

CONTENTS

| | | | |
|--|------|--|------|
| Foreword | 0-1 | 7. Efficient working method | 4-27 |
| Before servicing this machine | 0-2 | 8. Operation in the special work sites | 4-32 |
| EC regulation approved | 0-3 | 9. Normal operation of excavator | 4-34 |
| Table to enter S/No and distribution | 0-4 | 10. Attachment lowering | 4-35 |
| Safety labels | 0-5 | 11. Storage | 4-36 |
| Machine data plate | 0-18 | 12. RCV lever operating pattern | 4-38 |
| Guide (direction, S/No, symbol) | 0-19 | 13. Switching hydraulic attachment circuit | 4-39 |

SAFETY HINTS

| | |
|---------------------------------------|------|
| 1. Before operating the machine | 1-1 |
| 2. During operating the machine | 1-16 |
| 3. During maintenance | 1-23 |
| 4. Parking | 1-26 |

SPECIFICATIONS

| | |
|---|------|
| 1. Major components | 2-1 |
| 2. Specifications | 2-2 |
| 3. Working range | 2-3 |
| 4. Weight | 2-5 |
| 5. Lifting capacities | 2-7 |
| 6. Bucket selection guide | 2-8 |
| 7. Specification for major components | 2-10 |
| 8. Recommended oils | 2-13 |

CONTROL DEVICES

| | |
|-------------------------------------|------|
| 1. Cab devices | 3-1 |
| 2. Cluster | 3-2 |
| 3. Switches | 3-34 |
| 4. Levers and pedals | 3-45 |
| 5. Air conditioner and heater | 3-48 |
| 6. Others | 3-55 |

OPERATION

| | |
|---|------|
| 1. Suggestion for new machine | 4-1 |
| 2. Check before starting the engine | 4-2 |
| 3. Starting and stop the engine | 4-3 |
| 4. Mode selection system | 4-10 |
| 5. Operation of the working device | 4-20 |
| 6. Traveling of the machine | 4-21 |

TRANSPORTATION

| | |
|---|-----|
| 1. Road traveling | 5-1 |
| 2. Preparation for transportation | 5-2 |
| 3. Dimension and weight | 5-3 |
| 4. Loading the machine | 5-5 |
| 5. Fixing the machine | 5-7 |
| 6. Loading and unloading by crane | 5-8 |

MAINTENANCE

| | |
|---------------------------------------|------|
| 1. Instruction | 6-1 |
| 2. Tightening torque | 6-6 |
| 3. Fuel, coolant and lubricants | 6-9 |
| 4. Maintenance check list | 6-11 |
| 5. Maintenance chart | 6-16 |
| 6. Service instruction | 6-18 |
| 7. Electrical system | 6-42 |
| 8. Air conditioner and heater | 6-45 |

TROUBLESHOOTING GUIDE

| | |
|----------------------------|-----|
| 1. Engine | 7-1 |
| 2. Electrical system | 7-2 |
| 3. Others | 7-3 |

HYDRAULIC BREAKER AND QUICK CLAMP

| | |
|---|-----|
| 1. Selecting hydraulic breaker | 8-1 |
| 2. Circuit configuration | 8-2 |
| 3. Maintenance | 8-3 |
| 4. Precaution while operating the breaker | 8-4 |
| 5. Quick clamp | 8-6 |

| | |
|-------------|-----|
| INDEX | 9-1 |
|-------------|-----|

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 Hyundai 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.

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

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

We expressly point out that Hyundai will not accept any responsibility for defects resulting from non-genuine parts or non workmanlike repair.

In such cases Hyundai 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 Hyundai or your Hyundai distributor for the latest available information for your machine or for questions regarding information in this manual.

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.

Hyundai 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.

EC REGULATION APPROVED

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

LWA : 103dB (EU only)

LPA : 71dB

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



EC Declaration of Conformity

1. HYUNDAI CONSTRUCTION EQUIPMENT EUROPE N.V VOSSENDAAL 11, 2440 GEEL (Belgium), as authorized representative in the European Community of HYUNDAI CONSTRUCTION EQUIPMENT Co. Ltd.(Korea)

certifies that the construction equipment machinery.

Machine Type : *****

Brand : HYUNDAI

Model : *****

Serial No : ***

Year of Manufacturing : 20**

2. Manufacturer

Hyundai Construction Equipment Co. Ltd.
12th, Fl., Hyundai Bldg. 75, Yulgok-ro, Jongno-Gu, Seoul,
Republic of Korea

Authorized representative :
Owner of the technical file for
machine production

HYUNDAI CONSTRUCTION EQUIPMENT EUROPE N.V.
VOSSENDAAL 11, 2440 GEEL
BELGIUM

3. Harmonized European directives :

2006/42/EC (Machinery), 97/68/EC (Exhaust Gas Emission),
2004/108/EC (Electromagnetic Compatibility), 200/14/EC (Noise
Emission)

4. Engine Manufacturer :

Engine Type :

Gross Power :

*** kW / **** rpm (SAE J1995)

Net Power :

*** kW / **** rpm (SAE J1349)

5. Noise level (Noise Emission Directive 2000/14/EC)

Certificate No :

Issue Date :

DD/MM/YYYY

Conformity Assesment Procedure :

Notified Body Involved :

Measured Sound Power Level :

** dB(A)

Guaranteed Sound Power Level :

** dB(A)

6. EMC Certification (EMC Directive 2004/108/EC)

Certificate No :

Issued Date :

DD/MM/YYYY

Notified Body Involved :

Standard(s) :

7. Remarks

J. C. JUNG

MANAGING DIRECTOR

Place and date of issue :

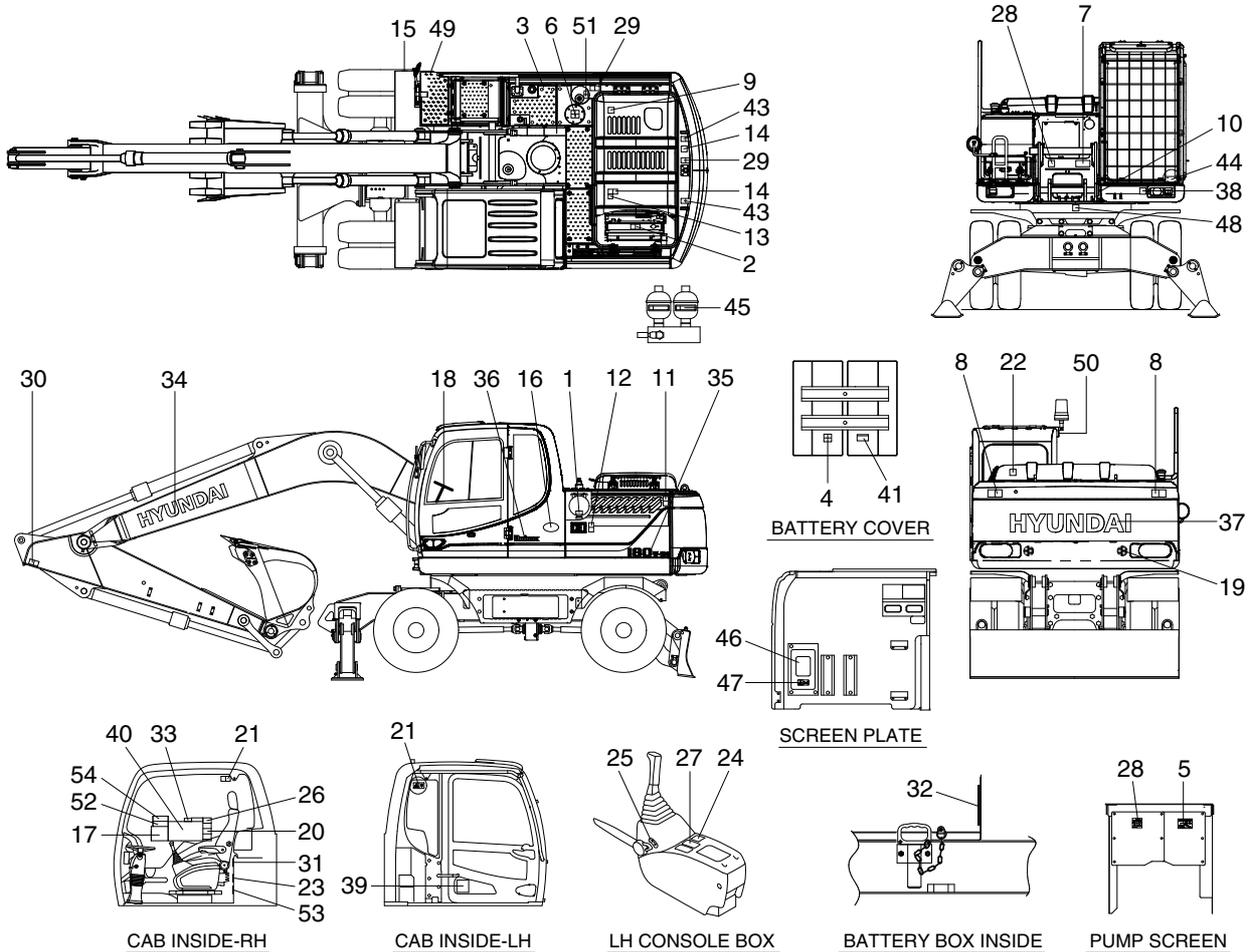
TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

| | |
|-----------------------------------|---|
| Machine Serial No. | |
| Engine Serial No. | |
| Manufacturing year | |
| Manufacturer Address | Hyundai Construction Equipment co., Ltd. 12th, Fl., Hyundai Bldg. 75, Yulgok-ro, Jongno-Gu, Seoul, 03058, Korea |
| Distributor for U.S.A Address | Hyundai Construction Equipment U.S.A, Inc 6100 Atlantic Boulevard Norcross GA 30071 U.S.A |
| Distributor for Europe Address | Hyundai Construction Equipment Europe N. V. Vossendal 11 2240 Geel Belgium |
| Dealer Address | |

