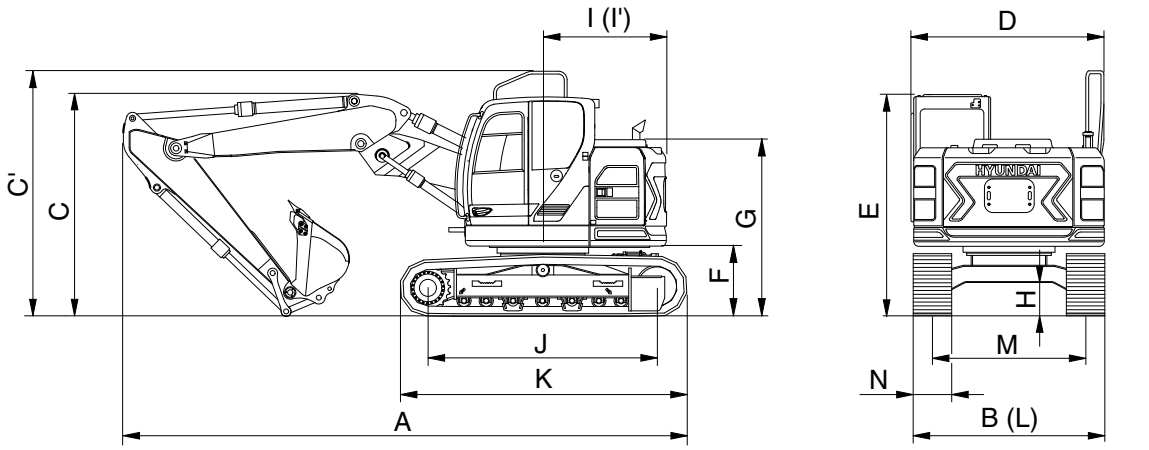


145ZF2SP03

Description		Unit	Specification	
			2.50 m (8' 2") arm	3.0 m (9' 10") arm
Operating weight		kg (lb)	16360 (36070)	16400 (36160)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7820 (25' 8")	7760 (25' 6")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2860 (9' 5")	3210 (10' 6")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		3090 (10' 2")	←
Undercarriage length	K		3798 (12' 6")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Height of blade	O		575 (1' 11")	←
Ground clearance of blade up	P		420 (1' 5")	←
Depth of blade down	Q		430 (1' 5")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.41 (5.82)	0.41 (5.83)
Max traction force		kg (lb)	12000 (26455)	←

3) HX145 LCR 2-PIECE BOOM

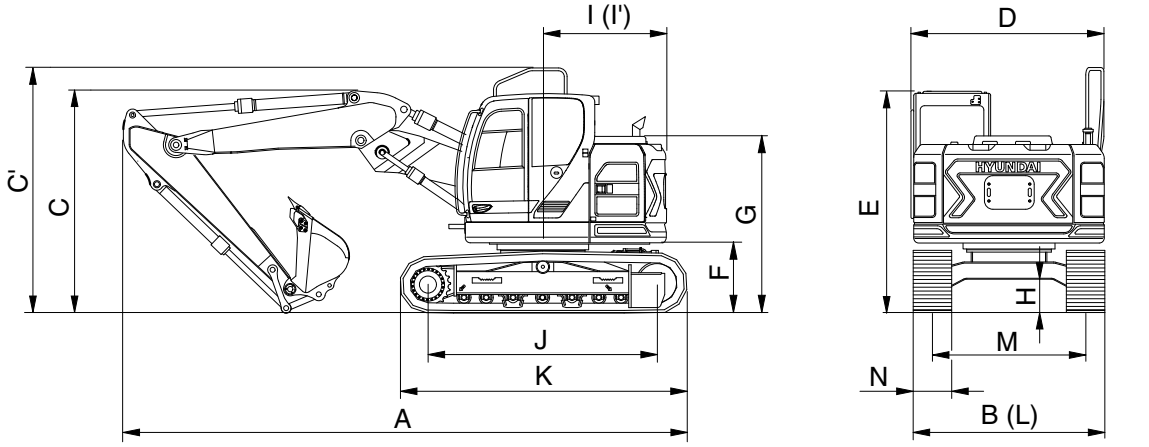
(1) 4.939 m (16' 2") 2-piece boom and 1.9 m (6' 3"), 2.1 m (6' 11") arm



145ZF2SP06

Description		Unit	Specification	
			1.9 m (6' 3") arm	2.1 m (6' 11") arm
Operating weight		kg (lb)	15770 (34770)	15800 (34830)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	7650 (25' 1")	7720 (25' 4")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2865 (9' 5")	2870 (9' 5")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		3090 (10' 2")	←
Undercarriage length	K		3798 (12' 6")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.39 (5.61)	0.39 (5.62)
Max traction force		kg (lb)	12000 (26455)	←

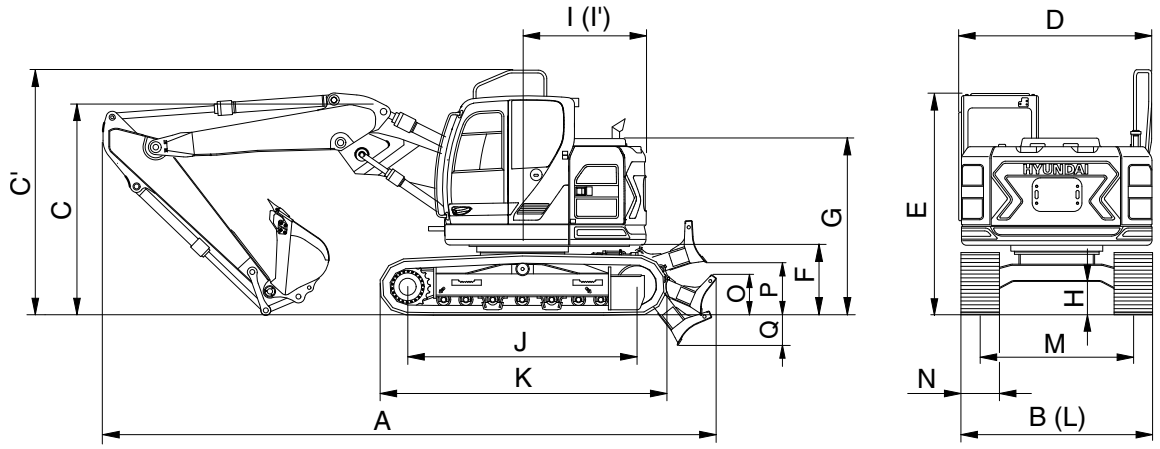
(2) 4.939 m (16' 2") 2-piece boom and 2.50 m (8' 2") arm



145ZF2SP06

Description		Unit	Specification
Operating weight		kg (lb)	15860 (34970)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)
Overall length	A	mm (ft-in)	7690 (25' 3")
Overall width, with 600 mm shoe	B		2600 (8' 6")
Overall height	C		2900 (9' 6")
Overall height of handrail	C'		3215 (10' 7")
Superstructure width	D		2500 (8' 2")
Overall height of cab	E		2900 (9' 6")
Ground clearance of counterweight	F		930 (3' 1")
Engine cover height	G		2320 (7' 7")
Minimum ground clearance	H		440 (1' 5")
Rear-end distance	I		1500 (4' 11")
Rear-end swing radius	I'		1500 (4' 11")
Distance between tumblers	J		3090 (10' 2")
Undercarriage length	K		3798 (12' 6")
Undercarriage width	L		2600 (8' 6")
Track gauge	M		2000 (6' 7")
Track shoe width, standard	N		600 (24")
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)
Swing speed		rpm	11.2
Gradeability		Degree (%)	35 (70)
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.40 (5.64)
Max traction force		kg (lb)	12000 (26455)

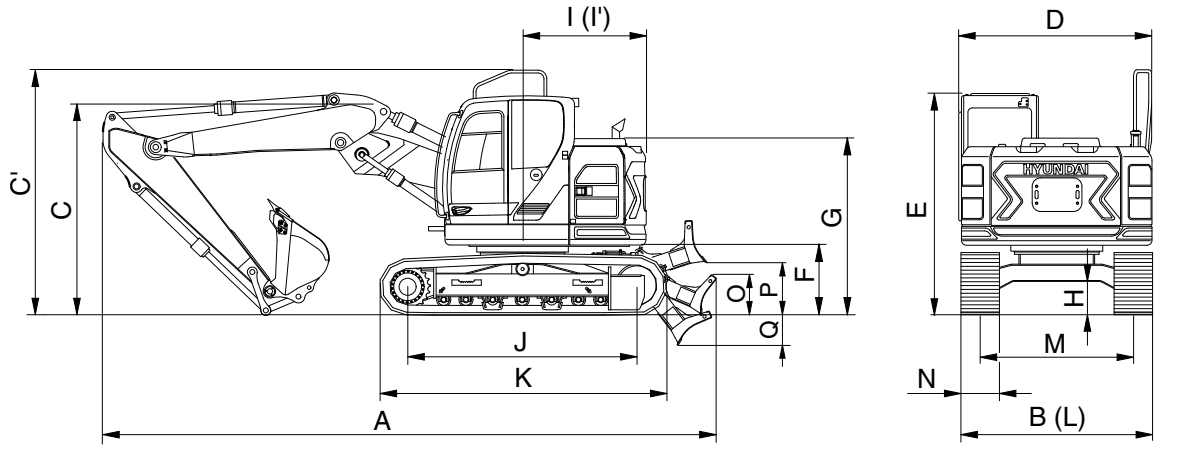
(3) 4.939 m (16' 2") 2-piece boom and 1.9 m (6' 3"), 2.1m (6' 11") arm with dozer



145ZF2SP07

Description		Unit	Specification	
			1.9 m (6' 3") arm	2.1 m (6' 11") arm
Operating weight		kg (lb)	16580 (36550)	16620 (36640)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)	←
Overall length	A	mm (ft-in)	8110 (26' 7")	8180 (26' 10")
Overall width, with 600 mm shoe	B		2600 (8' 6")	←
Overall height	C		2865 (9' 5")	2870 (9' 5")
Overall height of handrail	C'		3215 (10' 7")	←
Superstructure width	D		2500 (8' 2")	←
Overall height of cab	E		2900 (9' 6")	←
Ground clearance of counterweight	F		930 (3' 1")	←
Engine cover height	G		2320 (7' 7")	←
Minimum ground clearance	H		440 (1' 5")	←
Rear-end distance	I		1500 (4' 11")	←
Rear-end swing radius	I'		1500 (4' 11")	←
Distance between tumblers	J		3090 (10' 2")	←
Undercarriage length	K		3798 (12' 6")	←
Undercarriage width	L		2600 (8' 6")	←
Track gauge	M		2000 (6' 7")	←
Track shoe width, standard	N		600 (24")	←
Height of blade	O		575 (1' 11")	←
Ground clearance of blade up	P		410 (1' 4")	←
Depth of blade down	Q		450 (1' 6")	←
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)	←
Swing speed		rpm	11.2	←
Gradeability		Degree (%)	35 (70)	←
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.41 (5.89)	0.42 (5.91)
Max traction force		kg (lb)	12000 (26455)	←

(4) 4.939 m (16' 2") 2-piece boom and 2.50 m (8' 2") arm with dozer

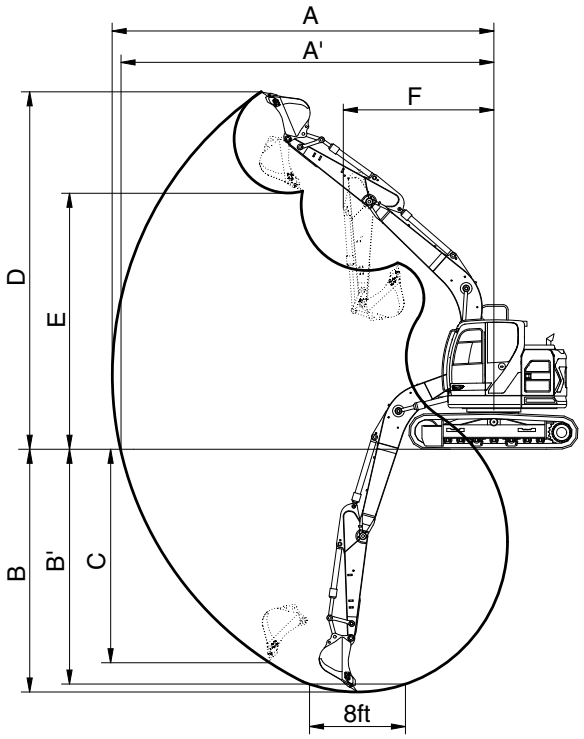


145ZF2SP07

Description		Unit	Specification
Operating weight		kg (lb)	16680 (36770)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.52 (0.68)
Overall length	A	mm (ft-in)	8150 (26' 9")
Overall width, with 600 mm shoe	B		2600 (8' 6")
Overall height	C		2900 (9' 6")
Overall height of handrail	C'		3215 (10' 7")
Superstructure width	D		2500 (8' 2")
Overall height of cab	E		2900 (9' 6")
Ground clearance of counterweight	F		930 (3' 1")
Engine cover height	G		2320 (7' 7")
Minimum ground clearance	H		440 (1' 5")
Rear-end distance	I		1500 (4' 11")
Rear-end swing radius	I'		1500 (4' 11")
Distance between tumblers	J		3090 (10' 2")
Undercarriage length	K		3798 (12' 6")
Undercarriage width	L		2600 (8' 6")
Track gauge	M		2000 (6' 7")
Track shoe width, standard	N		600 (24")
Height of blade	O		575 (1' 11")
Ground clearance of blade up	P		410 (1' 4")
Depth of blade down	Q		450 (1' 6")
Travel speed (low/high)		km/hr (mph)	3.3/5.5 (2.1/3.4)
Swing speed		rpm	11.2
Gradeability		Degree (%)	35 (70)
Ground pressure (600 mm shoe)		kgf/cm^2(psi)	0.42 (5.93)
Max traction force		kg (lb)	12000 (26455)

3. WORKING RANGE

1) 4.60 m (15' 1") MONO BOOM

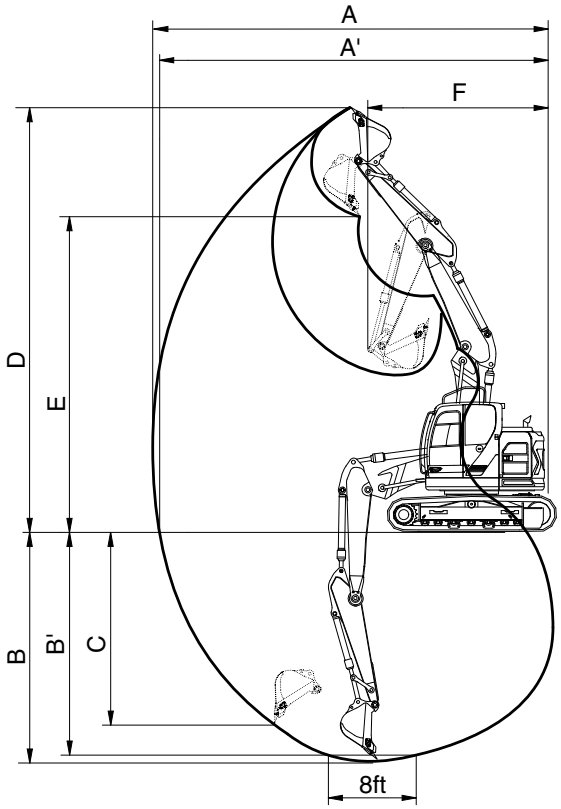


145ZF2SP04

Description		1.90 m (6' 3") Arm	2.10 m (6' 11") Arm	※2.50 m (8' 2") Arm	3.00 m (9' 10") Arm
Max digging reach	A	7730 mm (25' 4")	7900 mm (25'11")	8310 mm (27' 3")	8770 mm (28' 9")
Max digging reach on ground	A'	7580 mm (24'10")	7750 mm (25' 0")	8170 mm (26'10")	8630 mm (28' 4")
Max digging depth	B	4890 mm (16' 1")	5100 mm (16' 9")	5500 mm (18' 1")	5990 mm (19' 8")
Max digging depth (8ft level)	B'	4640 mm (15' 3")	4870 mm (16' 0")	5290 mm (17' 4")	5810 mm (19' 1")
Max vertical wall digging depth	C	4400 mm (14' 5")	4600 mm (15' 1")	5000 mm (16' 5")	5400 mm (17' 9")
Max digging height	D	8840 mm (29' 0")	8970 mm (29' 5")	9350 mm (30' 8")	9730 mm (31'11")
Max dumping height	E	6350 mm (20'10")	6470 mm (21' 3")	6850 mm (22' 6")	7230 mm (23' 9")
Min swing radius	F	1860 mm (6' 1")	2030 mm (6' 8")	1980 mm (6' 6")	2260 mm (7' 5")
Bucket digging force	SAE	87.3 [94.8] kN	87.3 [94.8] kN	87.3 [94.8] kN	87.3 [94.8] kN
		8900 [9660] kgf	8900 [9660] kgf	8900 [9660] kgf	8900 [9660] kgf
		19620 [21300] lbf	19620 [21300] lbf	19620 [21300] lbf	19620 [21300] lbf
	ISO	102 [110.8] kN	102 [110.8] kN	102 [110.8] kN	102 [110.8] kN
		10400 [11290] kgf	10400 [11290] kgf	10400 [11290] kgf	10400 [11290] kgf
		22930 [24890] lbf	22930 [24890] lbf	22930[24890] lbf	22930 [24890] lbf
Arm crowd force	SAE	76.5 [83.1] kN	73.6 [79.9] kN	62.8 [68.2] kN	55.9 [60.7] kN
		7800 [8470] kgf	7500 [8140] kgf	6400 [6950] kgf	5700 [6190] kgf
		17200 [18670] lbf	16530 [17950] lbf	14110 [15320] lbf	12570 [13640] lbf
	ISO	80.4 [87.3] kN	77.5 [84.1] kN	65.7 [71.4] kN	57.9 [62.8] kN
		8200 [8900] kgf	7900 [8580] kgf	6700 [7270] kgf	5900 [6410] kgf
		18080 [19630] lbf	17420 [18910] lbf	14770 [16040] lbf	13010 [14120] lbf

※ : STD [ ] : Power boost

2) 4.939 M (16' 2") 2-PIECE BOOM



145ZF2SP08

Description		1.90 m (6' 3") Arm	2.10 m (6' 11") Arm	2.50 m (8' 2") Arm
Max digging reach	A	8000 mm (26' 3")	8270 mm (27' 2")	8675 mm (28' 6")
Max digging reach on ground	A'	7850 mm (25' 9")	8130 mm (26' 8")	8540 mm (28' 0")
Max digging depth	B	4985 mm (16' 4")	5175 mm (17' 0")	5580 mm (18' 4")
Max digging depth (8ft level)	B'	4870 mm (16' 0")	5060 mm (16' 7")	5470 mm (17'11")
Max vertical wall digging depth	C	4030 mm (13' 3")	4555 mm (14'11")	5015 mm (16' 5")
Max digging height	D	9000 mm (29' 6")	9340 mm (30' 8")	9715 mm (31'10")
Max dumping height	E	6555 mm (21' 6")	6850 mm (22' 6")	7230 mm (23' 9")
Min swing radius	F	2220 mm (7' 3")	2300 mm (7' 7")	2250 mm (7' 5")
Bucket digging force	SAE	87.3 [94.8] kN	87.3 [94.8] kN	87.3 [94.8] kN
		8900 [9660] kgf	8900 [9660] kgf	8900 [9660] kgf
		19620 [21300] lbf	19620 [21300] lbf	19620 [21300] lbf
	ISO	102 [110.8] kN	102 [110.8] kN	102 [110.8] kN
		10400 [11290] kgf	10400 [11290] kgf	10400 [11290] kgf
		22930 [24890] lbf	22930 [24890] lbf	22930[24890] lbf
Arm crowd force	SAE	76.5 [83.1] kN	73.6 [79.9] kN	62.8 [68.2] kN
		7800 [8470] kgf	7500 [8140] kgf	6400 [6950] kgf
		17200 [18670] lbf	16530 [17950] lbf	14110 [15320] lbf
	ISO	80.4 [87.3] kN	77.5 [84.1] kN	65.7 [71.4] kN
		8200 [8900] kgf	7900 [8580] kgf	6700 [7270] kgf
		18080 [19630] lbf	17420 [18910] lbf	14770 [16040] lbf

[ ] : Power boost

4. WEIGHT

Item	HX145LCR		HX145 LCRD	
	kg	lb	kg	lb
Upper structure assembly				
· Main frame weld assembly	1300	2870	1266	2791
· Engine assembly	558	1230	←	←
· Main pump assembly	90	200	←	←
· Main control valve assembly	140	310	←	←
· Swing motor assembly	120	260	←	←
· Hydraulic oil tank assembly	150	330	←	←
· Fuel tank assembly	120	260	←	←
· Counterweight	2800	6170	←	←
· Cab assembly	450	990	←	←
Lower chassis assembly				
· Track frame weld assembly	1640	3620	1713★1 1771★2	3777★1 3904★2
· Swing bearing	228	503	←	←
· Travel motor assembly	240	530	←	←
· Turning joint	50	110	←	←
· Track recoil spring	93	206	←	←
· Idler	105	231	←	←
· Carrier roller	20	45	←	←
· Track roller	35	80	←	←
· Sprocket	40	88	←	←
· Track-chain assembly (600 mm standard triple grouser shoe)	1804	3977	←	←
· Dozer blade assembly	-	-	519	1144
Front attachment assembly				
· 4.6 m boom assembly	830	1830	←	←
· 2-piece boom assembly	1018	2244	←	←
· 2.5 m arm assembly	435	960	←	←
· 0.52 m^3 SAE heaped bucket	460	1010	←	←
· Boom cylinder assembly	130	290	←	←
· Arm cylinder assembly	160	350	←	←
· Bucket cylinder assembly	100	220	←	←
· Bucket control rod assembly	90	200	←	←
· Dozer blade cylinder assembly	-	-	44	97

★1 HX145CRD ★2 HX145LCRD

※ This information is different with operating and transportation weight because it is not including harness, pipe, oil, fuel so on.

※ Refer to Transportation for actual weight information and Specifications for operating weight.

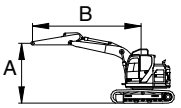
5. LIFTING CAPACITIES

1) HX145LCR MONO BOOM

Unit : mm

Model	Boom Type	Boom Length	Arm Length	Counterweight Weight (kg)	Shoe Width	Dozer Front	Dozer Rear	Outrigger Front	Outrigger Rear
HX145LCR	Mono	4600	1900	2800	600	-	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Lift-point height (A)		Lift-point radius (B) 1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		At max. reach Capacity		Reach
												m (ft)
7.5m	kg									*5160	*5160	2.27
24.6ft	lb									*11380	*11380	(7.5)
6.0m	kg			*5270	*5270	*4160	3760			*3510	*3510	4.63
19.7ft	lb			*11620	*11620	*9170	8290			*7740	*7740	(15.2)
4.5m	kg			*6050	*6050	*4910	3730			*3160	2500	5.73
14.8ft	lb			*13340	*13340	*10820	8220			*6970	5510	(18.8)
3.0m	kg					*5560	3540	3760	2280	*3130	2100	6.30
9.8ft	lb					*12260	7800	8290	5030	*6900	4630	(20.7)
1.5m	kg					5710	3310	3670	2200	3270	1960	6.47
4.9ft	lb					12590	7300	8090	4850	7210	4320	(21.2)
0.0m	kg			*5830	5770	5560	3180	3610	2140	3380	2010	6.29
0.0ft	lb			*12850	12720	12260	7010	7960	4720	7450	4430	(20.6)
-1.5m	kg			*7860	5810	5530	3160			3890	2300	5.71
-4.9ft	lb			*17330	12810	12190	6970			8580	5070	(18.7)
-3.0m	kg			*5420	*5420	*3560	3280			*3380	3200	4.58
-9.8ft	lb			*11950	*11950	*7850	7230			*7450	7050	(15.0)

※ Note

1. Lifting capacity are based on SAE J1097 and ISO 10567.
2. Lifting capacity of the ROBEX 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.

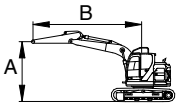
※ Lifting capacities are based upon a standard machine conditions.
Lifting capacities will vary with different work tools, ground conditions and attachments.
The difference between the weight of a work tool attachment must be subtracted.
Consult your HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.

⚠ Failure to comply to the rated load can cause possible personal injury or property damage.
Make adjustments to the rated load as necessary for non-standard configurations.

Unit : mm

Model	Boom	Boom	Arm	Counterweight	Shoe	Dozer		Outrigger	
	Type	Length	Length	Weight (kg)	Width	Front	Rear	Front	Rear
HX145LCR	Mono	4600	2100	2800	600	-	-	-	-

· : Rating over-front · : Rating over-side or 360 degree

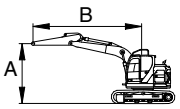


Lift-point height (A)		Lift-point radius (B)								At max. reach		
		1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach
												m (ft)
7.5m	kg									*4600	*4600	2.74
24.6ft	lb									*10140	*10140	(9.0)
6.0m	kg			*4950	*4950	*4460	3800			*3360	3310	4.87
19.7ft	lb			*10910	*10910	*9830	8380			*7410	7300	(16.0)
4.5m	kg			*5330	*5330	*4730	3750			*3070	2370	5.93
14.8ft	lb			*11750	*11750	*10430	8270			*6770	5220	(19.4)
3.0m	kg			*7860	6620	*5400	3550	3760	2280	*3050	2010	6.48
9.8ft	lb			*17330	14590	*11900	7830	8290	5030	*6720	4430	(21.2)
1.5m	kg					5720	3310	3660	2190	3140	1880	6.65
4.9ft	lb					12610	7300	8070	4830	6920	4140	(21.8)
0.0m	kg			*6280	5730	5540	3160	3590	2120	3220	1920	6.47
0.0ft	lb			*13850	12630	12210	6970	7910	4670	7100	4230	(21.2)
-1.5m	kg	*5280	*5280	*8140	5750	5500	3120			3680	2170	5.90
-4.9ft	lb	*11640	*11640	*17950	12680	12130	6880			8110	4780	(19.4)
-3.0m	kg			*5850	*5850	*4010	3210			*3450	2940	4.83
-9.8ft	lb			*12900	*12900	*8840	7080			*7610	6480	(15.8)

Unit : mm

Model	Boom	Boom	Arm	Counterweight	Shoe	Dozer		Outrigger	
	Type	Length	Length	Weight (kg)	Width	Front	Rear	Front	Rear
HX145LCR	Mono	4600	2500	2800	600	-	-	-	-

· : Rating over-front · : Rating over-side or 360 degree

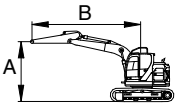


Lift-point height (A)		Lift-point radius (B)								At max. reach		
		1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach
												m (ft)
7.5m	kg			*4060	*4060					*2910	*2910	3.63
24.6ft	lb			*8950	*8950					*6420	*6420	(11.9)
6.0m	kg					*3820	*3820			*2260	*2260	5.42
19.7ft	lb					*8420	*8420			*4980	*4980	(17.8)
4.5m	kg			*3950	*3950	*4310	3810	*3330	2360	*2070	*2070	6.38
14.8ft	lb			*8710	*8710	*9500	8400	*7340	5200	*4560	*4560	(20.9)
3.0m	kg			*7130	6800	*5090	3590	3780	2290	*2040	1810	6.90
9.8ft	lb			*15720	14990	*11220	7910	8330	5050	*4500	3990	(22.6)
1.5m	kg			*8100	6020	5740	3320	3660	2180	*2130	1700	7.06
4.9ft	lb			*17860	13270	12650	7320	8070	4810	*4700	3750	(23.1)
0.0m	kg			*6750	5690	5530	3140	3570	2100	*2350	1730	6.89
0.0ft	lb			*14880	12540	12190	6920	7870	4630	*5180	3810	(22.6)
-1.5m	kg	*4740	*4740	*8620	5660	5450	3070	3540	2070	*2830	1920	6.36
-4.9ft	lb	*10450	*10450	*19000	12480	12020	6770	7800	4560	*6240	4230	(20.9)
-3.0m	kg	*8830	*8830	*6640	5780	*4620	3130			*3350	2470	5.38
-9.8ft	lb	*19470	*19470	*14640	12740	*10190	6900			*7390	5450	(17.6)

Unit : mm

Model	Boom	Boom	Arm	Counterweight	Shoe	Dozer		Outrigger	
	Type	Length	Length	Weight (kg)	Width	Front	Rear	Front	Rear
HX145LCR	Mono	4600	3000	2800	600	-	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



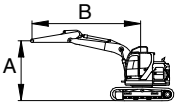
Lift-point height (A)		Lift-point radius (B)										At max. reach		
		1.5 m (4.9 ft)		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		7.5 m (24.6 ft)		Capacity		Reach
														m (ft)
7.5m	kg											*2300	*2300	4.48
24.6ft	lb											*5070	*5070	(14.7)
6.0m	kg					*3280	*3280	*1920	*1920			*1900	*1900	6.01
19.7ft	lb					*7230	*7230	*4230	*4230			*4190	*4190	(19.7)
4.5m	kg					*3450	*3450	*3230	2410			*1760	*1760	6.89
14.8ft	lb					*7610	*7610	*7120	5310			*3880	*3880	(22.6)
3.0m	kg			*5250	*5250	*4630	3660	3820	2320			*1750	1630	7.37
9.8ft	lb			*11570	*11570	*10210	8070	8420	5110			*3860	3590	(24.2)
1.5m	kg			*8650	6220	*5600	3380	3680	2200	*1910	1540	*1820	1530	7.52
4.9ft	lb			*19070	13710	*12350	7450	8110	4850	*4210	3400	*4010	3370	(24.7)
0.0m	kg			*7520	5740	5550	3160	3560	2090			*2000	1550	7.36
0.0ft	lb			*16580	12650	12240	6970	7850	4610			*4410	3420	(24.1)
-1.5m	kg	*4280	*4280	*9100	5620	5430	3050	3500	2040			*2360	1700	6.87
-4.9ft	lb	*9440	*9440	*20060	12390	11970	6720	7720	4500			*5200	3750	(22.5)
-3.0m	kg	*7420	*7420	*7510	5680	*5160	3060					*3150	2090	5.97
-9.8ft	lb	*16360	*16360	*16560	12520	*11380	6750					*6940	4610	(19.6)
-4.5m	kg			*4370	*4370							*2550	*2550	4.42
-14.8ft	lb			*9630	*9630							*5620	*5620	(14.5)

2) HX145LCR 2-PIECE BOOM

Unit : mm

Model	Boom	Boom	Arm	Counterweight	Shoe	Dozer		Outrigger	
	Type	Length	Length	Weight (kg)	Width	Front	Rear	Front	Rear
HX145LCR	2PCS	4939	1900	2800	600	-	-	-	-

· : 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)
7.5m	kg	*6340	*6340					*5810	*5810	3.21
24.6ft	lb	*13980	*13980					*12810	*12810	(10.5)
6.0m	kg	*5610	*5610	*5140	3830			*4390	3030	5.14
19.7ft	lb	*12370	*12370	*11330	8440			*9680	6680	(16.9)
4.5m	kg	*6910	*6910	*5450	3730	3860	2350	3690	2240	6.15
14.8ft	lb	*15230	*15230	*12020	8220	8510	5180	8140	4940	(20.2)
3.0m	kg			5970	3500	3790	2280	3190	1920	6.69
9.8ft	lb			13160	7720	8360	5030	7030	4230	(21.9)
1.5m	kg			5700	3270	3680	2190	3020	1800	6.85
4.9ft	lb			12570	7210	8110	4830	6660	3970	(22.5)
0.0m	kg			5550	3140	3610	2120	3100	1840	6.68
0.0ft	lb			12240	6920	7960	4670	6830	4060	(21.9)
-1.5m	kg	*9370	5770	5520	3120	3610	2120	3500	2070	6.13
-4.9ft	lb	*20660	12720	12170	6880	7960	4670	7720	4560	(20.1)

※ Note

1. Lifting capacity are based on SAE J1097 and ISO 10567.
2. Lifting capacity of the ROBEX 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.

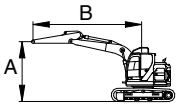
※ Lifting capacities are based upon a standard machine conditions.
Lifting capacities will vary with different work tools, ground conditions and attachments.
The difference between the weight of a work tool attachment must be subtracted.
Consult your HD Hyundai Construction Equipment dealer regarding the lifting capacities for specific work tools and attachments.

⚠ Failure to comply to the rated load can cause possible personal injury or property damage.
Make adjustments to the rated load as necessary for non-standard configurations.

Unit : mm

Model	Boom	Boom	Arm	Counterweight	Shoe	Dozer		Outrigger	
	Type	Length	Length	Weight (kg)	Width	Front	Rear	Front	Rear
HX145LCR	2PCS	4939	2100	2800	600	-	-	-	-

· : Rating over-front · : Rating over-side or 360 degree

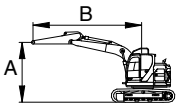


Lift-point height (A)		Lift-point radius (B)						At max. reach		
		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		Capacity		Reach
										m (ft)
7.5m	kg	*5810	*5810					*5300	*5300	3.58
24.6ft	lb	*12810	*12810					*11680	*11680	(11.7)
6.0m	kg			*4900	3850			*4170	2830	5.38
19.7ft	lb			*10800	8490			*9190	6240	(17.6)
4.5m	kg	*6190	*6190	*5260	3750	3870	2360	3510	2130	6.35
14.8ft	lb	*13650	*13650	*11600	8270	8530	5200	7740	4700	(20.8)
3.0m	kg			5980	3510	3790	2280	3050	1830	6.87
9.8ft	lb			13180	7740	8360	5030	6720	4030	(22.5)
1.5m	kg			5700	3260	3670	2180	2890	1720	7.03
4.9ft	lb			12570	7190	8090	4810	6370	3790	(23.1)
0.0m	kg			5530	3120	3590	2100	2960	1750	6.86
0.0ft	lb			12190	6880	7910	4630	6530	3860	(22.5)
-1.5m	kg	*9130	5710	5490	3080	3570	2090	3320	1950	6.33
-4.9ft	lb	*20130	12590	12100	6790	7870	4610	7320	4300	(20.8)
-3.0m	kg			5570	3150					
-9.8ft	lb			12280	6940					

Unit : mm

Model	Boom	Boom	Arm	Counterweight	Shoe	Dozer		Outrigger	
	Type	Length	Length	Weight (kg)	Width	Front	Rear	Front	Rear
HX145LCR	2PCS	4939	2500	2800	600	-	-	-	-

· : Rating over-front · : Rating over-side or 360 degree

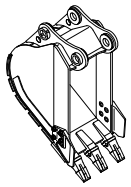
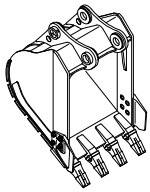
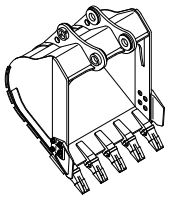


Lift-point height (A)		Lift-point radius (B)								At max. reach		
		3.0 m (9.8 ft)		4.5 m (14.8 ft)		6.0 m (19.7 ft)		7.5 m (24.6 ft)		Capacity		Reach
												m (ft)
7.5m	kg									*3570	*3570	4.33
24.6ft	lb									*7870	*7870	(14.2)
6.0m	kg			*4450	3920					*2910	2440	5.90
19.7ft	lb			*9810	8640					*6420	5380	(19.4)
4.5m	kg	*4440	*4440	*4860	3800	3900	2380			*2690	1900	6.80
14.8ft	lb	*9790	*9790	*10710	8380	8600	5250			*5930	4190	(22.3)
3.0m	kg	*8480	6640	*5820	3550	3800	2290			*2640	1660	7.28
9.8ft	lb	*18700	14640	*12830	7830	8380	5050			*5820	3660	(23.9)
1.5m	kg			5720	3280	3670	2170			2640	1560	7.43
4.9ft	lb			12610	7230	8090	4780			5820	3440	(24.4)
0.0m	kg	*4590	*4590	5510	3100	3560	2080			2700	1580	7.27
0.0ft	lb	*10120	*10120	12150	6830	7850	4590			5950	3480	(23.9)
-1.5m	kg	*8330	5600	5430	3030	3520	2040			2980	1740	6.78
-4.9ft	lb	*18360	12350	11970	6680	7760	4500			6570	3840	(22.2)
-3.0m	kg	*8520	5720	5480	3080							
-9.8ft	lb	*18780	12610	12080	6790							

6. BUCKET SELECTION GUIDE

1) HX145 LCR

(1) General bucket

		
0.23 m³ SAE heaped bucket	0.40, 0.46 m³ SAE heaped bucket	0.52, ※0.58, 0.65, 0.71 m³ SAE heaped bucket

Capacity		Width		Weight	Recommendation					
					4.6 m (15' 1") Mono boom				4.9 m (16' 1") Adjust boom	
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.9 m arm (6' 3")	2.1 m arm (6' 11")	2.5 m arm (8' 2")	3.0 m arm (9' 10")	2.1 m arm (6' 11")	2.5 m arm (8' 2")
0.23 m³ (0.30 yd³)	0.20 m³ (0.26 yd³)	520 mm (20.5")	620 mm (24.4")	335 kg (740 lb)	●	●	●	⊙	●	●
0.40 m³ (0.52 yd³)	0.35 m³ (0.46 yd³)	750 mm (29.5")	850 mm (33.5")	410 kg (900 lb)	●	●	●	⊙	●	●
0.46 m³ (0.60 yd³)	0.40 m³ (0.52 yd³)	840 mm (33.1")	940 mm (37.0")	435 kg (960 lb)	●	●	●	○	●	⊙
0.52 m³ (0.68 yd³)	0.45 m³ (0.59 yd³)	915 mm (36.0")	1015 mm (40.0")	460 kg (1010 lb)	●	●	●	X	⊙	⊙
※0.58 m³ (0.76 yd³)	0.50 m³ (0.65 yd³)	1000 mm (39.4")	1100 mm (43.3")	480 kg (1060 lb	●	●	⊙	X	⊙	○
0.65 m³ (0.85 yd³)	0.55 m³ (0.72 yd³)	1105 mm (43.5")	1205 mm (47.4")	500 kg (1100 lb)	⊙	⊙	○	X	○	X
0.71 m³ (0.93 yd³)	0.60 m³ (0.78 yd³)	1190 mm (46.9")	1290 mm (50.8")	540 kg (1190 lb)	○	○	X	X	X	X

※ : Standard bucket

● Applicable for materials with density of 2000 kg/m³ (3370 lb/yd³) or less

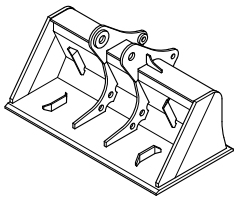
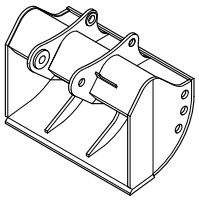
⊙ Applicable for materials with density of 1600 kg/m³ (2700 lb/yd³) or less

○ Applicable for materials with density of 1100 kg/m³ (1850 lb/yd³) 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.

(2) Special bucket

Slope finishing bucket	Ditch cleaning bucket
	
◎ 0.55 m³ SAE heaped bucket	★ 0.45 m³ SAE heaped bucket

Capacity		Width		Weight	Recommendation				
					4.6 m (15' 1") Mono boom			4.9 m (16' 9") Adjust boom	
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.9 m arm (6' 3")	2.1 m arm (6' 11")	2.5 m arm (8' 2")	2.1 m arm (6' 11")	2.5 m arm (8' 2")
◎ 0.55 m³ (0.72 yd³)	0.45 m³ (0.59 yd³)	1800 mm (70.9")	-	585 kg (1290 lb)	⊙	○	○	⊙	○
★ 0.45 m³ (0.59 yd³)	0.40 m³ (0.52 yd³)	1520 mm (59.8")	-	410 kg (900 lb)	●	●	⊙	●	⊙

◎ : Slope finishing bucket

★ : Ditch cleaning bucket

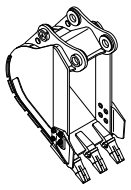
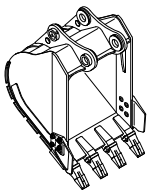
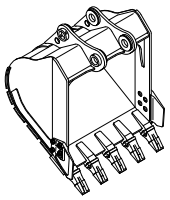
● Applicable for materials with density of 2000 kg/m³ (3370 lb/yd³) or less

⊙ Applicable for materials with density of 1600 kg/m³ (2700 lb/yd³) or less

○ Applicable for materials with density of 1100 kg/m³ (1850 lb/yd³) or less

2) HX140 LCR 2-PIECE BOOM

(1) General bucket

		
0.23 m³ SAE heaped bucket	0.40, 0.46 m³ SAE heaped bucket	0.52, ※0.58, 0.65, 0.71 m³ SAE heaped bucket

Capacity		Width		Weight	Recommendation		
					4.9 m (16' 1") adjust boom		
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.9 m arm (6' 3")	2.1 m arm (6' 11")	2.5 m arm (8' 2")
0.23 m³ (0.30 yd³)	0.20 m³ (0.26 yd³)	520 mm (20.5")	620 mm (24.4")	335 kg (740 lb)	●	●	●
0.40 m³ (0.52 yd³)	0.35 m³ (0.46 yd³)	750 mm (29.5")	850 mm (33.5")	410 kg (900 lb)	●	●	⊙
0.46 m³ (0.60 yd³)	0.40 m³ (0.52 yd³)	840 mm (33.1")	940 mm (37.0")	435 kg (960 lb)	⊙	⊙	■
0.52 m³ (0.68 yd³)	0.45 m³ (0.59 yd³)	915 mm (36.0")	1015 mm (40.0")	460 kg (1010 lb)	■	■	▲
※0.58 m³ (0.76 yd³)	0.50 m³ (0.65 yd³)	1000 mm (39.4")	1110 mm (43.7")	480 kg (1060 lb)	■	▲	▲
0.65 m³ (0.85 yd³)	0.55 m³ (0.72 yd³)	1105 mm (43.5")	1205 mm (47.4")	500 kg (1100 lb)	▲	▲	X
0.71 m³ (0.93 yd³)	0.60 m³ (0.78 yd³)	1190 mm (46.9")	1290 mm (50.8")	540 kg (1190 lb)	▲	X	X

※ : Standard bucket

● Applicable for materials with density of 2100 kg/m³ (3500 lb/yd³) or less

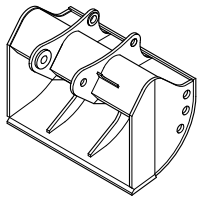
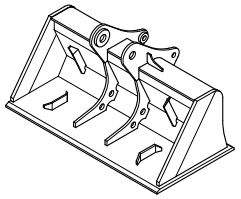
⊙ Applicable for materials with density of 1800 kg/m³ (3000 lb/yd³) or less

■ 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

X Not recommended

(2) Special bucket

Ditch cleaning bucket	Slope finishing bucket
	
★0.45 m³ SAE heaped bucket	◆0.55 m³ SAE heaped bucket

Capacity		Width		Weight	Recommendation		
					4.9 m (16' 1") boom		
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.9 m arm (6' 3")	2.1 m arm (6' 11")	2.5 m arm (8' 2")
★ 0.45 m³ (0.59 yd³)	0.40 m³ (0.52 yd³)	1520 mm (59.8")	-	410 kg (900 lb)	●	⊙	■
◆ 0.55 m³ (0.72 yd³)	0.45 m³ (0.59 yd³)	1800 mm (70.9")	-	585 kg (1290 lb)	■	▲	▲

★ : Ditch cleaning bucket
◆ : Slope finishing bucket

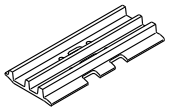
● Applicable for materials with density of 2100 kg/m³ (3500 lb/yd³) or less
⊙ Applicable for materials with density of 1800 kg/m³ (3000 lb/yd³) or less
■ Applicable for materials with density of 1500 kg/m³ (2500 lb/yd³) or less
▲ Applicable for materials with density of 1200 kg/m³ (2000 lb/yd³) or less
X Not recommended

7. UNDERCARRIAGE

1) TRACKS

X-leg type center frame is integrally welded with reinforced box-section track frames. The design includes dry tracks, lubricated rollers, idlers, sprockets, hydraulic track adjusters with shock absorbing springs and assembled track-type tractor shoes with triple grousers.

2) TYPES OF SHOES

Model	Shapes		Triple grouser		
					
HX145CR	Shoe width	mm (in)	500 (20)	600 (24)	700 (28)
	Operating weight	kg (lb)	15050 (33180)	15270 (33660)	15480 (34130)
	Ground pressure	kgf/cm^2 (psi)	0.48 (6.79)	0.4 (5.74)	0.35 (4.99)
	Overall width	mm (ft-in)	2500 (8' 2")	2600 (8' 6")	2700 (8' 10")
HX145CR (with dozer)	Shoe width	mm (in)	500 (20)	600 (24)	700 (28)
	Operating weight	kg (lb)	15880 (35010)	16110 (35520)	16330 (36000)
	Ground pressure	kgf/cm^2 (psi)	0.50 (7.16)	0.43 (6.06)	0.37 (5.26)
	Overall width	mm (ft-in)	2500 (8' 2")	2600 (8' 6")	2700 (8' 10")
HX145LCR	Shoe width	mm (in)	500 (20)	600 (24)	700 (28)
	Operating weight	kg (lb)	15310 (33750)	15540 (34260)	15750 (34720)
	Ground pressure	kgf/cm^2 (psi)	0.46 (6.53)	0.39 (5.52)	0.34 (4.8)
	Overall width	mm (ft-in)	2500 (8' 2")	2600 (8' 6")	2700 (8' 10")
HX145LCR (with dozer)	Shoe width	mm (in)	500 (20)	600 (24)	700 (28)
	Operating weight	kg (lb)	16120 (35540)	16360 (36070)	16580 (36550)
	Ground pressure	kgf/cm^2 (psi)	0.48 (6.88)	0.41 (5.82)	0.36 (5.05)
	Overall width	mm (ft-in)	2500 (8' 2")	2600 (8' 6")	2700 (8' 10")
HX145LCR 2-pcs boom	Shoe width	mm (in)	500 (20)	600 (24)	700 (28)
	Operating weight	kg (lb)	15630 (34460)	15860 (34970)	16080 (35450)
	Ground pressure	kgf/cm^2 (psi)	0.47 (6.67)	0.4 (5.64)	0.34 (4.90)
	Overall width	mm (ft-in)	2500 (8' 2")	2600 (8' 6")	2700 (8' 10")

3) NUMBER OF ROLLERS AND SHOES ON EACH SIDE

Item	Quantity	
	HX145CR	HX145LCR
Carrier rollers	2 EA	2 EA
Track rollers	7 EA	7 EA
Track shoes	45 EA	47 EA

4) SELECTION OF TRACK SHOE

Suitable track shoes should be selected according to operating conditions.

Method of selecting shoes

Confirm the category from the list of applications in **table 2**, then use **table 1** to select the shoe. Wide shoes (Categories B and C) have limitations on applications. Before using wide shoes, check the precautions, then investigate and study the operating conditions to confirm if these shoes are suitable.

Select the narrowest shoe possible to meet the required flotation and ground pressure. Application of wider shoes than recommendations will cause unexpected problem such as bending of shoes, crack of link, breakage of pin, loosening of shoe bolts and the other various problems.

※ Table 1

Track shoe	Specification	Category
500 mm triple grouser	Standard	A
600 mm triple grouser	Option	A
700 mm triple grouser	Option	B

※ Table 2

Category	Applications	Applications
A	Rocky ground, river beds, normal soil	· Travel at low speed on rough ground with large obstacles such as boulders or fallen trees
B	Normal soil, soft ground	· These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles

8. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	Perkins 1204F
Type	4-cycle turbocharged charge air cooled diesel engine
Cooling method	Water cooling
Number of cylinders and arrangement	4 cylinders, in-line
Firing order	1-3-4-2
Combustion chamber type	Direct injection type
Cylinder bore × stroke	105 × 127 mm (4.1" × 5.0")
Piston displacement	4400 cc (269 cu in)
Compression ratio	16.5 : 1
Rated net horse power (SAE J1349)	116 Hp (87 kW) at 1950 rpm
Rated gross horse power (SAE J1995)	124 Hp (92.6 kW) at 1950 rpm
Maximum torque	54 kgf · m (391 lbf · ft) at 1400 rpm
Engine oil quantity	10.5 ℓ (2.8 U.S. gal)
Dry weight	558 kg (1230 lb)
High idling speed	2000 ± 50 rpm
Low idling speed	1000 ± 100 rpm
Rated fuel consumption	165 g/Hp · hr at 1950 rpm
Starting motor	24 V-4.5 kW
Alternator	24 V-100 A
Battery	2 × 12 V × 100 Ah

2) MAIN PUMP

Item	Specification
Type	Variable displacement tandem axis piston pumps
Capacity	2 × 65 cc/rev
Maximum pressure	350 kgf/cm^2 (4980 psi) [380 kgf/cm^2 (5400 psi)]
Rated oil flow	2 × 126.8 ℓ/min (33.5 U.S. gpm / 28.0 U.K. gpm)
Rated speed	1950 rpm

[ ]: Power boost

3) GEAR PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	15cc/rev
Maximum pressure	40 kgf/cm^2 (570 psi)
Rated oil flow	29.2 ℓ /min (7.7 U.S. gpm / 6.4 U.K. gpm)

4) MAIN CONTROL VALVE

Item	Specification
Type	11 spools
Operating method	Hydraulic pilot system
Main relief valve pressure	350 kgf/cm^2 (4980 psi) [380 kgf/cm^2 (5400 psi)]
Overload relief valve pressure	400 kgf/cm^2 (5690 psi)

[ ]: Power boost

5) SWING MOTOR

Item	Type 1	Type 2
Type	Fixed displacement axial piston motor	
Capacity	71 cc/rev	72 cc/rev
Relief pressure	285 kgf/cm^2 (4050 psi)	
Braking system	Automatic, spring applied hydraulic released	
Braking torque	31.3 kgf · m (226 lbf · ft)	30 kgf · m (217 lbf · ft)
Brake release pressure	33.8 kgf/cm^2 (481 psi)	15~50 kgf/cm^2 (213~711 psi)
Reduction gear type	2 - stage planetary	

6) TRAVEL MOTOR

Item	Type 1	Type 2	Type 3
Type	Variable displacement axial piston motor		
Relief pressure	350 kgf/cm^2 (4970 psi)		
Capacity (max / min)	77/45 cc/rev	77/45 cc/rev	77/45 cc/rev
Reduction gear type	2-stage planetary		
Braking system	Automatic, spring applied hydraulic released		
Brake release pressure	9.5 kgf/cm^2 (135 psi)	10.7 kgf/cm^2 (135 psi)	14.3 kgf/cm^2 (203 psi)
Braking torque	19.7 kgf · m (143 lbf · ft)	19.7 kgf · m (143 lbf · ft)	33 kgf/cm^2 (239 psi)

7) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Stroke	Ø105 × 1105 mm
	Cushion	Extend only
Arm cylinder	Bore dia × Stroke	Ø115 × 1138 mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Stroke	Ø100 × 850 mm
	Cushion	Extend only
Dozer cylinder (option)	Bore dia × Stroke	Ø100 × 250 mm
	Cushion	-
Adjust cylinder (opt)	Bore dia × Stroke	Ø145 × 613 mm
	Cushion	-
Adjust boom cylinder (opt)	Bore dia × Stroke	Ø105 × 975 mm
	Cushion	Extend only

※ **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) SHOE

Item		Width	Ground pressure	Link quantity	Overall width
HX145LCR	Standard	500 mm (20")	0.45 kgf/cm^2 (6.40 psi)	47	2500 mm (8' 2")
	Option	600 mm (24")	0.38 kgf/cm^2 (5.40 psi)	47	2600 mm (8' 6")
		700 mm (28")	0.33 kgf/cm^2 (4.69 psi)	47	2700 mm (8' 10")

9. 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	10.5 (2.8)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
DEF/ AdBlue® tank	Mixture of urea and deionized water	19.0 (5.0)	ISO 22241, High-purity urea + deionized water (32.5:67.5)
Swing drive	Gear oil	TYPE 1 : 3.5 (0.9) TYPE 2 : 2.5 (0.7)	★SAE 75W-90
Final drive		2.3×2 (0.6×2)	SAE 80W-90
Hydraulic tank	Hydraulic oil	Tank : 96 (25.4) System : 180 (47.6)	★ISO VG 15 ISO VG 32 ISO VG 46, HBHO VG 46★3 ISO VG 68
Fuel tank	Diesel fuel★1	265 (70.0)	★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	14.5 (3.8)	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 ≤ 15 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 HD Hyundai Construction Equipment dealers.

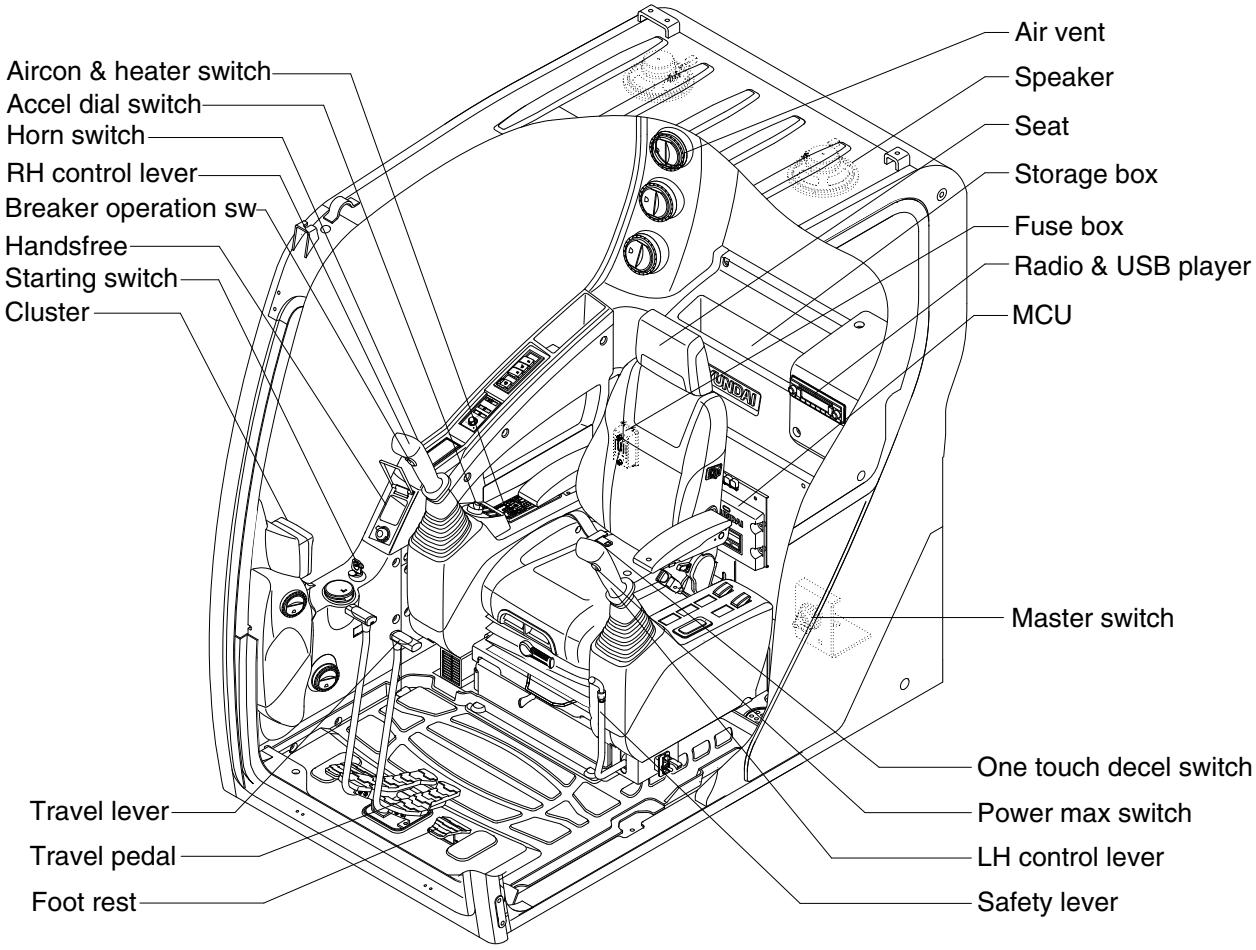
1. CAB DEVICES

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 safety warning system for early detection of machine malfunction.



145ZF3CD01A

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. Also, 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 6, Maintenance.

※ When the cluster provides a warning immediately check the problem, and perform the required action.

235F3CD05A

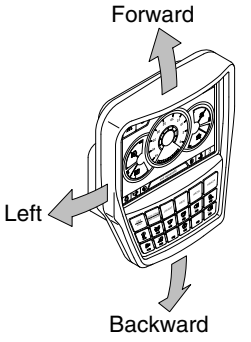
※ The warning lamp pops up and/or blinks and the buzzer sounds when the machine has a problem.

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.

Default

Option

235F3CD07A

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

※ Operation screen type can be set by the screen type menu of the display.
Refer to page 3-27 for details.

(2) RPM / Speed gauge

290F3CD49

① This display the engine speed.

(3) Engine coolant temperature gauge

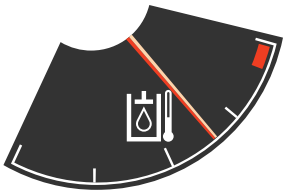
290F3CD53

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 on the normal condition, check the electric device as that can be caused by the poor connection of electricity or 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 on the normal condition, check the electric device as that can be caused by the poor connection of electricity or sensor.

(5) Fuel level gauge

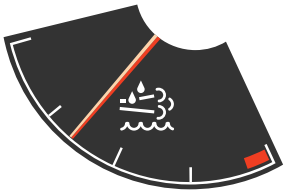
290F3CD55

① This gauge indicates the amount of fuel in the fuel tank.

② Fill the fuel when 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, check the electric device as that can be caused by the 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 the red range, or lamp pops up and the buzzer sounds.

③ Do not pour DEF/AdBlue® any more when the DEF/AdBlue® fill up warning lamp lights ON.

※ Refer to page 3-11.

※ If the gauge indicates the red range or lamp blinks in red even though the machine is on the normal condition, check the electric device as that can be caused by the poor connection of electricity or sensor.

(7) Tripmeter display

290F3CD56

① This displays the engine the tripmeter.

※ Refer to page 3-29 for details.

(8) Eco gauge

290F3CD58

① This gauge indicates the fuel consumption rate and machine load status. So that operators can be careful with fuel economy.

② The fuel consumption rate or machine load is higher, the number of segment is increased.

③ The color of Eco gauge indicates operation status.

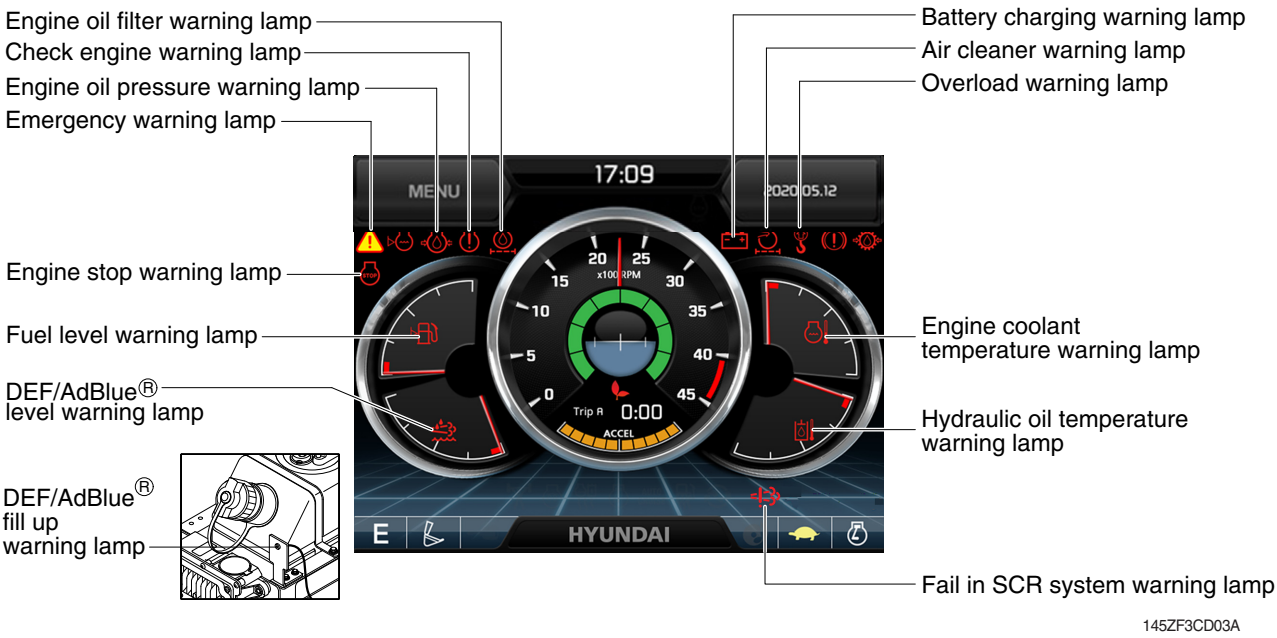
- White : Idle operation
- Green : Economy operation
- Yellow : Non-economy operation at a medium level.
- Red : Non-economy operation at a high level.

(9) Accel dial gauge

290F3CD59

① This gauge indicates the level of accel dial.

3) WARNING LAMPS

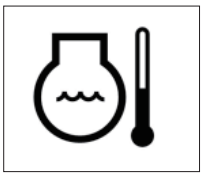


※ **Warning lamps and buzzer**

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	· The pop-up warning lamp moves to the original position and blinks, and the buzzer stops when ; - the buzzer stop switch AUTO IDLE Buzzer Stop is pushed - the lamp of the LCD is touched
	Warning lamp pops up on the center of the LCD and the buzzer sounds	· The pop-up warning lamp moves to the original position and light ON, and the buzzer stops when ; - the buzzer stop switch AUTO IDLE Buzzer Stop is pushed - the lamp of the LCD is touched ※ **Refer to page 3-11 for details.**
	Warning lamp pops up on the center of the LCD and the buzzer sounds	※ **Refer to page 3-7 for details.**

※ **Refer to page 3-16 for the buzzer stop switch** AUTO IDLE Buzzer Stop .

(1) Engine coolant temperature warning lamp



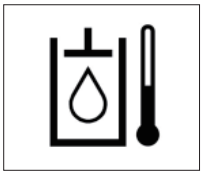
290F3CD61

① Engine coolant temperature warning is indicated two 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 AUTO IDLE Buzzer Stop is pushed. And the buzzer stops and , lamps keep blink.

③ Check the cooling system when the lamps keep blink.

(2) Hydraulic oil temperature warning lamp



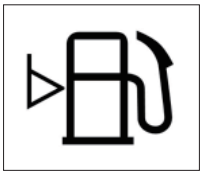
290F3CD62

① Hydraulic oil temperature warning is indicated two 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 AUTO IDLE Buzzer Stop is pushed. And the buzzer stops and , lamps keep blink.

③ Check the hydraulic oil level and hydraulic oil cooling system.

(3) Fuel level warning lamp



290F3CD63

① This warning lamp pops up and the buzzer sounds when the level of fuel is below 31 ℓ (8.2 U.S. gal).

② Fill the fuel immediately when the lamp blinks.

(4) Emergency warning lamp

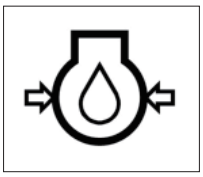
290F3CD64

① This warning lamp pops up and the buzzer sounds when each of the below warnings is happened.
- Engine coolant overheating (over 107˚C)
- Hydraulic oil overheating (over 105˚C)
- MCU input voltage abnormal
- Cluster communication data error
- Engine ECM communication data error

※ The pop-up warning lamp moves to the original position and blinks when the buzzer stop switch AUTO IDLE Buzzer Stop is pushed. And the buzzer stops.

② When this warning lamp blinks, machine must be checked and serviced immediately.

(5) Engine oil pressure warning lamp



290F3CD65

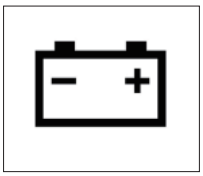
① This warning lamp pops up and the buzzer sounds when the engine oil pressure is low.
② If the lamp blinks, shut OFF the engine immediately. Check oil level.

(6) Check engine warning lamp

290F3CD66

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

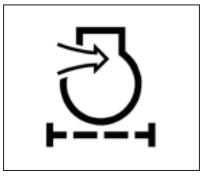
(7) Battery charging warning lamp



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 filter of air cleaner is clogged.
② Check the filter and clean or replace it.

(9) Overload warning lamp (opt)

290F3CD69

① When the machine is overload, the overload warning lamp pops up and the buzzer sounds during 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 when 30 minutes elapsed with empty condition of the DEF/AdBlue® tank, stop the engine immediately and check the DEF/AdBlue® tank.

② Fill the DEF/AdBlue® immediately in the DEF/AdBlue® tank.

※ Refer to page 3-11.

(11) DEF/AdBlue® level warning lamp

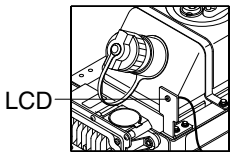
290F3CD257

① This warning lamp indicates when ON, that the DEF/AdBlue® level is low as 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
DEF/AdBlue® level	Check engine	Stop engine	
On	Off	Off	· The DEF/AdBlue® level has fallen below the initial warning level (20%).
On	Off	Off	· The DEF/AdBlue® level has fallen below the critical warning level (14%).
On	On	Off	· The DEF/AdBlue® level has fallen below the initial derate warning level (8%). · 75% torque derate.
On	On	On	· The DEF/AdBlue® level has fallen below the initial warning level (3.5%). · 5 minute control engine speed and then hold idle only.

(12) DEF/AdBlue® fill up warning lamp



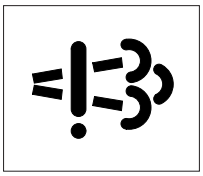
145ZF3CD07

① This lamp lights ON when the DEF/AdBlue® tank is completely filled with DEF/AdBlue®.

※ Fill the tank with the DEF/AdBlue® after start switch ON and then turn OFF the start switch.

※ Do not pour DEF/AdBlue® any more when this lamp lights ON. Otherwise DEF/AdBlue® tank may freeze and burst in winter season.

(13) Fail in SCR system warning lamp



300A3CD15

① This warning lamp indicates there are faults related to SCR system.

② The lamp lights ON when each of the below warnings is happened.

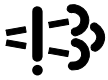
a. Low DEF/AdBlue® level

b. Poor quality of DEF/AdBlue®

c. Tempering or malfunction in the aftertreatment system

③ Once the lamp lights ON, the engine will derate shortly.

※ **Please contact your HD Hyundai Construction Equipment service center or local dealer.**

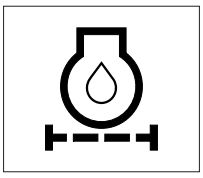
Warning lamp		Torque reduction
	Time	
On	Fault detected	-
Blink	After 2 h 30 min	-
Blink rapidly	After 3 h 40 min	· Torque is reduced to 0% (low idling) of the hightest torque within 2~10 min.

※ **After 3 hours 40 minutes of warning light, only the first restart is allowed to enter the safe harbor for 20 minutes.**

※ **If a new fault occurs within 40 hours of operation since the first fault, the warning lamp will come ON. After 10 minutes of operation, the warning lamp will blink rapidly and torque will be reduced to 0% (low idling) within 2~10 min.**

※ **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.**

(14) Eninge oil filter warning lamp

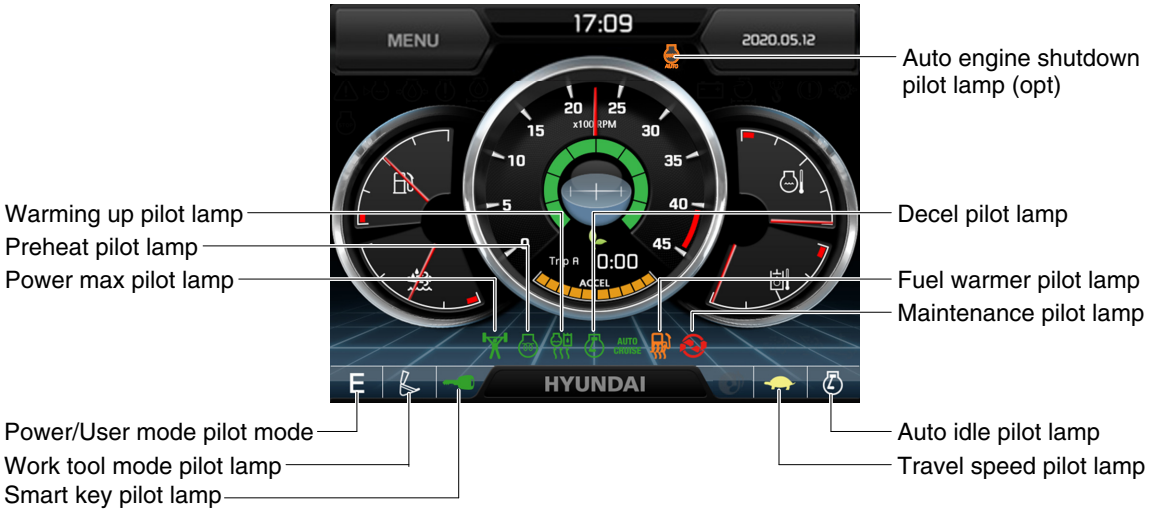


300A3CD306

① This warning lamp pops up and the buzzer sounds when the filter of eninge oil is clogged.

② Check the filter and clean or replace it.

4) PILOT LAMPS



235F3CD74A

(1) Mode pilot lamps

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

(2) Power max pilot lamp

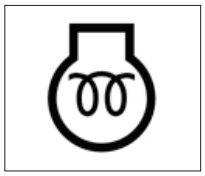
290F3CD78

① The lamp will be ON when pushing power max switch on the LH RCV lever.

② The power max function is operated maximum 8 seconds.

※ **Refer to the page 3-34 for power max function.**

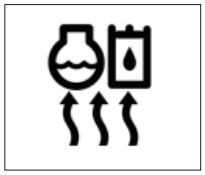
(3) Preheat pilot lamp



290F3CD79

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

(4) Warming up pilot lamp



290F3CD80

① This lamp is turned ON 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, or when 10 minutes have passed since starting the engine.

(5) Decel pilot lamp

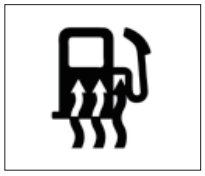
290F3CD81

① Operating one touch decel switch on the RCV lever makes the lamp ON.
② Also, the lamp will be ON and engine speed will be lowered automatically to save fuel consumption when all levers and pedals are at 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 3-33.

(6) Fuel warmer pilot lamp



290F3CD82

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

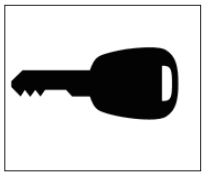
(7) Maintenance pilot lamp

290F3CD83

① This lamp will be ON when the consuming parts are needed to change or replace. It means that the change or replacement interval of the consuming parts remains below 30 hours.
② Check the message in maintenance information of main menu. Also, this lamp lights ON for 3 minutes when the start switch is ON position.

※ Refer to the page 3-23-1.

(8) Smart key pilot lamp (opt)



290F3CD214

① This lamp is ON when the engine is started by the start button.
② This lamp is red when the a authentication fails, green when succeeds.
※ **Refer to the page 3-24.**

(9) Auto engine shutdown pilot lamp (opt)

220A3CD202A

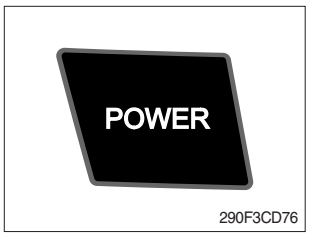
① This lamp is turned ON when the auto engine shutdown is activated.
※ **Refer to the page 3-21-1.**

5) SWITCHES

235F3CD86A

※ **When some of the switches are selected, the pilot lamps are displayed on the LCD. Refer to the page 3-12 for details.**

(1) Power mode switch

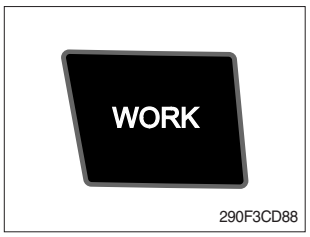


290F3CD76

① This switch is to select the machine power mode and selected power mode pilot lamp is displayed on the pilot lamp position.
- P : Heavy duty power work.
- S : Standard power work.
- E : Economy power work.

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

(2) Work mode switch

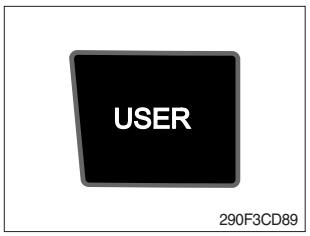


290F3CD88

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 the page 4-7 for details.**

(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 : Automatically saved after key OFF.
- Action : Push this switch.
- Cancel : Push this switch once more.

② Refer to the page 3-20 for another set of user mode.

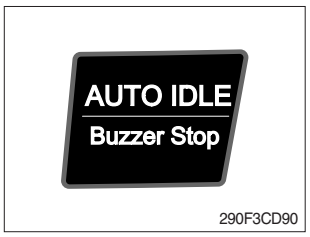
(4) Travel speed switch

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. Machine stability may be adversely affected.

⚠ Personal injury 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 3-29 for the camera.

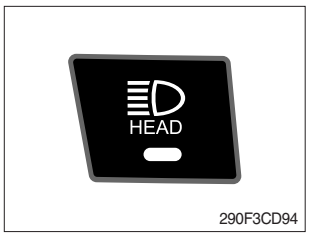
③ If the camera is not installed, this switch is used only ESC function.

(7) Work light switch

① This switch is used to operate the work light.

② The pilot lamp is turned ON when operating the switch.

(8) Head light switch



① This switch is used to operate the head light.
② The pilot lamp is turned ON when operating the switch.

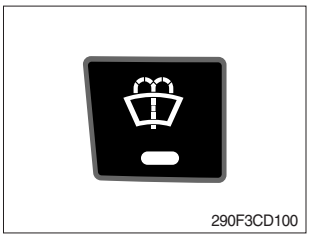
(9) Intermittent wiper switch

① This switch is used to wipe operates intermittently.
② The pilot lamp is turned ON when operating the switch.

(10) Wiper switch

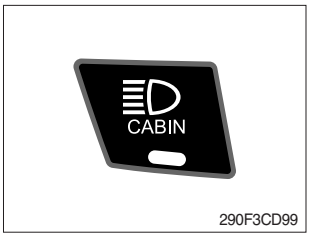
① This switch is used to operate the window wiper.
② Note that the wiper will self-park when switched off.
③ The pilot lamp is turned ON when operating the switch.
※ If the wiper does not operate with the switch in ON position, turn the switch OFF immediately. Check the cause. If the switch remains ON, motor failure can result.

(11) Washer switch



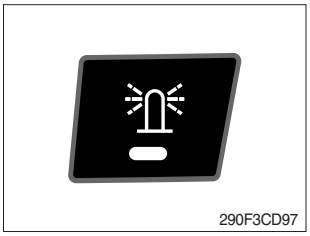
① The washer liquid is sprayed and the wiper is operated only while pressing this switch.
② The pilot lamp is turned ON when operating the switch.

(12) Cab light switch



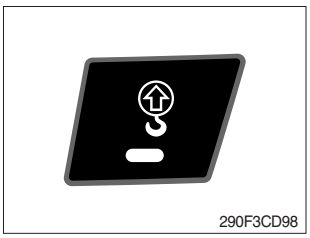
① This switch turns ON the cab light on the cab.
② The pilot lamp is turned ON when operating the switch.

(13) Beacon switch (opt)



① This switch turns ON the rotary light on the cab.
② The pilot lamp is turned ON when operating the switch.

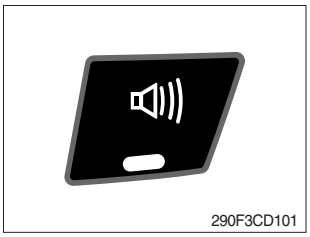
(14) Overload switch (opt)



① When this switch turned ON, buzzer makes sound and overload warning lamp comes ON in case that the machine is overload.
② When it turned OFF, buzzer stops and warning lamp goes out.

⚠ 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.

(15) Travel alarm switch



① This switch is to activate travel alarm function surrounding when the machine travels.
- ON : The travel alarm function is activated.
- OFF : The travel alarm function is not activated.

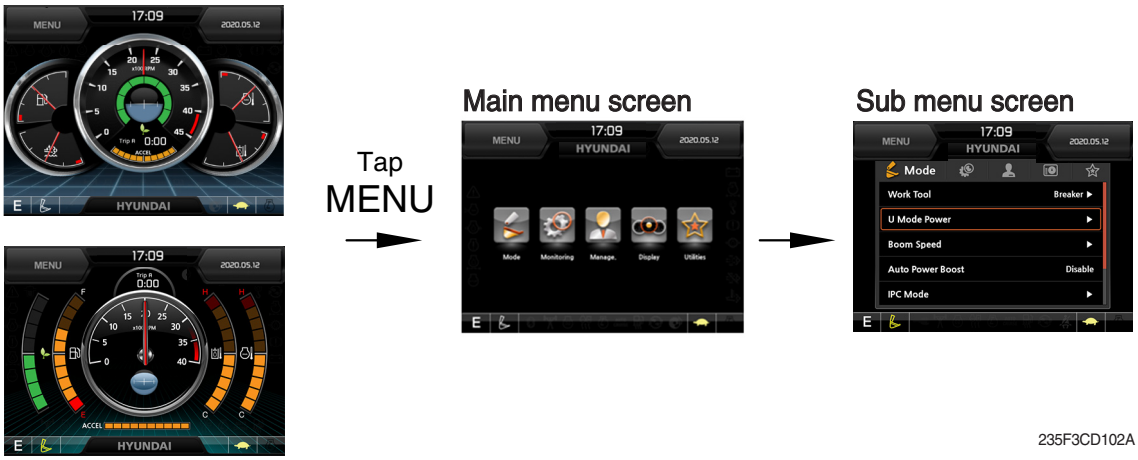
(16) Main menu quick touch switch

① This switch is to activate the main menu in the cluster.
※ Refer to the page 3-19.

6) MAIN MENU

※ You can select or set the menu by 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



235F3CD102A

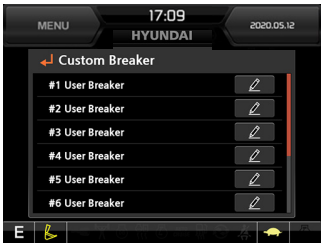
(1) Structure

No	Main menu	Sub menu	Description
1	 Mode 290F3CD103	Work tool U mode power Boom/Arm speed Auto power boost IPC mode Auto engine shutdown (option) 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, Accel initial mode / step Switch function
2	 Monitoring 290F3CD104	Active fault Logged fault Delete logged fault Monitoring	MCU, Engine ECM, AAVM (option) MCU, Engine ECM, 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 Service menu Clinometer Update	General record, Hourly, Daily, Mode record Replacement, Change interval oils and filters ESL mode setting, Password change Model, MCU, Monitor, switch controller, RMCU, Relay drive unit, AAVM (option) A/S phone number, A/S phone number change Power shift, Operating hour, Breaker mode pump acting, EPPR current level, Overload pressure 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	3 kinds (A, B, C) Camera on/off, AAVM (option)

(2) Mode setup

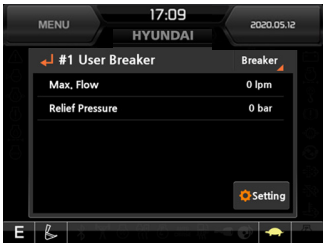
① Work tool

235F3CD108A



220S3CD253A

A



235F3CD254A

B

· Select on 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.

② U mode power

220S3CD111A

235F3CD112A

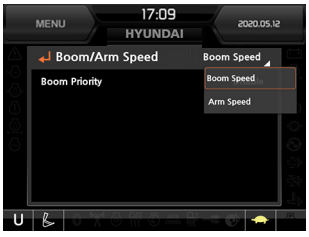
· Engine high idle rpm, auto idle rpm and pump torque (power shift) can be modulated and memorized separately in U-mode.
· U-mode can be activated by user mode switch.

Step (▮)	Engine speed (rpm)	Idle speed (rpm)	Power shift (bar)
1	1300	750	0
2	1400	800	3
3	1500	850	6
4	1600	900	9
5	1700	950	12
6	1800	1000	16
7	1850	1050	20
8	1900	1100 (auto decel)	26
9	1950	1150	32
10	2000	1200	38

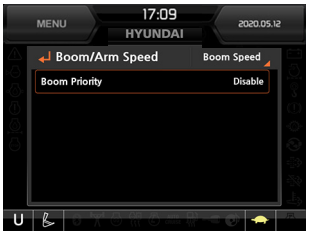
※One touch decel & low idle : 1000 rpm

③ Boom/Arm speed

235F3CD113A



235F3CD114A

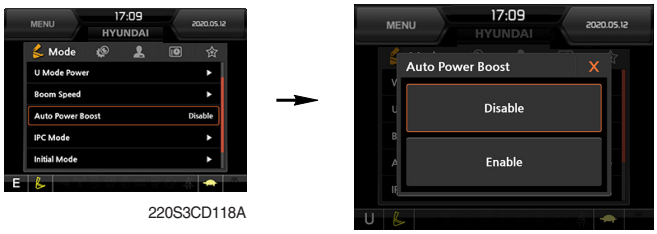


235F3CD115A

· **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



220S3CD118A

220S3CD117A

· 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.
Disable - Not operated.

⑤ IPC mode

220S3CD310A
220S3CD311A
235F3CD304A
220S3CD312A
235F3CD305A
220S3CD313A
235F3CD306A

· The IPC mode can be selected by this menu.
- Speed mode
- Balance mode (default)
- Efficiency mode

· This mode is applied only general operation mode of the work tool mode.

※ Please update the cluster programs if this mode is not displayed in the mode setup menu. Refer to the page 3-25-1.

⑥ Automatic engine shutdown (option)

220S3CD91A 220S3CD92A 235F3CD13A

· 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

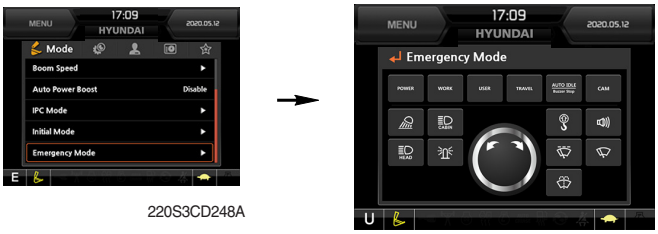
220S3CD122A 235F3CD119A

· **Key on initial mode**
  - Selected the power mode is activated when the engine is started.

· **Accel initial mode**
  - Last setting value
  - User setting value

· **Accel initial step**
  - 0~9 step

⑧ Emergency mode



220S3CD248A 220S3CD249A

· This mode can be use when the switches are abnormal on the cluster.
· The cluster switches will be selected by touched each icon.

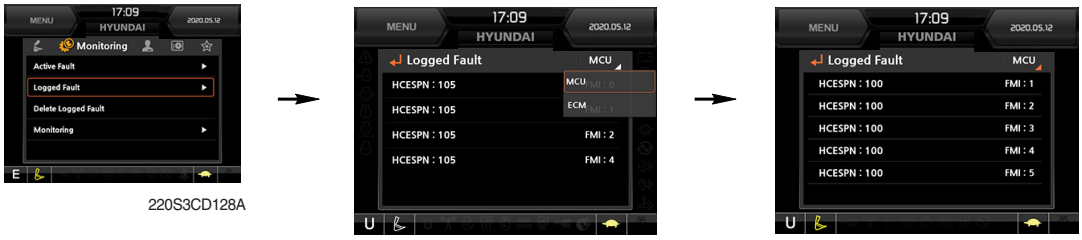
(3) Monitoring

① Active fault

220S3CD120A　　235F3CD121A　　220S3CD125A

· The active faults of the MCU, engine ECM or AAVM (option) can be checked by this menu.

② Logged fault



220S3CD128A　　235F3CD123A　　220S3CD124A

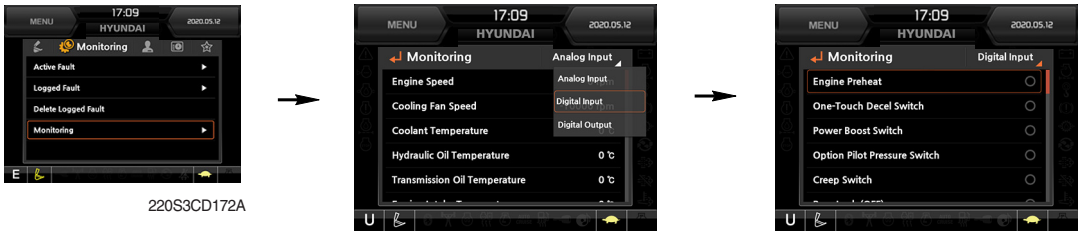
· The logged faults of the MCU, engine ECM or AAVM (option) can be checked by this menu.

③ Delete logged fault

220S3CD134A　　220S3CD126A　　220S3CD127A

· The logged faults of the MCU, engine ECM or AAVM (option) can be deleted by this menu.

④ Monitoring



220S3CD172A　　235F3CD188A　　235F3CD189A

· 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 ● are light ON.

(4) Management

① Fuel rate information

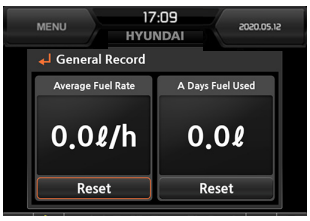
220S3CD14A

220S3CD15A

A

· **General record (A)**

- Average fuel rate (left) (from "Reset" to now)
  Fuel consumption devided 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).



220S3CD16A

B

· **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 for 12 hours earlier data.
- All hourly records deletion by "Reset".

220S3CD17A

C

· **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.
- Automatic deletion for 7 days earlier data.
- All daily records deletion by "Reset".

220S3CD18A

D

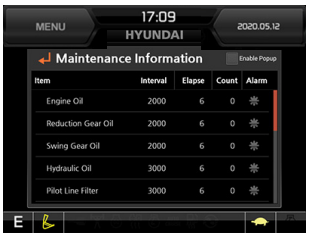
· **Mode record (D)**

- Average fuel rate for each power mode/accel dial (at least 7) from "Reset" to now.
- No record during idle.
- All mode records deletion by "Reset".

220S3CD19A

② Maintenance information

220S3CD131A



220S3CD132A

220S3CD133A

- 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 or replace interval can be changed in the unit of 50 hours.

※ **Refer to the maintenance chart for further information of maintenance interval.**

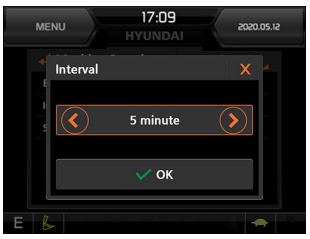
③ Machine security

220S3CD190A

220S3CD135A

220S3CD136A

220S3CD137A



220S3CD138A

· **ESL mode setting**

- ESL : Engine Starting Limit
- ESL mode is desingned 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.

220S3CD190A

220S3CD140A

220S3CD135A

Enter the current password

220S3CD142A

Enter the new password

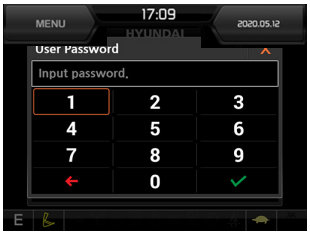
220S3CD143A

Enter the new password again

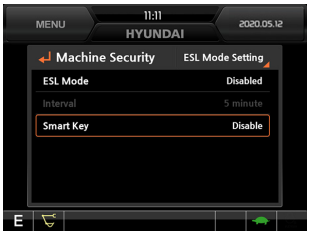
※ **Before first use, please set user password and owner password in advance for machine security.**

- Smart key

220S3CD190A



220S3CD135A

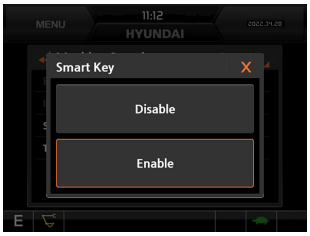


235F3CD001

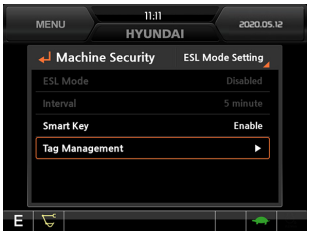
- Smart key is registered when equipped with optional smart key. If smart key is not inside of the cabin, authentication process fails and the password is needed.
- Tag management menu is activated when the Smart key menu is Enabled.
  You can register and delete the tags.

- Tag management

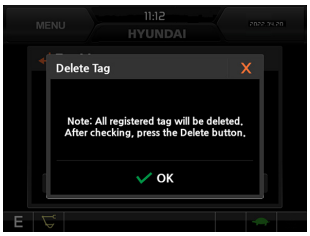
- When registering a tag : Only the tag you want to register must be in the cabin.
- When deleting a tag : All registered tags are deleted.



235F3CD002

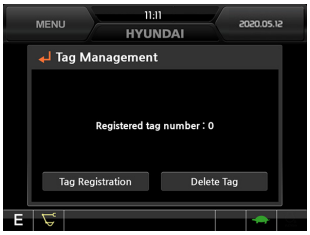


235F3CD003



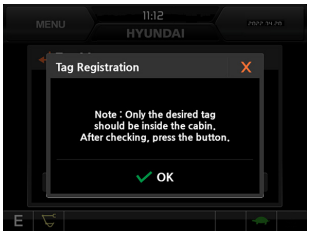
235F3CD006

Deleting



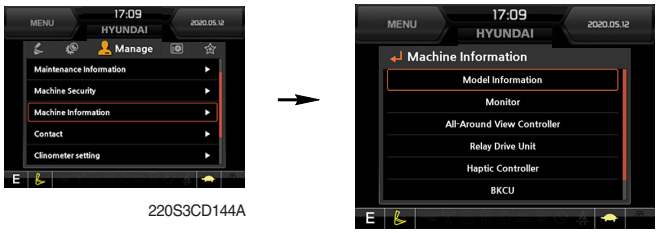
235F3CD004

Registering



235F3CD005

④ Machine Information



220S3CD144A

220S3CD145A

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

⑤ Contact (A/S phone number)

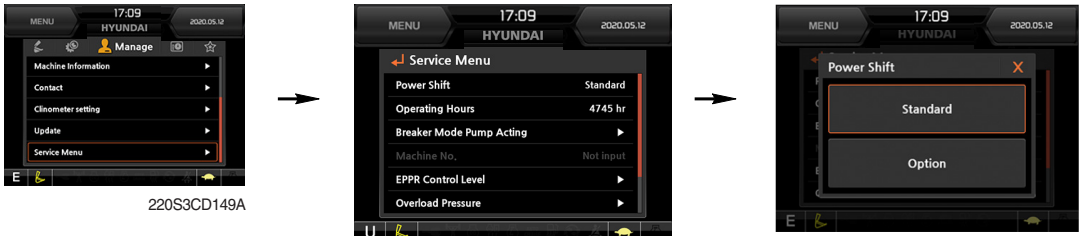
220S3CD146A

220S3CD147A

220S3CD148A

Enter the new A/S phone number

⑥ Service menu



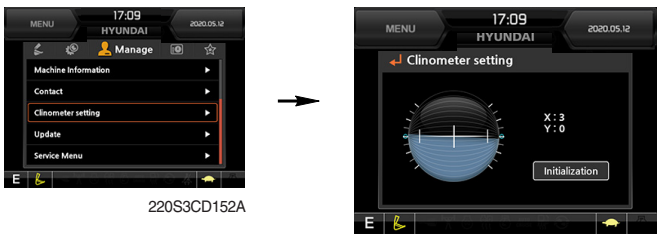
220S3CD149A

220S3CD150A

220S3CD251A

· Power shift (standard/option) : Power shift pressure can be set by option menu.
· Operating hours : Operating hours since the machine line out can be checked by this menu.
· Breaker mode pump acting (1 pump/2 pump)
· EPPR current level (attach flow EPPR 1 & 2, boom priority EPPR, attach relief pressure EPPR 1& 2)
· Overload pressure : 100 ~ 350 bar

⑦ Clinometer



220S3CD152A

220S3CD153A

· When the machine is on the flatland, if tap the "initialization", the values of X, Y reset "0".
· You can confirm tilt of machine in cluster's operating screen.

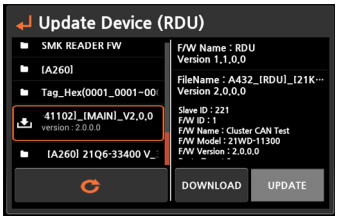
⑧ Update (cluster & ETC devices)

220S3CD67A

220S3CD135A

220S3CD280A

235F3CD04A



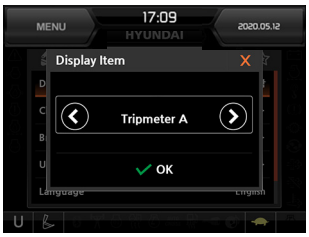
380F3CD06

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

(5) Display

① Display item

220S3CD154A



235F3CD155A

235F3CD156A

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

② Clock

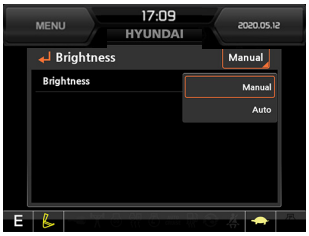
220S3CD157A

235F3CD158A

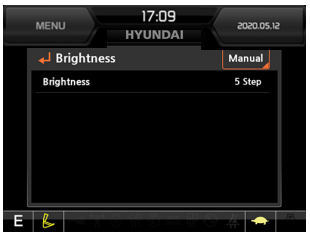
- The first line's three spots "**/**/****" represent Month/Day/Year each.
- The second line shows the current time. (0:00~23:59)

③ Brightness

220S3CD159A

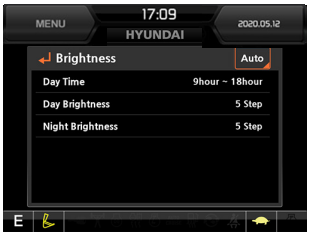


220S3CD160A

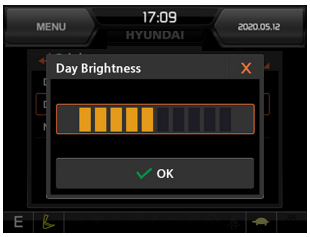


220S3CD139A

220S3CD141A



220S3CD191A

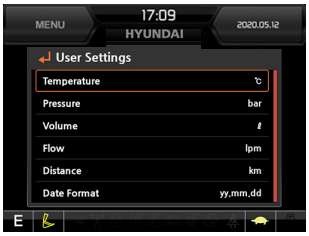


220S3CD192A

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

④ Unit

220S3CD161A



220S3CD162A

235F3CD193A

- Temperature : ˚C ↔ ˚F
- Pressure : bar ↔ MPa ↔ kgf/cm^2
- Volume : ℓ ↔ gal
- Flow : lpm ↔ gpm
- Distance : km ↔ mile
- Date format : yy/mm/dd ↔ mm/dd/yy ↔ dd-mm-yy

⑤ Language

220S3CD163A

220S3CD164A

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

⑥ Screen type

220S3CD165A

A Type (Default) 220S3CD166A

235F3CD156A

B Type (Option) 220S3CD174A

235F3CD157A

(6) Utilities

① Tripmeter

235F3CD168A

220S3CD169A

- Maximum 3 kinds of tripmeters can be used at the same time.
- Each tripmeter can be turned on by choosing "Start" while it also can be turned off by choosing "Stop".
- If the tripmeter icon is activated in the operation screen, it can be controlled directly there.