SAFETY LABELS

1. LOCATION

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



- | | | |
|--------------------------------|-----------------------------|--|
| 1 Air cleaner filter | 18 Steering wheel | 35 Model name |
| 2 Radiator cap | 19 Reflecting | 36 Logo (ROBEX) |
| 3 Fueling | 20 Ref operator's manual | 37 Trade mark (CWT) |
| 4 Battery accident | 21 Safety front window | 39 Service instruction |
| 5 Hydraulic oil level | 22 Safety rear window | 40 Lifting chart |
| 6 Hydraulic oil lubrication | 23 Air conditioner filter | 41 Electric welding |
| 7 Reduction gear grease | 24 Console box tilting | 43 Lifting eye |
| 8 Keep clear-rear | 25 Safety lever | 45 Accumulator |
| 9 Turbocharger cover | 26 Clamp locking | 47 RCV-lever pattern |
| 10 Name plate | 27 Ideogram-dozer/outrigger | 48 Swing bearing |
| 11 Keep clear-side | 28 High pressure hose | 49 Battery position |
| 12 Stay fix | 29 Falling | 50 Beacon lamp |
| 13 Shearing-engine hood | 30 Keep clear-boom/arm | 51 Fuel shut off |
| 14 No step-engine hood and CWT | 31 Hammer | 52 Caution (water separator, turbocharger) |
| 15 Transporting | 32 Swing ideogram | 53 MCU connector |
| 16 Low emission engine | 33 Swing lock | 54 Air compressor-cab |
| 17 Control ideogram | 34 Trade mark (boom) | |

18W9S0SL01

2. DESCRIPTION

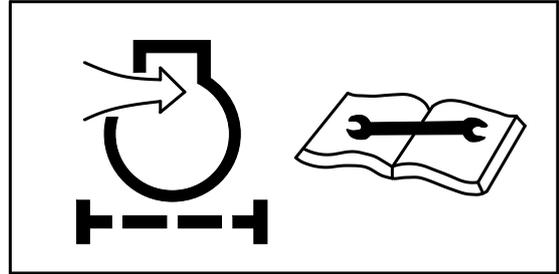
There are several specific warning labels on this machine please become familiarized with all warning labels.

Replace any safety label that is damaged, or missing.

1) AIR CLEANER FILTER (item 1)

This warning label is positioned on the air cleaner cover.

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



21070FW01

2) RADIATOR CAP (item 2)

This warning label is positioned on the radiator.

- ▲ **Never open the filler cap while engine running or at high coolant temperature.**

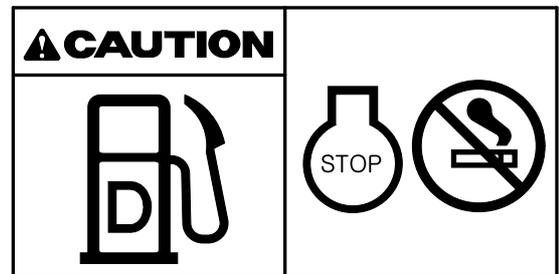


14070FW03

3) FUELING (item 3)

This warning label is positioned on the fuel filler neck.

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



21070FW04

4) BATTERY ACCIDENT (item 4)

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.**
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 terminals with a wet hand.**

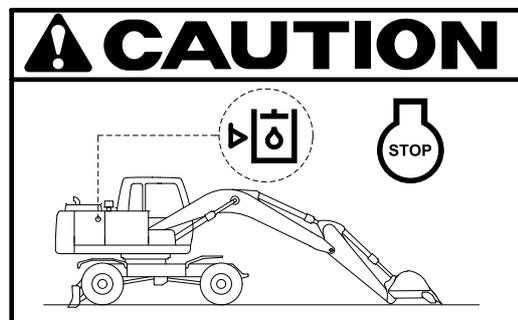


36070FW05

5) HYDRAULIC OIL LEVEL (item 5)

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.**



20W70FW07A

6) HYDRAULIC OIL LUBRICATION (item 6)

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 engine running or at high hydraulic oil temperature.
- ▲ Loosen the cap slowly and release internal pressure completely.

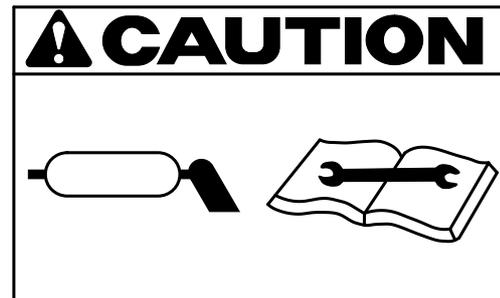


21070FW08

7) REDUCTION GEAR GREASE (item 7)

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.

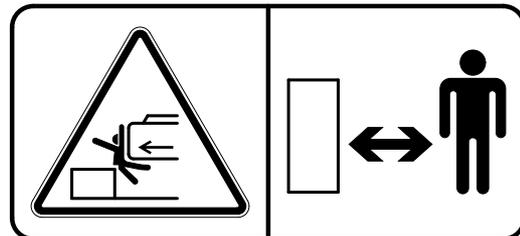


21070FW35

8) KEEP CLEAR-REAR (item 8)

This warning label is positioned on the counterweight.

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



21090FW09

9) TURBOCHARGER COVER (item 9)

This warning label is positioned on the turbocharger cover.

- ▲ Do not touch turbo charger or it may cause severe burn.



21070FW02

10) KEEP CLEAR-SIDE (item 11)

This warning label is positioned on the LH 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

11) STAY FIX (item 12)

This warning label is positioned on the both 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.**

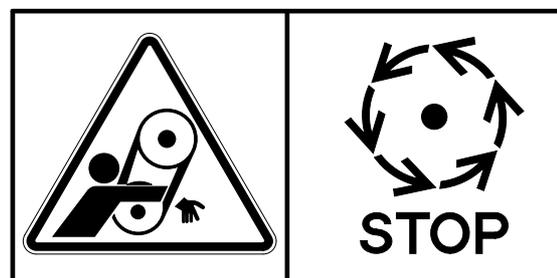


21070FW14

12) SHEARING-ENGINE HOOD (item 13)

This warning label is positioned on the engine hood.

- ⚠ **Do not open the engine hood during the engine's running.**
- ⚠ **Do not touch exhaust pipe or it may cause severe burn.**

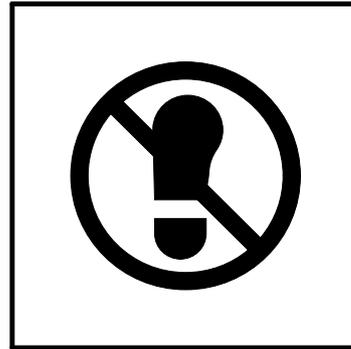


21070FW15

13) NO STEP-ENGINE HOOD/CWT (item 14)

This warning labels are positioned on the engine hood and counterweight.

- ⚠ Do not step on the engine hood and counterweight.

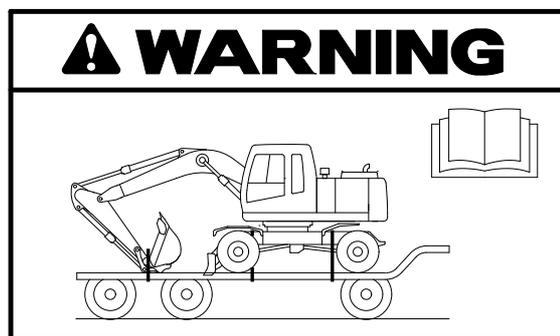


21070FW16

14) TRANSPORTING (item 15)

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 5-7 for details.

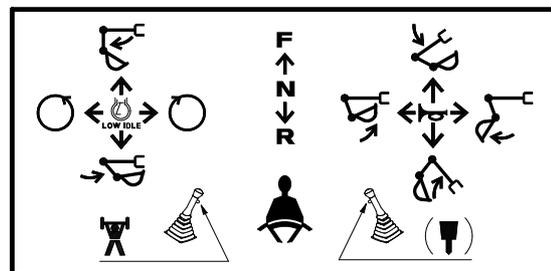


20W70FW17

15) CONTROL IDEOGRAM (item 17)

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 4-20 for details.



20W70FW19

16) 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.

(2) MAX HEIGHT

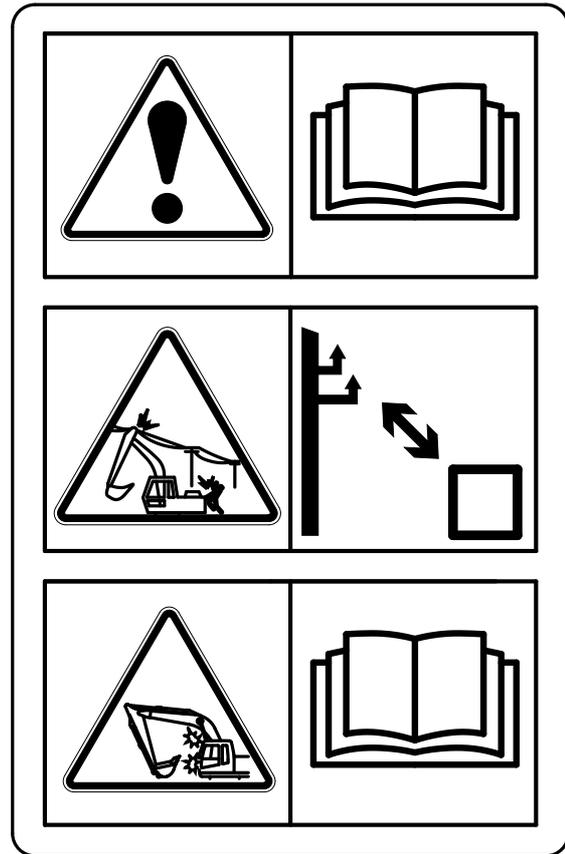
▲ Serious injury or death can result from contact with electric lines.

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.

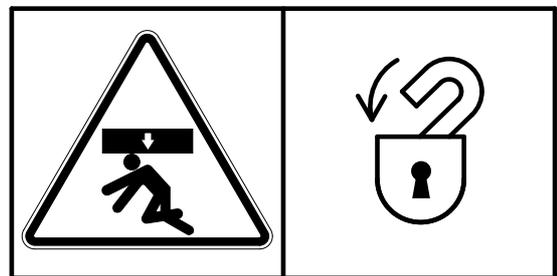


2609A0SL05

17) SAFETY FRONT WINDOW (item 21)

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

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



21070FW24

18) SAFETY REAR WINDOW (item 22)

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

※ The rear window serves us an alternate exit.

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

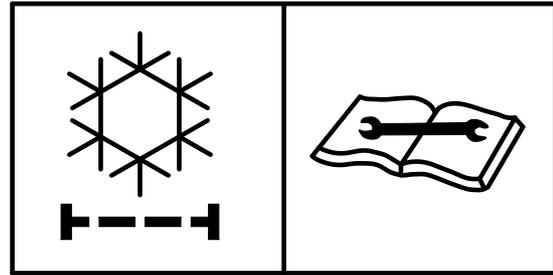


2609A0SL02

19) AIR CONDITIONER FILTER (item 23)

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.**

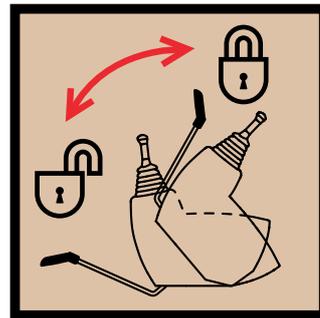


21070FW26

20) CONSOLE BOX TILTING (item 24)

This warning label is positioned on the LH console box.

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

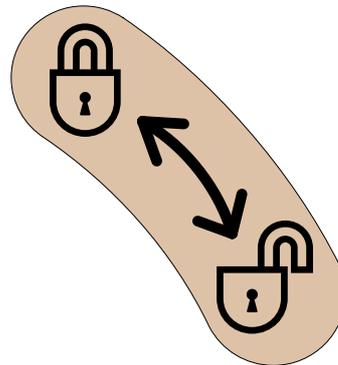


30007A1FW06

21) SAFETY LEVER (item 25)

This warning label is positioned on the cover of the safety lever.

- ▲ **Before you get off the machine be sure to place the safety lever LOCKED position.**

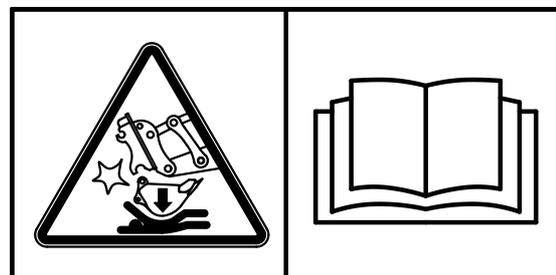


30007A1FW07A

22) CLAMP-LOCKING (item 26)

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.**

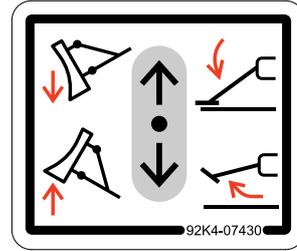


14070FW60

23) DOZER/OUTRIGGER IDEOGRAM (item 27)

This warning label is positioned on the LH console box.

- ※ See page 4-20 for details.
- ※ Guidelines for using the general dozer blade.
 - Be careful not to apply an excessive load when using a blade.
 - Avoid impacts and loads on the bottom due to machine modification or excessive working conditions.
 - Check the BLADE UP status before traveling the machine.
 - Avoid any collision with the upper working device and the blade.
 - Do not move machine in the blade jack up state.
 - When using blade jack up, use it in an environment where the ground is not rough and the machine and ground are same level.



92K4-07430

24) HIGH PRESSURE HOSE (item 28)

This warning label is positioned on the screen plate.

- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Study the service manual before service job.



14070FW29

25) FALLING (item 29)

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

26) KEEP CLEAR-BOOM/ARM (item 30)

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

- ▲ **Serious injury or death can result from falling of the attachment.**
- ▲ **To prevent serious injury or death, keep clear the underneath of attachment.**

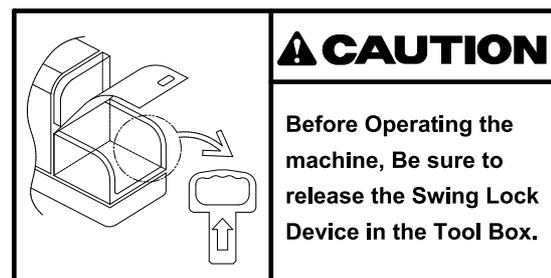


14070FW31

27) SWING IDEOGRAM (item 32)

This warning label is positioned in the tool box.

- ▲ **Before you operating the machine, be sure to release the swing lock pin in the tool box.**

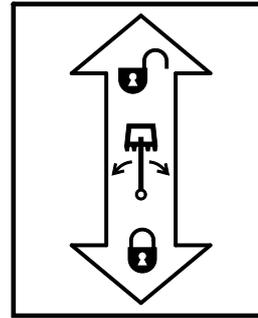


20W70FW63

28) SWING LOCK (item 33)

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

- ▲ **Before you leaving the machine, always place the swing lock pin securely in the LOCK position.**

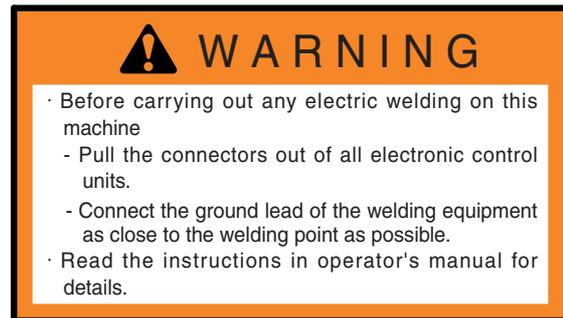


20W70FW64

29) ELECTRIC WELDING (item 41)

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.**

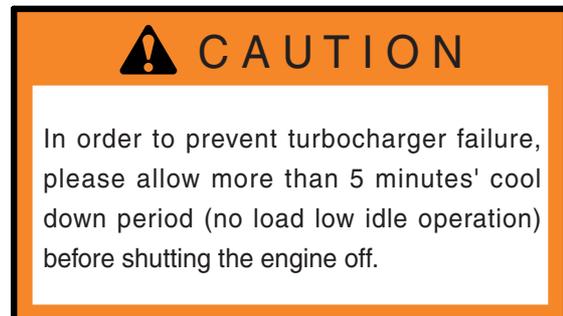


7807AFW20

30) TURBOCHARGER (item 42)

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

- ▲ **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.**

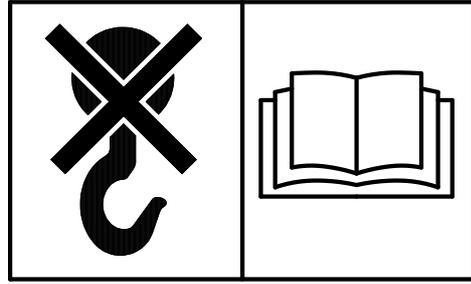


7807AFW20

31) LIFTING EYE (item 43)

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.