③ Camera setting

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

· If the rear camera installed on the machine, set enable.

235F3CD200A

220S3CD255A

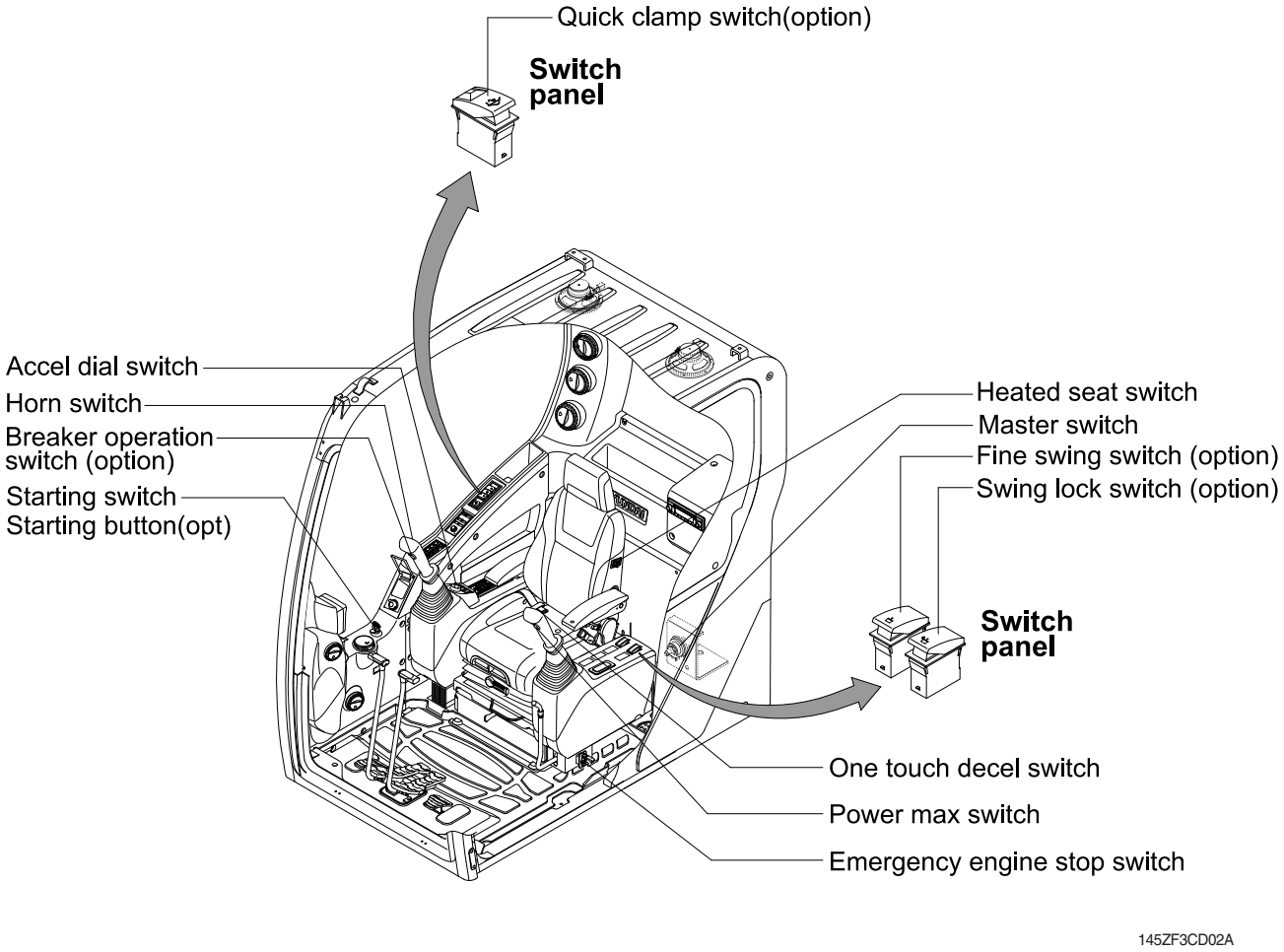
220S3CD256A

· In the operation screen, rear camera screen show up when ESC/CAM button is pushed.

235F3CD156A

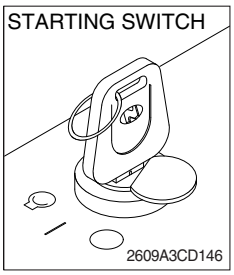
290F3CD221

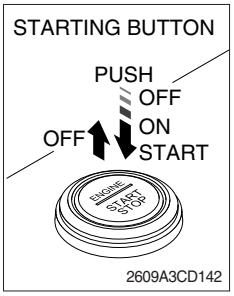
3. SWITCHES



145ZF3CD02A

1) STARTING SWITCH & STARTING BUTTON (OPT)





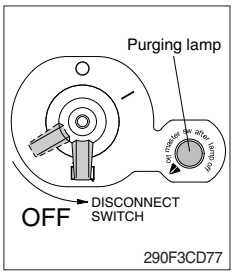
Starting button with smart key tag (opt)

(1) There are three positions, OFF, ON and START.
- ◯(OFF) : None 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 take according to ambient temperature.

※ Key must be in the ON position with engine running to maintain electrical and hydraulic function and prevent serious machine damage.

2) MASTER SWITCH



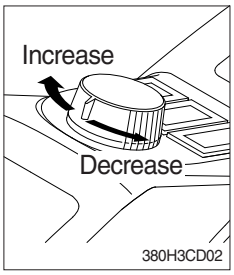
(1) This switch is used to shut off the entire electrical system.

(2) I : The battery remains connected to the electrical system.
O : The battery is disconnected to the electrical system.

※ **Never turn the master switch to O (OFF) with the engine running. Engine and electrical system damage could result.**

※ **Off the master switch after purging lamp OFF.**

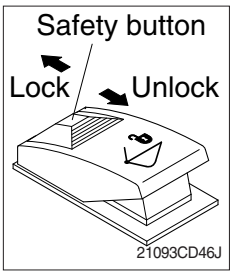
3) ACCEL DIAL SWITCH



(1) There are 10 dial setting.

(2) Setting 1 is low idle and setting 10 is high idle.
- By rotating the accel dial to right : Engine speed increases
- By rotating the accel dial to left : Engine speed decreases

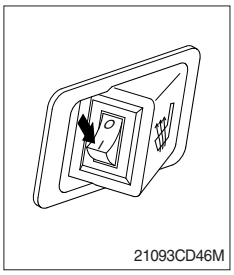
4) QUICK CLAMP SWITCH (option)



(1) This switch is used to engage or disengage the moving hook on quick clamp.

※ **Refer to the page 8-6 for details.**

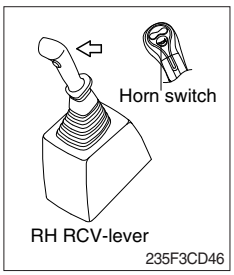
5) HEATED SEAT SWITCH (option)



(1) This switch is used to heat the seat.
- Heater ON : 10±3.5˚C
- Heater OFF : 20±3˚C

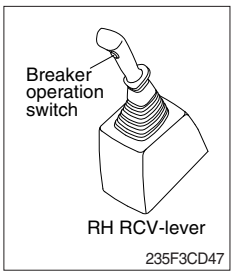
(2) On pressing the switch, the indicator lamp is turned ON.

6) HORN SWITCH



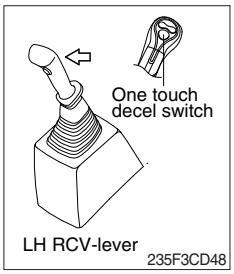
(1) This switch is at the top of right side control lever.
On pressing, the horn sounds.

7) BREAKER OPERATION SWITCH



(1) On pressing this switch, the breaker operates only when the breaker operation mode is selected.

8) ONE TOUCH DECEL SWITCH

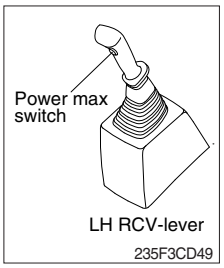


(1) This switch is used to actuate the deceleration function quickly.

(2) The engine speed is increased to previous setting value by pressing the switch again.

(3) One touch decel function is available only when the auto idle pilot lamp is turned OFF.

9) POWER MAX SWITCH

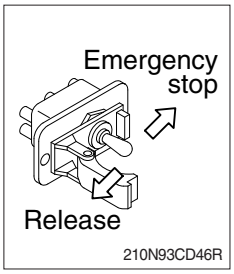


(1) This switch activate power max function.
When this switch is kept pressed, hydraulic power of work equipment will be increased to approx 110 percent during 8 seconds.

(2) After 8 seconds, function is cancelled automatically even the switch keeps pressed.

※ **Do not use for craning purposes.**

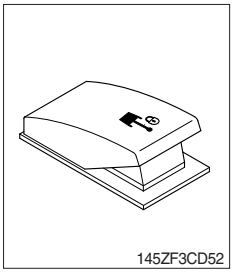
10) EMERGENCY ENGINE STOP SWITCH



(1) This switch is used to emergency stop the engine.

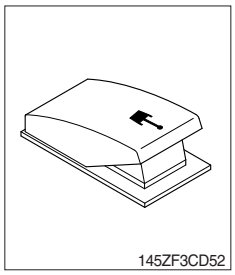
※ **Be sure to keep the emergency switch on the release position when restart the engine.**

11) SWING LOCK SWITCH (option)



(1) When the switch is pressed ON position, the swing parking brake is locked and swing control is not available by shut off the swing pilot pressure to the swing spool.

12) FINE SWING SWITCH (option)



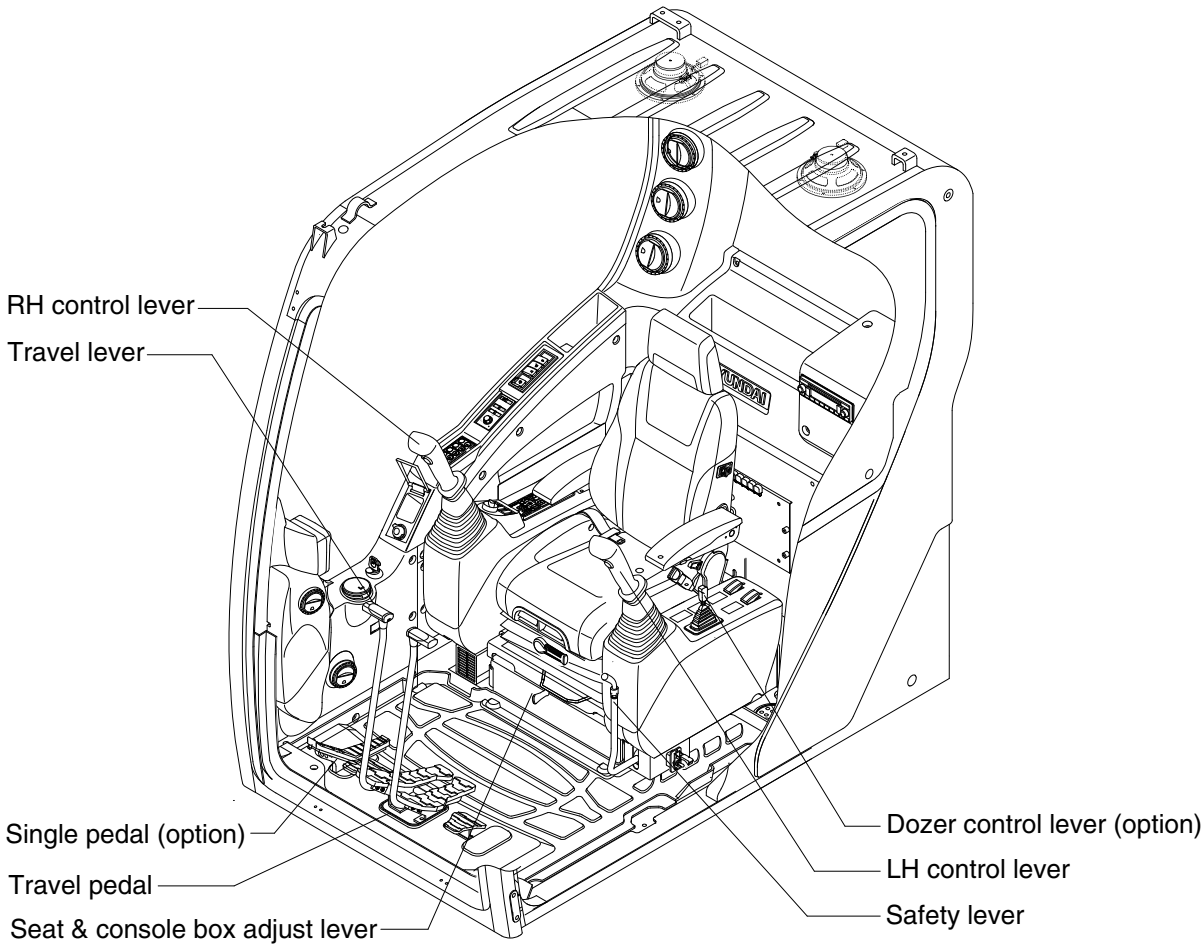
(1) When the switch is pressed ON position, the swing parking brake is released.

(2) Swing control improves during deceleration of a swing because the swing is allowed the drift instead of stopping abruptly.

⚠ If the machine is operating on a slope with the switch in this position, swing motion may became uncontollable which could result in property damage, personal injury or death.

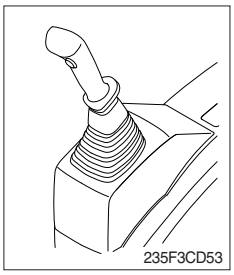
Do not use this position when the machine is operating on a slope.

4. LEVERS AND PEDALS



145ZF3CD16B

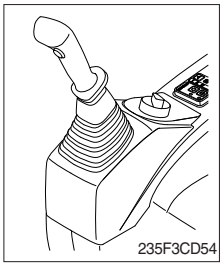
1) LH CONTROL LEVER



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

(2) Refer to operation of working device in chapter 4 for details.

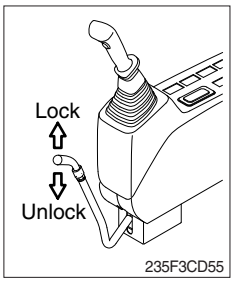
2) RH CONTROL LEVER



(1) This joystick is used to control the boom and the bucket.

(2) Refer to operation of working device in chapter 4 for details.

3) SAFETY LEVER



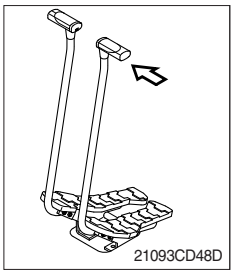
(1) All control levers and pedals are disabled from operation by locating the lever to lock position as shown.

※ **Be sure to lower the lever to LOCK position when leaving from operator's seat.**

(2) By pull lever to UNLOCK position, the machine is operational.

※ **Do not use the safety lever for handle when getting on or off the machine.**

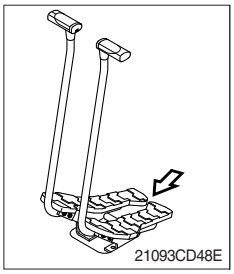
4) TRAVEL LEVER



(1) This lever is mounted on travel pedal and used for traveling by hand. The operation principle is same as the travel pedal.

(2) Refer to traveling of the machine in chapter 4 for details.

5) TRAVEL PEDAL

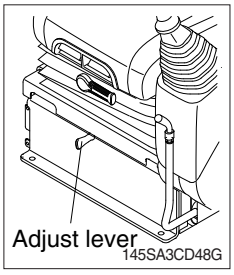


(1) This pedal is used to move the machine forward or backward.

(2) If left side pedal is pressed, left track will move.
If right side pedal is pressed, right track will move.

(3) Refer to traveling of machine in chapter 4 for details.

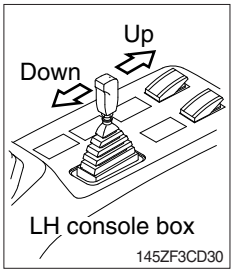
6) SEAT AND CONSOLE BOX ADJUST LEVER



(1) This lever is used to move the seat and console box to fit the contours of the operator's body.

(2) Pull the lever to adjust forward or backward over 170㎜(6.7").

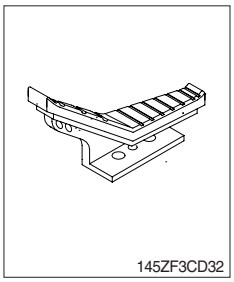
7) DOZER CONTROL LEVER (option)



(1) This lever is used to operate the dozer blade.

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

8) SINGLE PEDAL (option)



(1) This pedal is used to operate the 2nd boom.

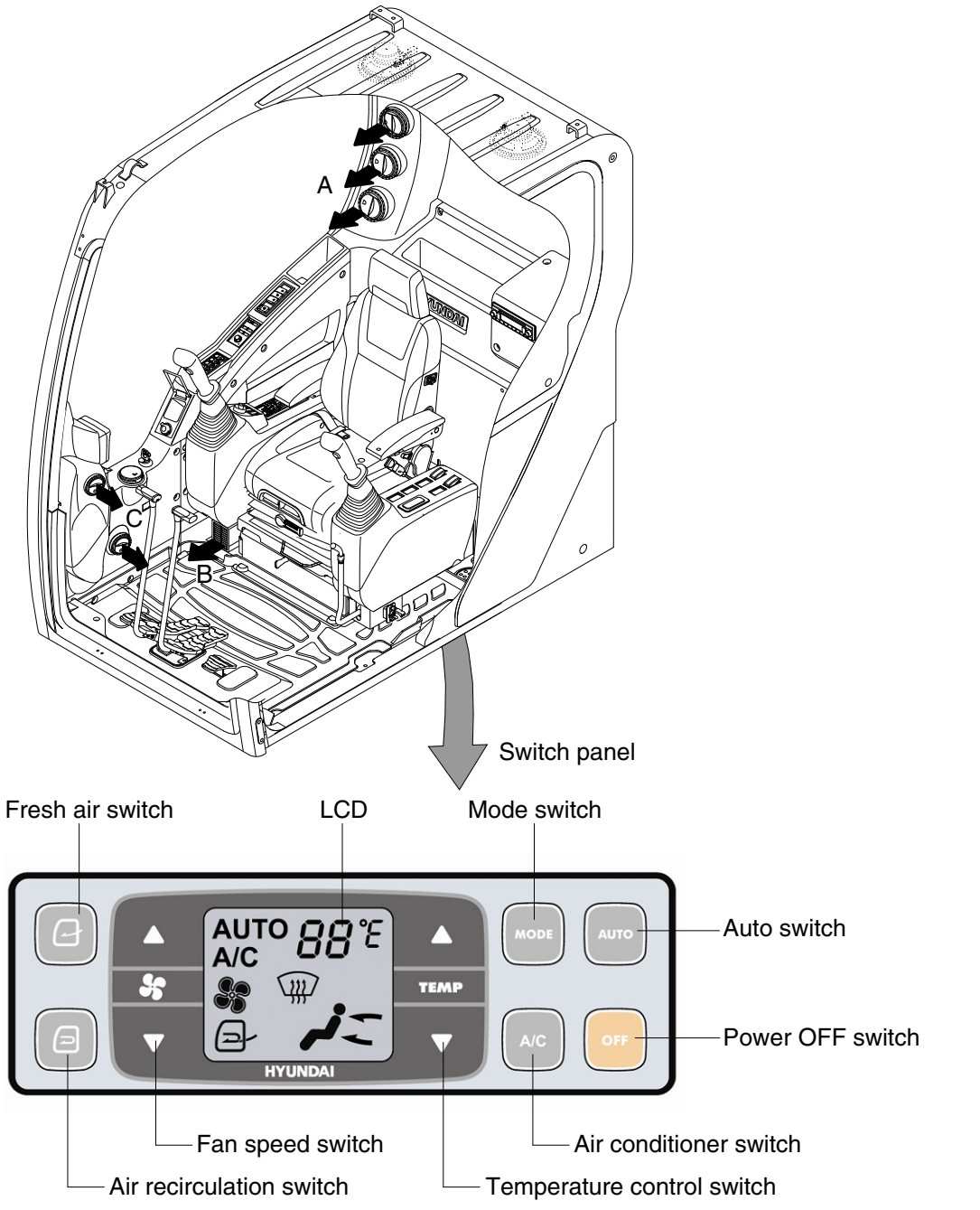
(2) If the pedal is pushed front, the 2nd boom will be going down. And the pedal is pushed rear, the 2nd boom will be going up.

※ **Refer to operation of working device in chapter 4 for details.**

5. 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**



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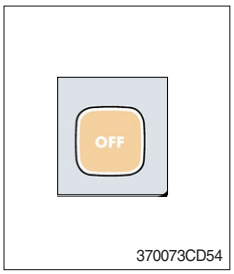
1) POWER OFF SWITCH

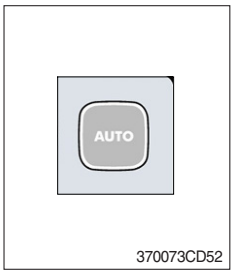


(1) This switch makes the system and the LED OFF.
Just before the power OFF, set values are stored.

(2) Default setting values

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

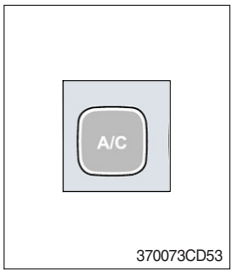
2) AUTO SWITCH



(1) Turn the starting switch to ON position, LCD lights ON.
Auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration sensing ambient and cabin inside temperature.

(2) This switch can restart system after system OFF.

3) AIR CONDITIONER SWITCH (compressor switch)

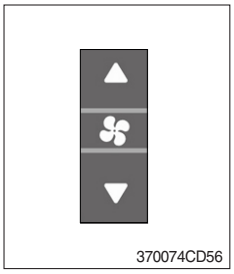


(1) This switch turns the compressor and the LCD ON.

(2) In accordance with the temperature sensed by duct (evaporator) sensor, compressor turns ON or OFF automatically.

※ **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.

4) FAN SPEED SWITCH

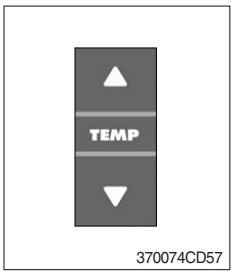


(1) Fan speed is controlled automatically by setted temperature.

(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.

(3) This switch makes the system ON.

5) TEMPERATURE CONTROL SWITCH



(1) Setting temperature indication
① Type A : 17~32˚C, scale : 1˚C
② Type B : Lo, 18~31˚C, Hi, scale : 1˚C

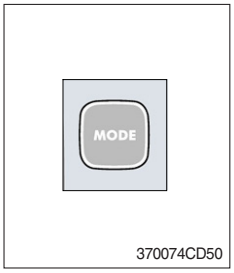
(2) Max cool and max warm beeps 5 times.

(3) The max cool or the max warm position operates as following table.

Temperature	Compressor	Fan speed	In/Outlet	Mode
Max cool	ON	Max (Hi)	Recirculation	Vent
Max warm	OFF	Max (Hi)	Fresh	Foot

(4) Temperature unit can be changed between celsius (˚C) and fahrenheit (˚F)
① Default status (˚C)
② Push Up/Down temperature control switch simultaneously more than 5 second displayed temperature unit change (˚C → ˚F)

6) MODE SWITCH

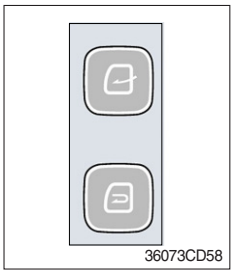


(1) Operating this switch, it beeps and displays symbol of each mode in order. (Vent → Vent/Foot → Def/Foot → Def/Vent → Def/Vent/Foot)

Mode switch		Vent	Vent/Foot	Def/Foot	Def/Vent	Def/Vent/Foot
Outlet	A	●	●		●	●
	B		●	●		●
	C			●	●	●

(2) When defroster mode operating, FRESH AIR/AIR RECIRCULATION switch turns to FRESH AIR mode and air conditioner switch turns ON.

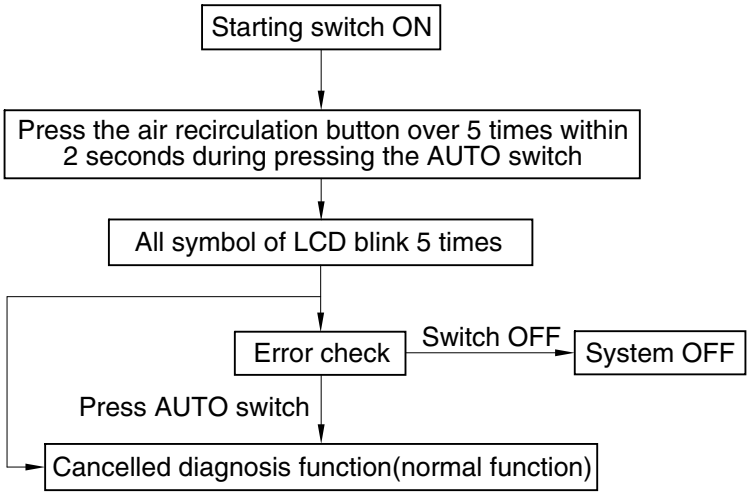
7) FRESH AIR/AIR RECIRCULATION SWITCH



(1) It is possible to change the air-inlet method.
① **Fresh air ( )**
Inhaling air from the outside.
※ **Check out the fresh air filter periodically to keep a good efficiency.**
② **Air recirculation ( )**
It recycles the heated or cooled air to increase the energy efficiency.
※ **Change air occasionally when using recirculation for a long time.**
※ **Check out the recirculation filter periodically to keep a good efficiency.**

8) SELF DIAGNOSIS FUNCTION

(1) Procedure



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(2) Error check

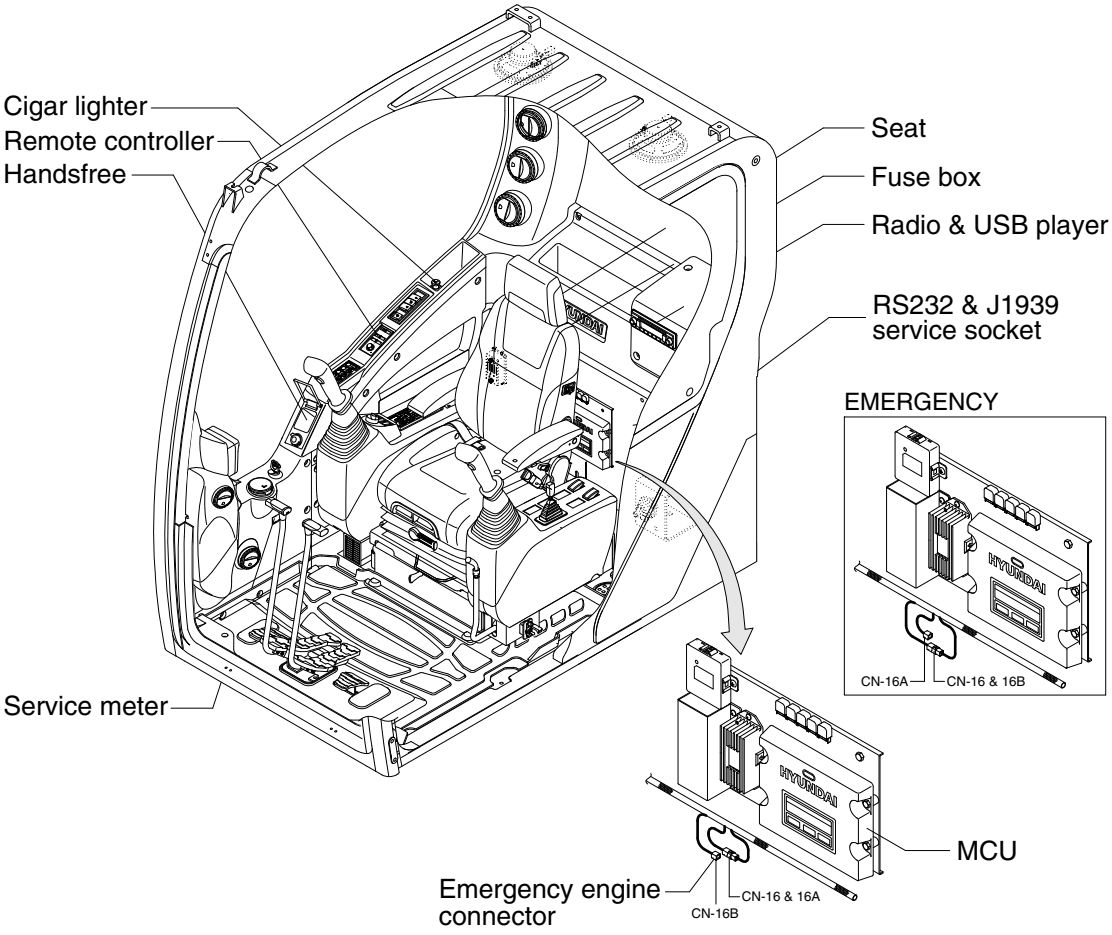
- The corresponding error code flickers on the setup temperature display panel, the other symbol will turn OFF.
- Error code flickers every 0.5 second.
- If error code is more than two, each code flickers 2 times in sequence.
- Error code

Error code	Description	Error code	Description
11	Cabin inside sensor	16	Mode actuator 1
12	Ambient sensor	17	Mode actuator 2
14	Duct (evaporator) sensor	18	Intake actuator
15	Temp actuator	-	-

(3) Fail safe function

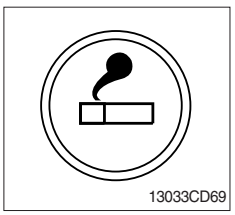
Error description	Fail safe function
Cabin inside sensor (11)	25˚C alternate value control
Ambient sensor (12)	20˚C alternate value control
Duct (evaporator) sensor (14)	1˚C alternate value control
Temp actuator (15)	If opening amount is 0 %, the alternate value is 0 %
	If not, the alternate value is 100 %
Mode actuator 1, 2 (16, 17)	The alternate value is vent

6. OTHERS



145ZF3CD05A

1) CIGAR LIGHTER



(1) This can be used when the engine starting switch is ON.

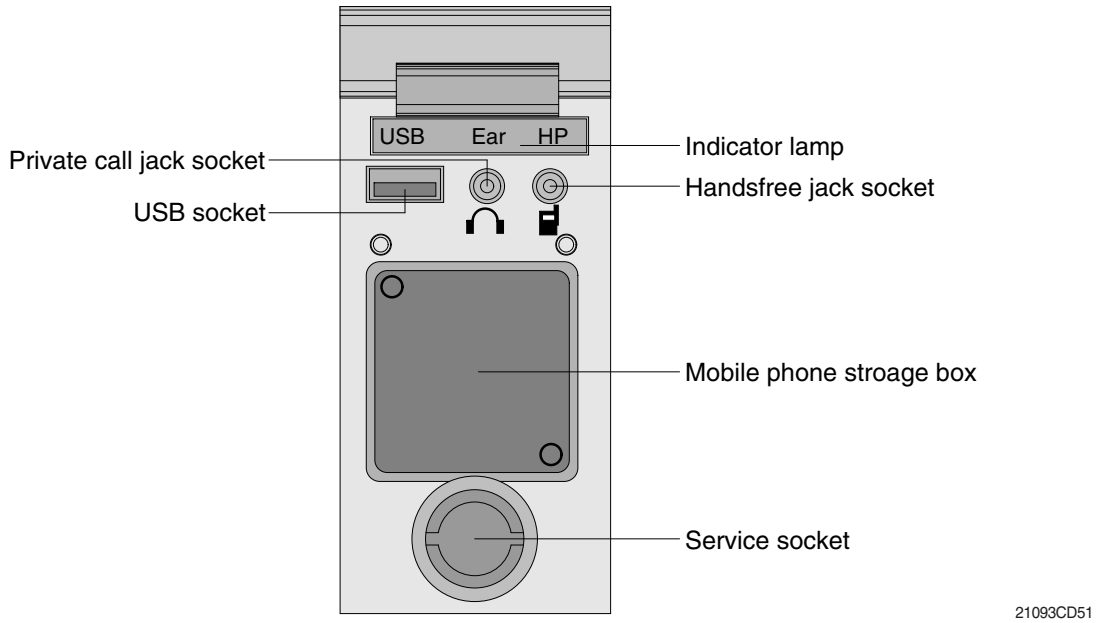
(2) The lighter can be used when it springs out in a short while after being pressed down.

※ **Service socket**

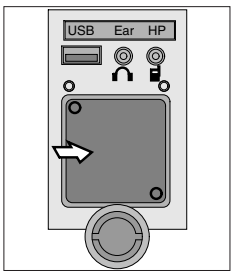
Use cigar lighter socket when you need emergency power.
Do not use the lighter exceeding 24 V, 100 W.

2) HANDSFREE

Allow you to dial a call or to have a conversation without holding your handset. Use the remote controller when making and answering a calls or ring off.

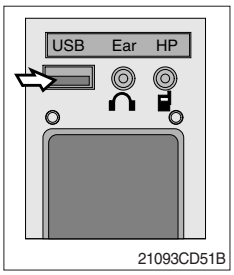


(1) Mobile phone storage box



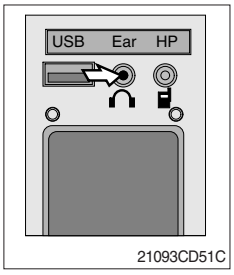
① Mobile phone can be stored when call by handsfree.

(2) USB socket



① This socket is used to charging the mobile phone.

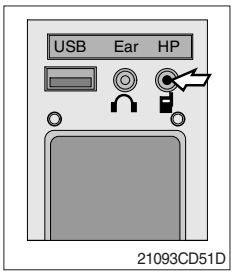
(3) Private call jack socket



① This can be used protect you privacy calling by using ear phone.

② The mobile phone must be connected handsfree jack socket.

(4) Handsfree jack socket

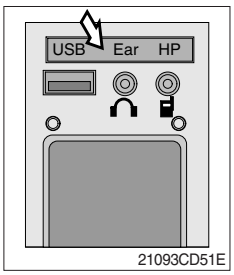


① Connect the jack cable when call by handsfree.

② Use the special adapter when jack cable is not interchangeable.

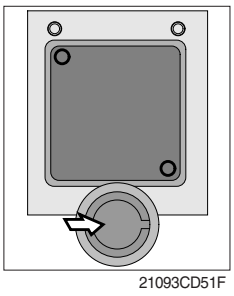
③ Check the jack type of mobile phone before use.

(5) Indicator lamp



① This lamp is turned ON when the handsfree mode selected.

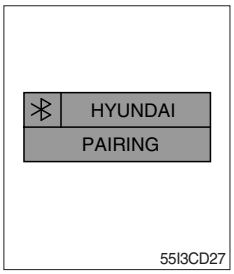
(6) Service socket



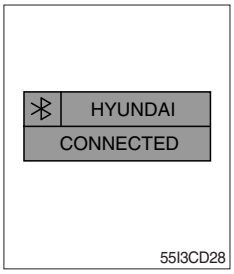
① Utilize the power of 12 V as your need and do not exceed power of 12 V, 30 W.

(7) Wireless handsfree

① Select the handsfree mode by pressing bluetooth button on the mobile phone.
Press the CALL button for more than 6 seconds for pairing (connection process of the mobile phone and handsfree), you can hear beep sounds three times.



② The mobile phone finds bluetooth named " HYUNDAI".
Select "HYUNDAI" and set "connect with Bluetooth on the mobile phone".
· Default password : 0000

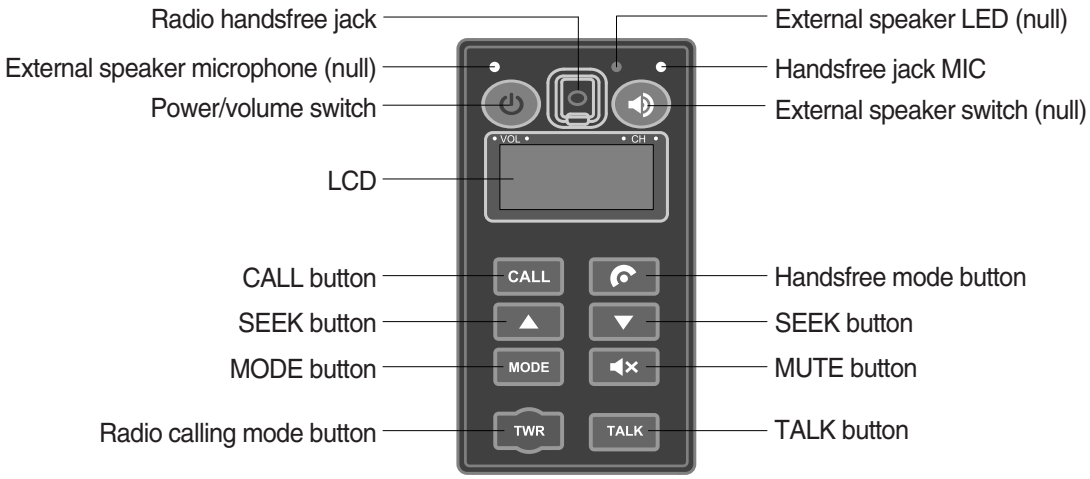


③ The Bluetooth pairing is made, the LCD screen shows "CONNECTED".

④ Once the Bluetooth pairing is made, they will be automatically connected after 20 seconds when start key ON.

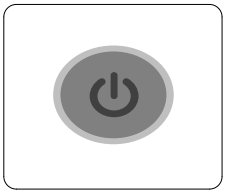
⑤ When you want to deactivate the pairing, press and hold the CALL button for more than 3 seconds then you can hear beep sounds twice and the function will be deactivated.

3) REMOTE CONTROLLER



55I3CD31

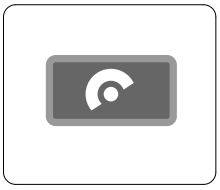
(1) Power and volume switch



55I3CD31A

① This switch is used to turn the audio or handsfree ON or OFF.
② This switch is turned to right, the handsfree volume is increased over 7 steps.
③ If it is turned to left, volume will be decreased.
※ **This switch adjust the audio volume when selected audio mode.**

(2) Mode change button



55I3CD31B

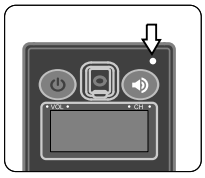
① This button is to select the handsfree mode or audio mode.
- Lamp ON : Handsfree mode ("TEL MUTE" displayed ON audio LCD)
- Lamp OFF : Audio mode

(3) Call button

55I3CD31C

① This button is used answer a call, last number radial, ring off.
② For calling, press the button 0.5~1.5 seconds until the beep sounds.
※ **This can be used when the starting switch is ON.**

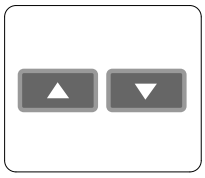
(4) Handsfree MIC



55I3CD31D

① This MIC transfers user voice to receiver of the call when making a call by handsfree.

(5) Seek button



55I3CD31E

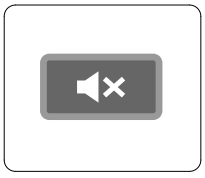
① If this button pressed, the radio automatically stops at the next frequency of broadcasting for your listening.

② This button enable to select the song of the MP3 from USB.

: Turn a station of higher frequency and the next song of the MP3.

: Turn a station of lower frequency and the previous song of the MP3.

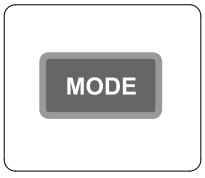
(6) Mute button



55I3CD31F

① Short press this button to mute or cancel the mute (silence) while broadcasting.

(7) Mode button



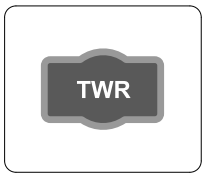
55I3CD31G

① Press the mode button to select the desired mode.

② Radio → MP3 → AUX

※ **The LCD displayed each mode.**

(8) Radio calling mode button



55I3CD31H

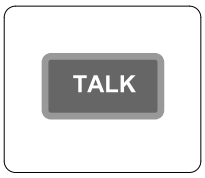
① Press this button, activated or deactivated the radio handsfree function.

② As long as you do not press this button, you can hear the other party.

③ The LED is turned ON when this button is activated.
The LED turned OFF when the audio mode or the mobile phone handsfree calling mode is activated.

※ **Radio handsfree**
You can make a call to external worker without holding the radio by hand. (The radio is not installed to the machine).

(9) Talk button

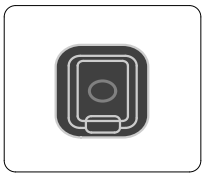


55I3CD31J

① The call is connected while pressing this button (when TALK button is activated).

※ **Unlike mobile phones, when you want to talk through the radio, you need to press the button (Push-to-talk method).**
While one is talking through the radio, the other party can only listen to him/her.

(10) Handsfree jack

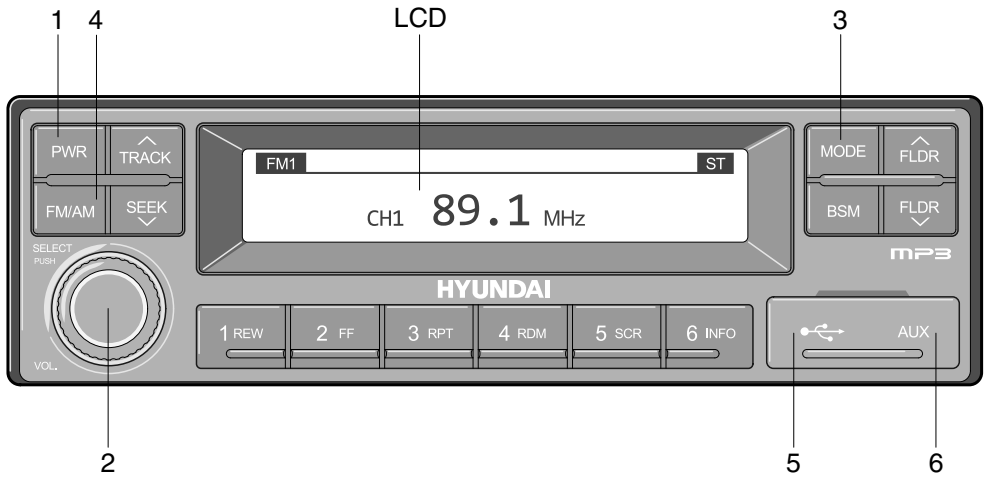


55I3CD31K

① Connect the jack cable when call by radio handsfree.

4) RADIO AND USB PLAYER : MACHINE SERIAL NO.: -#0328

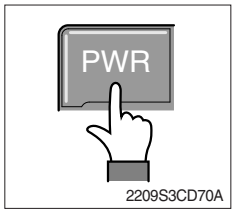
■ BASIC FUNCTIONS



2209S3CD70

1 Power (PWR) button
2 Volume/Sound setting button
3 Mode selection button
4 Radio (FM/AM) selection button
5 USB slot
6 AUX terminal

(1) Power (PWR) button

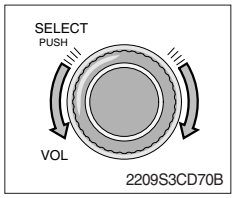


2209S3CD70A

① Press the PWR button to turn on the audio. While the audio is operating, press the button to turn the power off.

(2) Volume/Sound setting button

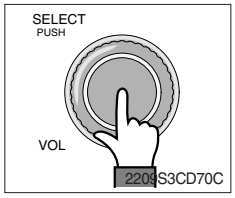
· Volume (VOL) button



2209S3CD70B

① Turn the VOL button clockwise to increase the volume and counter-clockwise to decrease the volume.

· Sound setting



① Press the SELECT button to conduct sound setting.
Each press of the button will change the sound setting in the following order.
BASS → MIDDLE → TREBLE → BALANCE → EQ → BEEP

② After selecting the desired setting, turn the SELECT button clockwise/counter-clockwise to adjust the sound setting value.

③ **BASS adjustment**
Turn the SELECT button clockwise to increase the bass and counter-clockwise to decrease the bass. BASS can be adjusted from max +10/min -10. If there are no adjustments for 3 seconds, the changes will be saved and the previous mode will be restored.

④ **MIDDLE adjustment**
Turn the SELECT button clockwise to increase the middle and counter-clockwise to decrease the middle. MIDDLE can be adjusted from max +10/min -10. If there are no adjustments for 3 seconds, the changes will be saved and the previous mode will be restored.

⑤ **TREBLE adjustment**
Turn the SELECT button clockwise to increase the treble and counter-clockwise to decrease the treble. TREBLE can be adjusted from max +10/min -10. If there are no adjustments for 3 seconds, the changes will be saved and the previous mode will be restored.

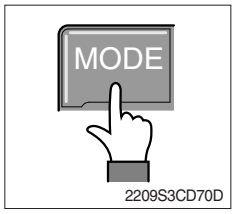
⑥ **Left/Right BALANCE adjustment**
Turn the SELECT button clockwise to increase the right-side speaker volume and counter-clockwise to increase the left-side speaker volume. BALANCE can be adjusted from 10L/10R. If there are no adjustments for 3 seconds, the changes will be saved and the previous mode will be restored.

⑦ **EQ (EQUALIZER) adjustment**
Turn the SELECT button clockwise/counter-clockwise to select the desired EQ. EQ settings are as shown below.
Cls (classic) → Pop → Rock → Jazz → off
If there are no adjustments for 3 seconds, the changes will be saved and the previous mode will be restored.

※ **Upon selecting EQ, the BASS, MIDDLE and TREBLE values will be turned off.**
The BASS, MIDDLE, TREBLE values can be set only when EQ Off is selected.

⑧ **BEEP sound adjustment**
Turn the SELECT button clockwise/counter-clockwise to the beep sound ON/OFF. If there are no adjustments for 3 seconds, the changes will be saved and the previous mode will be restored.

(3) MODE selection button



① Pres the MODE button to change to RADIO/USB/AUX/iPod modes. However, the mode can be selected only when the respective media is connected.

② If iPod is connected to the audio, the mode will change in the following order.
RADIO → iPod → USB (handfree)

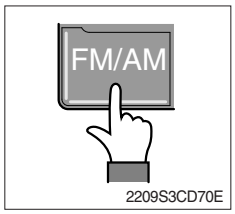
③ If USB, AUX is connected to the audio, the mode will change in the following order.
RADIO → USB(front) → USB(handfree) → AUX

※ USB and AUX mode will operate only when corresponding devices are connected.

※ When connecting iPod, AUX and front USB cannot be connected.

※ The iPod is connected to the USB in the machine handfree.