21070FW10

32) ACCUMULATOR (item 45)

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 Hyundai distributor.

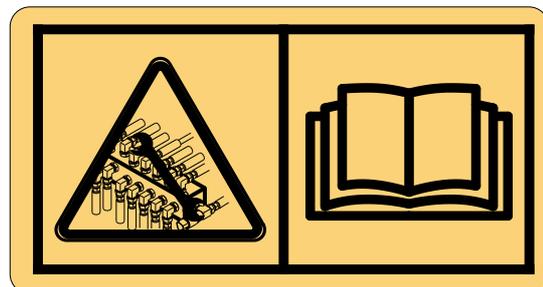


1107A0FW46

33) RCV LEVER PATTERN (item 47)

This warning label is positioned on the screen plate.

- ※ See page 4-29 for details.

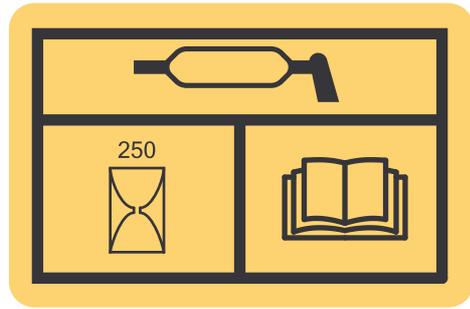


14W90FW47

34) SWING BEARING (item 48)

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

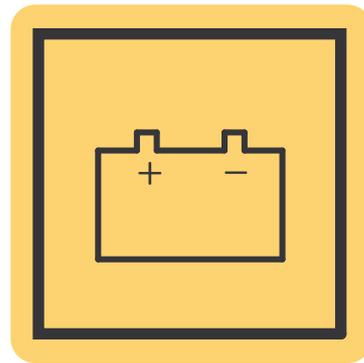
- ※ See page 6-33 for details.



38090FW04

35) BATTERY POSITION (item 49)

This warning label is positioned right side of tool box.

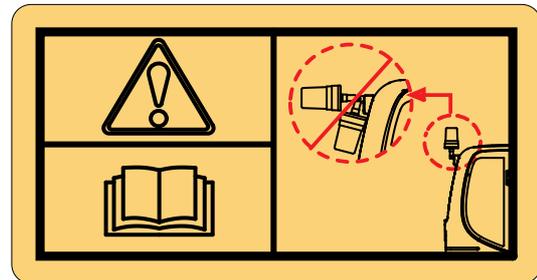


38090FW03

36) BEACON LAMP (item 50)

This warning label is positioned on the right outside of the cabin.

- ※ Make sure the beacon lamp maintains a vertical position. A horizontal position can result in a decrease in life time of the lamp due to the infiltration of foreign substances such as dust or water.
- ※ While the machine transfer, the beacon lamp is easy to break. In that case, change the position of the lamp to the horizontal.

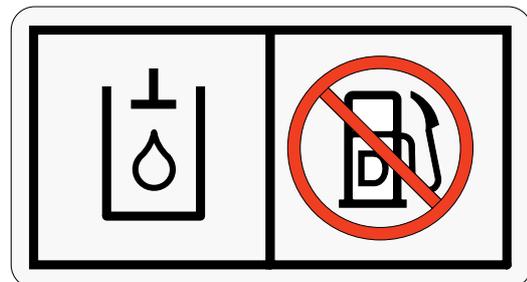


140Z90FW49

37) FUEL SHUT OFF (item 51)

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

- ※ Fill only the hydraulic oil.
- ※ Do not fill the diesel fuel.

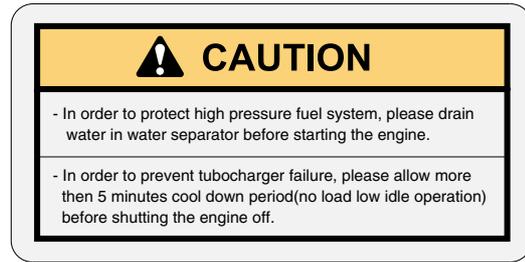


140WH90FW51

38) CAUTION (W/SEPARATOR, TURBOCHARGER) (item 52)

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

39) MCU CONNECTOR (item 53)

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

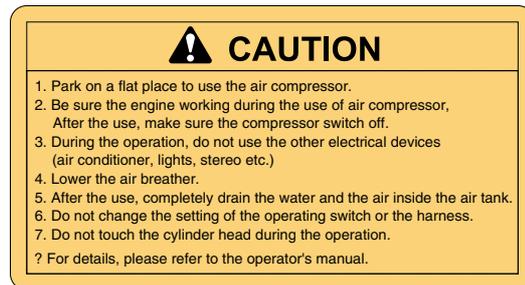
- ※ **MCU communicates the machine data with Laptop computer through RS232 service socket.**
- ※ **See page 3-67 for details.**



1409S0FW52

40) AIR COMPRESSOR-CAB (item 54)

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



18W9S0FW54

MACHINE DATA PLATE



FOR EU ONLY

21090FW10

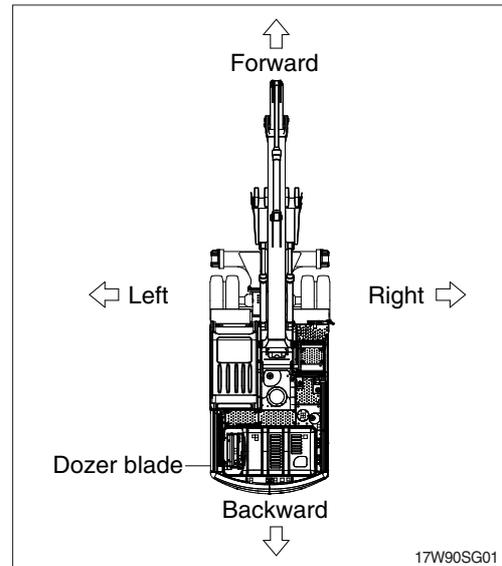
- | | | | | | |
|---|----------------------|---|-------------------------------|---|--------------|
| 1 | Machine type / model | 2 | Product identification number | 3 | Engine power |
| 4 | Operating mass | 5 | Manufacturing year | | |

※ 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 HYUNDAI 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 dozer blade is in the rear and machine is on the traveling direction.

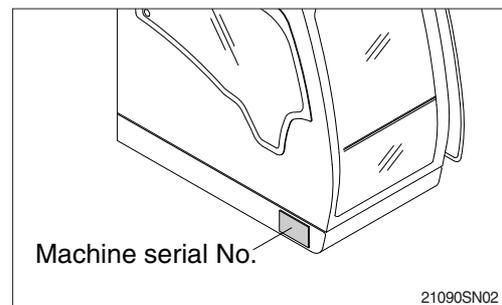


2. SERIAL NUMBER

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

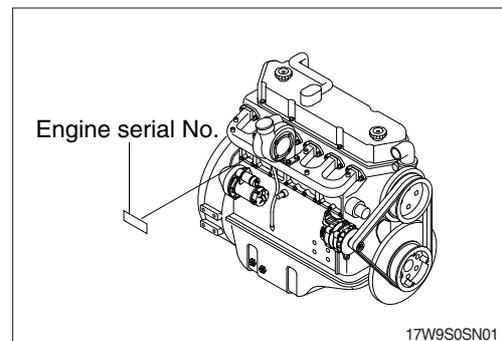
1) MACHINE SERIAL NUMBER

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.

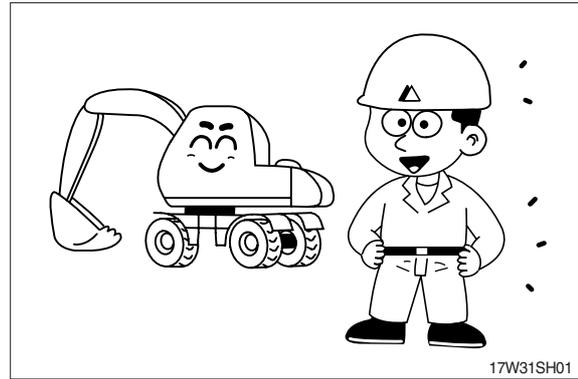
SAFETY HINTS

1. BEFORE OPERATING THE MACHINE

Think-safety first.

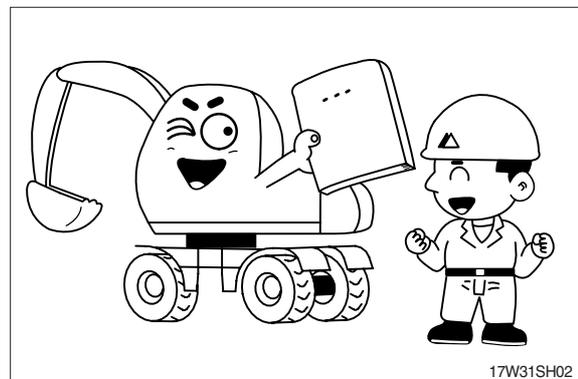
In special situation, wear protective clothing including a safety helmet, safety shoes, gloves, safety glasses and ear protection as required by the job condition.

Almost every accident is caused by disregarding the simple and fundamental safety hints.



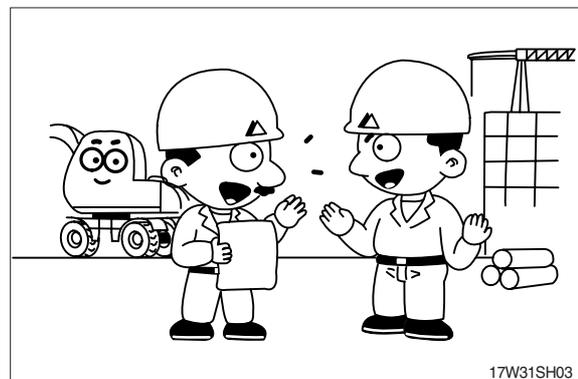
Be sure to understand thoroughly all about the operator's manual before operating the machine.

Proper care is your responsibility.

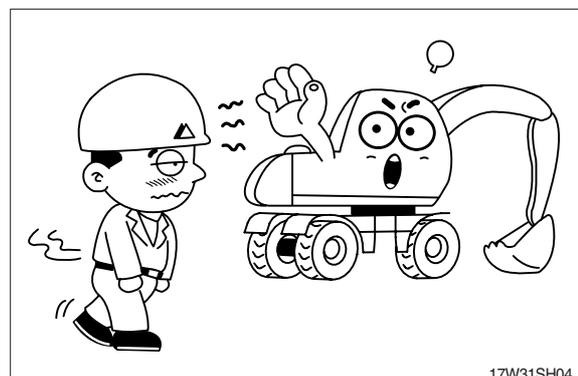


Fully understand the details and process of the construction before starting the work.

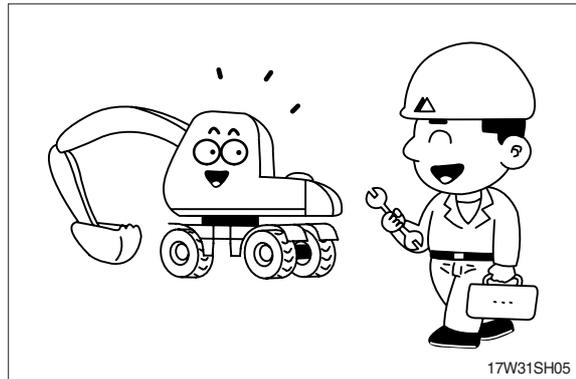
If you find anything dangerous on the job, consult with the job supervisor for the preventive measures before operating the machine.



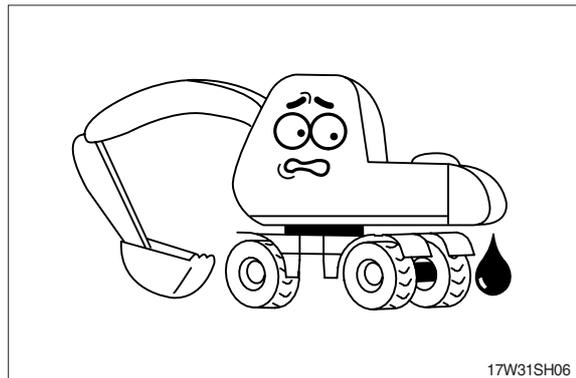
Do not operate when tired, or after drinking alcoholic beverages or any type of drugs.



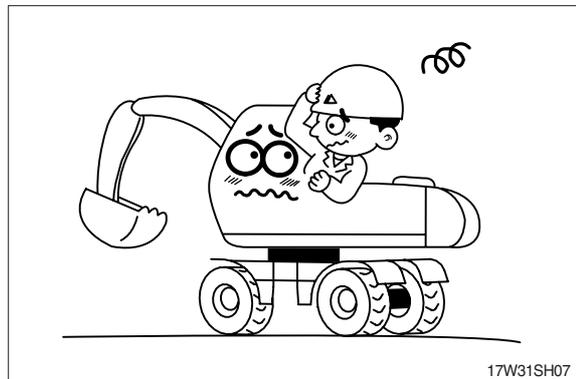
Check daily according to the operation manual.
Repair the damaged parts and tighten the loosened bolts.



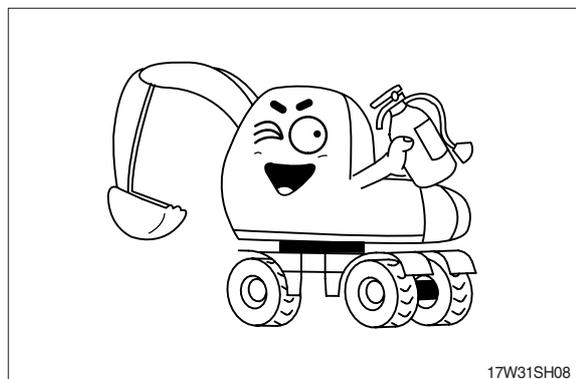
Check for leakage of engine oil, hydraulic oil,
fuel and coolant.
Keep machine clean, clean machine regularly.



Do not operate the machine if it requires repairs.
Operate after complete repair.



Be prepared if a fire starts.
Keep a fire extinguisher handy and emergency
numbers for a fire department near your tele-
phone.

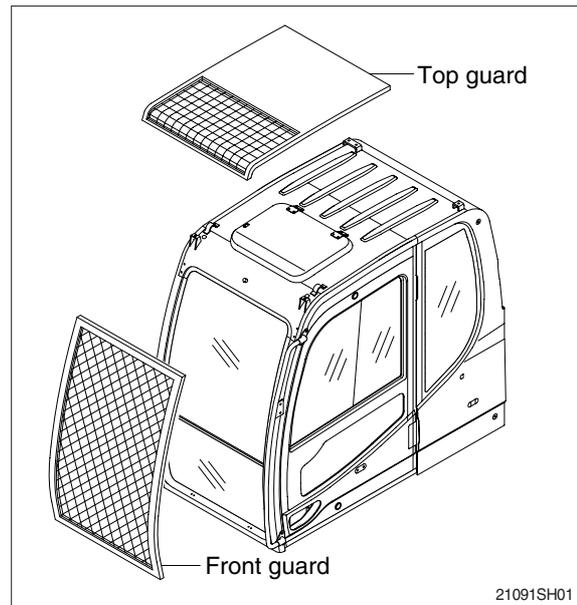


PROTECTION AGAINST FALLING OR FLYING OBJECTS

If there is any danger of falling or flying objects hitting the operator, install protective guards in place to protect the operator as required for each particular situation.

Be sure to close the front window before commencing work.

Make sure to keep all persons other than operator outside the range of falling or flying objects. In case you need top guard, front guard and FOPS (falling object protective structure), please contact Hyundai distributor in Europe.



UNAUTHORIZED MODIFICATION

Any modification made without authorization from Hyundai can create hazards.

Before making a modification, consult your Hyundai distributor. Hyundai will not be responsible for any injury or damage caused by any unauthorized modification.