(4) Radio (FM/AM) selection button



① Each press of the FM/AM button will change the radio mode in the following order.
FM1 → FM2 → FM3 → AM

② Preset memory of up to FM : 18 stations, AM : 6 stations

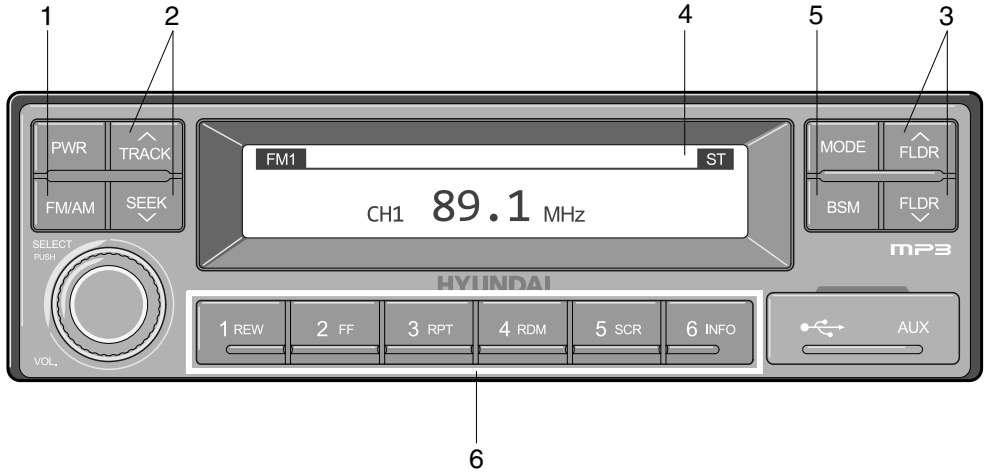
(5) USB slot

Connects USB to play USB music files.

(6) AUX terminal

Connects AUX cable to play AUX music files.

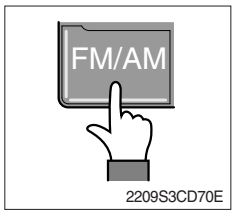
■ RADIO



2209S3CD71

1 Radio (FM/AM) selection button
2 TRACK/SEEK button
3 Broadcast manual search (FLDR) button
4 LCD display
5 BSM (Best Station Memory) button
6 Saving broadcast frequencies to PRESET numbers

(1) Radio (FM/AM) selection button



2209S3CD70E

① Each press of the FM/AM button will change the radio mode in the following order.
FM1 → FM2 → FM3 → AM

② In addition, pressing the FM/AM button when the starting switch is in ON state will turn the power on and activate the radio.

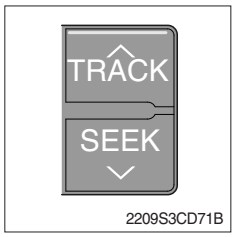
③ **Setting regional Radio Frequency**

▶ North America Frequency
Press the FM/AM and Preset 1 button simultaneously to set frequency in accordance to the North America Frequency settings. “nA” will become displayed on the LCD for one second.
FM : 87.7 ~ 107.9 MHz (200 KHz)
AM : 530 ~ 1710 KHz (10 KHz)

▶ Local/Middle East/Asia Frequency
Press the FM/AM and Preset 2 button simultaneously to set frequency in accordance to the Local/Middle East/Asia Frequency settings. “lnT” will become displayed on the LCD for one second.
FM: 87.5 ~ 108 MHz (100 KHz)
AM: 531 ~ 1602 KHz (9 KHz)

▶ Europe Frequency
Press the FM/AM and Preset 3 button simultaneously to set frequency in accordance to the North America Frequency settings. “Eu” will become displayed on the LCD for one second.
FM: 87.5 ~ 108 MHz (50 KHz)
MW: 531 ~ 1602 KHz (9 KHz)
LW: 153 ~ 279 KHz (1 KHz)

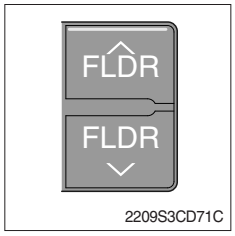
(2) TRACK/SEEK button



① As buttons used to automatically search broadcasts, pressing the button will automatically search and stop at a frequency with superior reception.
TRACK ∧ : Searches frequencies higher than current frequency
SEEK ∨: Searches frequencies lower than current frequency

※ When frequencies cannot be properly found due to weak broadcast reception, try using manual FLDR button. (Refer to manual FLDR button explanation below)

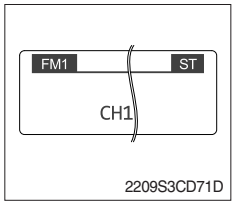
(3) Broadcast manual search (FLDR) button



① As button used to search frequencies manually, a press of the SEEK step (refer to note below) will change the frequency.
Pressing and holding the button will continue changing the frequency. Releasing the button will stop the search at the current frequency.
FLDR ∧: Searches frequencies higher than current frequency
FLDR ∨: Searches frequencies lower than current frequency

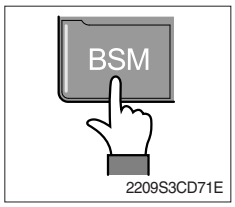
※ SEEK STEP : FM-100KHz, AM-9KHz

(4) LCD display



① The currently received broadcast frequency info and status are displayed.

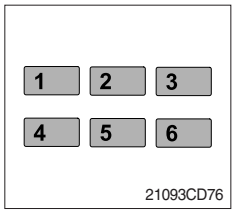
(5) BSM (Best Station Memory) button



① Press and hold the BSM button to listen to the presets saved in FM BAND FM1, FM2, and FM3 or AM BAND AM for 5 seconds each. When you find a station you wish to listen to, press the BSM button again to receive the selected broadcast.

② Shortly press the BSM button to automatically save frequencies with superior reception in presets (1REW~6INFO). The BSM feature will save AM frequencies in AM mode and FM frequencies in FM mode.

(6) Saving broadcast frequencies to PRESET numbers



Up to 18 FM broadcasts and 6 AM broadcasts can be saved.

① Use the auto/manual search buttons to find the desired frequency.

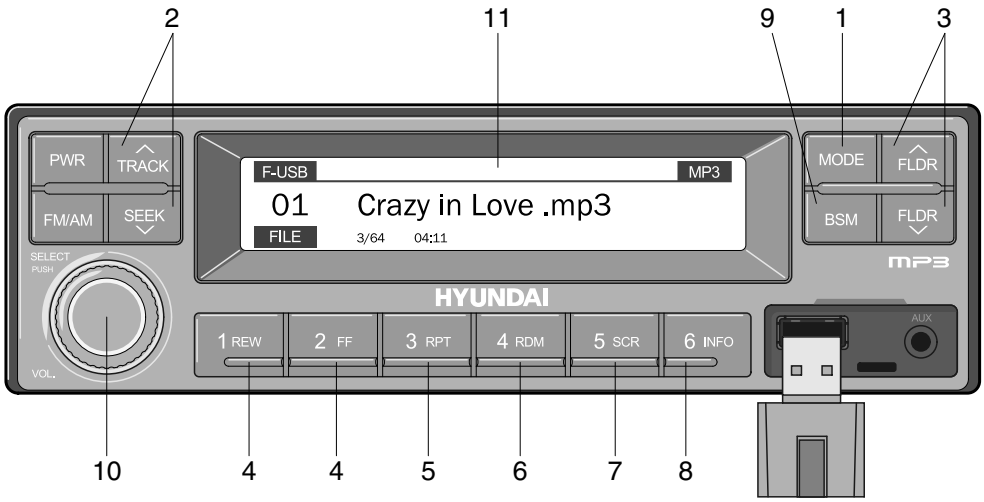
② Select the preset button (1REW~ 6INFO) to which you wish to save the selected frequency. Press and hold the preset button.

③ The frequency will be saved to the preset button to a sound of a beep. The saved frequency number will be displayed on the LCD DISPLAY. (However, the beep will not sound if the beep function has been turned off in sound setting.)

④ After saving is complete, pressing the preset button will play the corresponding broadcast frequency.

※ No beep sound signifies that the preset has not been saved. In this case, try again from the first step. (However, the beep will not sound if the beep function has been turned off in sound setting.)

■ USB CONNECTION

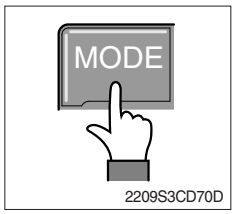


2209S3CD72

1 USB selection button
2 TRACK UP/SEEK DOWN button
3 FLDR UP/DOWN button
4 FF/REW button
5 RPT/FOLDER RPT button
6 RDM/FOLDER RDM button
7 Scroll (SCR) button
8 View music info (INFO) button
9 Scan button (BSM)
10 Finding and playing file (SELECT) button
11 LCD display

- Operates only when a USB is connected. Connecting a USB to the audio will automatically convert to USB mode.
- Connecting the USB when the starting switch is in ON state will turn the power on and automatically play the songs within the USB.

(1) USB selection button

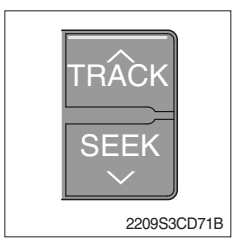


2209S3CD70D

① While playing a different mode, press the MODE button to convert to USB mode. Connecting a USB to the audio will automatically convert to USB mode even if another mode is playing and automatically play the songs within the USB.

② If the USB is connected to both the front USB and handfree, then MODE is converted in the following order.
RADIO → USB(front) → USB(handfree)

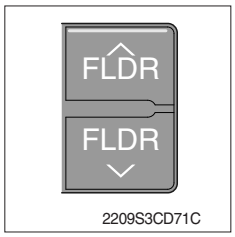
(2) TRACK UP/SEEK DOWN button



2209S3CD71B

① While playing USB, press the TRACK∧ button to play the beginning of the next song.
Press the SEEK∨ button to return to the beginning of the current song. Press the button again to play the beginning of the previous song.

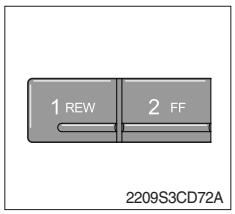
(3) FLDR UP/DOWN button



① If there are more than 2 folders in the USB, pressing the FLDR UP/ DOWN button will move to the previous or next folder.

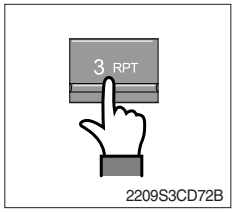
② If there are no folders in the USB, then pressing the button will move up/down within the folder in 10 file increments.

(4) FF/REW button



① While a USB is operating, press and hold the FF button to fast-forward the song. When fast-forward is complete, the next song will properly play from the beginning even if you continue holding the button. Press and hold the REW button to rewind the song. When rewind is complete, the current song will properly play from the beginning even if you continue holding the button. Shortly pressing the buttons will not operate the FF/REW.

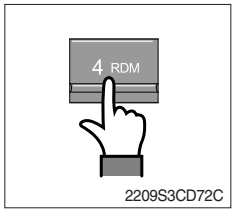
(5) RPT/FOLDER RPT button



① While music is playing, shortly press the RPT button to repeat the currently playing song.

② (RPT function) Press and hold the RTP button to sequentially repeat all songs within the current folder. (FOLDER RPT, however, music files in the USB must be saved in folder format.)

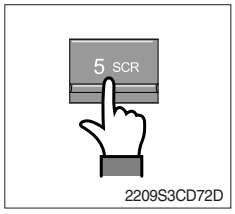
(6) RDM/FOLDER RDM button



① While music is playing, shortly press the RDM button to randomly play the songs in the current folder. (RDM)

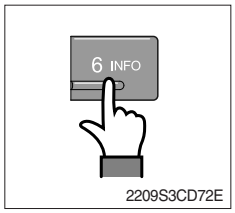
② While music is playing, press and hold the RDM button to randomly play the songs in the current folder. (FOLDER RDM, however, music files in the USB must be saved in folder format.)

(7) Scroll (SCR) button



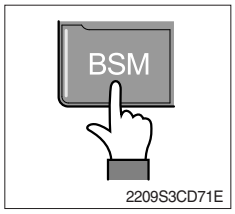
① Press the SCR button to turn ON/OFF the scroll function which scrolls the file name of the currently playing song on the LCD from right to left.

(8) View music info (INFO) button



① Each time the INFO button is pressed, the info on the currently playing song will be displayed in the following order.
FILE NAME → TITLE → ARTIST → ALBUM → DIR

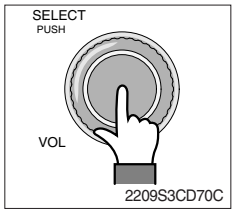
(9) Scan button (BSM)



① While music is playing, shortly press the BSM button to scan each song within the USB for 10 seconds in sequential order. (SCN)

② Press and hold the BSM button to scan each song within the current folder for 10 seconds in sequential order. (FOLDER SCN, however, music files in the USB must be saved in folder format.)

(10) Finding and playing file (SELECT) button

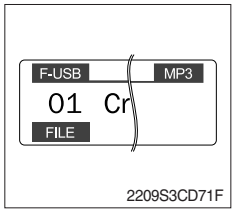


① While USB is playing, press and hold the SELECT button for over 3 seconds to enter FILE BROWER mode and search for desired files.

② After entering FILE BROWSER mode, turn the SELECT button left/right to find the desired folder. After finding the folder, press the SELECT button to select the folder. Turn the SELECT button left/right to find the desired song and press the SELECT button to play.

③ If there are no adjustments for 3 seconds after pressing the SELECT button, the function will be turned off and the USB play screen will be displayed.

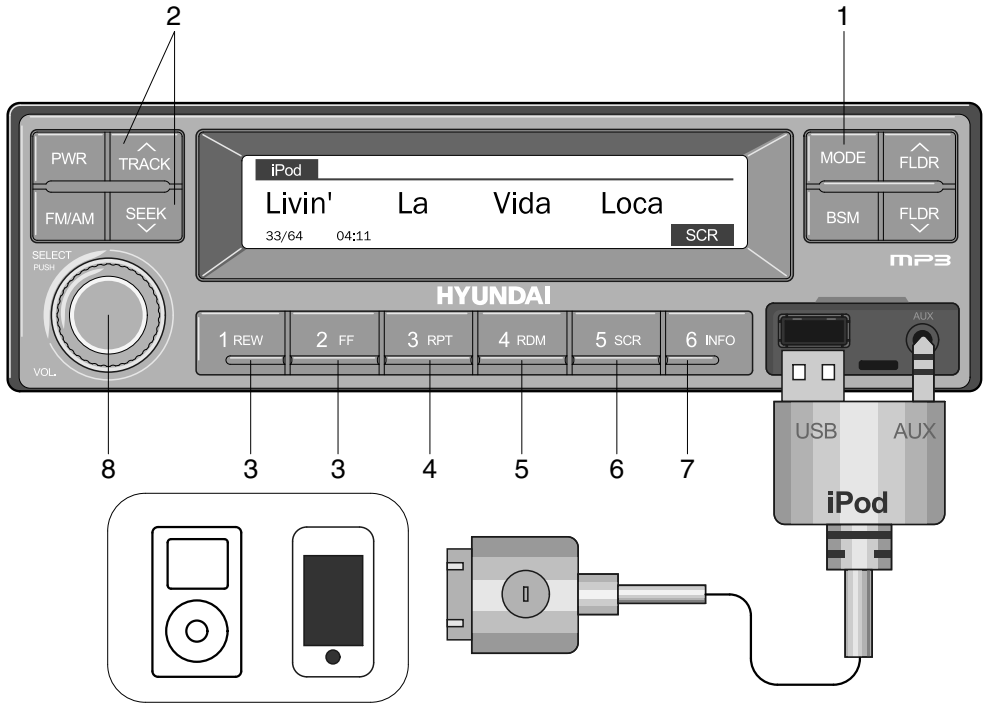
(11) LCD display



① Displays the info of the currently playing song.

- F-USB : Displays USB is connected to the Audio Front
- R-USB : Displays USB is connected to the handfree
- RPT : Displays that repeat function is turned on
- RPT : Displays that folder repeat function is turned on
- RDM : Displays that random play is turned on
- RDM : Displays that folder random play is turned on
- SCR : Displays that SCROLL is turned on

■ iPOD CONNECTION

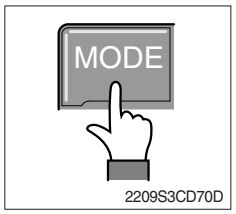


2209S3CD73

1 iPod selection button
2 TRACK UP/SEEK DOWN button
3 FF/REW button
4 Repeat (RPT) button
5 Random play (RDM) button
6 Scroll (SCR) button
7 View music info (INFO) button
8 Finding and playing file (SELECT) button

- Operates only when an iPod is connected. Connecting an iPod to the audio will automatically convert to iPod mode. Connecting the USB when the starting switch is in ON state will turn the power on and automatically play the songs within the iPod.
- The iPod cable is supplied separately.

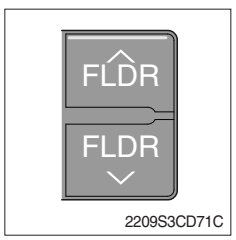
(1) iPod selection button



2209S3CD70D

① While playing a different mode, press the MODE button to convert to iPod mode. Connecting an iPod to the audio will automatically convert to iPod mode even if another mode is playing and automatically play the songs within the iPod.

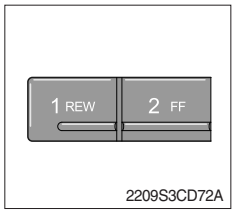
(2) TRACK UP/SEEK DOWN button



2209S3CD71C

① While playing music, press the TRACK∧ button to play the beginning of the next song.
Press the SEEK∨ button to return to the beginning of the current song. Press the button again to play the beginning of the previous song.

(3) FF/REW button



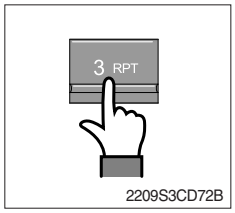
① While an iPod is operating, press and hold the FF button to fast- forward the song.

② When fast-forward is complete, the next song will properly play from the beginning even if you continue holding the button. Press and hold the REW button to rewind the song.

③ When rewind is complete, the current song will properly play from the beginning even if you continue holding the button.

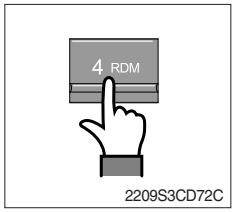
④ Shortly pressing the buttons will not operate the FF/REW.

(4) Repeat (RPT) button



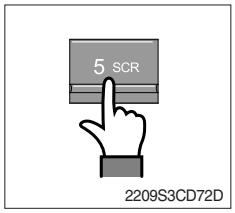
① While music is playing, press the RPT button to repeat the currently playing song.

(5) Random play (RDM) button



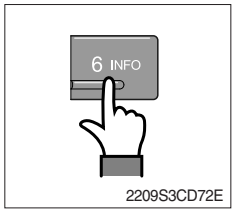
① While music is playing, press the RDM button to randomly play the songs.

(6) Scroll (SCR) button



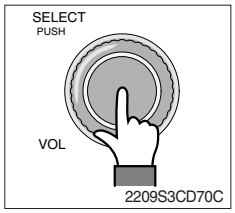
① Displays the file name of the currently playing song on the LCD. Here, the SCR button turns the file name SCROLL ON/OFF.

(7) View music info (INFO) button



① Each time the INFO button is pressed, the info on the currently playing song will be displayed in order of ARTIST → ALBUM → TITLE.

(8) Finding and playing file (SELECT) button



① While iPod is playing, press and hold the SELECT button for over 3 seconds to enter CATEGORY mode and search for desired files.

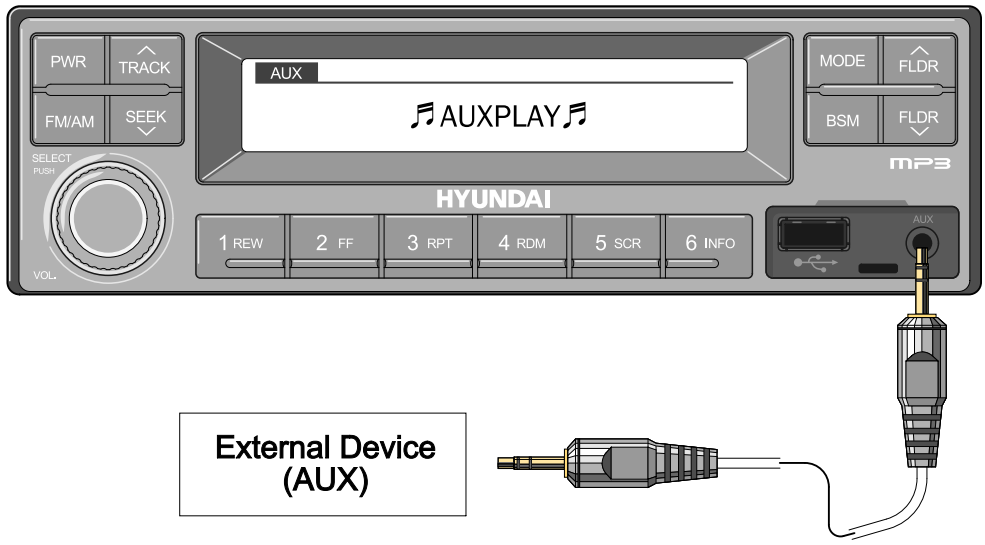
② After entering CATEGORY mode, turn the SELECT button left/right to find the desired category.

③ Category will be displayed in the following order.
PLAYLISTS → ARTISTS → ALBUMS → GENRES → SONGS → COMPOSERS → AUDIOBOOKS → PODCACSTS

④ After finding the category, press the SELECT button to select the category. Turn the SELECT button left/right to find the desired song and press the SELECT button to play.

⑤ If there are no adjustments for 3 seconds after pressing the SELECT button, the function will be turned off and the iPod play screen will be displayed.

■ AUX connection



2209S3CD74

- Operates only when an external device is connected to AUX. Connecting an AUX device to the audio using the AUX cable will automatically convert to AUX mode.
- When an external device is connected, only the PWR, FM/AM, MODE, and VOL buttons can be operated.
- Settings can be made only through the external device connected to AUX.
- The AUX cable is supplied separately.

(1) Connecting an external device using the AUX cable

① While playing a different mode, press the MODE button to convert to AUX mode.

② If an external device is connected to the Audio through the AUX terminal, AUX mode will automatically be converted and play music from AUX. Connecting the AUX when the starting switch is in ON state will turn the power on and automatically play the songs within the AUX.

RADIO AND USB PLAYER (WITH BLUETOOTH) : MACHINE SERIAL NO.: #0329-

9403CD100

■ FRONT PANEL PRESENTATION

1 ····· Power ON/OFF, Volume UP/DOWN button

2 ····· Manual UP/DOWN Tuning, File search, SEL button

3 ····· Mode button, Audio mute button

4 ····· Call & Pair button

5 ····· Call end button

6 ····· Station preset 1
DIS ····· Display button

7 ····· Station preset 2

8 ····· Station preset 3
RPT ····· Repeat play button

9 ····· Station preset 4
RDM ····· Random play button

10 ····· Station preset 5
DIR- ····· Directory down button

11 ····· Station preset 6
DIR+ ····· Directory up button

12 ····· Scan play button (SCAN)
Best station memory (BSM) button

13 ····· Auto tune up, Seek up button

14 ····· Auto tune down, Track down button

15 ····· USB connector

16 ····· AUX IN Jack

17 ····· MIC hole

RADIO AND USB PLAYER (WITHOUT BLUETOOTH) : MACHINE SERIAL NO.: #0329-

9403CD101

■ FRONT PANEL PRESENTATION

1 ····· Power ON/OFF, Volume UP/DOWN button

2 ····· Manual UP/DOWN Tuning, File search, SEL button

3 ····· Mode button, Audio mute button

4 ····· Radio seek up button

5 ····· Radio seek down button

6 ····· Station preset 1
DIS ····· Display button

7 ····· Station preset 2

8 ····· Station preset 3
RPT ····· Repeat play button

9 ····· Station preset 4
RDM ····· Random play button

10 ····· Station preset 5
DIR- ····· Directory down button

11 ····· Station preset 6
DIR+ ····· Directory up button

12 ····· Scan play button (SCAN)
Best station memory (BSM) button

13 ····· Track up button

14 ····· Track down button

15 ····· USB connector

16 ····· AUX IN Jack

■ 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 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 little 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 sound effect 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 :

a. Select the desired station.
b. 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


9403CD110

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 no mp3 or wma files in USB device, it will convert to the previous mode after display NO FILE.**

(2) Track Up / Down button

9403CD106

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.

9403CD107

(3) MP3 directory / File searching

9403CD111

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

9403CD112

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 random play the tracks in 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-CAED 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.**

※ **The temperature below -10 Celsius, the audio unit with USB hook up would be affected to 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) Keep PAIRING the cellular phone with audio unit in a few minutes as the phone are being switched on well enough.

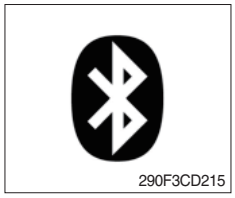
※ **Since this audio unit is on standby to connect with your cellular phone via bluetooth wireless technology, using this audio unit without running the engine can result battery drainage.**

※ **This audio unit 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 in use.**

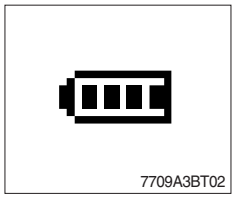
※ **Digital Noise & Echo suppression system provides the best sound clarity with little or no distortion (Echo & side tone will happen depending on cellular phone or service network).**

※ **To ensure the quality of calling, you should select a proper bluetooth VR level. This audio unit has already set with the best bluetooth VR level.**



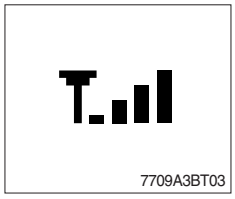
① Bluetooth icon

It will blink while establishing the bluetooth pairing.
It will light after a bluetooth device connected.



② Battery icon

It indicates the battery status of the connected bluetooth device.



③ 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 appears PAIR STR 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 to 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 pone and this audio unit, the both units will be automatically recognized on its paring and when you turn on the key in your car even though this 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.

4) Bluetooth connection and disconnection

(1) When established bluetooth connection 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 connected.


9403CD118

(2) To disconnect bluetooth link
Press and hold CALL END button (4) for 2 seconds, it shows DIS CON and disappears bluetooth Icon on the display.


9403CD117

(3) To disconnect bluetooth link
Press CALL button (3) briefly, it blinks bluetooth Icon on the display while bluetooth is being connected. If the connection is completed, it appears bluetooth Icon 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.


9403CD117/8

(2) To accept call
Press CALL button (4), it appears ANSWER CALL and follows TALKING on the display.

(3) To end call
To end call, press CALL END button (5), it appears REJECT 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 you 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, then simply press CALL button once again, it would make the last call with phone number display 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 once more send button. First press button shows phone contact list in your phone, then second press 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 activated automatically when you make a call by 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 maybe different depends on cellular phone. Please follow the cellular phone menu. Some kinds of phone 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

Interfere noise or abnormal compressed files in the MP3 disc or USB instrument may cause extraordinary operation (or unit frozen/locking up). It's strongly recommended to use appropriate USB storage not cause any malfunction to the audio unit. In the unlikely event that the player fails to operate correctly, try out to reset unit by any of following two methods.

(1) press and hold 

simultaneously for about 5 seconds. (without Bluetooth)

Press and hold 


simultaneously for about 5 seconds. (with Bluetooth)

(2) Take out the fuse for the audio system in the vehicle once and then plug again.

※ 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 operation correctly.

2) Precautions

When the inside of the car is very cold and the player is used soon 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.

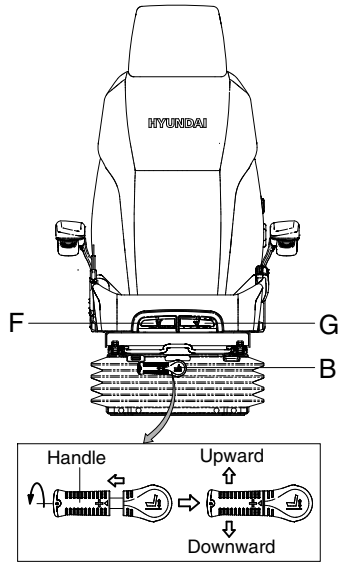
(4) USB version : USB 1.1

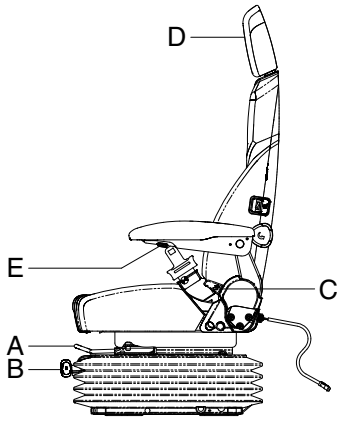
(5) Bluetooth version : V2.1

(6) Bluetooth supported profile :
- A2DP : Advanced Audio Distribution Profile
- AVRCP : Audio/Video Remote Control Profile
- HFP : Hands-Free Profile

5) SEAT

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.





21093CD55

(1) Forward/Backward adjustment (A)

① Pull lever A to adjust seat forward or backward.

② The seat can be moved forward and backward over 140 mm (5.5") in 13 steps.

(2) Height/weight adjustment (B)

① Turn the handle to adjust seat upward or downward

· Turn to clockwise, the seat is moved to upward and the weight is increased.
If it is turned to counterclockwise, the seat is moved to downward and the weight is decreased.

② **Method of changing direction** (up/down)

· First, pull the handle to outside.

· Second, rotate 180˚ and release the handle.

(3) Reclining adjustment (C)

Pull lever C to adjust seat back rest.

(4) Arm rest adjustment (E)

This can be adjusted by pushing the button E to right and left.

(5) Head rest adjustment (D)

This is adjustable vertically to fit operator's requirements over 60 mm (2.4").

(6) Seat cushion tilt adjustment (F)

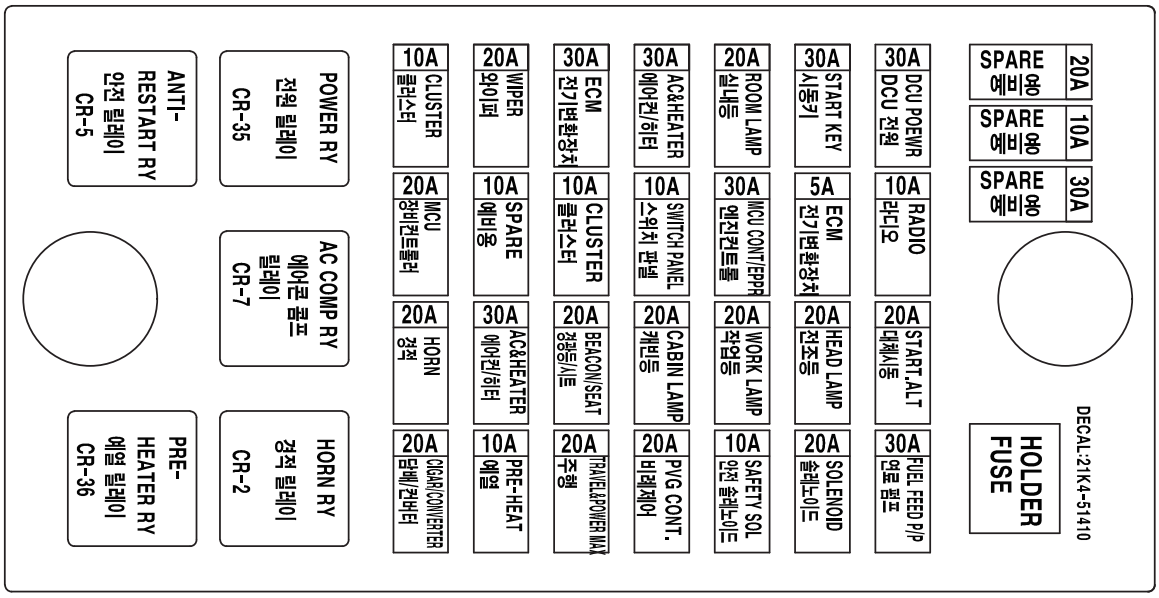
Pull lever F to adjust seat cushion tilting angle.

(7) Seat cushion length adjustment (G)

⚠ Pull lever G to adjust seat cushion forward or backward.

⚠ Always check the condition of the seat belt and mounting hardware before operating the machine. Replace the seat belt at least once every three years, regardless of appearance.

6) FUSE & RELAY BOX



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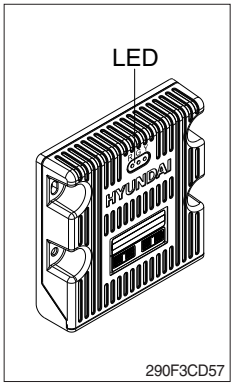
(1) The fuses protect the electrical parts and wiring from burning out.

(2) The fuse box cover indicates the capacity of each fuse and circuit it protects.

※ **Replace a fuse with another of the same capacity.**

⚠ **Before replacing a fuse, be sure to turn OFF the starting switch.**

7) MCU



290F3CD57

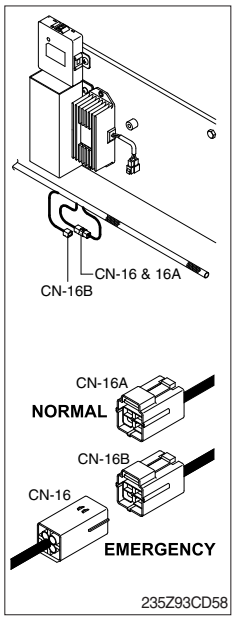
(1) To match the pump absorption torque with the engine torque, MCU varies EPPR valve output pressure, which control pump discharge amount whenever feedbacked engine speed drops under the reference rpm of each mode set.

(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 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

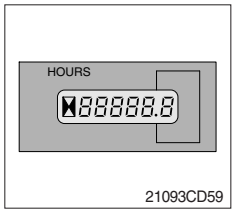


(1) When the CAN communication between the ECM and the MCU is abnormal due to malfunction, change CN-16 connection from CN-16A to CN-16B and then control the engine speed by rotating accel dial switch.

※ **Never connect connector CN-16 with CN-16B when MCU is in normal operation.**

※ **Make repair as soon as possible.**

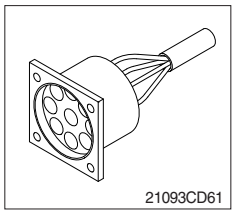
9) SERVICE METER



(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) RS232 & J1939 SERVICE SOCKET



(1) MCU communicates the machine data with Laptop computer through RS232 service socket.

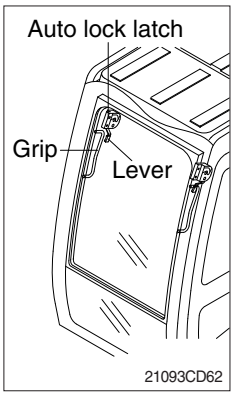
(2) ECM communicates the engine data with cummins INSITE adapter through J1939 service socket.

① ECM fault code check

② ECM program change

③ Engine data monitoring & test

11) UPPER WINDSHIELD

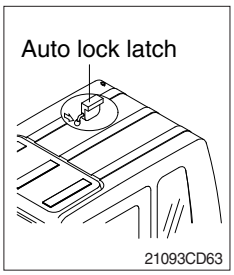


(1) Perform the following procedure in order to open the upper windshield.

① Pull both levers with hold both grips that are located at the top of the windshield frame and push the windshield upward.

② Hold both grips and back into the lock position until auto lock latch is engaged, then release the grips.

⚠ When working, without having locked the windshield by the auto lock (by pushing the windshield to the rear untill 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 auto lock latch in order to release the auto lock latch.

② Reverse above step ① and ② in order to close the upper windshield.

1. SUGGESTION FOR NEW MACHINE

1) It takes about 100 operation hours to enhance its designed performance.

2) Operate according to below three steps and avoid excessive operation for the initial 100 hours.

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

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

3) Be careful during the initial 100 hours operation

(1) Check daily for the level and leakage of coolant, engine oil, hydraulic oil and fuel.

(2) Check regularly the lubrication and fill grease daily all lubrication points.

(3) Tighten bolts.

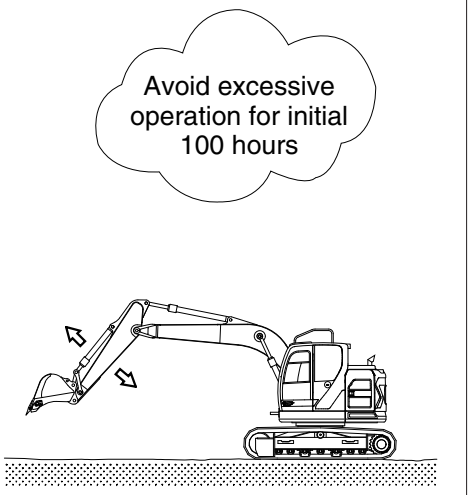
(4) Warm up the machine fully before operation.

(5) Check the gauges occasionally during the operation.

(6) Check if the machine is operating normally during operation.

4) Replace followings after initial 250 hours of operation.

Checking items	Hours
Engine oil	250
Engine oil filter element	
Fuel filter	
Prefilter	
Hydraulic oil return filter element	
Hydraulic oil tank drain filter cartridge	
Line filter element	
Swing reduction gear oil	
Travel reduction gear oil	



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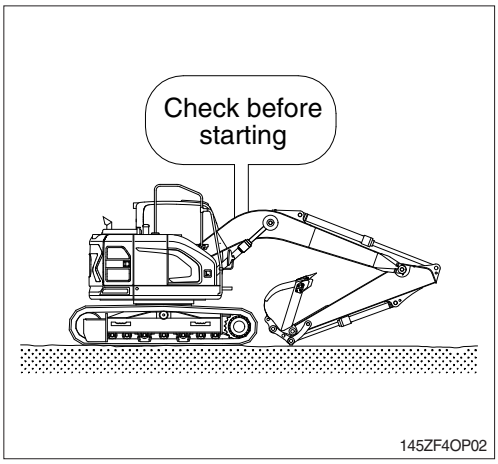
2. CHECK BEFORE STARTING THE ENGINE

1) Look around the machine and under the machine to check for loosen nut or bolts, collection of dirt, or leakage of oil, fuel or coolant and check the condition of the work equipment and hydraulic system. Check also loosen wiring, and collection of dust at places which reach high temperature.

※ **Refer to the daily check on the chapter 6, maintenance.**

2) Adjust seat to fit the contours of the operator's body for the pleasant operation.

3) Adjust the rear view mirror.



145ZF4OP02

3. STARTING AND STOP THE ENGINE

1) CHECK INDICATOR LIGHTS

(1) Check if all the operating levers are in the neutral position.

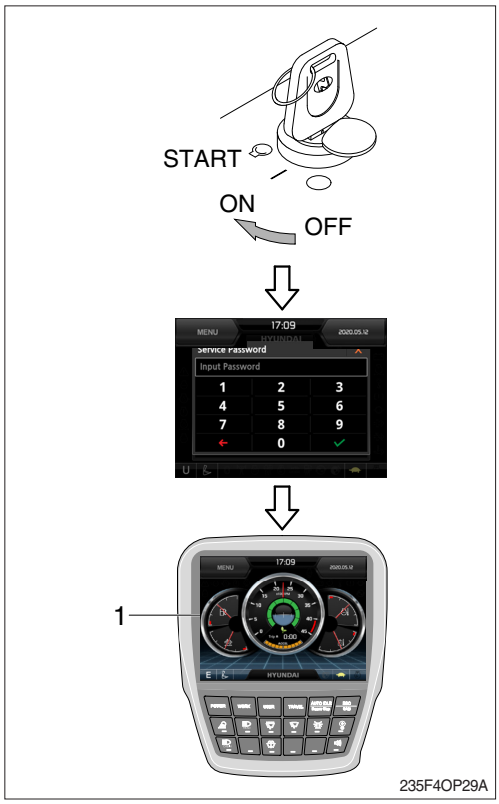
(2) Turn the starting switch to the ON position. Buzzer sounding for 4 seconds with HYUNDAI logo on cluster.

※ **If the ESL mode is set to the enable, enter the password to start engine.**

※ **If the password has failed 5 times, please wait 30 minutes before re-attempting to enter the password.**

※ **Refer to page 3-24 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 TEMPERATURE

※ **Sound the horn to warn the surroundings after checking if personnel or obstacles are in the area.**

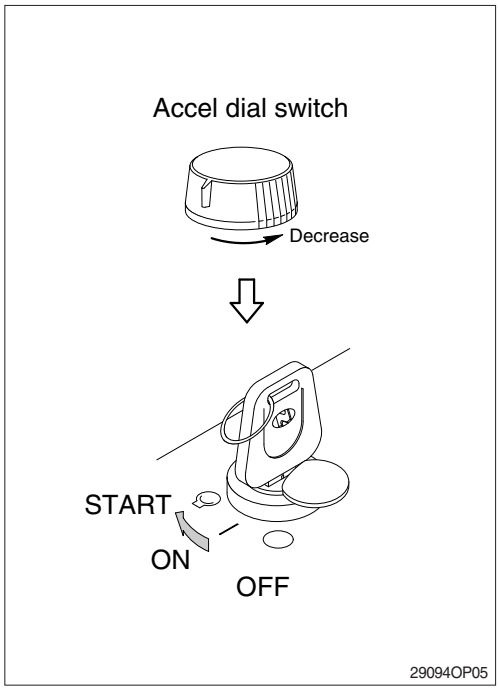
(1) Turn the accel dial switch to low idle position.

(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 stater 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

※ **Sound horn to warn surroundings after checking if there are obstacles in the area.**

※ **Replace the engine oil and fuel referring to recommended oils at page 6-10.**

※ **Fill the anti-freeze solution to the coolant as required.**

※ **If you turn ON the starting switch, the fuel warmer is automatically operated to heat the fuel by sensing the coolant temperature.**

(1) Check if all the levers are in the neutral position.

(2) Turn the accel dial switch to low idle position.

(3) Turn the starting switch to the ON position, and wait 1~2 minutes. More time may take according to ambient temperature.

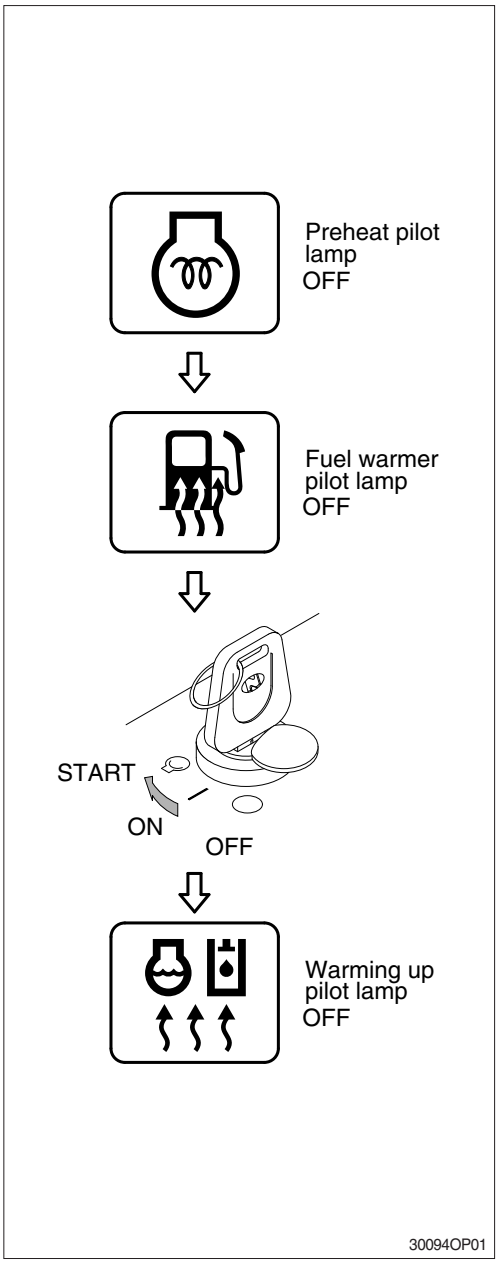
(4) Wait for five minutes to warm up the engine after the preheating pilot lamp off, and than turn the starting switch to the START position to start the engine.

※ **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 the warming up automatically starts.

※ **Do not operate the working devices, or convert the operation mode into other mode during the warming up.**



4) INSPECTION AFTER ENGINE START

Inspect and confirm the following after engine starts.

(1) Is the level gauge of hydraulic oil tank in the normal level?

(2) Are there leakages of oil or water?

(3) Are all the warning lamps turned OFF (1-12)?
The seat belt reminder warning lamp (15) pops up and the buzzer sounds until fasten the seat belt.

(4) Are the indicator of water temperature gauge (13) and hydraulic temperature gauge (14) in the operating range?

(5) Are 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.**

145ZF4OP022A

5) WARMING-UP OPERATION

※ **The most suitable temperature for the hydraulic oil is about 50˚C (122˚F).**
It can cause serious trouble in the hydraulic system by sudden operation when the hydraulic oil temperature is below 25˚C (77˚F).
Then 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.

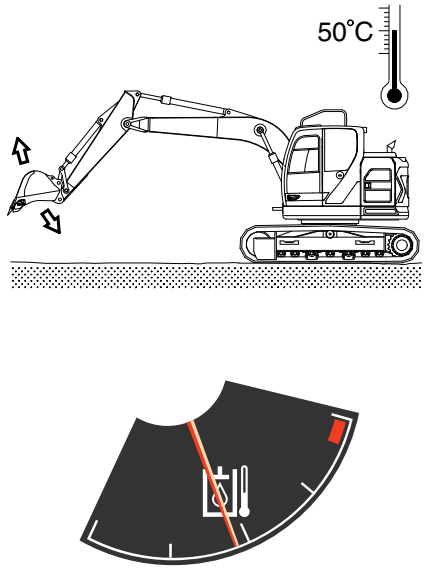
(3) Operate bucket lever for 5 minutes.

※ **Do not operate anything except bucket lever.**

(4) Run the engine at the high speed and operate the bucket lever and arm lever for 5-10 minutes.

※ **Operate only the bucket lever and arm lever.**

(5) This warming-up operation will be completed by operation of all cylinders several times, and operation of swing and traveling.



145ZF4OP03

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 medium speed to allow it to cool gradually, then stop it.**

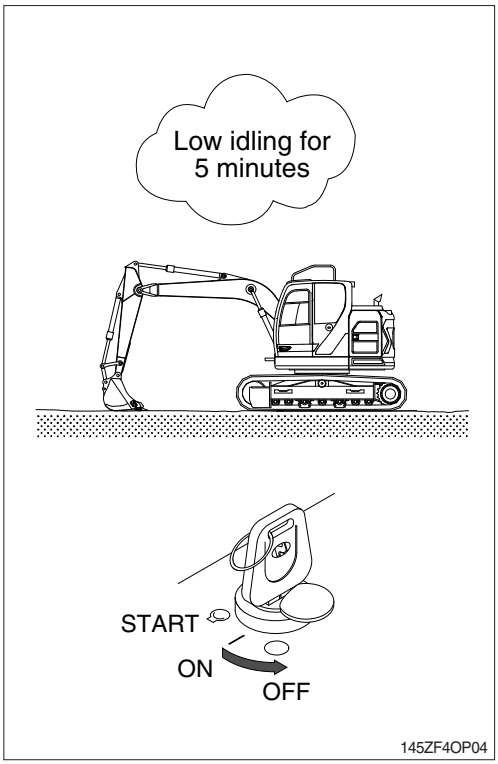
(1) Down the bucket on the ground then put all the levers in the neutral position.

(2) Run the engine at low idle speed for about 5 minutes.

(3) Return the key of starting switch to the OFF position.

(4) Remove the key to prevent other people using the machine and LOCK safety lever.

(5) 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 **Work tool mode (breaker, crusher)**

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

235F4OP31A

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 preperable 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 3-16.

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 set which are mid-range of max engine speed, power shift and auto idle speed.