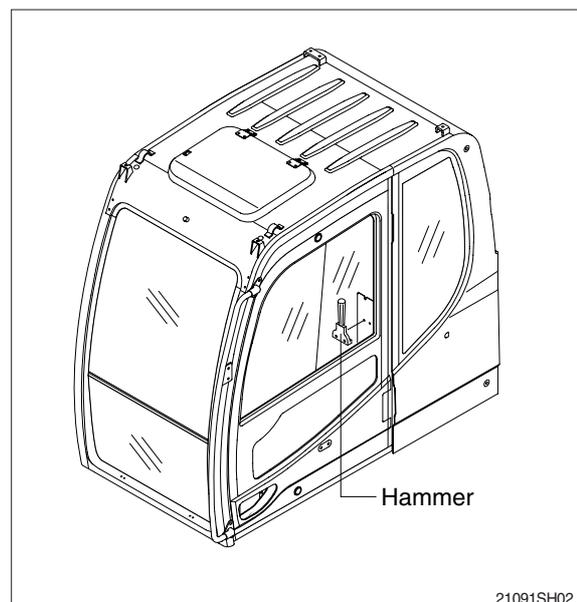
PREPARE FOR EMERGENCY

Only in case of emergency, use the installed hammer for breaking the windshield of the cab, and then exit carefully.

Have a fire extinguisher and first aid kit ready for emergencies such as fires or accidents.

Learn how to use the fire extinguisher.

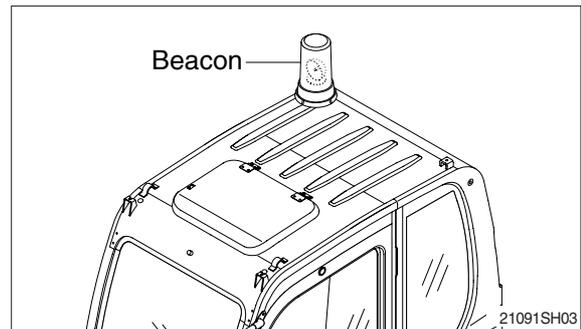
Be sure you know the phone numbers of persons you should contact in case of an emergency.



ROTATING BEACON

When you operate a machine on a road or beside a road, a rotating beacon is required to avoid any traffic accident.

Please contact your Hyundai distributor to install it.



PRECAUTIONS FOR ATTACHMENTS

When installing and using an optional attachment, read the instruction manual for the attachment and the information related to attachments in this manual.

Do not use attachments that are not authorized by Hyundai or your Hyundai distributor. Use of unauthorized attachments could create a safety problem and adversely affect the proper operation and useful life of the machine.

Any injuries, accidents, product failures resulting from the use of unauthorized attachments are not the responsibility of Hyundai.

The stability of this machine is enough to be used for general work. When you operate this machine, allow for the lifting capacity tables. If you want to use other special applications (not covered in this manual), you have to attach additional counterweight or be cautious while running the machine.

SAFETY RULES

Only trained and authorized personnel can operate and maintain the machine.

Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.

When working with another operator or a person on worksite traffic duty, be sure all personnel understand all hand signals that are to be used.

SAFETY FEATURES

Be sure all guards and covers are in their proper position. Have guards and covers repaired if damaged.

Use safety features such as safety lock and seat belts properly.

Never remove any safety features. **Always** keep them in good operating condition.

Improper use of safety features could result in serious bodily injury or death.

MACHINE CONTROL PATTERN

Check machine control pattern for conformance to pattern on label in cab.

If not, change label to match pattern before operating machine.

Failure to do so could result in injury.

CALIFORNIA PROPOSITION 65

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

This product contains or emits chemicals known to the State of California to cause cancer or birth defects or other reproductive harm.

Battery posts, terminals and related accessories contain lead and lead compounds.

WASH HANDS AFTER HANDLING

Do not load the machine with the lifting eyes on the counterweight.

▲ The wrong loading method can result in serious bodily injury or death.



13031SH55

FIRE PREVENTION AND EXPLOSION PREVENTION

Regeneration

The exhaust gas temperatures during regeneration will be elevated. Follow proper fire prevention instructions and use the disable regeneration function when appropriate.

General

All fuels, most lubricants, and some coolant mixtures are flammable.

To minimize the risk of fire or explosion, the following actions are recommended.

Always perform a Walk-Around Inspection, which may help you identify a fire hazard.

Do not operate a machine when a fire hazard exists. Contact your dealer for service.



3001SH01

Understand the use of the primary exit and alternative exit on the machine.

Do not operate a machine with a fluid leak. Repair leaks and clean up fluids before resuming machine operation. Fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire. A fire may cause personal injury or death.

Do not weld on or drill holes in the engine cover. Flammable material such as leaves, twigs, papers, trash may accumulate in engine compartment.

Remove flammable material such as leaves, twigs, papers, trash and so on. These items may accumulate in the engine compartment or around other hot areas and hot parts on the machine.

Keep the access doors to major machine compartments closed and access doors in working condition in order to permit the use of fire suppression equipment, in case a fire should occur.

Clean all accumulations of flammable materials such as fuel, oil, and debris from the machine.

Do not operate the machine near any flame.

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

Do not weld or flame cut on tanks or lines that contain flammable fluids or flammable material. Empty and purge the lines and tanks. Then clean the lines and tanks with a nonflammable solvent prior to welding or flame cutting. Ensure that the components are properly grounded in order to avoid unwanted arcs.

Dust that is generated from repairing nonmetallic hoods or fenders may be flammable and/or explosive. Repair such components in a ventilated area away from open flames or sparks. Use suitable Personal Protection Equipment (PPE).

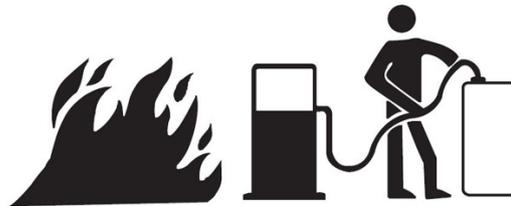
Inspect all lines and hoses for wear or deterioration. Replace damaged lines and hoses. The lines and the hoses should have adequate support and secure clamps. Tighten all connections to the recommended torque. Damage to the protective cover or insulation may provide fuel for fires.

Store fuels and lubricants in properly marked containers away from unauthorized personnel. Store oily rags and flammable materials in protective containers. Do not smoke in areas that are used for storing flammable materials.



3001SH02

Use caution when you are fueling a machine. Do not smoke while you are fueling a machine. Do not fuel a machine near open flames or sparks. Always stop the engine before fueling. Fill the fuel tank outdoors. Properly clean areas of spillage.



Never store flammable fluids in the operator compartment of the machine.

3001SH03

Battery and battery cables

The following actions are recommended to minimize the risk of fire or an explosion related to the battery.



3001SH04

Do not operate a machine if battery cables or related parts show signs of wear or damage. Contact your dealer for service.

Follow safe procedures for engine starting with jump-start cables. Improper jumper cable connections can cause an explosion that may result in injury.

Do not charge a frozen battery. This action may cause an explosion.

Gases from a battery can explode. Keep any open flames or sparks away from the top of a battery. Do not smoke in battery charging areas.

Never check the battery charge by placing a metal object across the terminal posts. Use a voltmeter in order to check the battery charge.

Daily inspect battery cables that are in areas that are visible. Inspect cables, clips, straps, and other restraint for damage. Replace any damaged parts. Check for signs of the following, which can occur over time due to use and environmental factors :

- Fraying
- Abrasion
- Cracking
- Discoloration
- Cuts on the insulation of the cable
- Fouling
- Corroded terminals, damaged terminals, and loose terminals

Replace damaged battery cable (s) and replace any related parts. Eliminate any fouling, which may have caused insulation failure or related component damage or wear. Ensure that all components are reinstalled correctly.

An exposed wire on the battery cable may cause a short ground if the exposed area comes into contact with a grounded surface. A battery cable short produces heat from the battery current, which may be a fire hazard.

An exposed wire on the ground cable between the battery and the disconnect switch may cause the disconnect switch to be bypassed if the exposed area comes into contact with a grounded surface. This action may result in an unsafe condition for servicing the machine. Repair components or replace components before servicing the machine.

▲ Fire on a machine can result in personal injury or death. Exposed battery cables that come into contact with a grounded connection can result in fires. Replace cables and related parts that show signs of wear or damage. Contact your Hyundai dealer.

Wiring

Check electrical wires daily. If any of the following conditions exist, replace parts before you operate the machine.

- Fraying
- Signs of abrasion or wear
- Cracking
- Discoloration
- Cuts on insulation
- Other damage

Make sure that all clamps, guards, clips, and straps are reinstalled correctly. This action will help to prevent vibration, rubbing against other parts, and excessive heat during machine operation.

Attaching electrical wiring to hoses and tubes that contain flammable fluids or combustible fluids should be avoided.

Consult your Hyundai dealer for repair or for replacement parts.

Keep wiring and electrical connections free of debris.

Lines, Tubes, and Hoses

Do not bend high-pressure lines. Do not strike high-pressure lines. Do not install any lines that are bent or damaged. Use the appropriate backup wrenches in order to tighten all connections to the recommended torque.