User mode switch

235F4OP32A

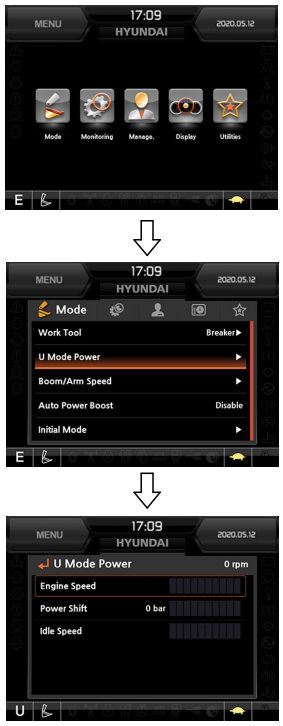
- High idle rpm, auto idle rpm and EPPR pressure can be adjusted and memorized in the U-mode.

※ **Refer to the page 3-20 for setting the user mode (available on U mode only).**

· LCD segment vs parameter setting

Step (▮)	Engine speed (rpm)	Idle speed (rpm)	Power shift (bar)
1	1300	750	0
2	1400	800	3
3	1500	850	6
4	1600	900	9
5	1700	950	12
6	1800	1000	16
7	1850	1050	20
8	1900	1100 (auto decel)	26
9	1950	1150	32
10	2000	1200	38

※One touch decel & low idle : 1000 rpm



235F4OP33A

(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 the page 3-22.

(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).

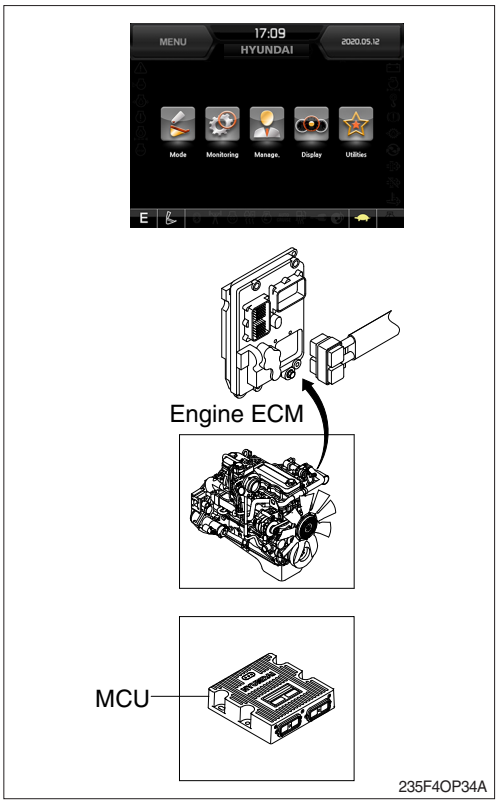
② **Engine ECM (Electronic Control Module)**

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

※ **Refer to the page 3-22 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

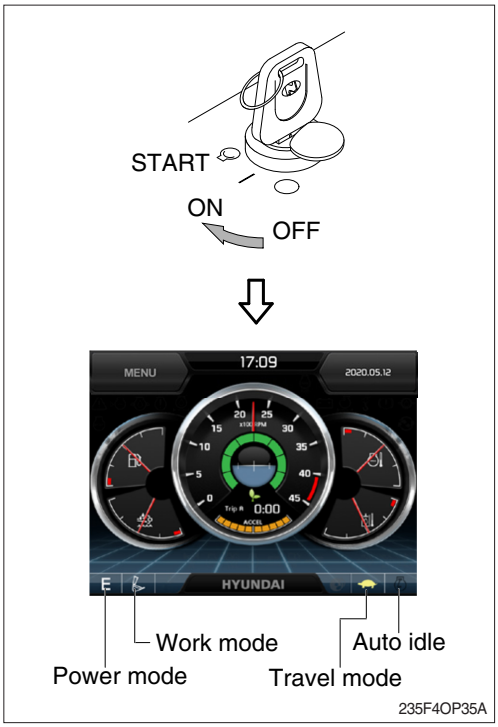
① When start key switch is turned on, the cluster turns on and buzzer sounds for 4 seconds. And then main information as gauges and engine speed are displayed on LCD.

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, 850 rpm.

② If coolant temperature is below 30˚C, the warm-ing up pilot lamp lights ON and after 4 seconds the engine speed increases to 1000 rpm automatically to warm up the machine.

· After 2-3 minutes, you can select any mode depending on job requirement.

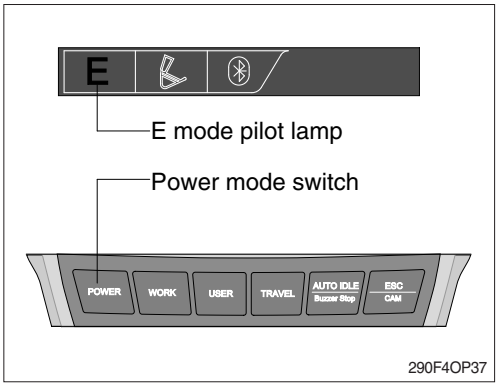
3) SELECTION OF POWER MODE

(1) E mode

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

Engine rpm	Effect
1650	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.

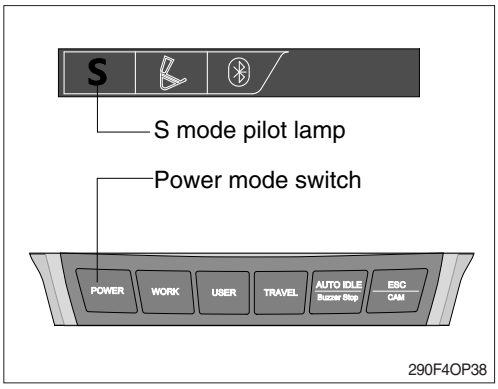


(2) S mode

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

Engine rpm	Effect
1750	Standard power

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

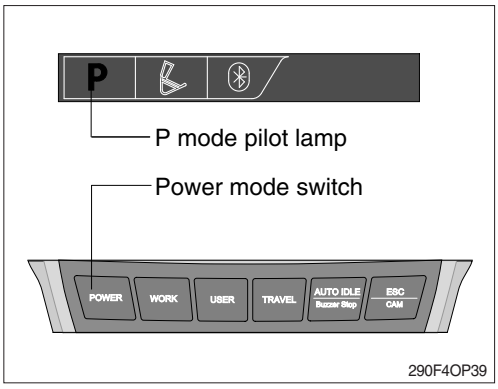


(3) P mode

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

Engine rpm	Effect
1850	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

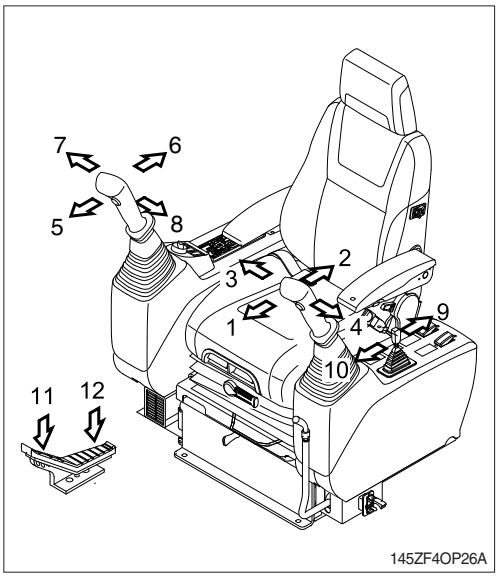
※ Confirm the operation of control lever and working device.

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.



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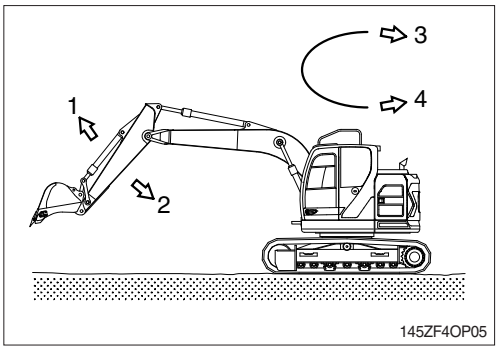
※ Left control lever

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



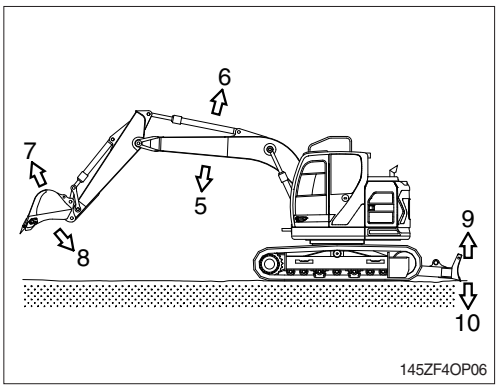
145ZF4OP05

※ Right control lever

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

※ Dozer blade control lever

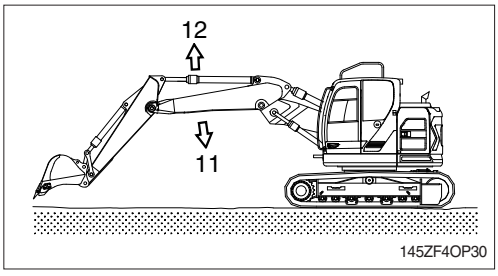
9 Dozer blade up
10 Dozer blade down



145ZF4OP06

※ Single pedal

11 2nd boom lower
12 2nd boom raise



145ZF4OP30

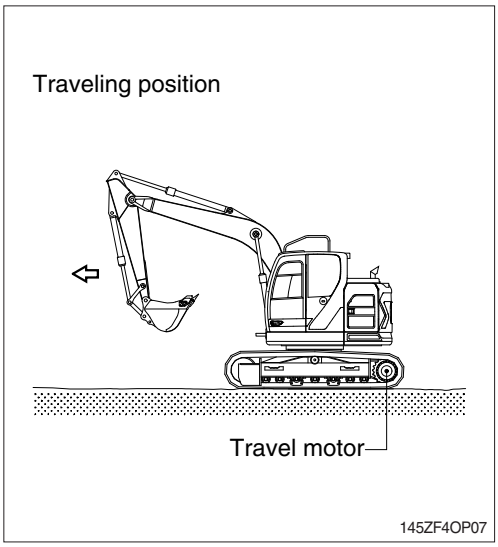
6. TRAVELING OF THE MACHINE

1) BASIC OPERATION

(1) Traveling position

It is the position which the traveling motor is in the rear and the working device is forward.

⚠ Be careful as the traveling direction will be reversed when the whole machine is swinged 180 degree.



(2) Traveling operation

It is possible to travel by either travel lever or pedal.

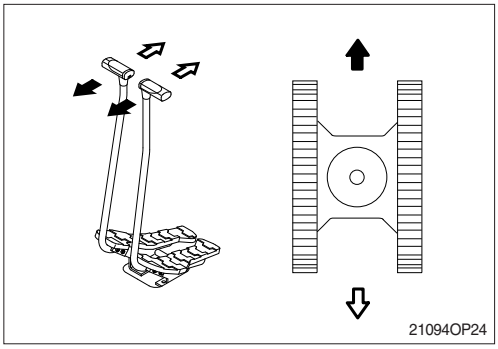
※ **Do not travel continuously for a long time.**

※ **Reduce the engine speed and travel at a low speed when traveling on uneven ground.**

(3) Forward and backward traveling

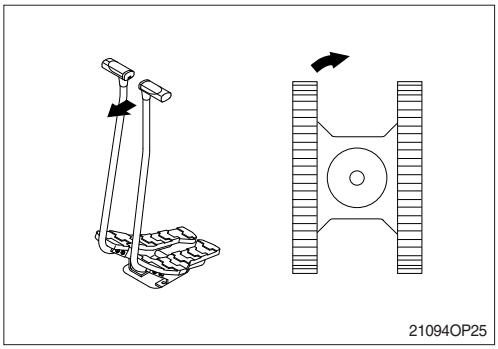
When the left and right travel lever or pedal are pushed at the same time, the machine will travel forward or backward.

※ **The speed can be controlled by the operation stroke of lever or pedal and change of direction will be controlled by difference of the left and right stroke.**



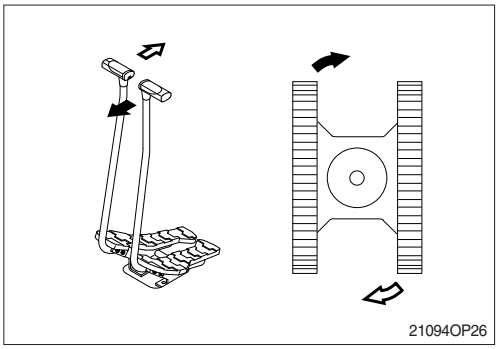
(4) Pivot turning

Operating only one side of lever or pedal make the change of direction possible by moving only one track.



(5) Counter rotation

It is to change the direction at the original place by moving the right and left track. Both side of lever or pedal are operated to the other way at the same time.



2) TRAVELING ON A SLOPE

(1) Make sure that the travel lever is properly maneuvered by confirming the travel motor is in the right location.

(2) Lower the bucket 20 to 30 ㎝ (1 ft) to the ground so that it can be used as a brake in an emergency.

(3) If the machine starts to slide or loses stability, lower the bucket immediately and brake the machine.

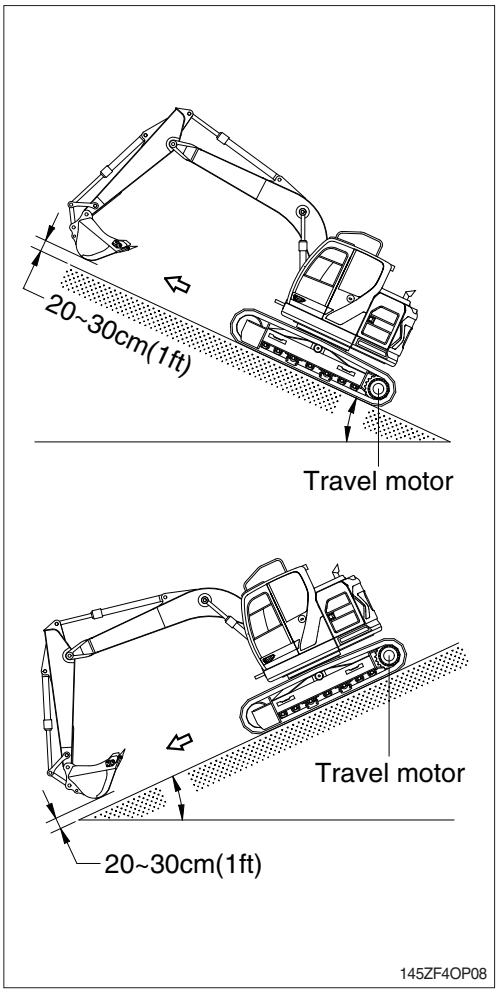
(4) When parking on a slope, use the bucket as a brake and place blocks behind the tracks to prevent sliding.

※ **Machine cannot 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.**

⚠ **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/fine switch on the LOCK while traveling on a slope (if equipped).**



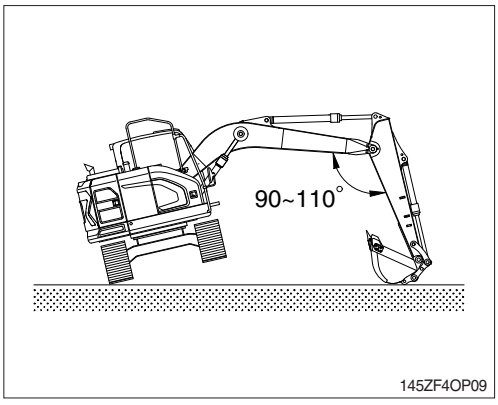
3) TRAVELING ON SOFT GROUND

※ **If possible, avoid to operate on soft ground.**

(1) Move forward as far as machine can move.

(2) Take care not to go beyond the depth where towing is impossible on soft ground.

(3) When driving becomes impossible, lower bucket and use boom and arm to pull the machine. Operate boom, arm, and travel lever at the same time to avoid the machine sinking.



4) TOWING THE MACHINE

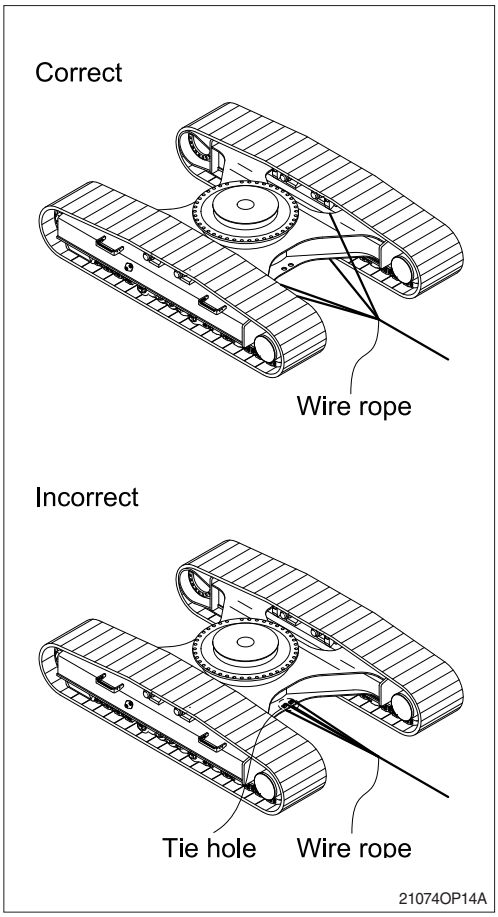
Tow the machine as follows when it can not move on it's own.

(1) Tow the machine by other machine after hook the wire rope to the frame as shown in picture at right.

(2) Hook the wire rope to the frame and put a support under each part of wire rope to prevent damage.

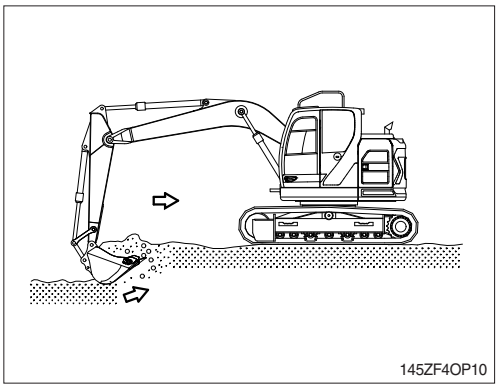
※ **Never tow the machine using only the tie hole, because this may break.**

⚠ **Make sure no personnel are standing close to the tow rope.**

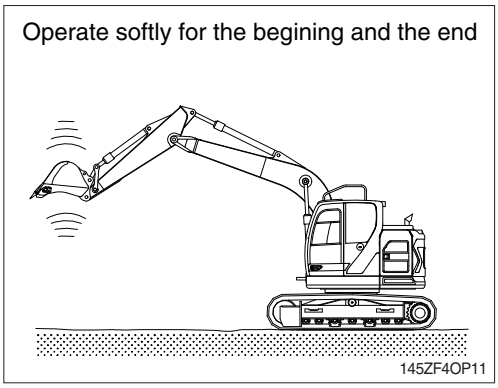


7. EFFICIENT WORKING METHOD

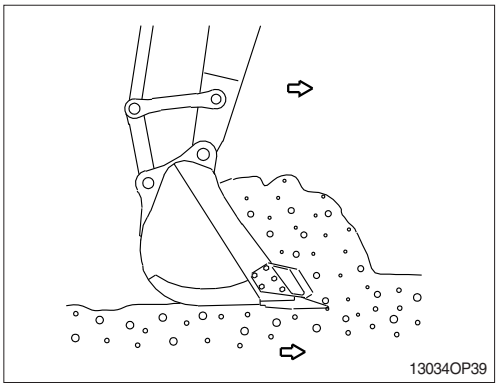
1) Do the digging work by arm.
   Use the pulling force of arm for digging and use together with the digging force of the bucket if necessary.



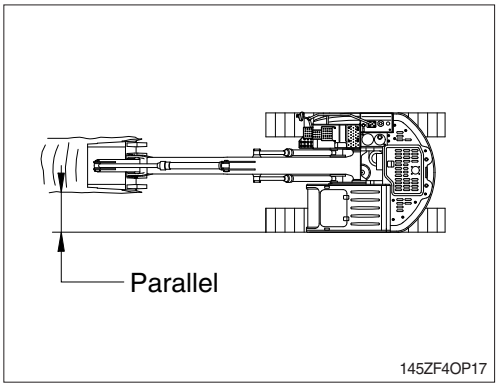
2) When lowering and raising the boom operate softly for the beginning and the end.
   In particularly, sudden stops while lowering the boom may cause damage to the machine.



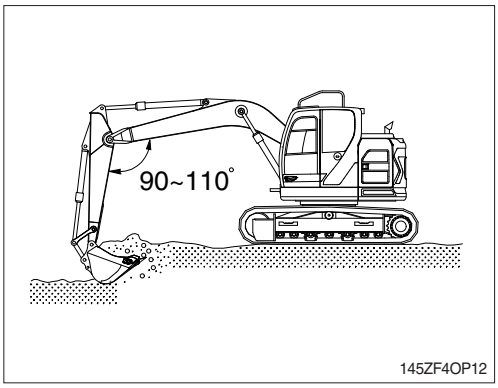
3) The digging resistance and wearing of tooth can be reduced by putting the end of bucket tooth to the digging direction.



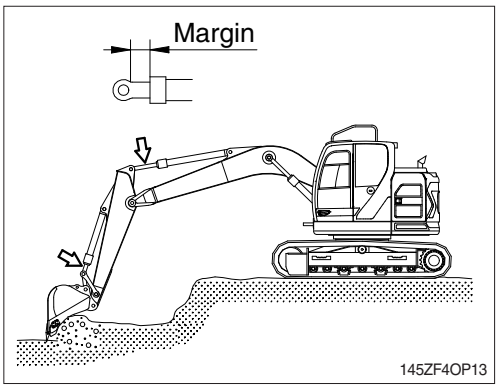
4) Set the tracks parallel to the line of the ditch to be excavated when digging ditch. Do not swing while digging.



5) Dig slowly with keeping the angle of boom and arm, 90-110 degree when maximum digging force is required.

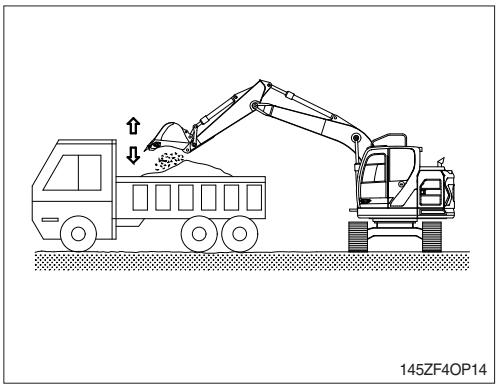


6) Operate leaving a small safety margin of cylinder stroke to prevent damage of cylinder when working with the machine.

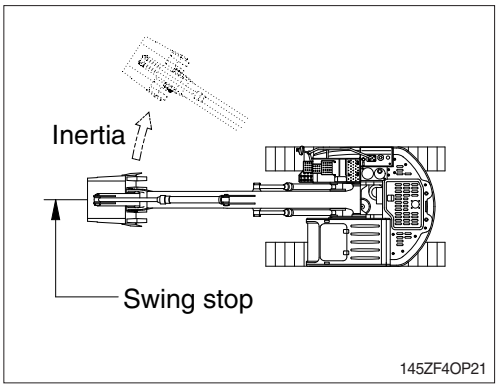


7) Keep the bucket to the dumping position and the arm horizontal when dumping the soil from the bucket.
   Operate bucket lever 2 or 3 times when hard to dump.

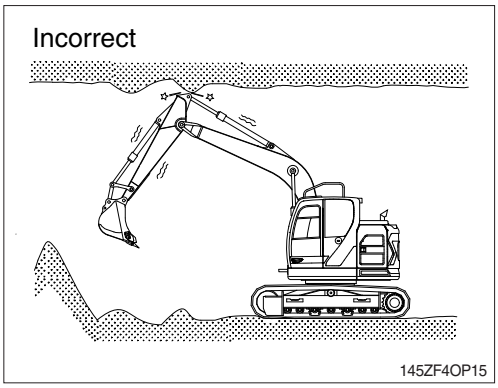
※ **Do not use the impact of bucket tooth when dumping.**



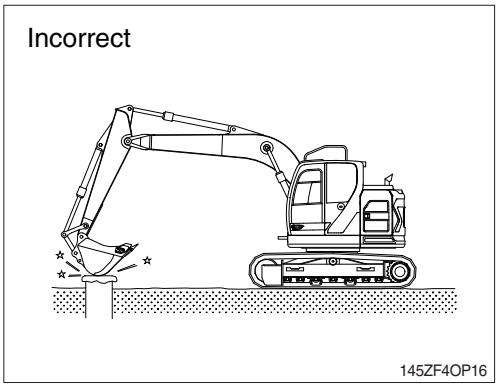
8) Operate stop of swing considering the swing slip distance is created by inertia after neutralizing the swing lever.



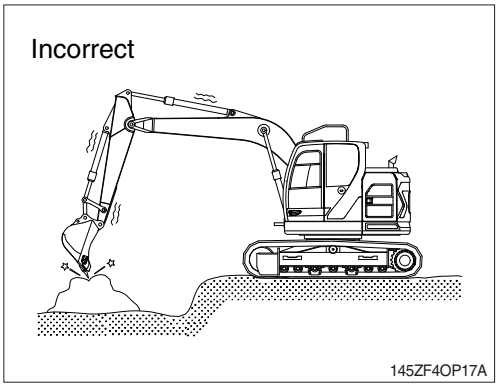
9) If the excavation is in an underground location or in a building, make sure that there is adequate overhead clearance and that there is adequate ventilation.



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) NEVER CARRY OUT EXCESSIVE OPERATIONS

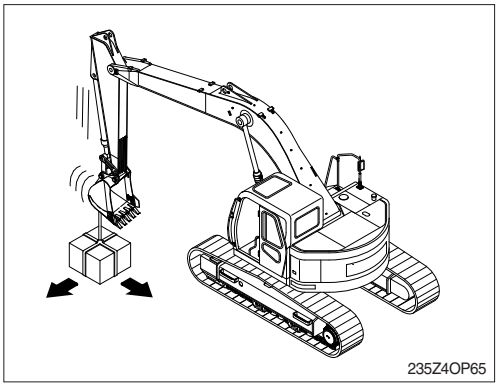
Operation exceeding machine performance may result in accident or failure.

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.

In case you need installing over load warning device for object handling procedure, please contact HD Hyundai Construction Equipment distributor.



12) 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.

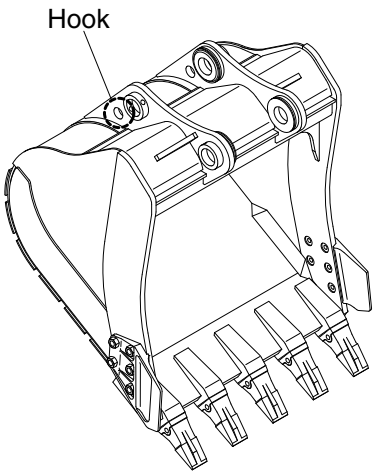
When performing lifting operation, never raise or lower a person.

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 his instructions.

- Execute operating methods and procedures under his 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.



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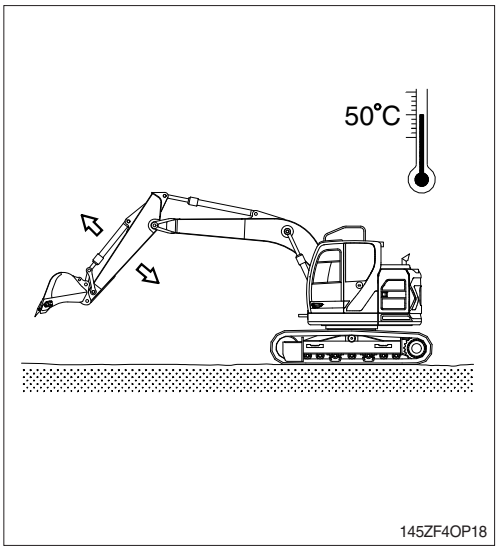
8. OPERATION IN THE SPECIAL WORK SITES

1) OPERATION 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 the 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 comes ON 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 part, such as pins and bushings, clean at all times.

(6) If the air conditioner and heater filters clogged, 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, and hydraulic cylinders and track tension cylinder 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 nut.

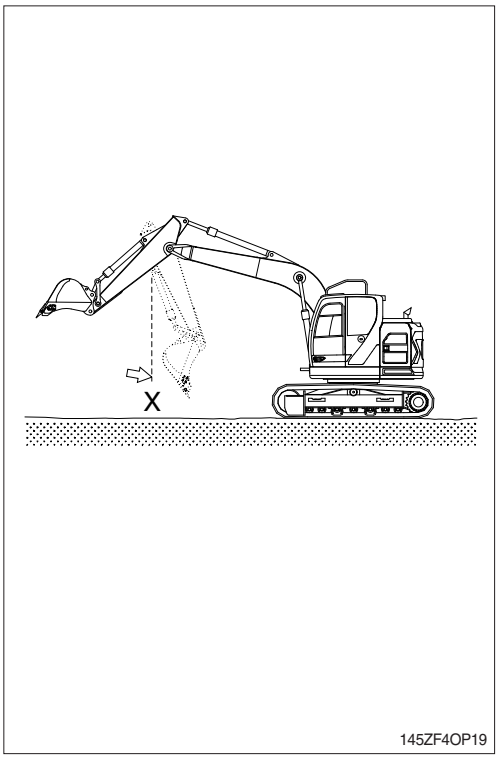
(2) Loosen the track tension a little when working in such areas.

(3) Do not turn the undercarriage directly over the sharp edge rock.

9. NORMAL OPERATION OF EXCAVATOR

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

1) When rolling in the arm, the roll-in movement stop momentary at point X in the picture shown, then recovers speed again after passing point X.
   The reason for this phenomenon is that movement by the arm weight is faster than the speed of oil flow into the cylinder.
2) When lowering the boom, one 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 started swing 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. That is happen only starting switch ON position and safety lever UNLOCK position. After the engine is stopped, set the safety lever to the LOCK position.

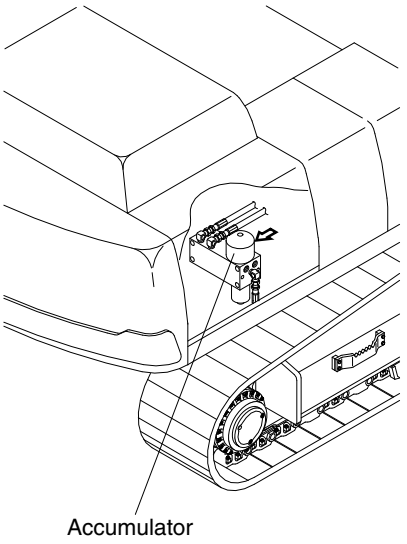
⚠ **Be sure no one is under or near the attachment before lowering the boom.**

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 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.



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11. STORAGE

Maintain the machine taking care of following to prevent the deterioration of machine when storing the machine for a long time, over 1 month.

1) BEFORE STORAGE

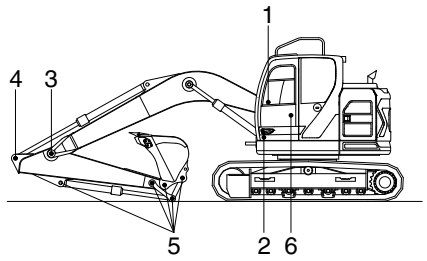
(1) Cleaning the machine

Clean the machine. Check and adjust tracks. 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.



1 Lubricating manifold (5EA)
2 Boom cylinder pin (2EA)
3 Boom and arm connection pin (1EA)
4 Arm cylinder pin (rod side, 1EA)
5 Arm and bucket (6EA)
6 Boom rear center bearing (1EA)

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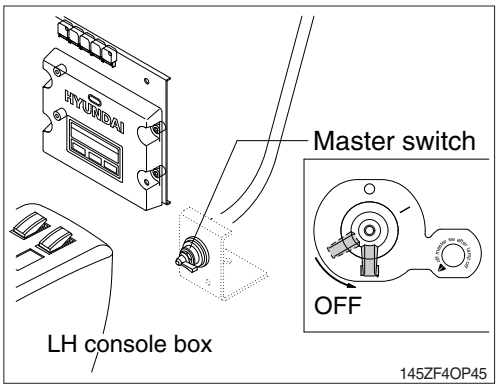
(3) Master switch

Turn OFF the master switch mounted rear side of the seat.

(4) Be sure to mix anticorrosive antifreezing solution in the radiator.



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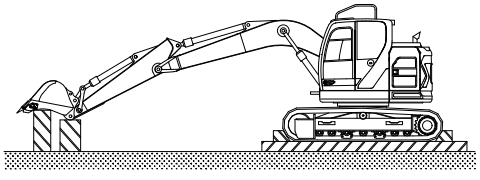
(5) Prevention of dust and moisture

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

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



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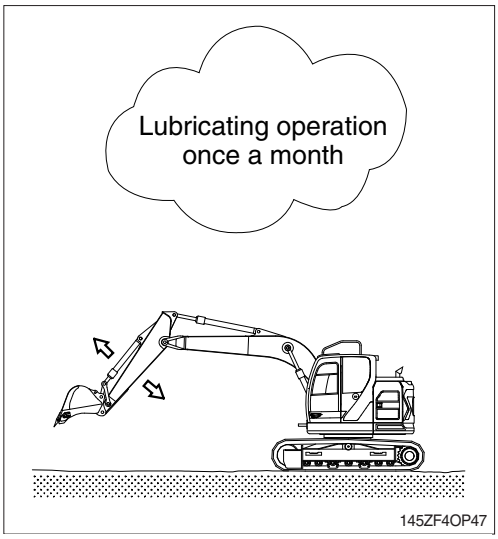
2) DURING STORAGE

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 6 months over

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.

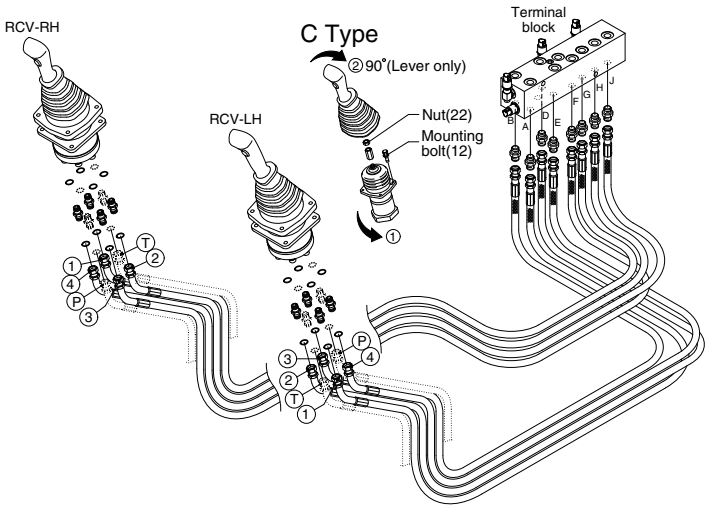
※ Remove the drain port plug and drain the water until the gear oil comes out and then tighten the drain plug.

※ Refer to the service instruction, section 6 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

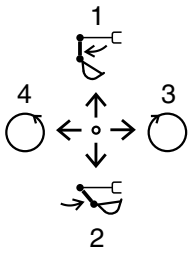
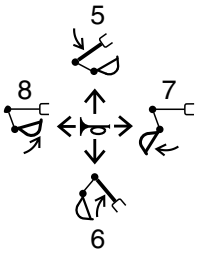
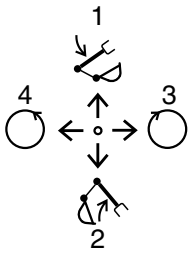
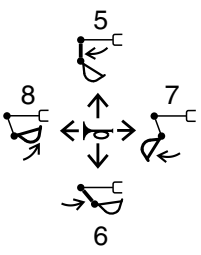
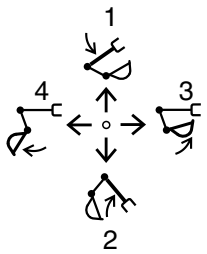
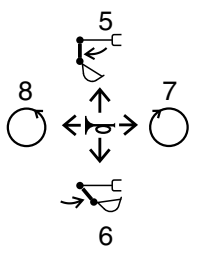
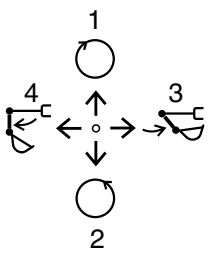
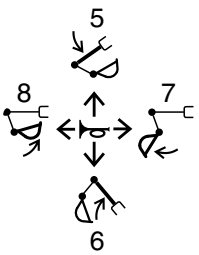
1) PATTERN CHANGE VALVE NOT INSTALL (standard)



※ 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).

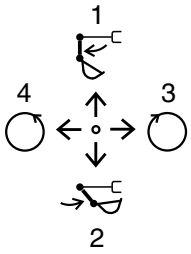
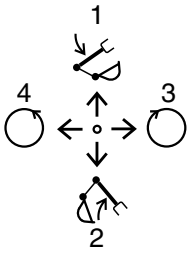
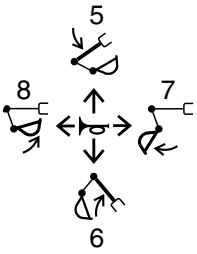
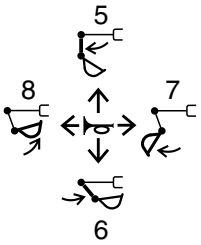
145ZF4OP41

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	1Arm out	②	D	-
				2Arm in	④	E	-
				3Swing right	③	B	-
				4Swing left	①	A	-
			Right	5Boom lower	④	J	-
				6Boom raise	②	H	-
				7Bucket out	①	G	-
				8Bucket in	③	F	-
A Type			Left	1Boom lower	②	D	J
				2Boom raise	④	E	H
				3Swing right	③	B	-
				4Swing left	①	A	-
			Right	5Arm out	④	J	D
				6Arm in	②	H	E
				7Bucket out	①	G	-
				8Bucket in	③	F	-
B Type			Left	1Boom lower	②	D	J
				2Boom raise	④	E	H
				3Bucket in	③	B	F
				4Bucket out	①	A	G
			Right	5Arm out	④	J	D
				6Arm in	②	H	E
				7Swing right	①	G	B
				8Swing left	③	F	A
C Type			Left	① Loosen the RCV lever mounting bolt (12) and rotates lever assy 90° counterclockwise; then install. ② To put lever in correct position, disassemble nut (22) and rotates only lever 90° clockwise.			
			Right	Same as ISO type			

2) PATTERN CHANGE VALVE INSTALL (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 easily changed from the "ISO type" to "A type" by changing the position of the lever position.

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

(2) Change of operating pattern

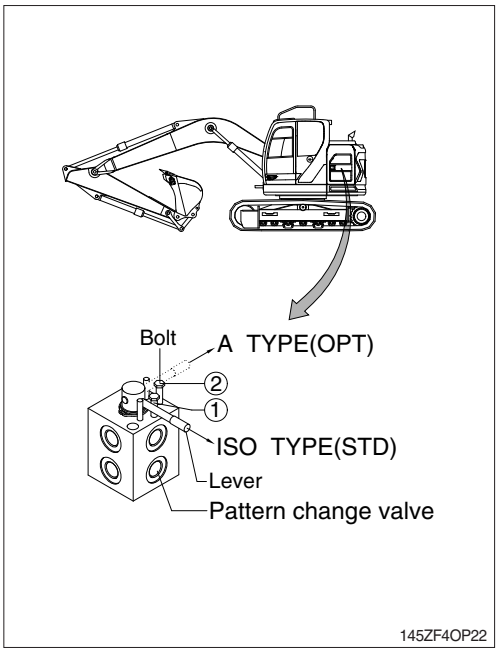
① Loosen bolt.

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.



1. PREPARATION FOR TRANSPORTATION

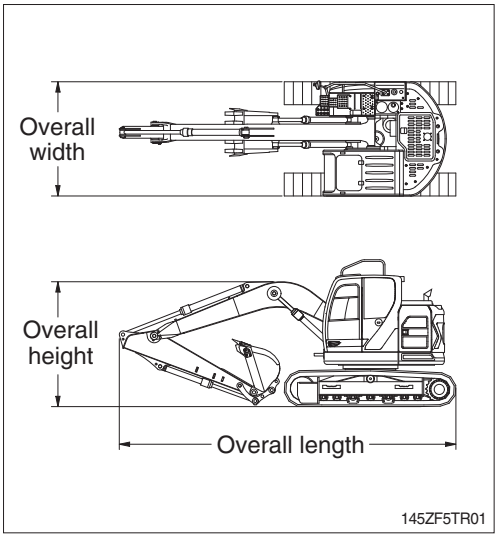
1) When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc.

2) Select proper trailer after confirming the weight and dimension from the chapter 2, specification.

3) Check the whole route such as the road width, the height of bridge and limit of weight and etc., which will be passed.

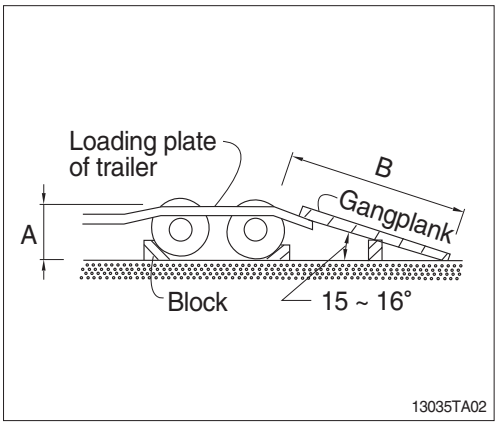
4) Get the permission from the related authority if necessary.

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

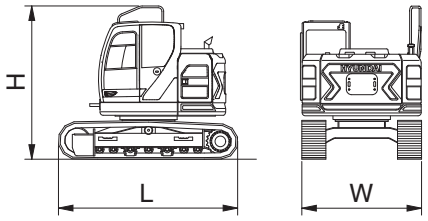


2. DIMENSION AND WEIGHT

1) BASE MACHINE (HX145LCR)

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	3798 (12' 6")
H	Height	mm (ft-in)	3215 (10' 7")
W	Width	mm (ft-in)	2600 (8' 6")
Wt	Weight	kg (lb)	12740 (28090)

※ With 600 mm (24") triple grouser shoes and 2800 kg (6170 lb) counterweight.



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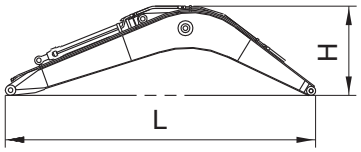
2) BOOM ASSEMBLY

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	4750 (15' 7")
H	Height	mm (ft-in)	1340 (4' 5")
W	Width	mm (ft-in)	520 (1' 8")
Wt	Weight	kg (lb)	1020 (2250)

※ 4.6 m (15' 1") boom with arm cylinder (Included piping and pins).

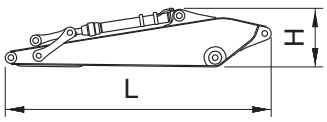


13035TA03

3) ARM ASSEMBLY

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	3240 (10' 8")
H	Height	mm (ft-in)	740 (2' 5")
W	Width	mm (ft-in)	380 (1' 3")
Wt	Weight	kg (lb)	620 (1370)

※ 2.50 m (8' 2") arm with bucket cylinder (Included linkage and pins).

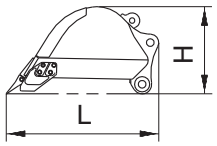


13035TA04

4) BUCKET ASSEMBLY

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	1400 (4' 7")
H	Height	mm (ft-in)	800 (2' 7")
W	Width	mm (ft-in)	1045 (3' 5")
Wt	Weight	kg (lb)	460 (1010)

※ 0.52 m^3 (0.68 yd^3) PCSA heaped bucket (Included tooth and side cutters).

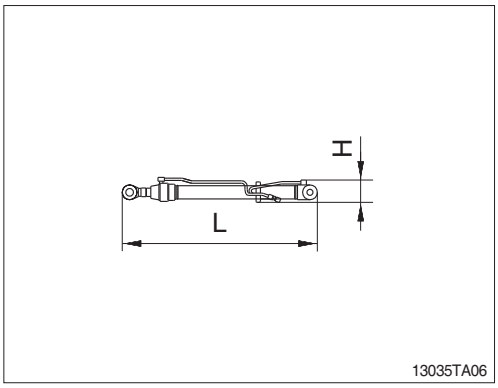


13035TA05

5) BOOM CYLINDER

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	1760 (5' 9")
H	Height	mm (ft-in)	210 (0' 8")
W	Width	mm (ft-in)	310 (1' 0")
Wt	Weight (2 EA)	kg (lb)	260 (570)

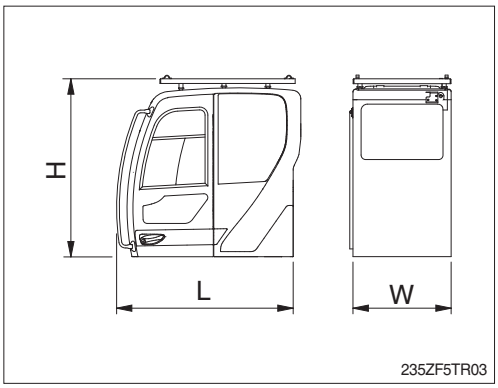
※ Included piping.



6) CAB ASSEMBLY

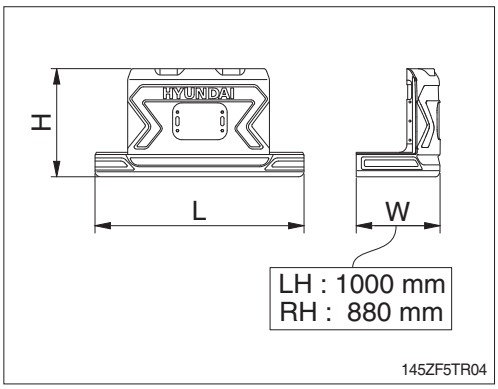
Mark	Description	Unit	Specification
L	Length	mm (ft-in)	1900 (6' 3") [1940 (6' 4")]
H	Height	mm (ft-in)	1735 (5' 8") [1830 (6')]
W	Width	mm (ft-in)	1090 (3' 7")
Wt	Weight	kg (lb)	481.3 (1061) [606.8 (1338)]

[ ] : with FOG GUARD



7) COUNTERWEIGHT

Mark	Description	Unit	Specification
L	Length	mm (ft-in)	2480 (8' 2")
H	Height	mm (ft-in)	1285 (4' 3")
W	Width	mm (ft-in)	See right figure
Wt	Weight	kg (lb)	2800 (6170)

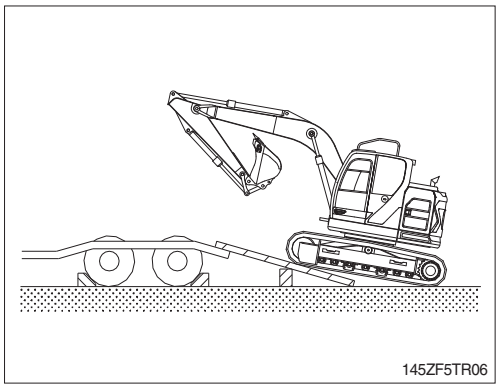


3. LOADING THE MACHINE

1) Load and unload the machine on a flat ground.

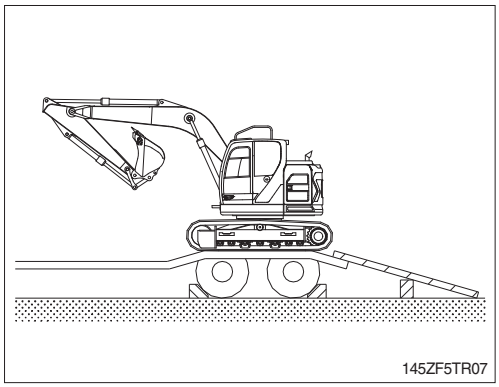
2) Use the gangplank with sufficient length, width, thickness and gradient.