Check lines, tubes, and hoses carefully. Wear Personal Protection Equipment (PPE) in order to check for leaks. Always use a board or cardboard when you check for a leak. Leaking fluid that is under pressure can penetrate body tissue. Fluid penetration can cause serious injury and possible death. A pin hole leak can cause severe injury. If fluid is injected into your skin, you must get treatment immediately. Seek treatment from a doctor that is familiar with this type of injury.

Replace the affected parts if any of the following conditions are present :

- End fittings are damaged or leaking.
- Outer coverings are chafed or cut.
- Wires are exposed.
- Outer coverings are swelling or ballooning.
- Flexible parts of the hoses are kinked.
- Outer covers have exposed embedded armoring.
- End fittings are displaced.

Make sure that all clamps, guards, and heat shields are installed correctly. During machine operation, this action will help to prevent vibration, rubbing against other parts, excessive heat, and failure of lines, tubes, and hoses.

Do not operate a machine when a fire hazard exists. Repair any lines that are corroded, loose, or damaged. Leaks may provide fuel for fires. Consult your Hyundai dealer for repair or for replacement parts.

Ether

Ether (if equipped) is commonly used in cold weather applications. Ether is flammable and poisonous.

Do not spray ether manually into an engine if the machine is equipped with a thermal starting aid for cold weather starting.

Use ether in ventilated areas. Do not smoke while you are replacing an ether cylinder or while you are using an ether spray.

Do not store ether cylinders in living areas or in the operator compartment of a machine. Do not store ether cylinders in direct sunlight or in temperatures above 49°C(120.2 °F). Keep ether cylinders away from unauthorized personnel.

Fire Extinguisher

As an additional safety measure, keep a fire extinguisher on the machine.

Be familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher regularly. Follow the recommendations on the instruction plate.

Consider installation of an aftermarket Fire Suppression System, if the application and working conditions warrant the installation.

Fire Safety

※ **Locate secondary exits and how to use the secondary exits before you operate the machine.**

※ **Locate fire extinguishers and how to use a fire extinguisher before you operate the machine.**

If you find that you are involved in a machine fire, your safety and that of others on site is the top priority. The following actions should only be performed if the actions do not present a danger or risk to you and any nearby people. At all times you should assess the risk of personal injury and move away to a safe distance as soon as you feel unsafe.

Move the machine away from nearby combustible material such as fuel/oil stations, structures, trash, mulch and timber.

Lower any implements and turn off the engine as soon as possible. If you leave the engine running, the engine will continue to feed a fire. The fire will be fed from away damaged hoses that are attached to the engine or pumps.

If possible, turn the battery disconnect switch to the OFF position. Disconnecting the battery will remove the ignition source in the event of an electrical short. Disconnecting the battery will eliminate a second ignition source if electrical wiring is damaged by the fire, resulting in a short circuit.

Notify emergency personnel of the fire and your location.

If your machine is equipped with a fire suppression system, follow the manufacturers procedure for activating the system.

※ **Fire suppression systems need to be regularly inspected by qualified personnel. You must be trained to operate the fire suppression system.**

Use the on-board fire extinguisher and use the following procedure :

1. Pull the pin.
2. Aim the extinguisher or nozzle at the base of the fire.
3. Squeeze the handle and release the extinguishing agent.
4. Sweep the extinguisher from side to side across the base of the fire until the fire is out.

Remember, if you are unable to do anything else, shut off the machine before exiting. By shutting off the machine, fuels will not continue to be pumped into the fire.

If the fire grows out of control, be aware of the following risks :

- Tires on wheeled machines pose a risk of explosion as tires burn. Hot shrapnel and debris can be thrown great distances in an explosion.
- Tanks, accumulators, hoses, and fittings can rupture in a fire, spraying fuels and shrapnel over a large area.

Remember that nearby all of the fluids on the machine are flammable, including coolant and oils. Additionally, plastics, rubbers, fabrics, and resins in fiberglass panels are also flammable.

Fire extinguisher Location

Make sure that a fire extinguisher is available. Be familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher. Obey the recommendations on the instruction plate.

Mount the fire extinguisher in the accepted location per local regulations.

If your machine is equipped with a ROPS structure, strap the mounting plate to the ROPS in order to mount the fire extinguisher. If the weight of the fire extinguisher exceeds 4.5 kg (10 lb), mount the fire extinguisher near the bottom of the ROPS. Do not mount the fire extinguisher at the upper one-third area on the ROPS.

Do not weld the ROPS structure in order to install the fire extinguisher. Also, do not drill holes in the ROPS structure in order to mount the fire extinguisher on the ROPS.

Consult your Hyundai dealer for the proper procedure for mounting the fire extinguisher.

THE EUROPEAN UNION PHYSICAL AGENTS (VIBRATION) DIRECTIVE 2002/44/EC

Vibration Data for Earth-moving Machines

Information Concerning Hand/Arm Vibration Level

When the machine is operated according to the intended use, the hand/arm vibration of this machine is below 2.5 m/s^2 .

Information Concerning Whole Body Vibration Level

The highest root mean square value of weighted acceleration to which the whole body is subjected, is less than 0.5 m/s^2 .

This section provides vibration data and a method for estimating the vibration level for earth moving machines.

Vibration levels are influenced by many different parameters. Many items are listed below.

- Operator training, behavior, mode and stress
- Job site organization, preparation, environment, weather and material
- Machine type, quality of the seat, quality of the suspension system, attachments and condition of the equipment

It is not possible to get precise vibration levels for this machine. The expected vibration levels can be estimated with the information in below Table in order to calculate the daily vibration exposure. A simple evaluation of the machine application can be used.

Estimate the vibration levels for the three vibration directions. For typical operating conditions, use the average vibration levels as the estimated level. With an experienced operator and smooth terrain, subtract the Scenario Factors from the average vibration level. For aggressive operations and severe terrain, add the Scenario Factors to the average vibration level in order to obtain the estimated vibration level.

※ All vibration levels are in meter per second squared.

ISO Reference Table A – Equivalent vibration levels of whole body vibration emission for earthmoving equipment.

| 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 | |

ISO Reference Table A – Equivalent vibration levels of whole body vibration emission for earthmoving equipment.

| Machine family | Machine kind | Typical operating condition | Vibration Levels | | | Scenario Factors | | |
|----------------|----------------------------|-----------------------------|------------------|--------|--------|------------------|--------|--------|
| | | | X axis | Y axis | Z axis | X axis | Y axis | Z axis |
| Loader | skid steer loader (tracks) | V-shaped motion | 1.21 | 1.00 | 0.82 | 0.30 | 0.84 | 0.32 |
| | Wheel backhoe loader | Excavating | 0.28 | 0.26 | 0.20 | 0.09 | 0.16 | 0.06 |
| | Wheel loader | Load and carry motion | 0.84 | 0.81 | 0.52 | 0.23 | 0.20 | 0.14 |
| | | Mining application | 1.27 | 0.97 | 0.81 | 0.47 | 0.31 | 0.47 |
| | | Transfer movement | 0.76 | 0.91 | 0.49 | 0.33 | 0.35 | 0.17 |
| | | V-shape motion | 0.99 | 0.84 | 0.54 | 0.29 | 0.32 | 0.14 |

※ Refer to “ISO/TR 25398 Mechanical Vibration-Guideline for the assessment of exposure to whole body vibration of ride on operated earthmoving machines” for more information about vibration. This publication uses data that is measured by international institutes, organizations and manufacturers. This document provides information about the whole body exposure of operators of earthmoving equipment.

Guidelines for Reducing Vibration Levels on Earthmoving Equipment

Properly adjust machines. Properly maintain machines. Operate machines smoothly. Maintain the conditions of the terrain. The following guidelines can help reduce the whole body vibration level :

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer's recommendations.
 - a. Tire pressures
 - b. Brake and steering systems
 - c. Controls, hydraulic system and linkages
3. Keep the terrain in good condition.
 - a. Remove any large rocks or obstacles.
 - b. Fill any ditches and holes.
 - c. Provide machines and schedule time in order to maintain the conditions of the terrain.
4. Use a seat that meets "ISO 7096". Keep the seat maintained and adjusted.
 - a. Adjust the seat and suspension for the weight and the size of the operator.
 - b. Inspect and maintain the seat suspension and adjustment mechanisms.
5. Perform the following operations smoothly.
 - a. Steer
 - b. Brake
 - c. Accelerate
 - d. Shift the gears.
6. Move the attachments smoothly.
7. Adjust the machine speed and the route in order to minimize the vibration level.
 - a. Drive around obstacles and rough terrain.
 - b. Slow down when it is necessary to go over rough terrain.
8. Minimize vibrations for a long work cycle or a long travel distance.
 - a. Use machines that are equipped with suspension systems.
 - b. Use the ride control system on machines.
 - c. If no ride control system is available, reduce speed in order to prevent bounce.
 - d. Haul the machines between workplaces.
9. Less operator comfort may be caused by other risk factors. The following guidelines can be effective in order to provide better operator comfort:
 - a. Adjust the seat and adjust the controls in order to achieve good posture.
 - b. Adjust the mirrors in order to minimize twisted posture.
 - c. Provide breaks in order to reduce long periods of sitting.
 - d. Avoid jumping from the cab
 - e. Minimize repeated handling of loads and lifting of loads.
 - f. Minimize any shocks and impacts during sports and leisure activities.