3) Place the swing lock/fine switch to the LOCK position (if equipped) before fixing the machine at the bed of trailer and confirm if the machine parallels the bed of trailer.
Keep the travel motor in the rear when loading and in the front when unloading.

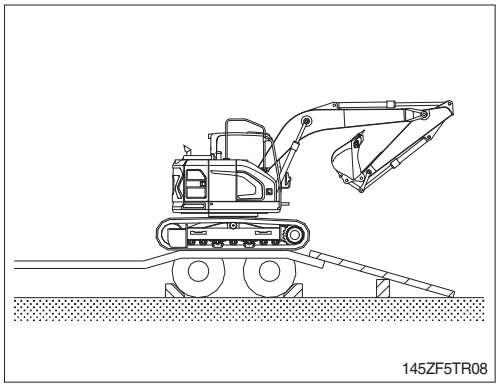

145ZF5TR06

4) 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.


145ZF5TR07

(2) Place the swing lock/fine switch to the LOCK position (if equipped) after the swing the machine 180 degree.


145ZF5TR08

(3) Lower the working equipment gently after the location is determined.

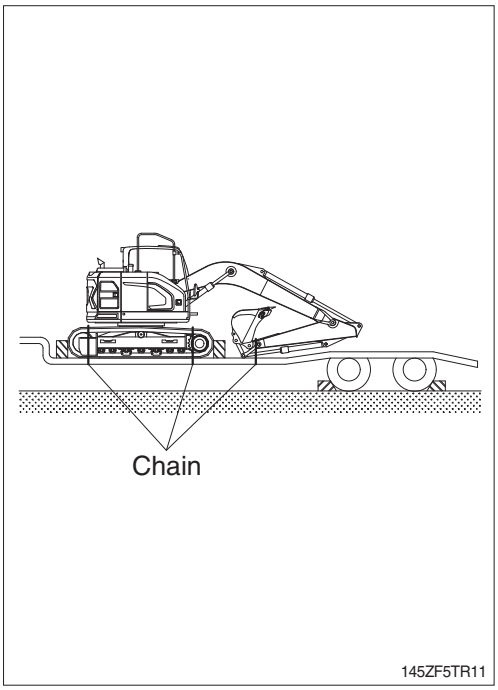
※ **Place rectangular timber under the bucket cylinder to prevent the damage of it during transportation.**

⚠ **Be sure to keep the travel speed switch on the LOW (turtle mark) while loading and unloading the machine.**

⚠ **Avoid using the working equipment for loading and unloading since it will be very dangerous.**

⚠ **Do not operate any other device when loading.**

⚠ **Be careful on the boundary place of loading plate or trailer as the balance of machine will abruptly be changed on the point.**

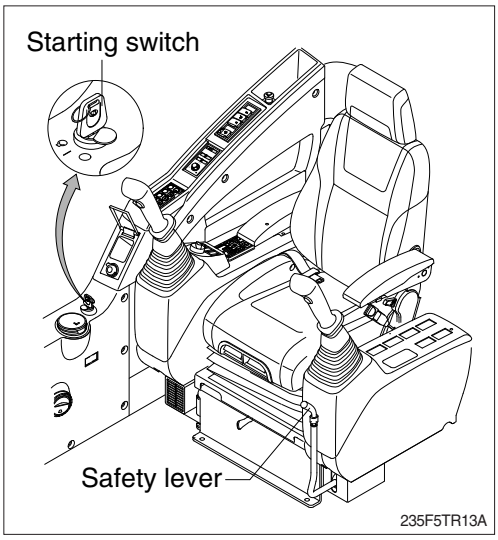


4. FIXING THE MACHINE

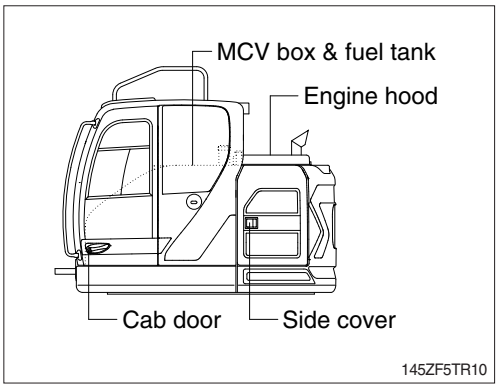
1) Lower down the working device on the loading plate of trailer.

2) Keep the safety lever on the LOCK position.

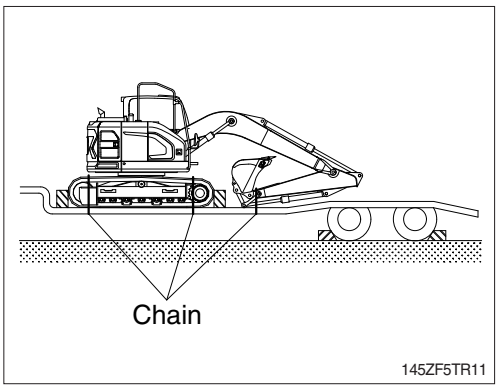
3) Turn OFF all the switches and remove the key.



4) Secure all locks.



5) Place timber underneath of the track and fix firmly with wire rope to prevent the machine from moving forward, backward, right or left.



5. LOADING AND UNLOADING BY CRANE

1) Check the weight, length, width and height of the machine referring to the chapter 2, specification when you are going to hoist the machine.
2) Use long wire rope and stay to keep the distance with the machine as it should avoid touching with the machine.
3) Put a rubber plate contact with wire rope and machine to prevent damage.
4) Place crane on the proper place.
5) Install the wire rope and stay like the illustration.

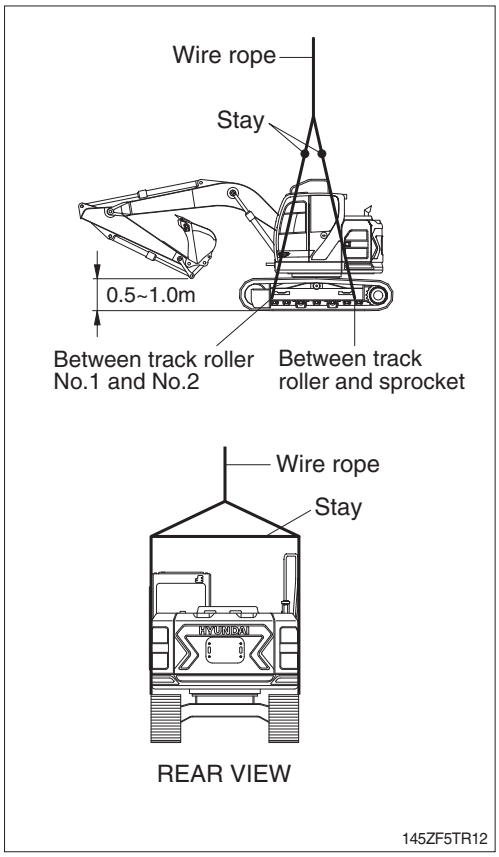
⚠ **Make sure wire rope is proper size.**

⚠ **Place the safety lever to LOCK position to prevent the machine moving when hoisting the machine.**

⚠ **The wrong hoisting method or installation of wire rope can cause damage to the machine.**

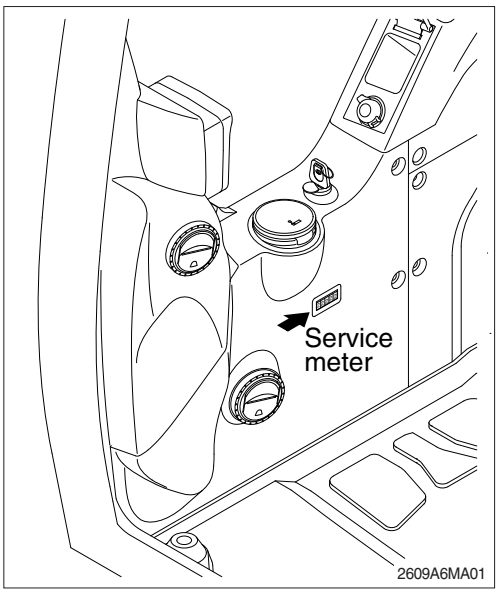
⚠ **Do not load abruptly.**

⚠ **Keep area clear of personnel.**



1. INSTRUCTION

1) INTERVAL OF MAINTENANCE



(1) You may inspect and service the machine by the period as described at page 6-11 based on hour meter at control panel.

(2) Shorten the interval of inspect and service depending on site condition. (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 100hours, carry out all the maintenance「Each 100hours, each 50 hours and daily service」 at the same time.

2) PRECAUTION

(1) Start to maintenance after you have the full knowledge of machine.

(2) The monitor installed on this machine does not entirely guarantee the condition of the machine.
Daily inspection should be performed according to clause 4, maintenance check list.

(3) Engine and hydraulic components have been preset in the factory.
Do not allow unauthorized personnel to reset them.

(4) Drain the used oil and coolant in a container and handle according to the method of handling for industrial waste to meet with regulations of each province or country.

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

△ Accumulated grease and oil on the machine is a fire hazard. Remove this debris with steam cleaning or high pressure water, at least every 1000 hours.

△ Inspect the engine compartment for any trash build up. Remove any trash build up from the engine compartment.

(5) Ask to 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 at proper time to keep the performance of machine.

(2) Use genuine parts.

(3) Use the recommended oil.

(4) Remove the dust or water around the inlet of oil tank before supplying oil.

(5) Drain oil when the temperature of oil is warm.

(6) Do not repair anything while operating the engine.

Stop the engine when you fill the oil.

(7) Relieve hydraulic system of the pressure before repairing the hydraulic system.

(8) Confirm if the cluster is in the normal condition after completion of service.

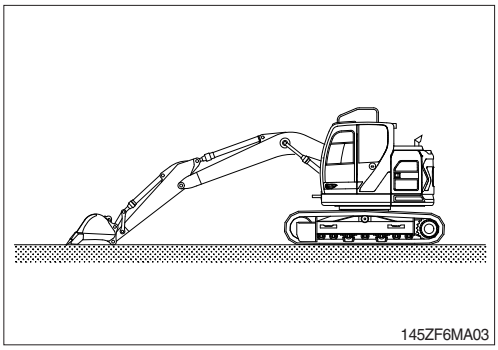
(9) For more detail information of maintenance, please contact local HD Hyundai Construction Equipment dealer.

※ **Be sure to start the maintenance after fully understand the chapter 1, safety hints.**

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

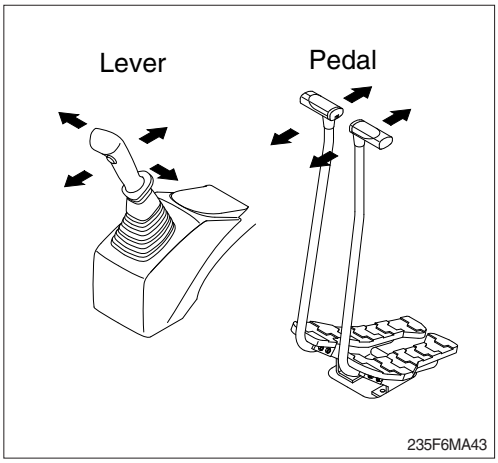
※ **Spouting of oil can cause the accident when loosening the cap or hose right after the operating of machine as the machine or oil is on the high pressure on the condition.**
Be sure to relieve the pressure in the system before repairing hydraulic system.

(1) Place machine in parking position, and stop the engine.

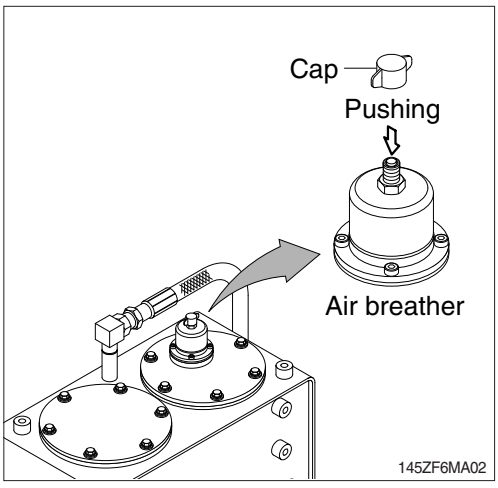


(2) Set the safety lever completely in the release position, operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ **This does not completely release the pressure, so when serving hydraulic component, loosen the connections slowly and do not stand in the direction where the oil spurt out.**



(3) Loosen the cap and 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 assemble the hose in the condition of twisted or sharp radius.

(5) Keep the specified tighten torque.

6) PERIODICAL REPLACEMENT OF SAFETY PARTS

(1) It is desirable to do periodic maintenance the machine for using the machine safely for a long time.
However, recommend to replace regularly the parts related safety not only safety but maintain satisfied performance.

(2) These parts can cause the disaster of life and material as the quality changes by passing time and it is worn, diluted, and gets fatigued by using repeatedly.
These are the parts which the operator can not judge the remained lifetime of them by visual inspection.

(3) Repair or replace if an abnormality of these parts is found even before the recommended replacement interval.

<table>
<tr><th colspan="3">Periodical replacement of safety parts</th><th>Interval</th></tr>
<tr><td colspan="2" rowspan="2">Engine</td><td>Fuel hose (tank-engine)</td><td rowspan="2">Every
2 years</td></tr>
<tr><td>Heater hose
(heater-engine)</td></tr>
<tr><td rowspan="6">Hydraulic system</td><td rowspan="3">Main circuit</td><td>Pump suction hose</td><td rowspan="3">Every
2 years</td></tr>
<tr><td>Pump delivery hose</td></tr>
<tr><td>Swing hose</td></tr>
<tr><td rowspan="3">Working device</td><td>Boom cylinder line hose</td><td rowspan="3">Every
2 years</td></tr>
<tr><td>Arm cylinder line hose</td></tr>
<tr><td>Bucket cylinder line hose</td></tr>
</table>

※1. Replace O-ring and gasket at the same time when replacing the hose.

2. 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 (engine-bracket, FR)	M12 × 1.75	12.3 ± 1.2	89 ± 8.7
2		Engine mounting bolt (engine-bracket, RR)	M12 × 1.75	12.3 ± 1.2	89 ± 8.7
3		Engine mounting bolt (bracket-frame, FR)	M16 × 2.0	34 ± 4.0	246 ± 28.9
4		Engine mounting bolt (bracket-frame, RR)	M16 × 2.0	34 ± 4.0	246 ± 28.9
5		Radiator mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
6		Coupling mounting socket bolt	M16 × 2.0	32.0 ± 1.6	231 ± 11.6
7		Main pump housing mounting bolt	M10 × 1.5	6.5 ± 0.7	47 ± 5.06
8	Hydraulic system	Main pump mounting socket bolt	M16 × 2.0	22 ± 1.5	159 ± 10.9
9		Main control valve mounting bolt	M12 × 1.75	12.2 ± 1.3	88.2 ± 9.4
10		Fuel tank mounting bolt	M20 × 2.5	46 ± 5.0	333 ± 36.2
11		Hydraulic oil tank mounting bolt	M20 × 2.5	46 ± 5.0	333 ± 36.2
12		Turning joint mounting bolt, nut	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
13	Power train system	Swing motor mounting bolt	M16 × 2.0	29.6 ± 3.2	214 ± 23.1
14		Swing bearing upper part mounting bolt	M18 × 2.5	41.3 ± 4.0	299 ± 28.9
15		Swing bearing lower part mounting bolt	M16 × 1.5	29.7 ± 3.0	215 ± 21.7
16		Travel motor mounting bolt	M16 × 2.0	25.7 ± 4.0	186 ± 28.9
17		Sprocket mounting bolt	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
18	Under carriage	Carrier roller mounting bolt, nut	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
19		Track roller mounting bolt	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
20		Track tension cylinder mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
21		Track shoe mounting bolt, nut	5/8 - 18UNF	42 ± 4.0	304 ± 28.9
22		Track guard mounting bolt	M16 × 2.0	29.6 ± 3.2	214 ± 23.1
23	Others	Counterweight mounting bolt	M36 × 3.0	308 ± 46	2228 ± 333
24		Cab mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
25		Operator's seat mounting bolt	M 8 × 1.25	4.05 ± 0.8	29.3 ± 5.8

※ 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 CJ-4, ACEA-E9)	SAE 10W-30, ★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)
Swing and travel reduction gear	SAE 85W-90 (GL-4/GL-5)
Grease	Lithium base grease NLGI No. 2
Fuel	ASTM D975-No. 2, Ultra low sulfur diesel
Coolant	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®

Ultra low sulfur diesel
- sulfur content ≤ 15 ppm

★Cold region
Russia, CIS, Mongolia

2) 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	10.5 (2.8)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
DEF/ AdBlue® tank	Mixture of urea and deionized water	19.0 (5.0)	ISO 22241, High-purity urea + deionized water (32.5:67.5)
Swing drive	Gear oil	TYPE 1 : 3.5 (0.9) TYPE 2 : 2.5 (0.7)	★SAE 75W-90
Final drive		2.3×2 (0.6×2)	SAE 80W-90
Hydraulic tank	Hydraulic oil	Tank : 96 (25.4) System : 180 (47.6)	★ISO VG 15 ISO VG 32 ISO VG 46, HBHO VG 46★3 ISO VG 68
Fuel tank	Diesel fuel★1	265 (70.0)	★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	14.5 (3.8)	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 ≤ 15 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 HD Hyundai Construction Equipment dealers.

4. MAINTENANCE CHECK LIST

1) DAILY SERVICE BEFORE STARTING

Check items	Service	Page
Visual check		
Fuel tank	Check, Refill	6-25
Hydraulic oil level	Check, Add	6-32
Engine oil level	Check, Add	6-18
Coolant level	Check, Add	6-20
Control panel & pilot lamp	Check, Clean	6-42
Prefilter (water, element)	Check, Drain, Clean	6-26
Fan belt tension and damage	Check, Adjust	6-24
DEF/AdBlue® tank	Check, Add	6-28
★ Attachment pin and bushing	Lubricate	
· 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	6-25
Track tension	Check, Adjust	6-37
Swing reduction gear oil	Check, Add	6-35
Attachment pin and bushing	Lubricate	6-41
· Bucket cylinder rod end		
· Bucket + Arm connecting		
· Bucket control link + Arm		
· Bucket control rod		
· Bucket link connecting		
· Dozer blade cylinder (rod end, tube end)		
· Dozer blade pivot pin		

3) INITIAL 50 HOURS SERVICE

Check items	Service	Page
Bolts & Nuts · Sprocket mounting bolts · Travel motor mounting bolts · Swing motor mounting bolts · Swing bearing mounting bolts · Engine mounting bolts · Counterweight mounting bolts · Turning joint locating bolts · Track shoe mounting bolts and nuts · Hydraulic pump mounting bolts	Check, Tight	6-8

4) EVERY 200 HOURS SERVICE

Check items	Service	Page
★ Return filter	Replace	6-33
★ Pilot line filter	Replace	6-34
★ Drain filter cartridge	Replace	6-34

★ Replace 3 filters for continuous hydraulic breaker operation only.

5) INITIAL 250 HOURS SERVICE

Check items	Service	Page
Engine oil	Change	6-18, 19
Engine oil filter	Replace	6-18, 19
Prefilter (element)	Replace	6-26
Fuel filter element	Replace	6-27
Pilot line filter element	Replace	6-34
Hydraulic oil return filter	Replace	6-33
Drain filter cartridge	Replace	6-34
Swing reduction gear case	Change	6-35
Swing reduction gear grease (swing motor type 2)	Check, Add	6-35
Travel reduction gear case	Change	6-36

※ Service the above items only for the new machine, and thereafter keep the normal service interval.

6) EVERY 250 HOURS SERVICE

Check items	Service	Page
Battery (voltage)	Check, Clean	6-42
Swing bearing grease	Lubricate	6-35
Aircon & heater fresh air filter	Check, Clean	6-45
Bolts & Nuts	Check, Tight	6-8
· Sprocket mounting bolts		
· Travel motor mounting bolts		
· Swing motor mounting bolts		
· Swing bearing mounting bolts		
· Engine mounting bolts		
· Counterweight mounting bolts		
· Turning joint locating bolts		
· Track shoe mounting bolts and nuts		
· Hydraulic pump mounting bolts		
Attachment pin and bushing	Lubricate	6-42
· 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		

7) EVERY 500 HOURS SERVICE

Check items	Service	Page
★Engine oil	Change	6-18, 19
★Engine oil filter	Replace	6-18, 19
Radiator, oil cooler and charge air cooler	Check, Clean	6-23
Prefilter (element)	Replace	6-26
Fuel filter (element)	Replace	6-27
Fuel screen filter	Replace	6-33
Air cleaner element (primary) ★1	Check, Clean	6-25

★ Use ultra low sulfur fuel only. Ultra low sulfur fuel : Sulfur content≤15 ppm

★1 When working in dusty environments, more frequent cleaning is high recommended.

8) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Air breather element	Replace	6-34
Travel motor reduction gear oil	Change	6-36
Swing reduction gear oil	Change	6-35
Swing reduction gear grease (swing motor type 2)	Check, Add	6-35
Grease in swing gear and pinion	Change	6-36
Hydraulic oil return filter	Replace	6-33
Drain filter cartridge	Replace	6-34
Pilot line filter	Replace	6-34

9) EVERY 1500 HOURS SERVICE

Check items	Service	Page
Crankcase breather filter	Replace	6-29
DEF/AdBlue® supply module filter	Replace	6-29

10) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Coolant	Change	6-20, 21, 22, 23
Hydraulic oil★1	Change	6-32-1
HBHO★2	Change	6-32-1
Hydraulic tank suction strainer	Check, Clean	6-33
Air cleaner element (primary, safety)★3	Replace	6-25
RCV lever	Check, Lubricate	6-37
Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-

★1 Conventional hydraulic oil

★2 If do not want to change HBHO (HD Hyundai Construction Equipment Bio Hydraulic Oil, ISO VG 46) every 2000 hours, contact HD Hyundai Construction Equipment dealer and ask about SAMPLING.

★3 When working in dusty environments, more frequent replacing is highly recommended.

※Change oil every 600 hours of continuous hydraulic breaker operation.

11) EVERY 3000 HOURS SERVICE

Check items	Service	Page
Fan belt	Replace	6-24

12) EVERY 4000 HOURS SERVICE

Check items	Service	Page
Fuel tank air breather filter	Replace	6-31

13) EVERY 5000 HOURS SERVICE

Check items	Service	Page
Hydraulic oil ★4	Change	6-32-1
Hydraulic tank suction strainer	Replace	6-33

★4 HD Hyundai Construction Equipment genuine long life hydraulic oil

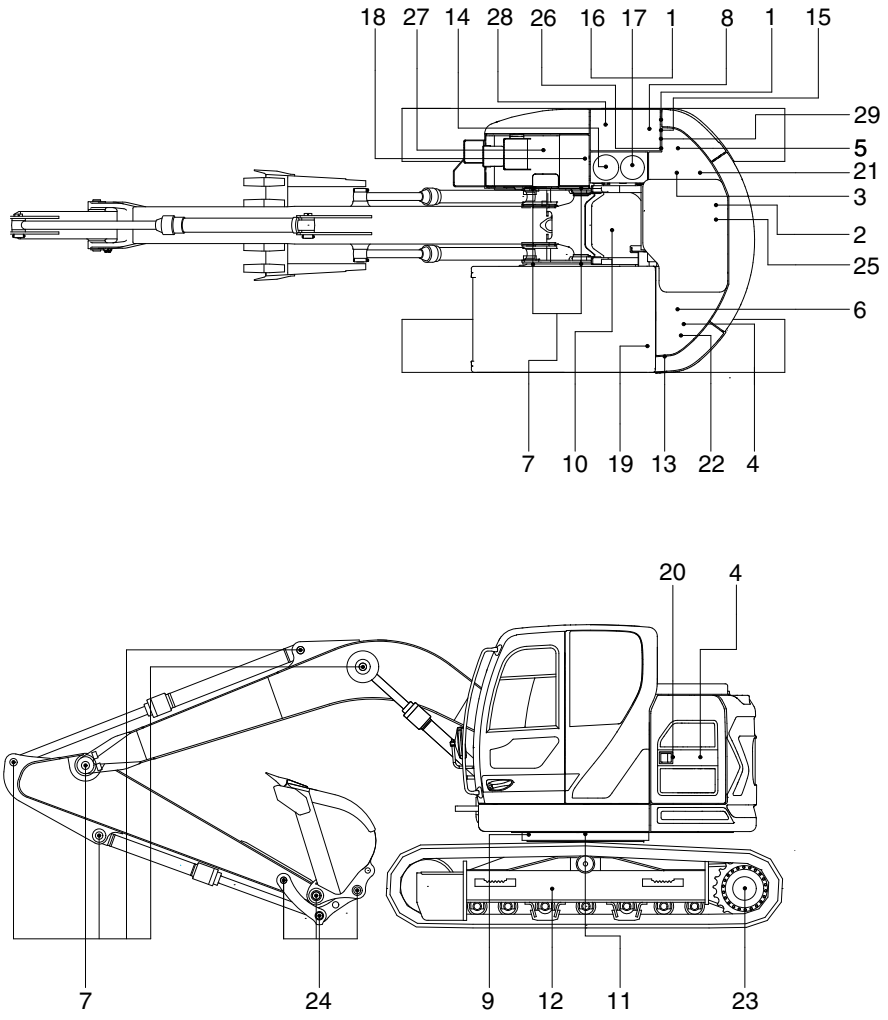
※ Change oil every 1000 hours of continuous hydraulic breaker operation.

14) WHEN REQUIRED

Whenever you have trouble in the machine, you must perform the service of related items, system by system.

Check items	Service	Page
Fuel system		
· Fuel tank	Drain or Clean	6-25
· Prefilter	Clean or Replace	6-26
· Fuel filter element	Replace	6-27
Engine exhaust sysem		
· DEF/AdBlue® supply module filter	Replace	6-29
· DEF/AdBlue® tank	Clean	6-28
Engine lubrication system		
· Engine oil	Change	6-18, 19
· Engine oil filter	Replace	6-18, 19
Engine cooling system		
· Coolant	Add or Change	6-20, 21, 22, 23
· Radiator	Clean or Flush	6-20, 21, 22, 23
· Charge air cooler	Check	6-23
Engine air system		
· Air cleaner element (primary)	Clean, Replace	6-25
· Air cleaner element (safety)	Replace	6-25
Hydraulic system		
· Hydraulic oil	Add or Change	6-32, 32-1
· Return filter	Replace	6-33
· Drain line filter	Replace	6-34
· Pilot line filter	Replace	6-34
· Element of breather	Replace	6-34
· Suction strainer	Clean	6-33
Under carriage		
· Track tension	Check, Adjust	6-37
Bucket		
· Tooth	Replace	6-39
· Side cutter	Replace	6-39
· Linkage	Adjust	6-39
· Bucket assy	Replace	6-38
Air conditioner and heater		
· Fresh air filter	Clean, Replace	6-45
· Recirculation filter	Clean, Replace	6-45

5. MAINTENANCE CHART



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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 use no open flames.

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	96 (25.4)	1
	2	Engine oil level	Check, Add	EO	10.5 (2.8)	1
	4	Radiator coolant	Check, Add	C	14.5 (3.8)	1
	5	Prefilter (water, element)	Check, Drain, Clean	-	-	1
	6	Fan belt tension and damage	Check, Adjust	-	-	1
	8	Fuel tank	Check, Refill	DF	265 (70.0)	1
	27	DEF/AdBlue® tank	Check, Add	DEF	19.0 (5.0)	1
50 Hours or weekly	8	Fuel tank (water, sediment)	Check, Drain	-	-	1
	10	Swing reduction gear case	Check, Add	GO	see page 6-35	1
	12	Track tension	Check, Adjust	PGL	-	2
	24	Bucket linkage & blade pins	Check, Add	PGL	-	12

Service interval	No.	Description	Service action	Oil symbol	Capacity ℓ (U.S.gal)	Service points No.
250 Hours	7	Attachment pins & bushing	Check, Add	PGL	-	11/14★4
	9	Swing bearing grease	Check, Add	PGL	-	3
	13	Battery (voltage)	Check, Clean	-	-	1
	19	Aircon and heater fresh air filter	Check, Clean	-	-	1
Initial 250 Hours	2	Engine oil	Change	EO	10.5 (2.8)	1
	3	Engine oil filter	Replace	-	-	1
	5	Prefilter (element)	Replace	-	-	1
	10	Swing reduction gear case	Change	GO	see page 6-35	1
		Swing reduction gear grease(type 2)	Check ,Add	PGL	see page 6-35	1
	14	Hydraulic oil return filter	Replace	-	-	1
	15	Drain filter cartridge	Replace	-	-	1
	18	Pilot line filter element	Replace	-	-	1
	21	Fuel filter element	Replace	-	-	1
	23	Travel reduction gear case	Change	GO	2.3 (0.6)	2
500 Hours	2	Engine oil	Change	EO	10.5 (2.8)	1
	3	Engine oil filter	Replace	-	-	1
	5	Prefilter (element)	Replace	-	-	1
	20	Air cleaner element (primary)	Check, Clean	-	-	1
	21	Fuel filter element	Replace	-	-	1
	22	Radiator, oil cooler, charge air cooler	Check, Clean	-	-	3
	29	Fuel screen filter	Replace	-	-	1
1000 Hours	10	Swing reduction gear case	Change	GO	see page 6-35	1
		Swing reduction gear grease(type 2)	Check ,Add	PGL	see page 6-35	1
	11	Swing gear and pinion grease	Change	PGL	5.9 kg (13.1 lb)	1
	14	Hydraulic oil return filter	Replace	-	-	1
	15	Drain filter cartridge	Replace	-	-	1
	16	Air breather element	Replace	-	-	1
	18	Pilot line filter element	Replace	-	-	1
	23	Travel reduction gear case	Change	GO	2.3 (0.6)	2
1500 Hours	25	Crankcase breather filter	Replace	-	-	1
	26	DEF/AdBlue® supply module filter	Replace	-	-	1
2000 Hours	1	Hydraulic oil★1	Change	HO	96 (25.4)	1
	1	Hydraulic oil (HBHO★2)	Change	-	96 (25.4)	1
	4	Radiator coolant	Change	C	14.5 (3.8)	1
	17	Hydraulic oil suction strainer	Check, Clean	-	-	1
	20	Air cleaner element (primary, safety)	Replace	-	-	2
	28	RCV lever	Check, Lubricate	-	-	2
	-	Hoses, fittings, clamps (fuel, coolant, hydraulic)	Check, Retighten, Replace	-	-	1
3000 Hours	6	Fan belt	Replace	-	-	1
4000 Hours	28	Fuel tank air breather filter	Replace	-	-	1
5000 Hours	1	Hydraulic oil★3	Change	HO	96 (25.4)	1
	17	Hydraulic tank suction strainer	Replace	-	-	1
As required	19	Aircon & heater fresh filter	Replace	-	-	1
		Aircon & heater recirculation filter	Clean, Replace	-	-	1
	20	Air cleaner element (primary)	Clean, Replace	-	-	1
		Air cleaner element (safety)	Replace	-	-	1

★1 Conventional hydraulic oil ★2 HD Hyundai Construction Equipment Bio Hydraulic Oil

★3 HD Hyundai Construction Equipment genuine long life hydraulic oil 4 Adjust boom

※ Oil symbol : Please refer to the recommended lubricants for specification.

DF : Diesel fuel GO : Gear oil HO : Hydraulic oil C : Coolant

PGL : Grease EO : Engine oil DEF : DEF/AdBlue®

1) CHECK ENGINE OIL LEVEL

Check the oil level with the machine on a flat ground before starting engine.

(1) Pull out the dipstick and wipe with a clean cloth.

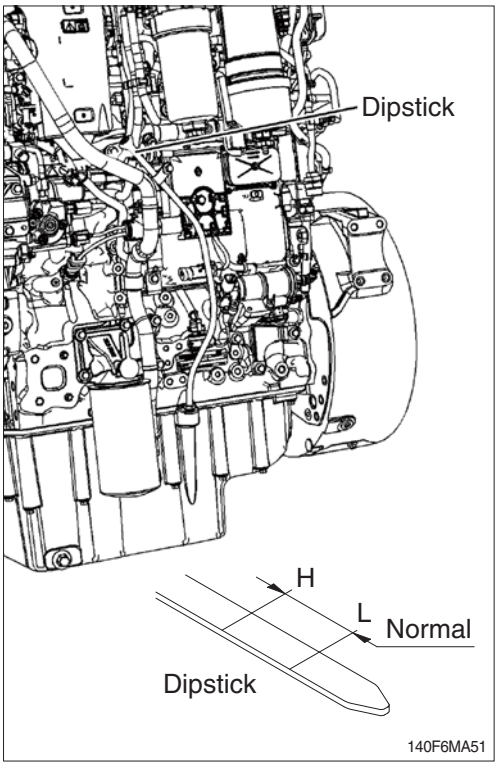
(2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.

(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.



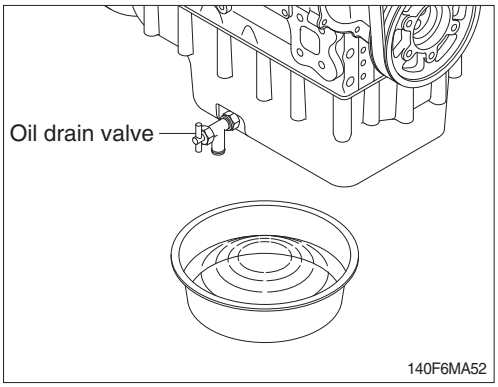
2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

(1) Warm up the engine.

(2) Turn the drain valve to the open position. Drain the oil immediately to be sure all the oil and suspended contaminants are removed from the engine.

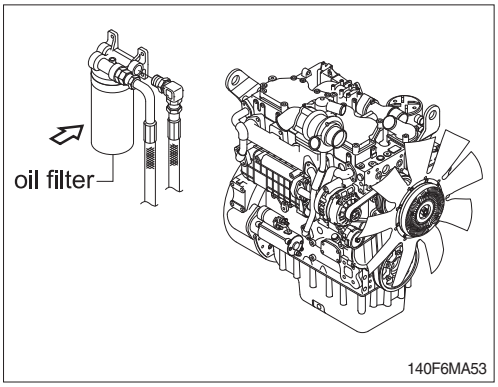
※ A drain pan with a capacity of 20 liters (5.0 U.S. gallons) will be adequate.

※ Disposal of the waste oil in accordance with local regulations.



(3) Clean around the filter head, remove the filter by the filter wrench and clean the gasket surface.

※ The O-ring can stick on the filter head. Be sure it is removed before installing the new filter.



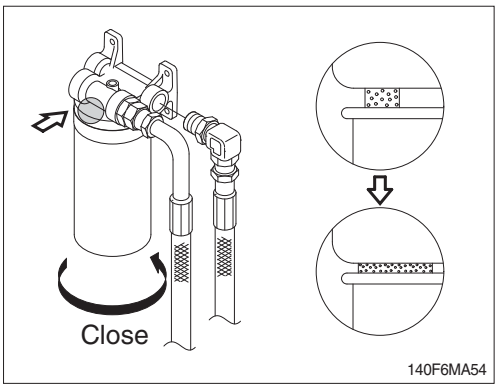
(4) Apply a light film of lubricating oil to the gasket sealing surface before installing the filters.

※ **Do not fill the oil filter with oil before installing them. This oil would not be filtered and could be contaminated. Contaminated oil can cause accelerated wear to engine components.**

(5) Install the new oil filter. Spin on the oil filter until the O-ring contacts the sealing surface.
Then rotate the oil filter 3/4 of a full turn.

※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**

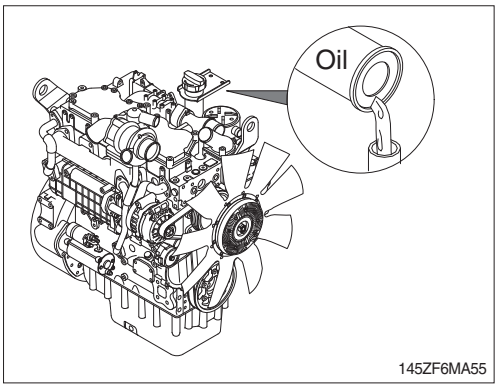
· Install the filter as specified by the filter manufacturer.



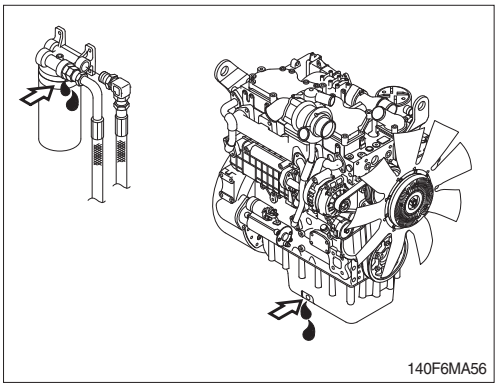
(6) Fill the engine with clean oil to the proper level.

· Quantity : 10.5 ℓ (2.8 U.S.gallons)

※ **Turn the drain valve to the close position.**



(7) 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.



3) CHECK COOLANT

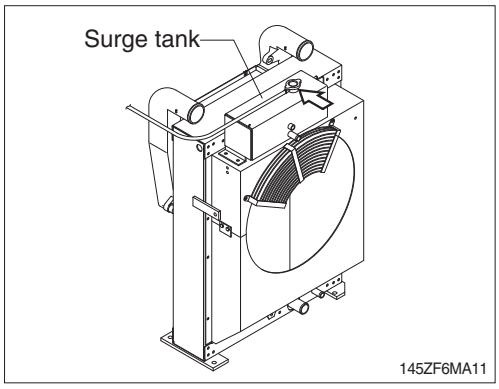
(1) Check if the level of coolant in surge tank is suficient.

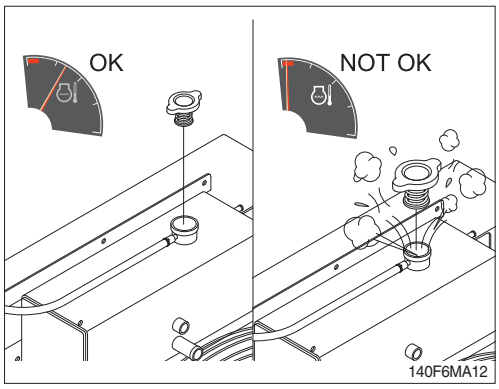
(2) Add the mixture of antifreeze and water after removing the cap of the surge tank if coolant is not sufficient.

(3) Replace gasket of radiator cap 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.**



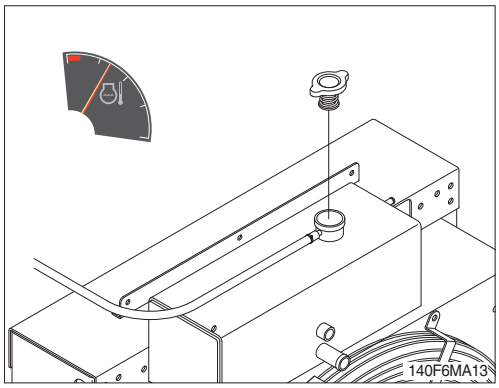


4) FLUSHING AND REFILLING OF RADIATOR

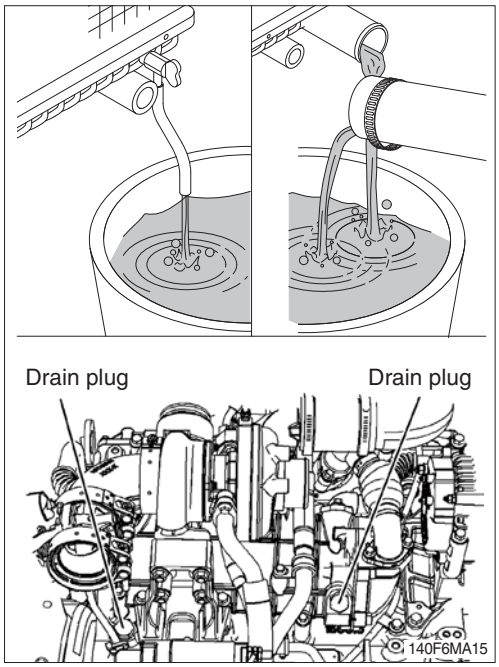
(1) Change coolant

⚠ **Avoid prolonged and repeated skin contact with used antifreeze. Such prolonged 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 cock on the radiator, remove the hose of the oil cooler and opening the drain plugs of the engine oil cooler housing.
A drain pan with a capacity of 40 liters (10.6 U.S. gallons) will be adequate.
· Tightening torque
- Drain cock : 4.2±0.4 kgf·m (30.4±2.9 lbf·ft)
- Drain plug (engine) : 3.5 kgf·m (25 lbf·ft)

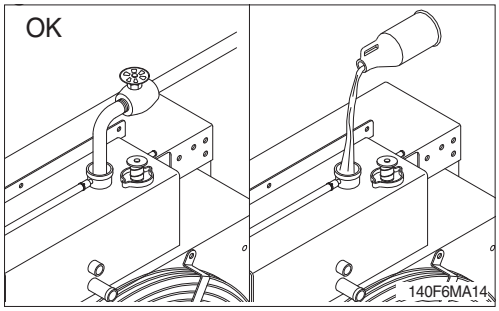


(2) Flushing of cooling system

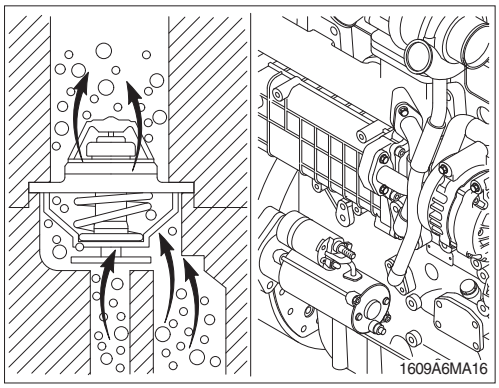
① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

※ **Use 0.5kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.**

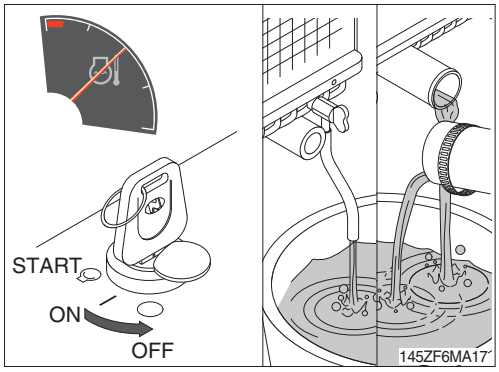
※ **Do not install the surge tank cap. The engine is to be operated without the cap for this process.**



※ **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.



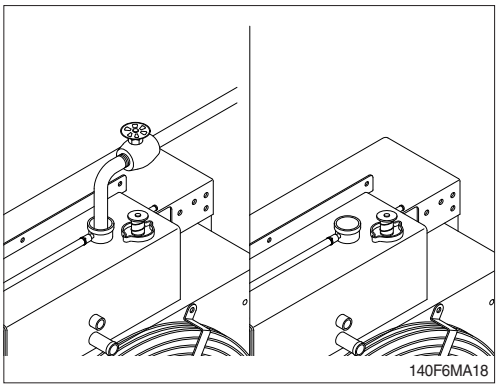
② Operate the engine for 5 minutes with the coolant temperature above 80°C (176°F) .
Shut the engine off, and drain the cooling system.



③ Fill the cooling system with clean water.

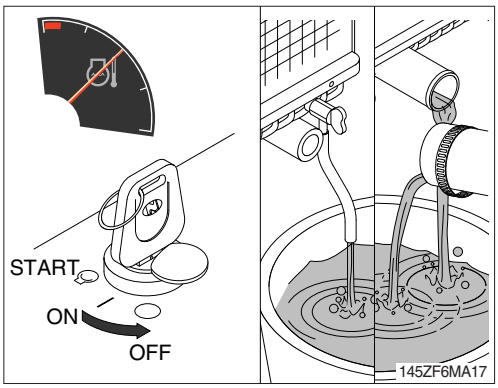
※ **Be sure to vent the engine and aftercooler for complete filling.**

※ **Do not install the surge tank cap or the new coolant filter.**



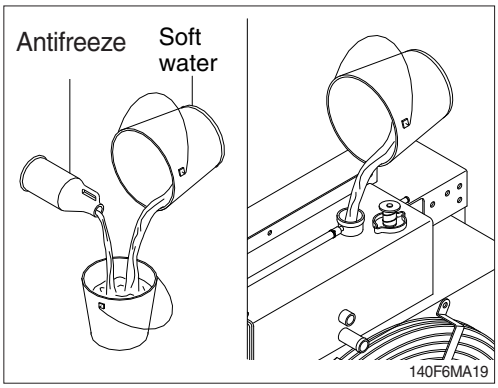
④ Operate the engine for 5 minutes with the coolant temperature above 80˚C (176˚F) .
Shut the engine off, and drain the cooling system.

※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**



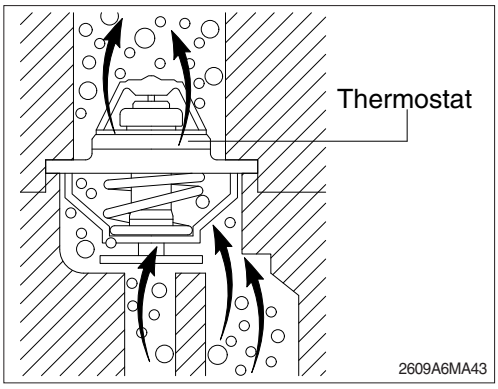
(3) Cooling system filling

① Use a mixture of 50 percent water and 50 percent ethylene glycol antifreeze to fill the cooling system.
Coolant capacity (engine only) : 9.4ℓ (2.5 U.S. gallons)

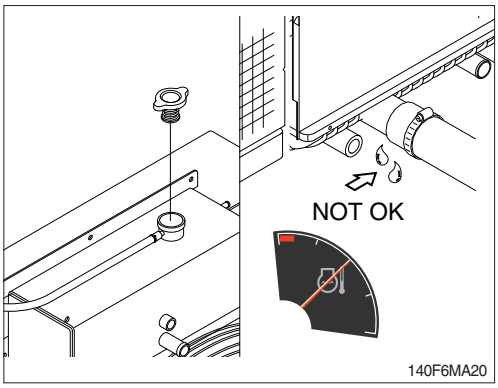


② The system has a maximum fill rate of 5 liters (1.3 U.S. gallons) per minute.
Do not exceed this fill rate.

※ **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.

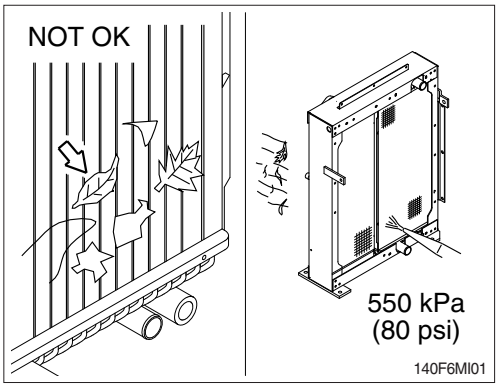


5) CLEAN RADIATOR AND OIL COOLER

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.

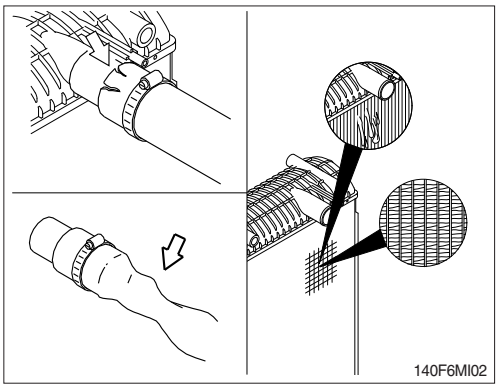
(2) Use 550 kPa (80 psi) air pressure to blow the dirt and debris from the fins.
Blow the air in the opposite direction of the fan air flow.



(3) Visually inspect the radiator for bent or broken fins.

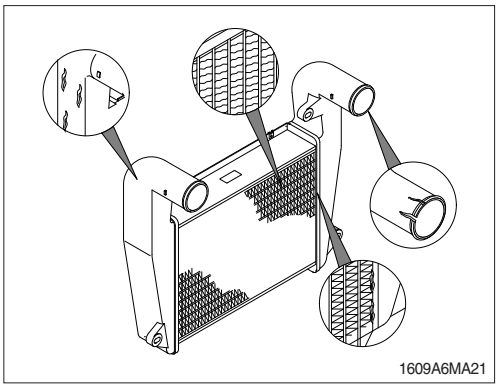
※ **If the radiator must be replaced due to bent or broken fins which can cause the engine to overheat, refer to the manufacturer's replacement procedures.**

(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 HD Hyundai Construction Equipment distributor.

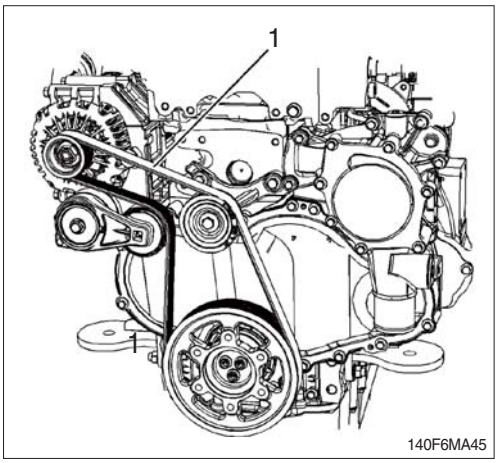


7) FAN BELT

(1) To maximize the engine performance, inspect the belt (1) for wear and for cracking.
Replace the belt if the belt is worn or damaged.

(2) Inspect the belt for cracks, splits, glazing, grease, displacement of the cord and evidence of fluid contamination.

(3) The belt must be replaced if the following conditions are present.
① The belt has a crack in more than one rib.
② More than one section of the belt is displaced in one rib of a maximum length of 50.8 mm (2 inch).

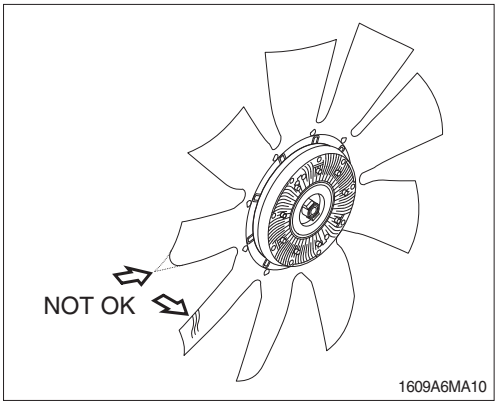


8) INSPECTION OF COOLING FAN

⚠ Personal 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 barring 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.



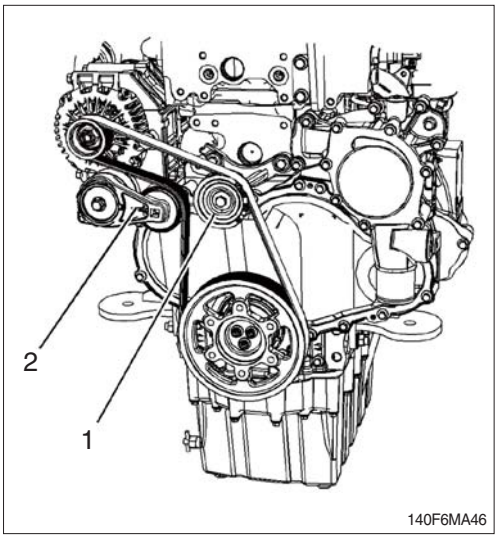
9) FAN BELT TENSIONER

(1) Ensure that the belt tensioner is securely installed.
Visually inspect the belt tensioner (2) for damage.

(2) Check that the pulley on the tensioner rotates freely and that the bearing is not loose.

(3) Some engines have an idler pulley (1). Ensure that the idler pulley is securely installed. Visually inspect the idler pulley for damage.

(4) Ensure that the idler pulley can rotate freely and that the bearing is not loose. If necessary, replace damaged components.



10) CLEANING OF AIR CLEANER

(1) Primary element

① Turn the cover to the left and remove the element.

② Clean the inside of the body.

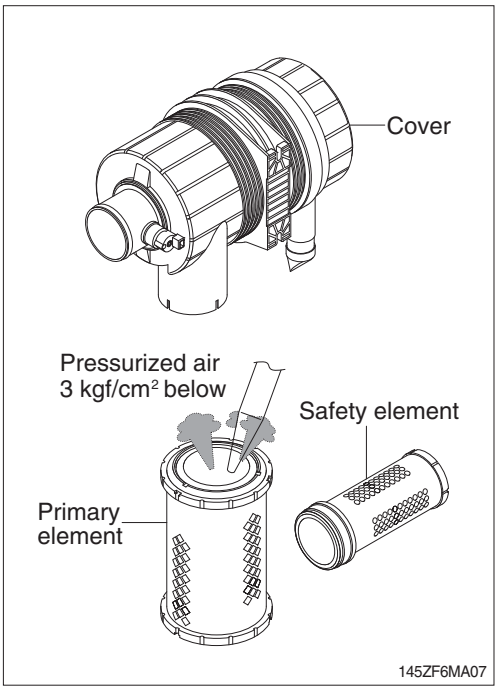
③ Clean the element with pressurized air.

- 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 element.

⑤ Insert element and turn the cover to the right.

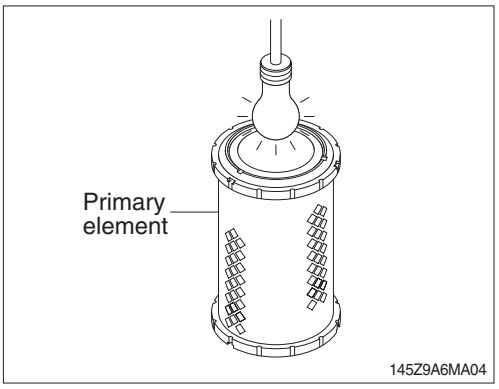
※ **Replace the primary element after 4 times cleanings.**



(2) Safety element

※ **Replace the safety element only when the primary element is cleaned for the 4 times.**

※ **Always replace the safety element. Never attempt to reuse the safety element by cleaning the element.**



11) FUEL TANK

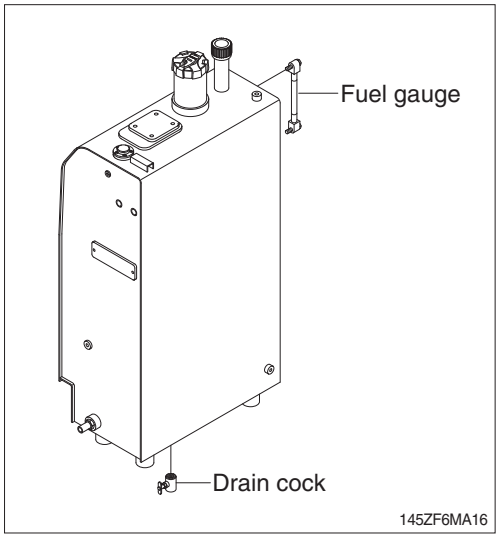
(1) Fill fuel fully when system the operation to minimize water condensation, and check it with fuel gauge before starting the machine.

(2) Drain the water and sediment in the fuel tank by opening the drain cock.

※ **Be sure to LOCK the cap of fuel tank.**

※ **Remove the strainer of the fuel tank and clean it if contaminated.**

⚠ **Stop the engine when refueling.**
All lights and flames shall be kept at a safe distance while refueling.



12) **PREFILTER** (WITH WATER SEPARATOR)

※ **Inspect or drain the collection bowl of water daily and replace the element every 500 hours.**

(1) Remove the element

① Place a suitable container under the water separator in order to catch any fuel that might spill. Clean up any spilled fuel. Clean the outside body of the filter assembly.

② Make a temporary mark (A) across the filter before the assembly is removed.

③ Install a suitable hose onto drain (3). Open the drain valve (2). Rotate the drain valve counterclockwise. Two full turns are required.
Loosen vent screw (1).

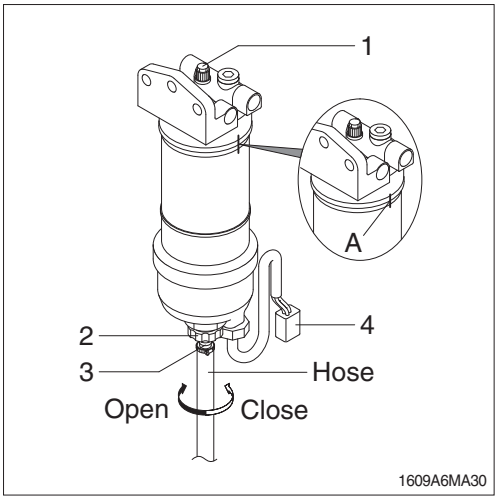
※ **Two complete rotations of the drain valve will release the drain valve from the filter element.**

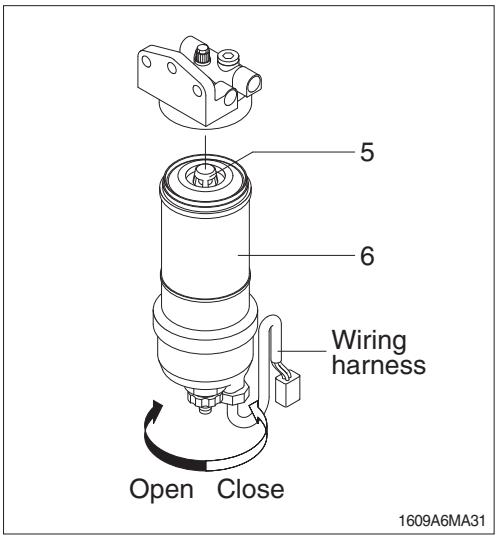
④ Allow the fuel to drain into the container. Remove the hose and install the drain valve into the filter element.
Engage the threads of the drain valve into the filter element. Do not secure the drain valve.

⑤ Tighten the vent screw (1) securely. Remove the wiring harness from connection (4).

⑥ Remove the filter bowl (6). Rotate the filter assembly counterclockwise in order to remove the filter assembly. Use a suitable tool in order to remove the filter assembly.

⑦ Rotate the filter element counterclockwise and remove the filter element (5). Clean the filter bowl.





(2) Install the element

① Locate the thread in the filter element (8) onto the threads (9). Spin on the element. Do not tighten.

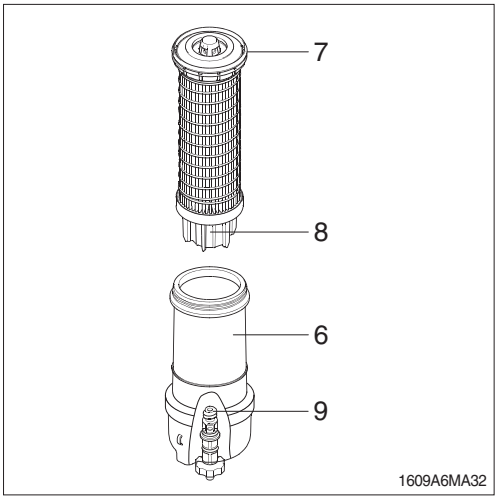
② Lubricate the O-ring seal (7) with clean engine oil.

※ **Do NOT fill the bowl with fuel before the assembly is installed.**

③ Do not use a tool in order to install the filter assembly. Tighten the filter bowl (6) by hand.
Install the filter bowl (6) and align with your temporary marks (A).

④ Tighten the drain valve (2) securely. Remove the container and dispose of the fuel in a safe place.

※ **The fuel filter element must be replaced at the same time as the prefilter element.**



13) REPLACEMENT OF FUEL FILTER

(1) Remove the element

① Place a suitable container under the fuel filter in order to catch any fuel that might spill. Clean up any spilled fuel. Clean the outside body of the filter assembly.

② Make a temporary mark (A) across the filter before the assembly is removed. Install a suitable hose onto drain (4). Open the drain valve (3). Rotate the drain valve counterclockwise. Two full turns are required. Loosen vent screw (1).

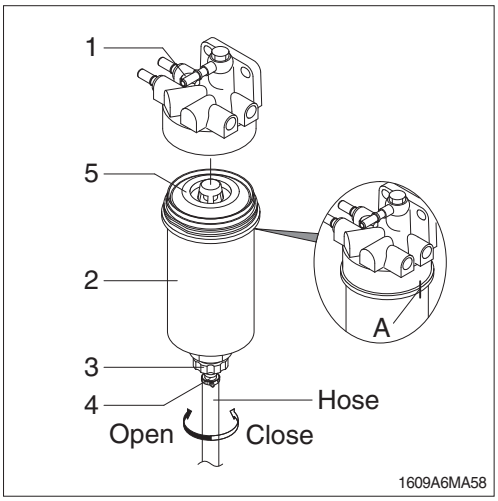
※ **Two complete rotations of the drain valve will release the drain valve from the filter element.**

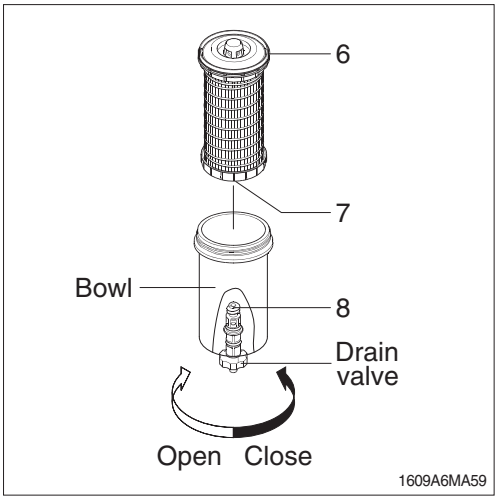
③ Allow the fuel to drain into the container. Remove the hose and install the drain valve into the filter element.
Engage the threads of the drain valve into the filter element. Do not secure the drain valve.

④ Tighten the vent screw (1) securely.

⑤ Remove the filter bowl (6). Rotate the filter assembly counterclockwise in order to remove the assembly. Use a suitable tool in order to remove the filter bowl.

⑥ Rotate the filter element counterclockwise and remove the filter element (5). Clean the filter bowl.





(2) Install the element

① Locate the thread in the filter element (7) onto the threads (8). Spin on the element. Do not tighten.

② Lubricate the O-ring seal (6) with clean engine oil.
Do NOT fill the filter bowl (2) with fuel before the filter assembly is installed.

③ Do not use a tool in order to install the filter assembly. Tighten the assembly by hand.
Install the filter bowl (2) and align with your temporary marks.

④ Tighten the drain valve (3).

※ **The prefilter fuel element must be replaced at the same time as the secondary filter element.**

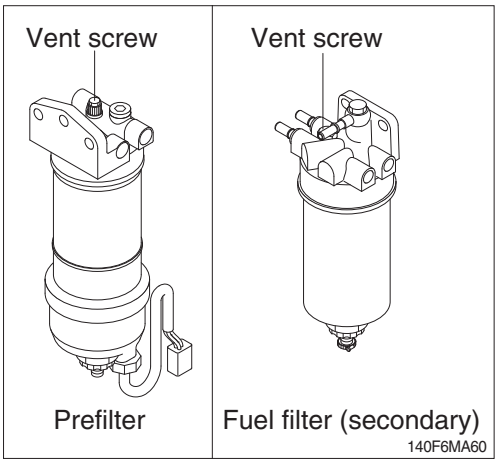
14) BLEEDING THE FUEL SYSTEM

(1) Loosen fuel supply line vent screw at the outlet of fuel filter head.

(2) Bleed until air bubbles comes out from fuel supply line completely.

(3) Tighten fuel supply line screw to its origin position.

⚠ 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. Personal injury and property damage can result. Wait at least 10 minutes after shutting down the engine before loosening any fittings in the high-pressure fuel system to allow pressure to do decrease to a lower level.



15) DEF/AdBlue® TANK

(1) The DEF/AdBlue® tank level must be checked daily with DEF/AdBlue® level gauge.

(2) If the DEF/AdBlue® level is found to below, DEF/AdBlue® must be added.

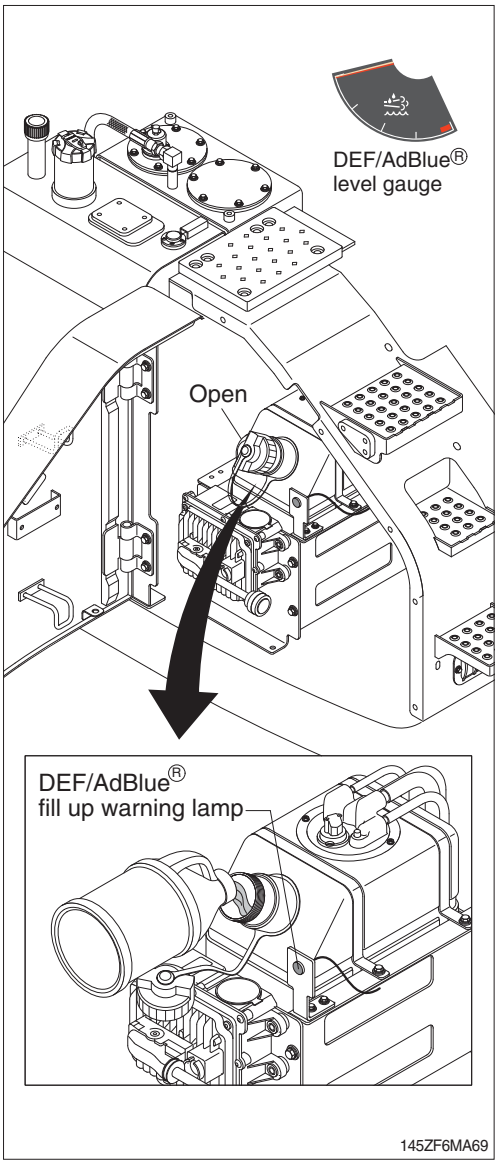
⚠ It is unlawful to tamper with or remove any component of the aftertreatment system. It is also unlawful to use a catalyst solution that does not meet the specifications provided or the operate the machine with no catalytic solution.

(3) DEF/AdBlue® fill up warning lamp turns on when tank is completely filled with DEF/AdBlue®. After turning light on, do not pour DEF/AdBlue® any more. DEF/AdBlue® will require room for expansion.

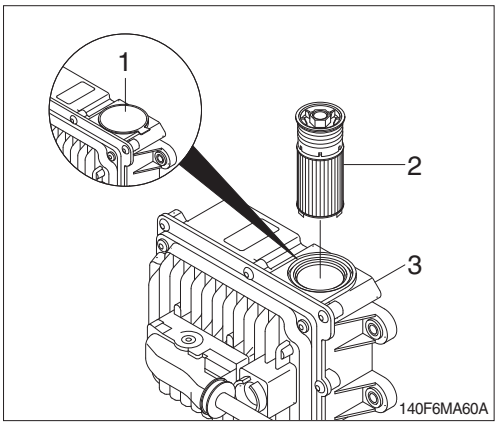
※ Fill the tank with DEF/AdBlue® after key on and then turn off the start key.

※ Be careful to entering dust, sand or other contamination substance when you refill the DEF/AdBlue® into the tank. Otherwise, fatal problem such as engine idle locking, derating or engine stopping can be happen.

※ Care should be takes when dispensing DEF/AdBlue®. Spills should be cleaned immediately. Spilt DEF/AdBlue® will attack paint and metal.



16) DEF/AdBlue® SUPPLY MODULE FILTER



(1) Ensure that the area around the DEF/AdBlue® supply module filter is clean and free from dirt. The DEF/AdBlue® threaded cap and the filter element are a combined assembly.

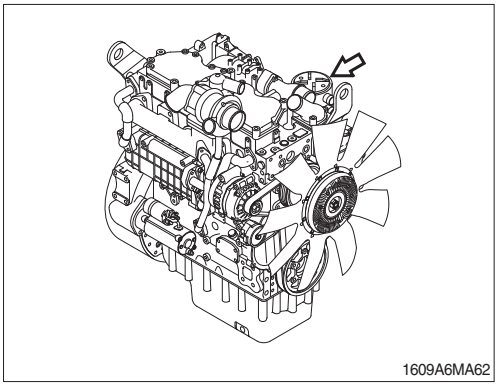
(2) Remove the protective cover (1). Remove DEF/AdBlue® supply module filter assembly (2) and discard the filter assembly.

(3) Install a new DEF/AdBlue® supply module filter assembly into DEF/AdBlue® pump housing (3).

(4) Tighten filter assembly and install the protective cover.
- Tightening torque : 1.4 kgf·m (10.1 lbf·ft)

※ Turning ON the start switch will automatically prime the DEF/AdBlue®.

17) CRANKCASE BREATHER FILTER



※ Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

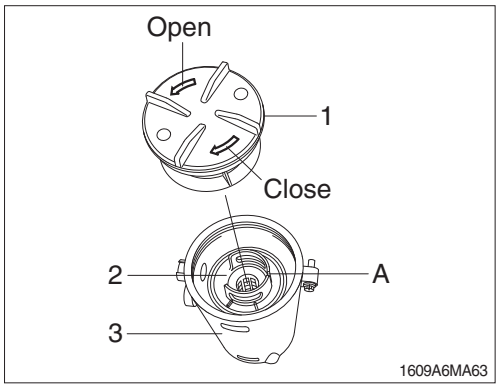
(1) The crankcase breather is a very important component in order to keep your engine emissions compliant.
- The filter element within the crankcase breather must be serviced at the prescribed service interval.
- The correct filter element must be installed before the engine is operated.
- The installation of the filter element is very important.
- The quality of the filter element that is installed is very important.
- The filter element protects the engine from excessive quantities of oil from entering the induction system. The filter element also protects the engine aftertreatment system.

※ Excessive quantities of oil that enter the induction system of the engine can rapidly increase the engine speed without control.

(2) Ensure that dirt cannot enter the breather assembly. Ensure that the outside body of the breather assembly is clean and free from damage.
Place a container under the breather assembly.

(3) Rotate the cap (1) counterclockwise into the unlocked position. Remove the cap from the body of the breather (3).

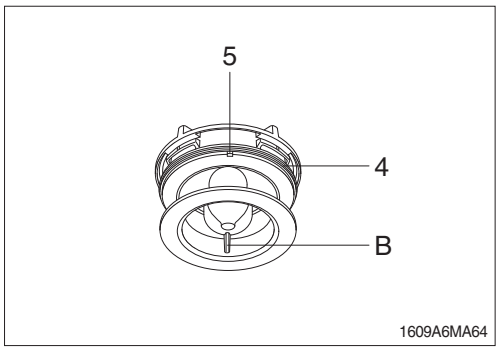
(4) Note the orientation of the filter element (2).
Remove the filter element.



(5) Remove the old seal (4) and install a new seal.

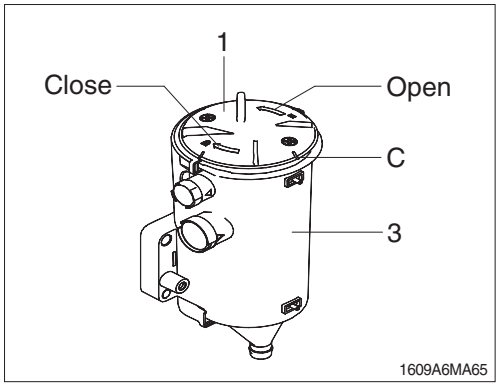
※ **The cut away from section (5) in the cap allows access to the seal.**

(6) Install a new filter element into the breather body (3) and orient the filter element so that position (A) is aligned. Align position (B) on the cap with position (A) on the filter element.



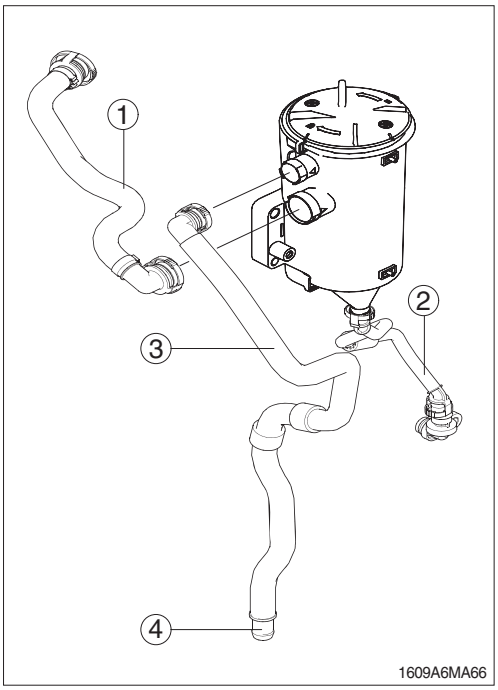
(7) Install the cap (1). Rotate the cap by hand clockwise until the cap locks into the locked position C on the breather body (3).

(8) Remove the container.



(9) Check the system for damage. Replace any component that is damaged. Ensure that the outlet (4) is clear and free from obstructions.

① Connection to breather cap for the engine
② Oil drain
③ Tube assembly to atmosphere
④ Outlet

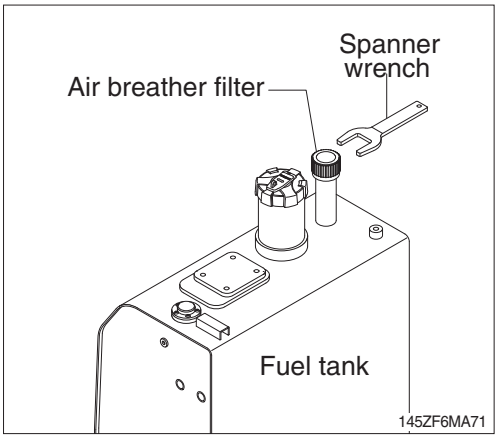


18) REPLACEMENT OF AIR BREATHER FILTER

(1) Stop the engine.

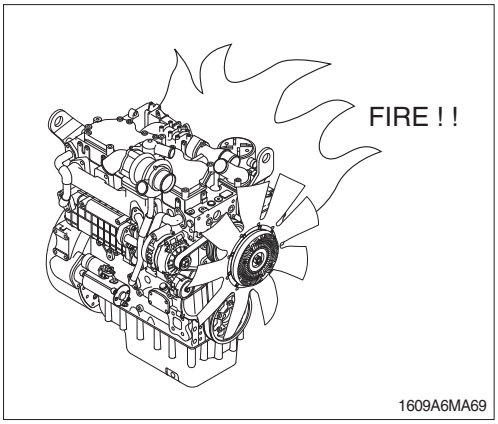
(2) Remove the air ventilation filter using the special spanner wrench and dispose it in accordance with environmental regulations.

(3) Replace the filter with new one.
· Tightening torque : 0.95±0.5 kgf · m
(6.9±3.6 lbf · ft)



19) LEAKAGE OF FUEL

⚠ Be careful and clean the fuel hose, injection pump, fuel filter and other connections as the leakage from these part can cause fire.



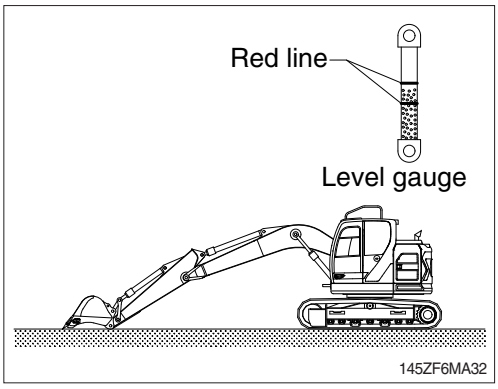
20) HYDRAULIC OIL CHECK

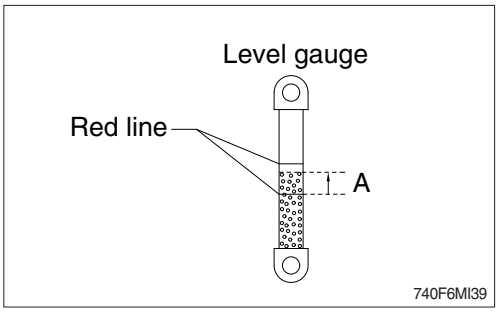
(1) Position the machine as shown in the illustration on the right. Then stop engine.

(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		Height A	
℃	°F	mm	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 3-22 for checking the temperature of the hydraulic oil.

※ Add the hydraulic oil, if necessary.

21) FILLING HYDRAULIC OIL

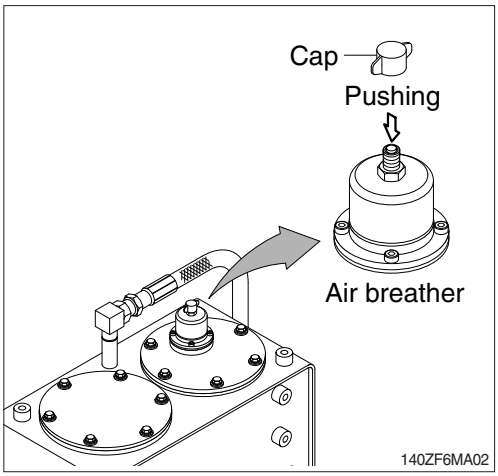
(1) Stop the engine to the position of level check.

(2) Remove the cork nut and relieve the pressure in the tank by pushing the top of the air breather.

(3) Remove the breather on the top of oil tank and fill the oil to the specified level.

(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.



22) CHANGE HYDRAULIC OIL

(1) Lower the bucket on the ground pulling the arm and bucket cylinder to the maximum.

(2) Remove the cork nut and relieve the pressure in the tank by pushing the top of the air breather.

(3) Remove the cover.
· Tightening torque : 6.9±1.4 kgf · m
(50±10 lbf · ft)

(4) Prepare a suitable container.

(5) To drain the oil open the drain valve at the bottom of the oil tank.

(6) Fill proper amount of recommended oil.

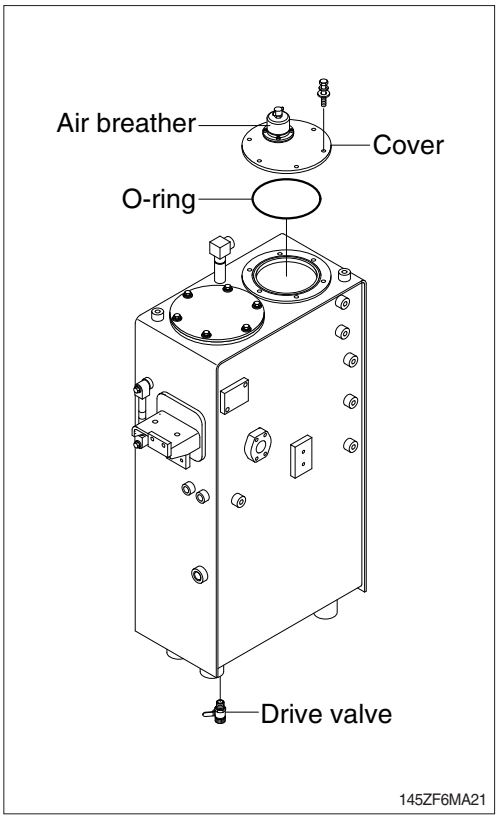
(7) Put the breather in the right position.

(8) Bleed air 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.

※ Incase 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 HD Hyundai Construction Equipment dealer.



23) CLEAN SUCTION STRAINER

Clean suction strainer as follows paying attention to the cause to be kept during oil filling.

(1) Remove the cover on the top of the oil tank.
· Tightening torque : 6.9±1.4 kgf · m
(50±10 lbf · ft)

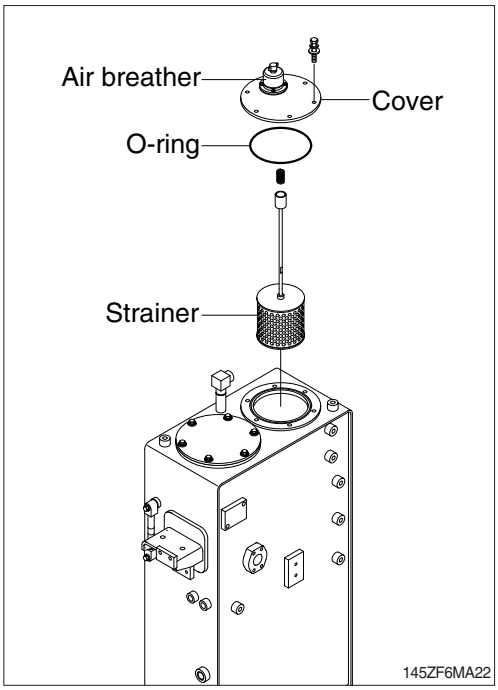
(2) Pull out the strainer in the tank.

(3) Wash the foreign material on the suction strainer with gasoline or cleaning oil.

(4) Replace the suction strainer if it is damaged.

(5) Assemble with reverse order of disassembly. Be sure to install a new O-ring and reinsert in the oil tank.

※ **Loosen the bolt slowly at the cover can be spring out by the spring when removing it.**



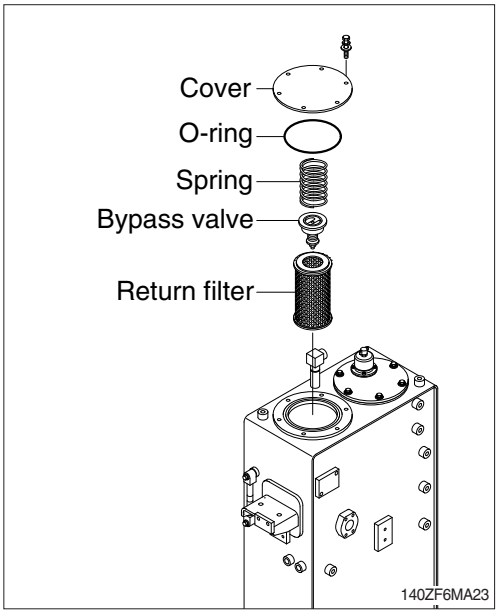
24) REPLACEMENT OF RETURN FILTER

Replace as follows paying attention to the cause to be kept during the replacement.

(1) Remove the cover.
· Tightening torque : 6.9±1.4 kgf · m
(50±10 lbf · ft)

(2) Remove the spring, by-pass valve, and return filter in the tank.

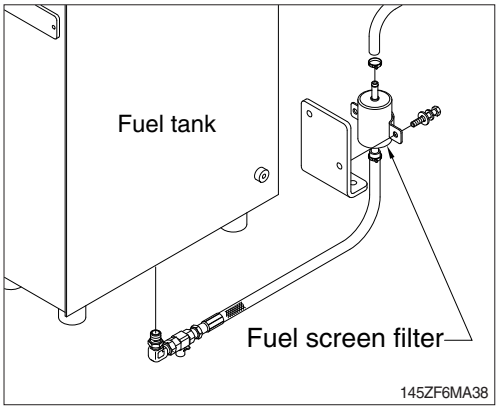
(3) Replace the filter element with new one.



25) REPLACEMENT OF FUEL SCREEN FILTER

(1) Replace the fuel screen filter.

(2) Ensure that the arrow mark is aligned to the direction of fuel flow. Install the hose lines and hose clamps.



26) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

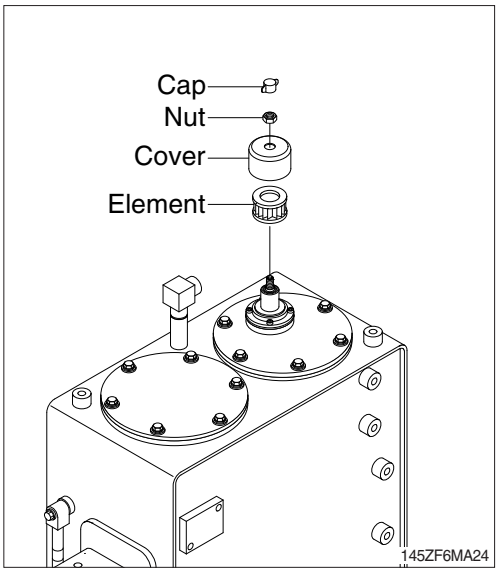
(1) Remove the cap and relieve the pressure in the tank by pushing the top of the air breather.

(2) Loosen the nut and remove the cover.

(3) Pull out the filter element.

(4) Replace the filter element new one.

(5) Reassemble by reverse order of disassembly.
- Nut tightening torque : 0.4~0.5 kgf · m
  (2.9~3.6 lbf · ft)

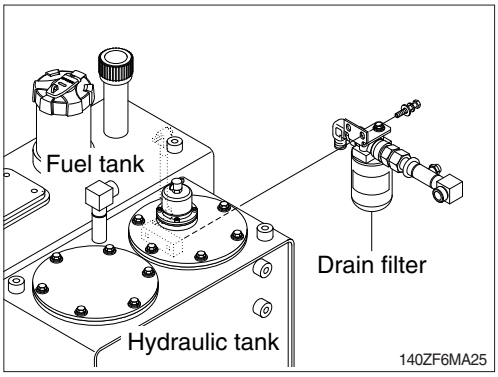


27) REPLACE OF DRAIN FILTER CARTRIDGE

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 for mounting.**

※ **Change cartridge after initial 250 hours of operation. Thereafter, change cartridge every 1000 hours.**



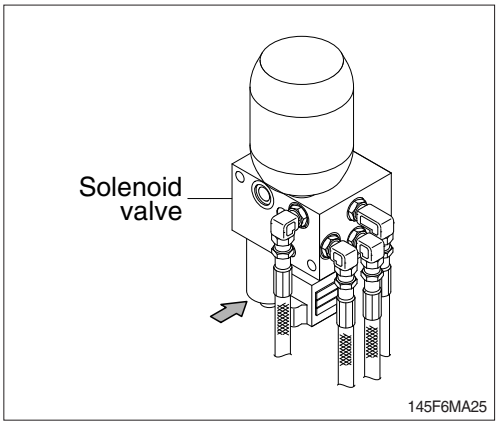
28) REPLACE OF PILOT LINE FILTER

(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.

※ **Change cartridge after initial 250 hours of operation. Thereafter, change cartridge every 1000 hours.**

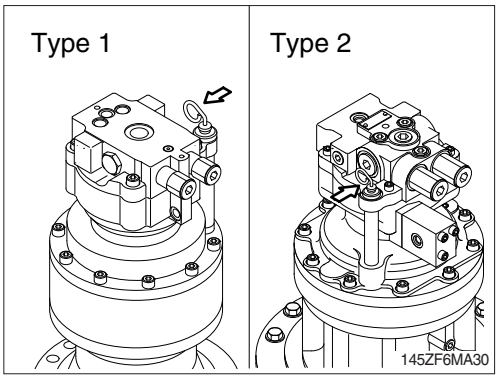


29) CHECK THE SWING REDUCTION GEAR OIL

(1) Pull out the dipstick and clean it.

(2) Insert it again.

(3) Pull out one more time to check the oil level and fill the oil if the level is not sufficient.



30) CHANGE SWING REDUCTION GEAR OIL

(1) Raise the temperature of oil by swinging the machine before replace the oil and park the machine on the flat ground.

(2) Prepare a proper container.

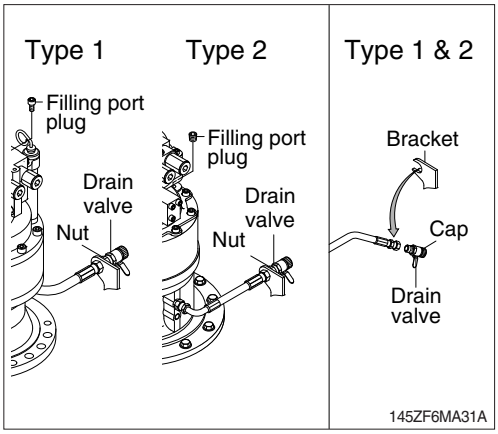
(3) Loosen the nut and take off the hose from the bracket.

(4) Remove the cap and open the drain valve.

(5) Clean around the valve and close the drain valve and cap.

(6) Fit the hose on the bracket and tighten the nut firmly.

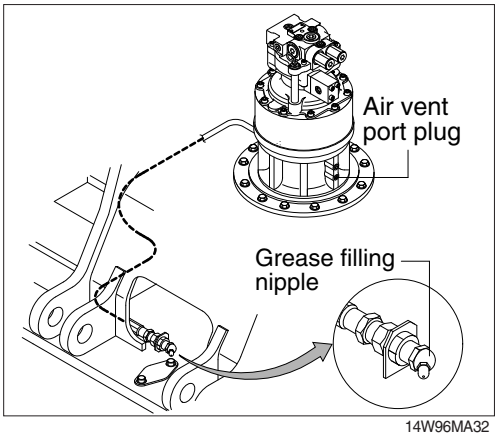
(7) Fill proper amount of recommended oil.
- Amount of oil
  - Type 1 : 3.5 ℓ (0.9 U.S.gal)
  - Type 2 : 2.5 ℓ (0.7 U.S.gal)



31) LUBRICATE BEARING OF OUTPUT SHAFT IN REDUCTION GEAR (TYPE 2 ONLY)

(1) Remove air vent plug.

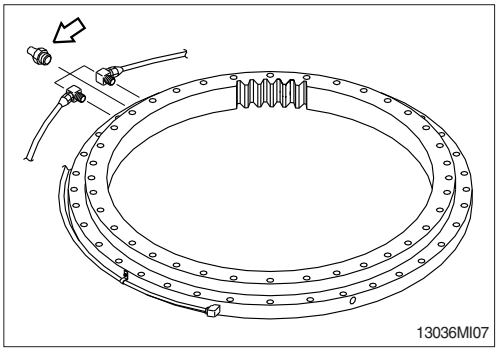
(2) Lubricate NLGI No.2 with grease gun until comes out new grease from air vent port.
- Amount of oil : 0.35 kg (0.09 lb)



32) LUBRICATE SWING BEARING

(1) Grease at 3 fitting.

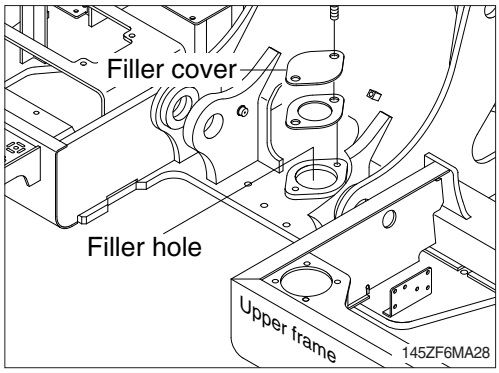
※ **Lubricate every 250 hours.**



33) SWING GEAR AND PINION

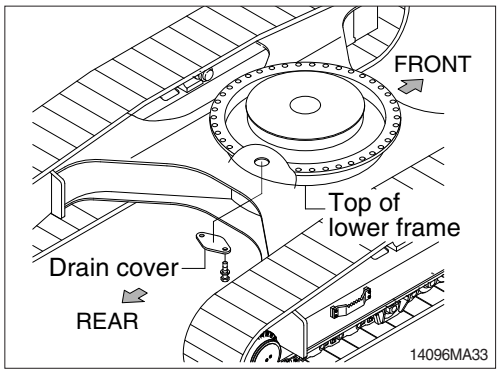
(1) Drain old grease

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

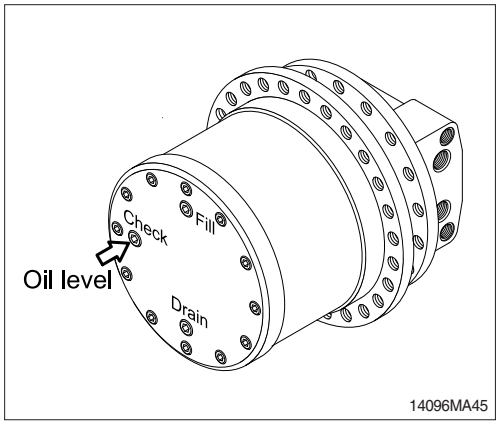
① Install drain cover.
② Fill with new grease.
③ Install filler cover.
· Capacity : 5.9 kg (13.1 lb)



34) CHECK THE TRAVEL REDUCTION GEAR OIL

(1) Operate the machine to the position of drain plug down to the flat ground.

(2) Loosen the level plug and check the oil level.
If the level is at the hole of the plug, it is normal.
Fill the oil if it is not sufficient.
· Amount of gear oil : 2.3 ℓ (0.6 U.S.gal)



35) CHANGE OF THE TRAVEL REDUCTION GEAR OIL

(1) Raise the temperature of the oil by traveling machine first.

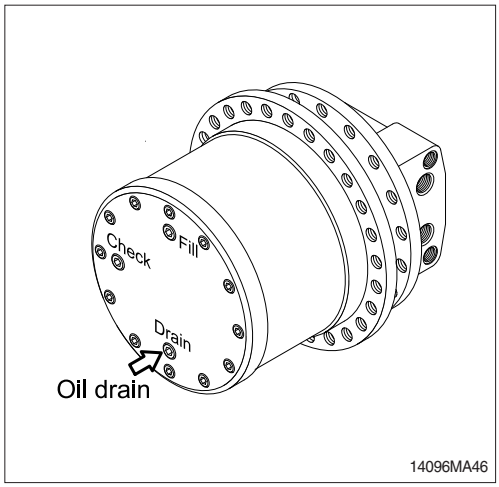
(2) Stop when the position of the drain plug is down.

(3) Loosen the level plug and then the drain plug.

(4) Drain the oil to adequate container.

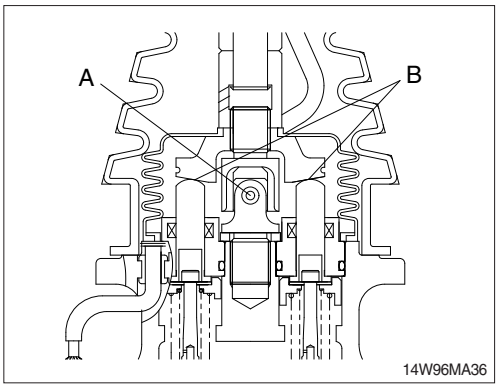
(5) Tighten the drain plug and fill specified amount of oil at filling port.

(6) Tighten the level plug and travel slowly to check if there is any leakage of oil.



36) LUBRICATE RCV LEVER

Remove the bellows and with a grease gun grease the joint part (A) and sliding parts (B).



37) ADJUSTMENT OF TRACK TENSION

※ **It is important to adjust the tension of track properly to extend the lifetime of track and traveling device.**

※ **The wear of pins and bushings on the undercarriage will vary with the working conditions and soil properties.**
It is thus necessary to continually inspect the track tension so as to maintain the standard tension on it.

(1) Raise the chassis with the boom and arm.

(2) Measure the distance between bottom of track frame on track center and track of shoe.

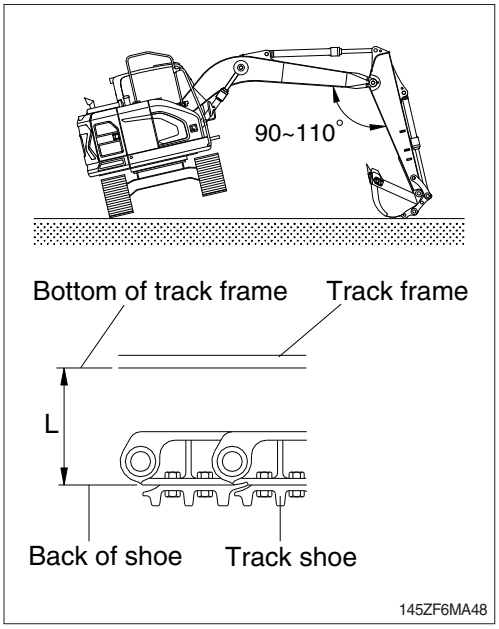
※ **Remove mud with rotating the track before measuring.**

(3) If the tension is tight, drain the grease in the grease nipple and if the tension is loose, charge the grease.

⚠ **Personal injury or death can result from grease under pressure.**

⚠ **Unscrew the grease nipple after release the tension by pushing the poppet only when necessarily required.**
Grease leaking hole is not existing. So, while unscrew the grease nipple, grease is not leaking until the grease nipple is completely coming out. If the tension is not released in advance, the grease nipple can be suddenly popped out by pressurized grease.

※ When the grease is drained, move the track to the forward and backward slightly.
If the track tension is loose even after the grease is charged to the maximum, change the pins and bushings as there are worn seriously.



Length (L)	
270~300 mm	10.6~11.8"

38) 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 signals to each other and work carefully for safety's sake.**

(1) Lower the bucket on the ground as the picture shown in the right.

(2) Lock the safety lever 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.**

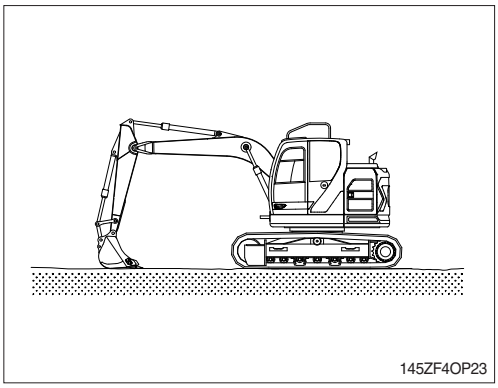
※ **If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.**

※ **After remove the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing 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 knocking 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.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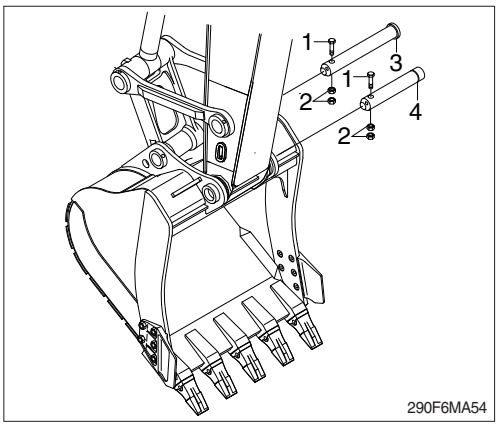

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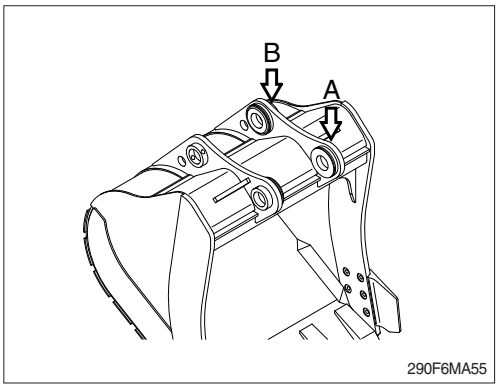

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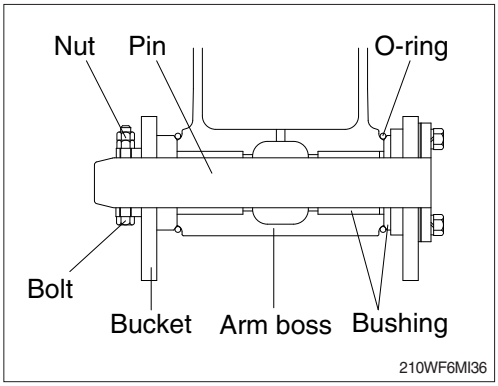

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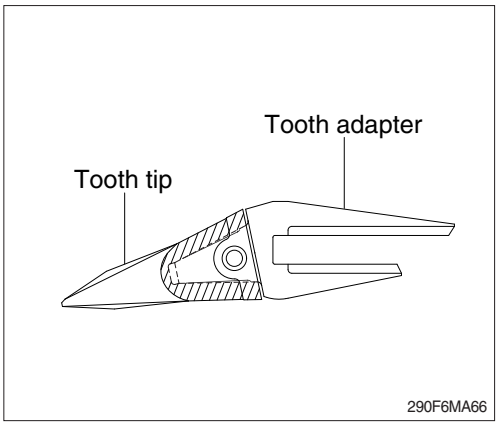
39) REPLACEMENT OF BUCKET TOOTH

(1) Timing of replacement

① Check wearing condition as shown in the illustration and replace tooth tip before adapter starts to wear.

② If excessive use, tooth adapter has worn out, replacement may become impossible.



(2) Instructions for replacement

① Pull out pin by striking pin with punch or hammer, avoiding damage to locking washer.

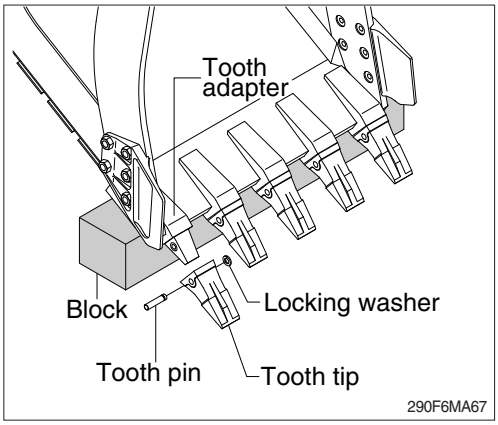
② Remove dust and mud from surface of tooth adapter by using knife.

③ Place locking washer in its proper place, and fit tooth tip to adapter.

④ Insert pin until locking washer is positioned at tooth pin groove.

⚠ Personal injury can result from bucket falling.

⚠ Block the bucket before changing tooth tips or side cutters.



40) ADJUSTMENT OF BUCKET CLEARANCE

(1) Lower the bucket on the ground as the picture shown in the right.

(2) Swing to the left and keep the arm boss to be contact to the bucket left.

(3) Lock the safety lever 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).

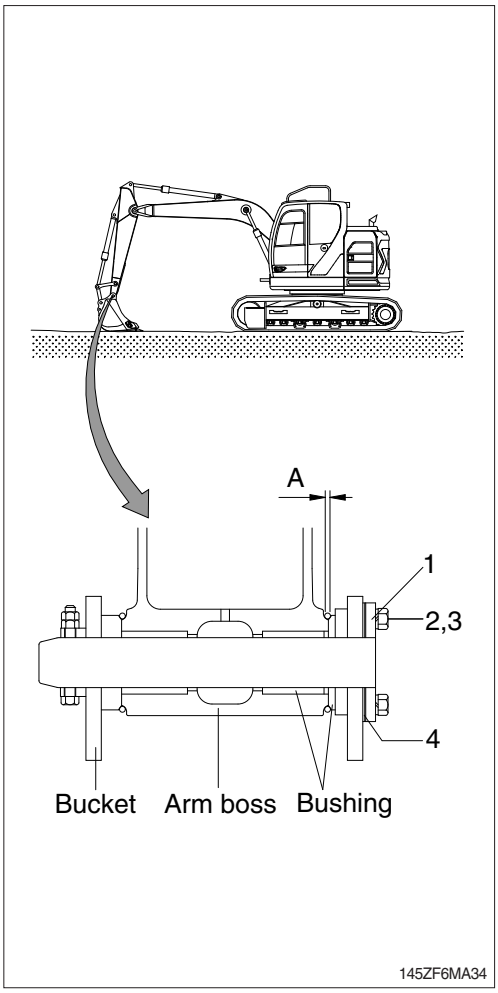
② Remove the shim equivalent value with measuring value.

③ Assemble the parts in the reverse order of removal.

· Tightening torque : 29.6±3.2 kgf · m
(214.0±23.1 lbf · ft)

· Normal clearance : 0.5 ~ 1.0 mm
(0.02 ~ 0.04 in)

※ If the bucket is not adjusted correctly, noise and vibration created during operation, and damaged O-ring, pin and bushing quickly.



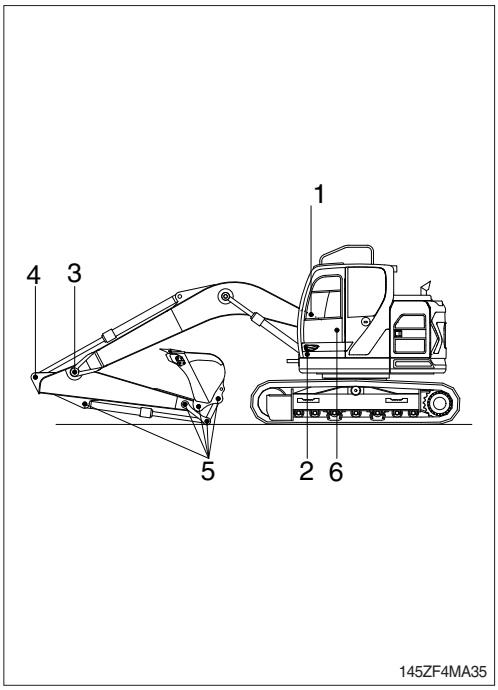
41) LUBRICATE PIN AND BUSHING

(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	5
2	Boom cylinder pin	2
3	Boom and arm connection pin	1
4	Arm cylinder pin (rod side)	1
5	Bucket cylinder pin (head side, rod side)	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

※ **Shorten lubricating interval when working in the water or dusty place.**



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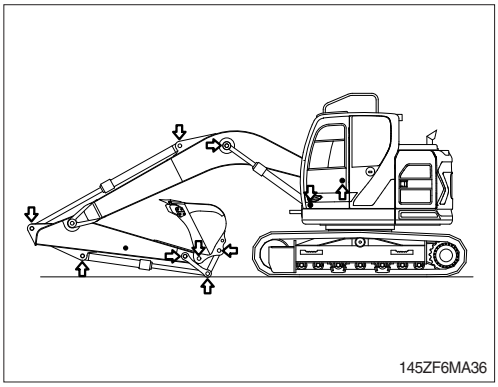
(2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

※ **Mount the lip to be faced outside when replace the dust seal.**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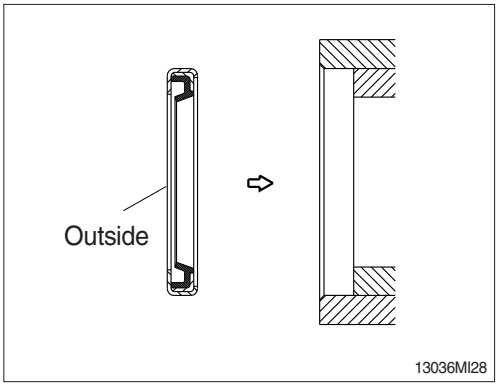
※ **If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.**

※ **Assemble the seal same direction with picture and use with plastic hammer when replace.**



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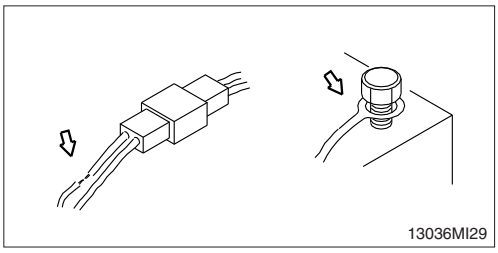
7. ELECTRICAL SYSTEM

1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



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2) BATTERY

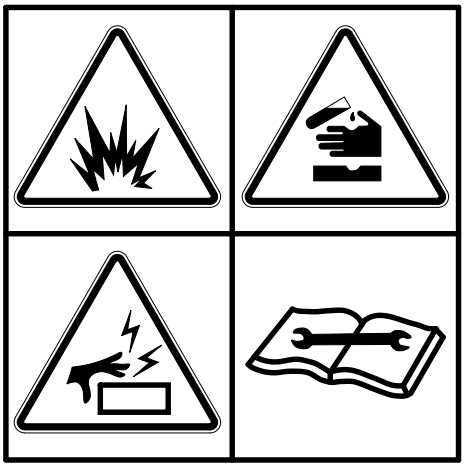
(1) Clean

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. Wash with clean water and go to the doctor if it enters the eyes.



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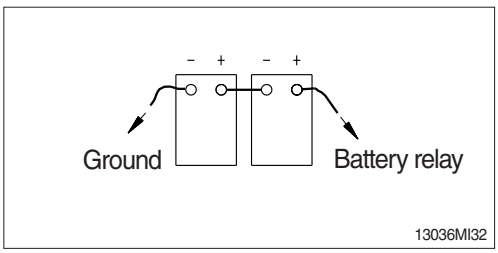
(2) Recycle

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.



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3) STARTING THE ENGINE WITH A BOOSTER CABLE

Keep following order when you are going to start engine using booster cable.

(1) Connection of booster cable

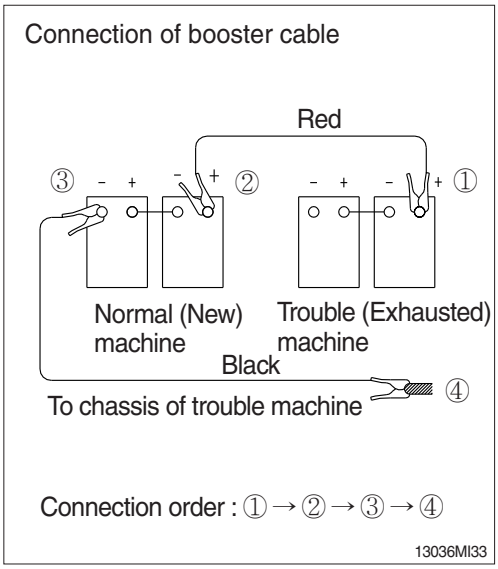
※ Use the same capacity of battery for starting.

① Make sure that the starting switches of the normal machine and trouble machine are both at 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.

※ Keep firmly all connection, the spark will be caused when connecting finally.

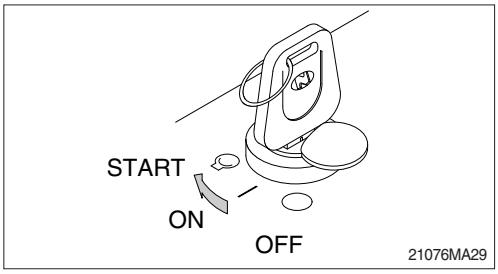


(2) Starting the engine

① Starting the engine of the normal machine and keep it to run at high idle.

② Start engine of the trouble machine with starting switch.

③ If you can not start it by one time, restart the engine 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.

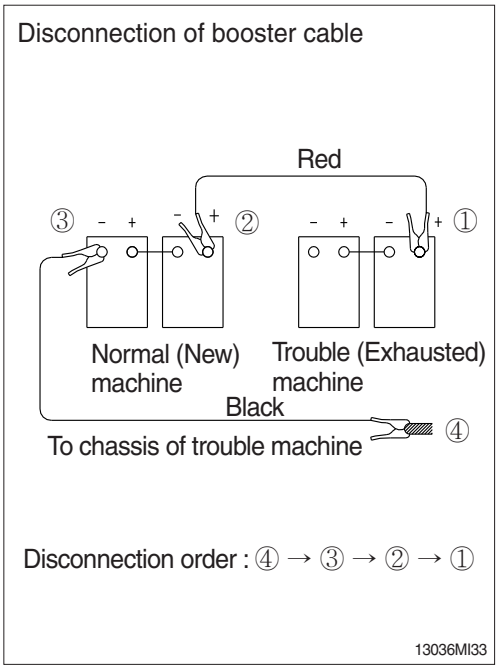
③ Run engine with high idle until charging the exhausted battery by alternator, fully.

⚠ Explosive gas is generated while using the battery or charging it. Keep away flame and be careful not to cause the spark.

※ Charge the battery in the well ventilated place.

※ Place the machine on the earth or concrete. Avoid charging the machine on the steel plate.

※ Do not connect (+) terminal and (-) terminal when connecting booster cable because it will be shorted.



(4) Welding repair

Before start to welding, follow the below procedure.

① Shut off the engine and remove the starting switch.

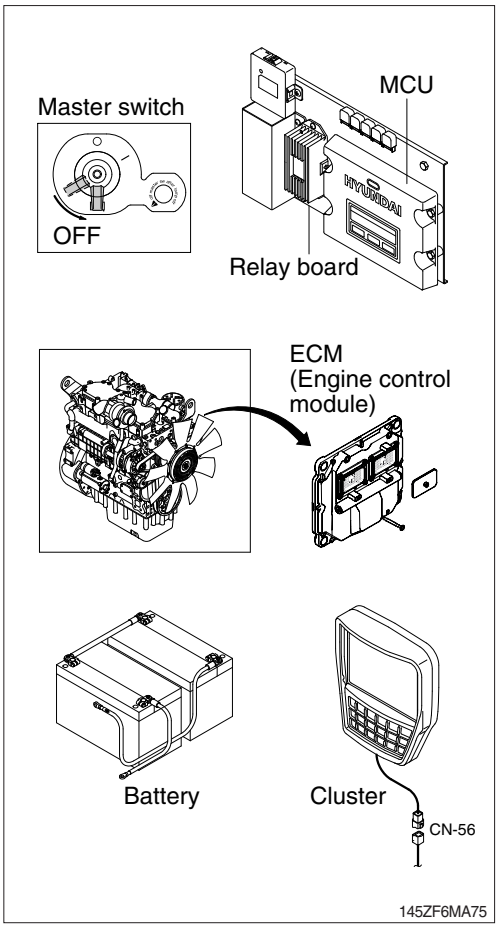
② Disconnect ground cable from battery by master switch.

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, ECM, cluster etc).

④ Connect the earth (ground) lead of the welding equipment as close to the welding point as possible.

※ Do not weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.

⚠ Do not attempt to welding work before carry out the above.
If not, it will caused serious damage at electric system.

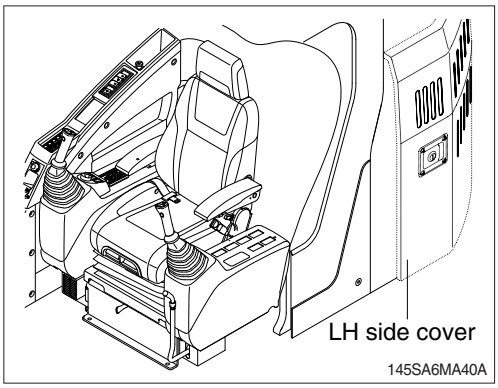


8. AIR CONDITIONER AND HEATER

1) CLEAN AND REPLACE OF FRESH AIR FILTER

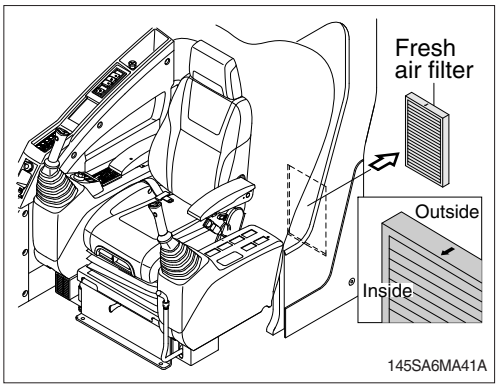
※ **Always stop the engine before servicing.**

(1) Open the LH side cover.



(2) Remove the fresh air filter.

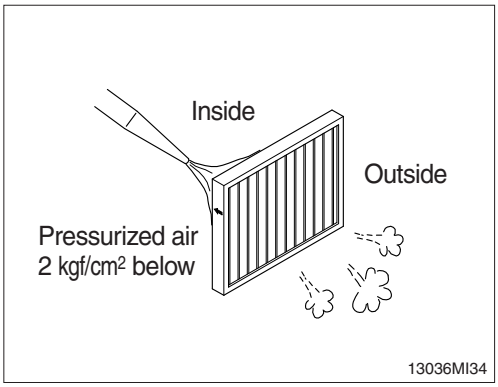
※ **When installing a filter, be careful not to change the filter direction.**



(3) Clean the filter using a pressurized air (below 2 kgf/cm², 28 psi).

△ **When using pressurized air, be sure to wear safety glasses.**

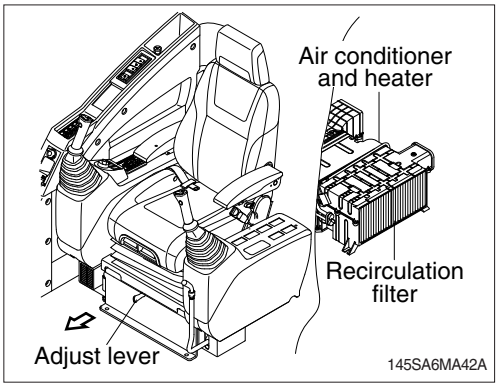
(4) **Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.**



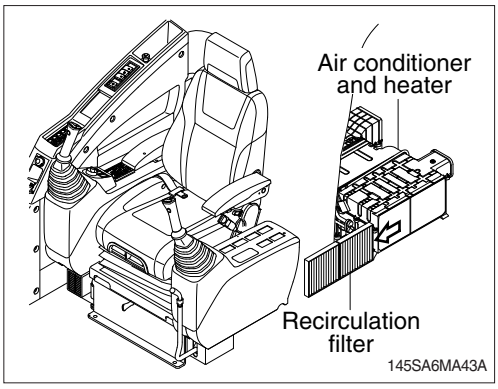
2) CLEAN AND REPLACE OF RECIRCULATION FILTER

※ **Always stop the engine before servicing.**

(1) Move seat and console box to arrow direction using the adjust lever.



(2) Remove recirculation filter.

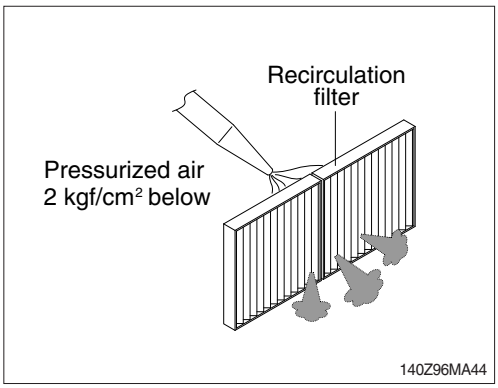


(3) Clean the recirculation filter using a pressurized air (below 2 kgf/cm², 28 psi) or washing with water.

△ **When using pressurized air, be sure to wear safety glasses.**

※ **Dry off after washing with water.**

(4) 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.

(2) Be careful not to overcool the cab.

(3) The cab is properly cooled if the operator feels cool when entering there 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 is not damaged.

5) CHECK DURING OFF-SEASON

Operate the air conditioner 2 or 3 times a month (each 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
HX145 LCR	HFC-134a	0.75 kg (1.65 lb)	1073 CO_2 eq.

※ 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 flourinated 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 preform 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. ENGINE

※ **This guide is not intended to cover every conditions, however many of the more common possibilities are listed.**

Trouble	Service	Remark
The engine oil pressure lamp lights ON when engine speed is raised after completion of warm up.	· 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 ON.	· Supply the 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 packing of it. · Replace the monitor.	
The engine does not start when the starting motor is turned over.	· Add fuel. · Repair where air is leaking into fuel system. · Check the injection pump or the nozzle. · Check the valve clearance. · Check engine compression pressure. · In cold weather, check if fuel warmer system is working normal.	Refer to the pages 3-35 and 4-4.
Exhaust gas is white or blue.	· Adjust to specified oil quantity. · Replace with specified fuel.	
Exhaust gas occasionally turns black.	· Clean or replace the air cleaner element. · Check the nozzle. · Check engine compression pressure. · Clean or replace the turbocharger.	
Combustion noise occasionally changes to breathing sound.	· Check the nozzle.	
Unusual combustion noise or mechanical noise.	· Check with specified fuel. · Check over-heating · Replace the muffler. · Adjust valve clearance.	

2. ELECTRICAL SYSTEM

Trouble	Service	Remark
Lamp does not glow brightly even when engine runs at high speed. Lamp flickers while engine runs.	· 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.	· Check the alternator. · Check and repair wiring.	
Unusual noise is emitted from the alternator.	· Check the alternator.	
Starting motor does not turn when starting switch is turned ON.	· 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.	· Charge the battery. · Check the safety relay.	
Starting motor turns the engine sluggishly.	· Charge the battery. · Check the starting motor.	
The starting motor disengages before the engine starts up.	· Check and repair the wiring. · Charge the battery.	
The engine warming up lamp does not go ON.	· 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.)	· 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.)	· Check the monitor. · Check and repair the wiring.	

3. OTHERS

Trouble	Service	Remark
Track slip out of place. Excessive wear of the sprocket.	· Adjust tension of track.	
Bucket either rises slowly or not at all.	· Add oil to specified level.	
Slow speed of travel, swing, boom, arm and bucket.	· Add oil to specified level.	
Unusual noise emitted from pump.	· Clean the hydraulic tank strainer.	
Excessive oil temperature rise of hydraulic oil.	· Clean the oil cooler. · Adjust fan belt tension. · Add oil to specified level.	

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.

4) **Breaker selection guide**

Description	unit	Breaker	
Part No.	-	31Q4-81110	31Q4-81150
Operating weight (top box bracket)	kgf	929	890
Oil flow	l/min	90~110	80~110
Working pressure	kgf/cm^2	120~160	150~170
Blow rate	B.P.M	350~550	350~700
Head cap N2 gas pressure	kgf/cm^2	10~15	11~16

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 HX145LCR system is 350 kgf/cm^2 (4980 psi).

4) Adjusting oil quantity

(1) Use the breaker mode from work tool of cluster. Use select switch to control the oil flow quantity.

· Setting oil quantity (110 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.

Oil quantity setting

145ZF3CD230A

5) The accumulator should be used to the breaker charging and return line.
If the accumulator is not used, it will be damage as the input wave is delivered.

※ **Keep the pressure pulsation of pump below 60 kgf/cm^2 (853 psi) by installing the accumulator.**

6) Do not connect the breaker return line to the main control, but connect to the return line front of the cooler.

7) Do not connect the breaker return line to drain lines, such as of swing motor, travel motor or pump, otherwise they should be damaged.

8) One of spool of the main control valve should be connected to the tank.

9) Select the size of pipe laying considering the back pressure.

10) Shimless tube should be used for the piping. The hose and seal should be used HD Hyundai Construction Equipment genuine parts.

11) Weld the bracket for pipe clamp to prevent damage caused by vibration.

3. MAINTENANCE

1) MAINTENANCE OF HYDRAULIC OIL AND FILTER

(1) As machine with an hydraulic breaker provides the hydraulic oil becomes severely contaminated.

(2) So, unless frequently maintained, the machine may easily go out of order.

(3) Inspect and maintain hydraulic oil and 3 kinds of filter elements in particular, in order to prolong machine life.

2) RELEASE 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 pressure still remains, the lifetime of the diaphragm in the accumulator will be shortened.

3) Be careful to prevent contamination by dust, sand and etc.

If such pollution become mixed into the oil, the pump moving parts will wear abnormally, shorten lifetime and become damaged.

4) When operating breaker, bolts and nuts of main equipment may be loosened by vibration. So, 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

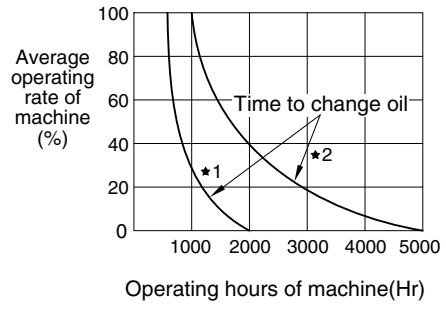
● **Replace following filter same time**

· Hydraulic return filter : 1 EA

· Pilot line filter : 1 EA

· Drain filter cartridge : 1 EA

Hyd oil change guide for hydraulic breaker



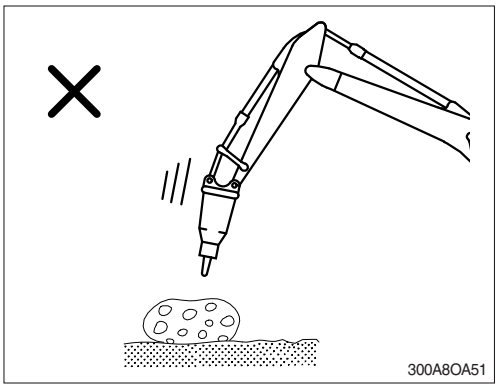
★1 : Conventional hydraulic oil

★2 : HD Hyundai Construction Equipment genuine long life hydraulic oil

4. PRECAUTIONS WHILE OPERATING THE BREAKER

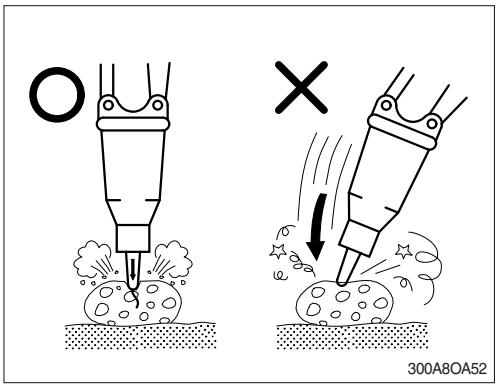
DO NOT BREAK ROCK WHILE LOWERING

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.



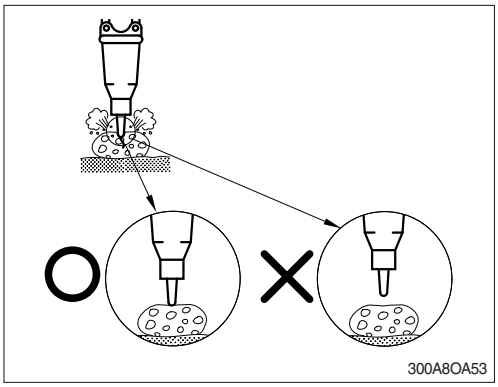
DIRECTION OF THRUST

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.

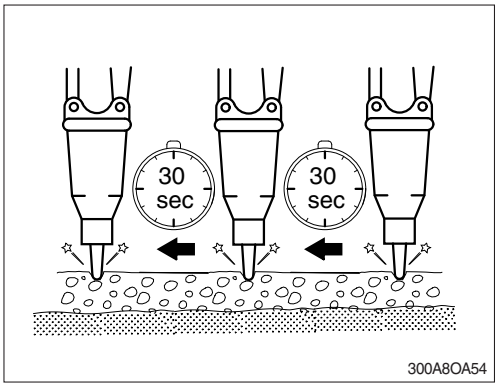


PROPER THRUST

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.

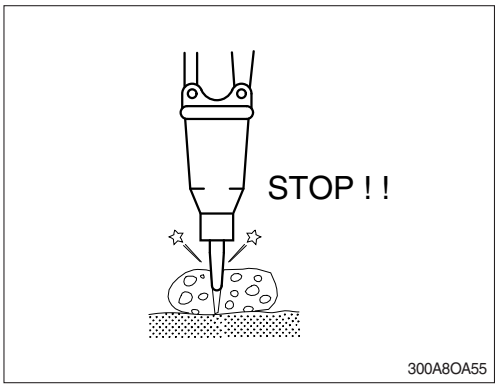


Move the impact point from the edge to the interior. Never try to break off a too large block, if the object has not broken within 30 seconds. The object should be broken up piece by piece in small blocks. Large distance steps will not improve working results.
Operating the breaker longer than 30 seconds may cause damage to the breaker.



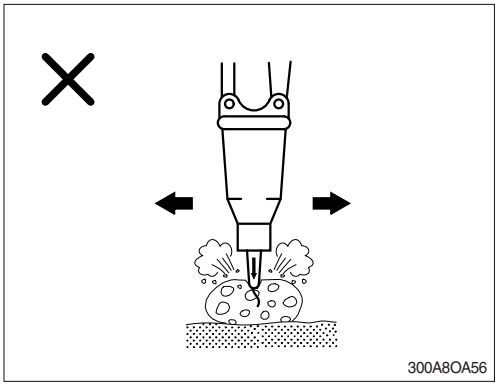
BLANKS THRUST

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.



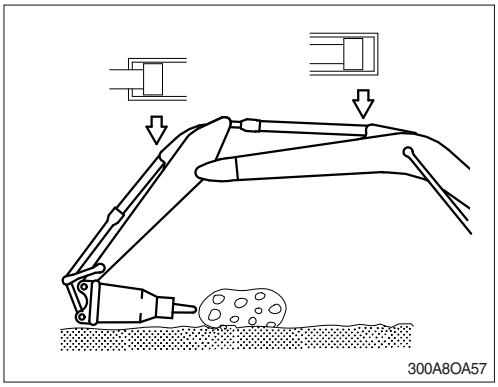
DO NOT MOVE MACHINE OR BREAKER WHILE STRIKING

Do not move hammer while striking.
This will cause damage to the working device and the swing system.



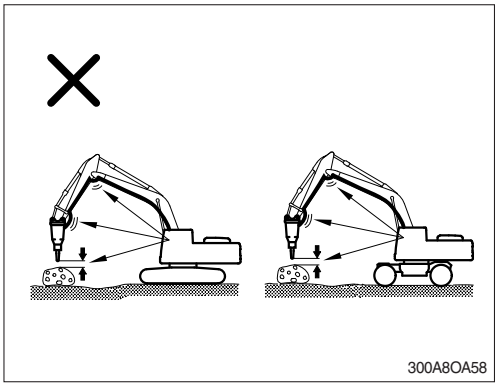
OPERATE BREAKER WITH A GAP IN EXCESS OF 100 mm (4 inches) FROM THE END OF THE STROKE TIP

If breaker is operated with the end tip, the cylinder may be damaged.



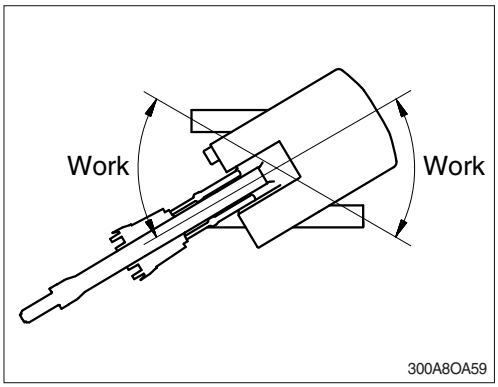
STOP THE OPERATION IMMEDIATELY IF HOSES VIBRATE EXCESSIVELY

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 Hyundal 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.

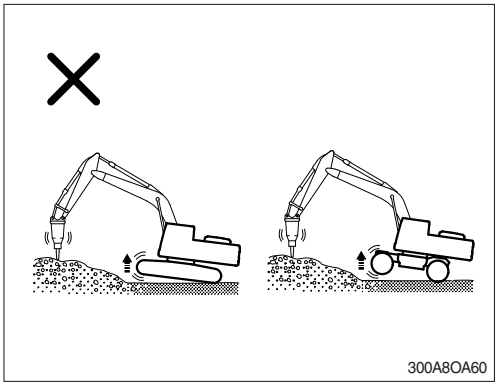


DO NOT WORK WHILE IN A SWING STATE

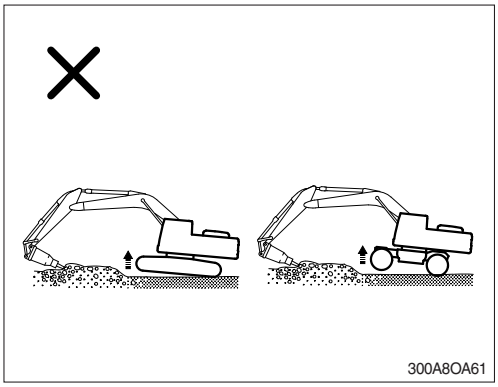
Do not work while swinging the upper structure. It cause oil leakage of the bend in the track shoe and rollers.



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.

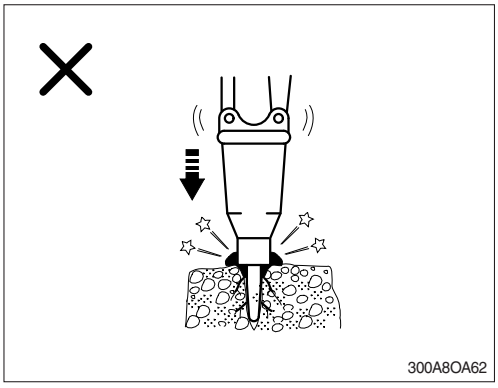


Do not extend the bucket cylinder fully and thrusting to raise the machine off the ground.



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.



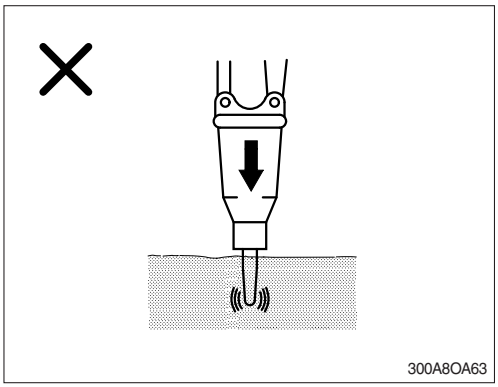
NEVER DRIVE THE CHISEL INTO THE GROUND

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.

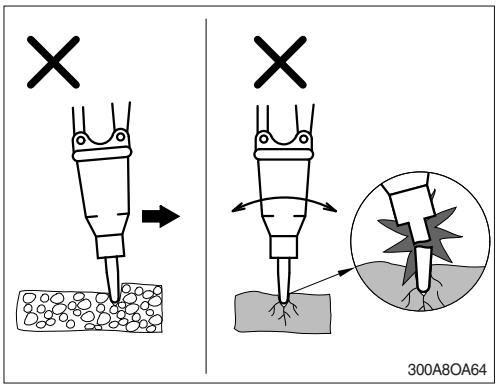


NEVER USE AS A LEVER

Do not use the chisel as a lever; e.g. crowbar, as this will cause the chisel to break.

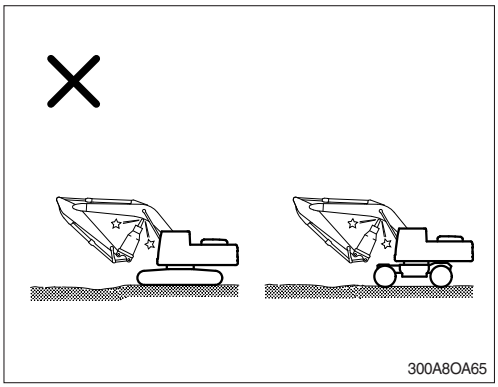
Under any circumstances, operating in this way is not permitted.

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

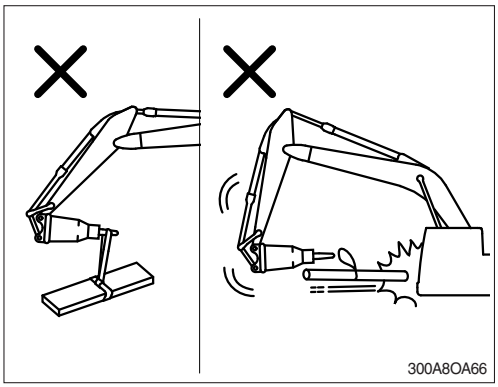
Be aware of clearance between breaker tip and the underside of boom as shown.



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.

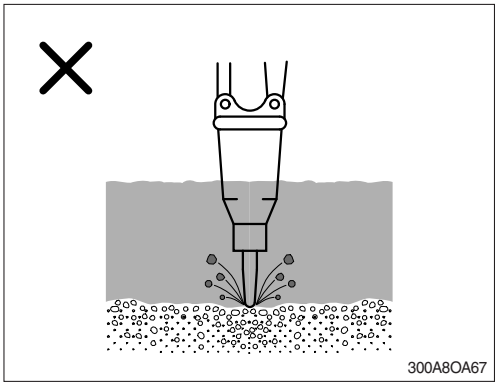


NEVER USE THE HYDRAULIC BREAKER UNDER WATER

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.

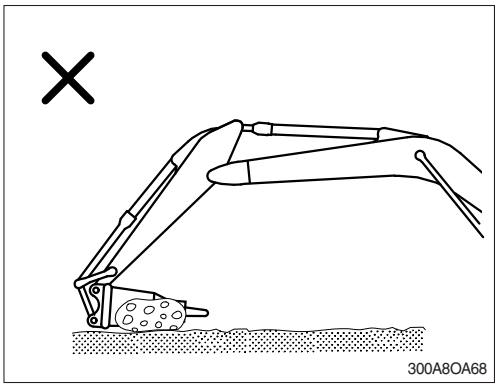
To operate the breaker under water, compressed air must be supplied into the breaker, into the impact chamber of the front-head, prior to use.

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.

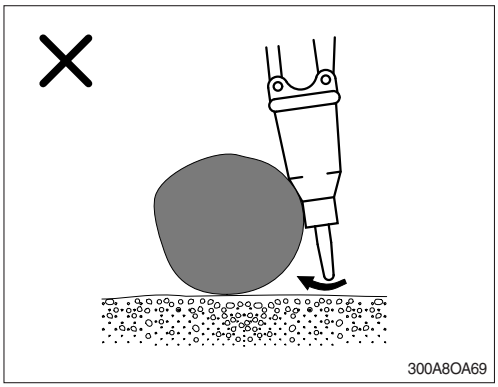


NEVER USE THE CHISEL OR HYDRAULIC BREAKER TO MOVE ROCKS OR OTHER OBJUCTS

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.

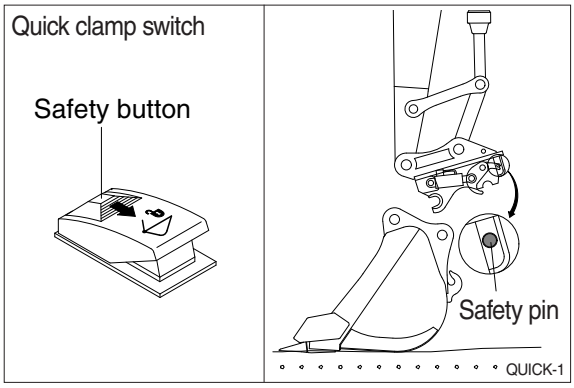


5. QUICK CLAMP

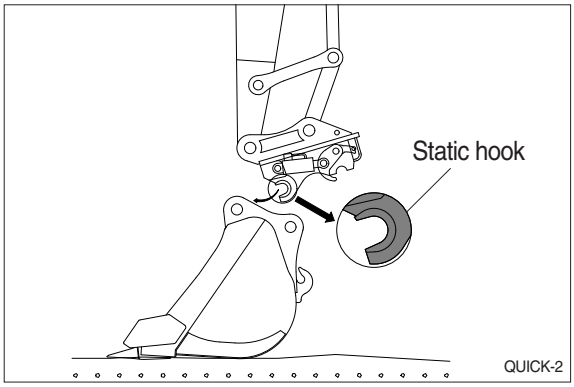
1) FIXING BUCKET WITH QUICK CLAMP

(1) Before fixing bucket, remove safety pin of the moving hook.

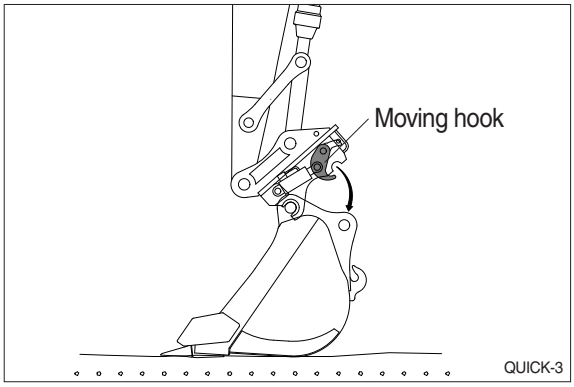
(2) Pulling safety button, press the quick clamp switch to unlock position. Then, the moving hook is placed on release position.



(3) Aligning the arm and bucket, insert static hook of quick clamp to the bucket pin.

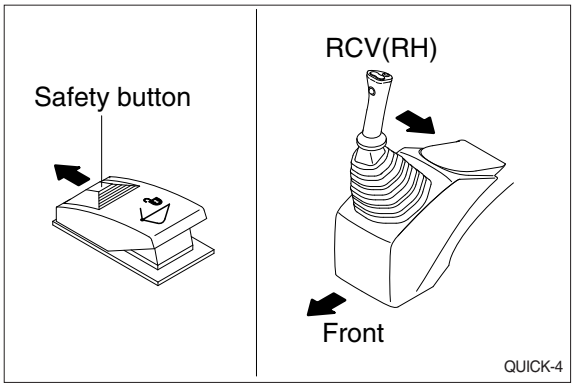


(4) Operate RCV lever to bucket-in position. Then, the moving hook is coupled with the bucket link pin.
Make sure that the moving hook is completely contacted with bucket link pin.

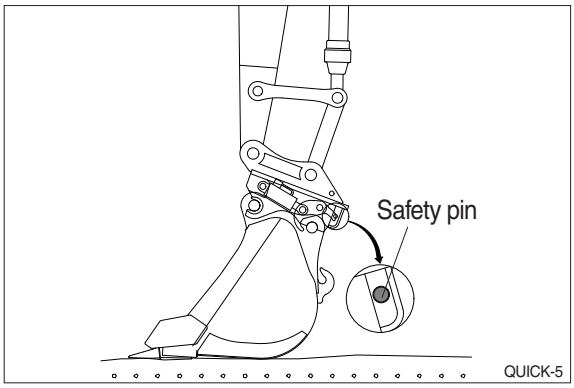


(5) Push safety button to lock position.
Operate RCV lever to bucket-in position.

※ **Be sure to check connection status between bucket pins and hooks of quick clamp.**



(6) After checking the connection status between bucket pins and hooks of quick clamp, **insert safety pin of moving hook to lock position.**

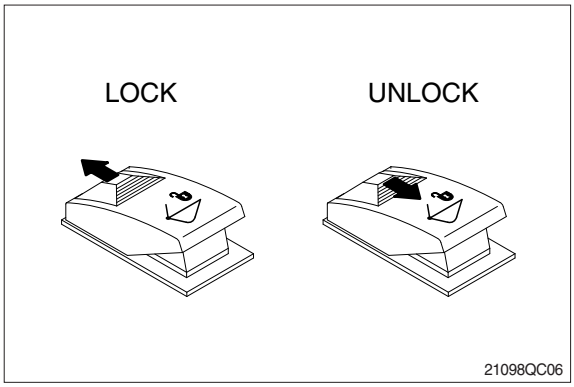


2) REMOVE BUCKET FROM QUICK CLAMP

Removing procedure is reverse of fixing.

3) PRECAUTION OF USING QUICK CLAMP

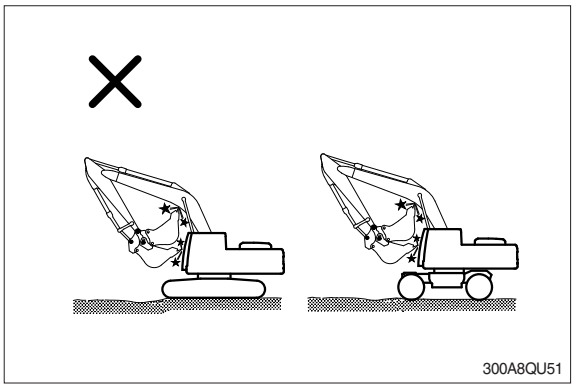
⚠ **When operating the machine with quick clamp, confirm that the quick clamp switch is lock position and safety pin of moving hook is inserted.**
Operating the machine with quick clamp switch unlocked and without safety pin of moving hook can cause the bucket to drop off and bring about the accident.



⚠ **Serious injury or death can result from this accident.**

⚠ **Be careful to operate the machine equipped with quick clamp. The bucket may hit cab, boom and boom cylinders when it reaches vicinity of them.**

HD Hyundai Construction Equipment will not be responsible for any injury or damage in case that safety pin is not installed properly.



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