Sources

The vibration information and calculation procedure is based on "ISO/TR 25398 Mechanical Vibration-Guideline for whole body vibration exposure of operators of earthmoving equipment. The method is based on measured vibration emission under real working conditions for all machines.

You should check the original directive. This document summarizes part of the content of the applicable law. This document is not meant to substitute the original sources. Other parts of these documents are based on information from the United Kingdom Health and Safety Executive.

MODIFICATIONS

Modifications to the machine, including use of unauthorized accessories and spare parts, may affect the machine's condition and its ability to function as it was designed. No changes of any kind may be performed without first obtaining written approval from Hyundai Heavy Industries. Hyundai Heavy Industries reserves the right to refuse all warranty claims that have resulted due to or can be attributed to unauthorized modifications.

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

The person who performs unauthorized modifications assumes all responsibility for consequences that arise due to the modification or can be attributed to the modification, including damage to the machine.

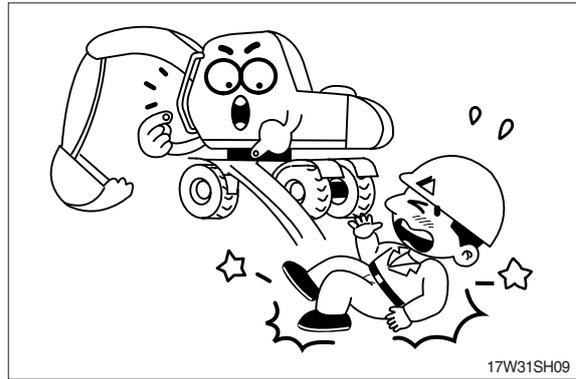
Modifications may be considered to be officially approved, if at least one of the following conditions has been met :

1. The attachment, the accessory, or the spare part has been made or distributed by Hyundai Heavy Industries and has been installed according to approved methods described in a publication available from Hyundai Heavy Industries; or
2. The modification has been approved in writing by the Engineering Department at each product company within Hyundai Heavy Industries.

2. DURING OPERATING THE MACHINE

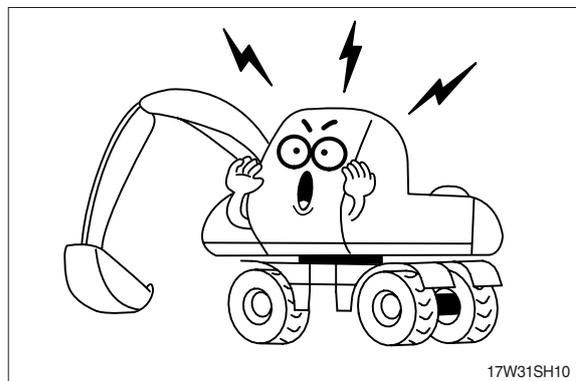
Use the handle and footstep when getting on or off the machine.

Do not jump on or off the machine.



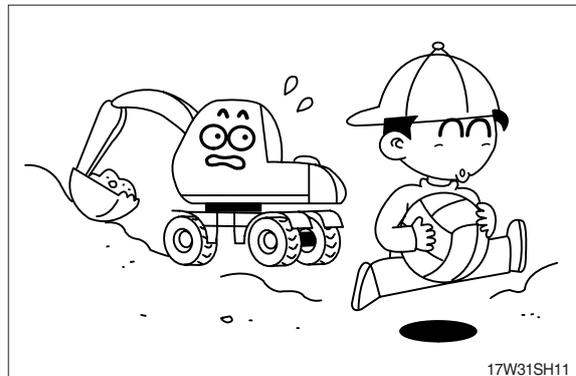
Sound the horn to warn nearby personnel before operating the machine.

Remove all the obstacles like frost on the window before operating the machine for the good visibility.



Operate carefully to make sure all personnel or obstacles are clear within the working range of the machine.

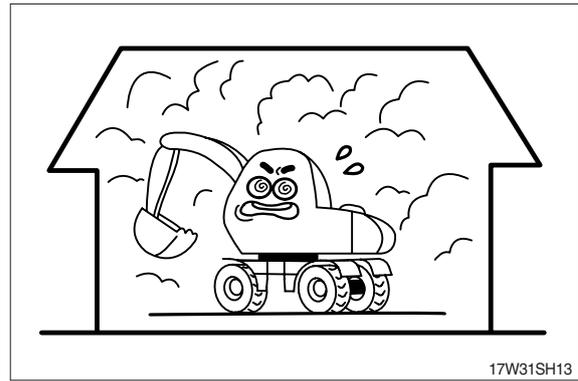
Place safety guards if necessary.



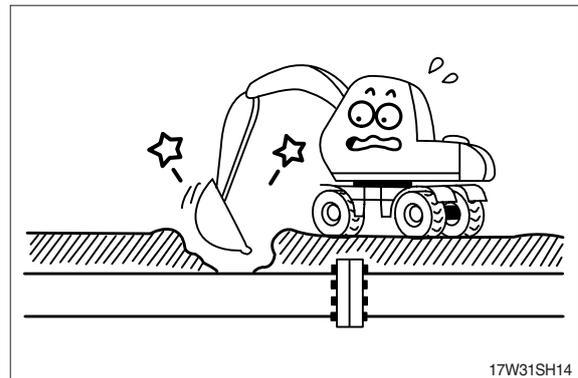
When using the work equipment, pay attention to job site.



Provide proper ventilation when operating engine in a closed area to avoid the danger of exhaust gases.



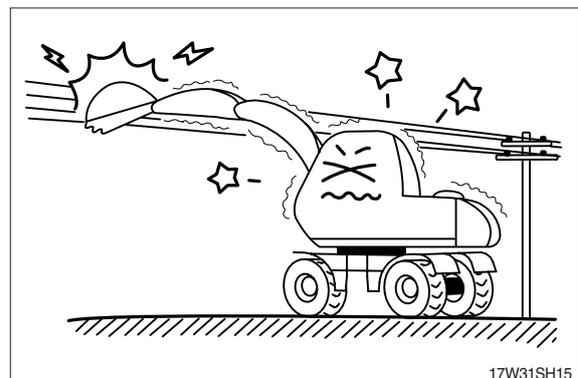
Check the locations of underground gas pipes or water line and secure the safety before operation.



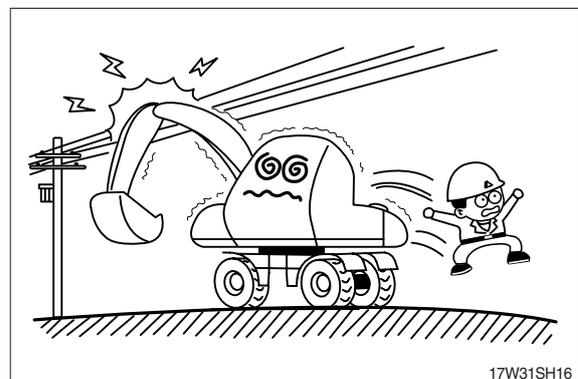
The operating near the electrical lines is very dangerous.

Operate within safe working range permitted as below.

| Supply voltage | Min safe separation |
|----------------|---------------------|
| 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) |

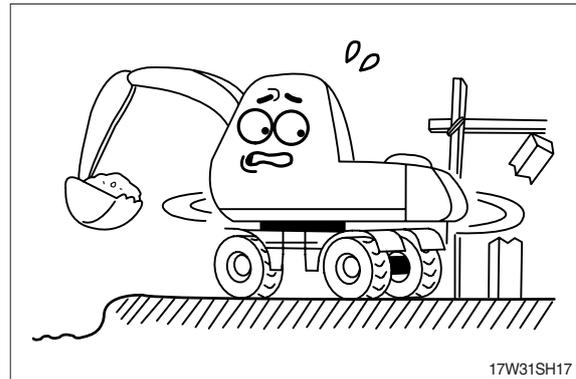


If the machine touches the electric power lines, keep sitting on the operator's seat and make sure the personnel on the ground not to touch the machine until turning off the electric current. Jump off the machine without contacting the machine when you need to get off.

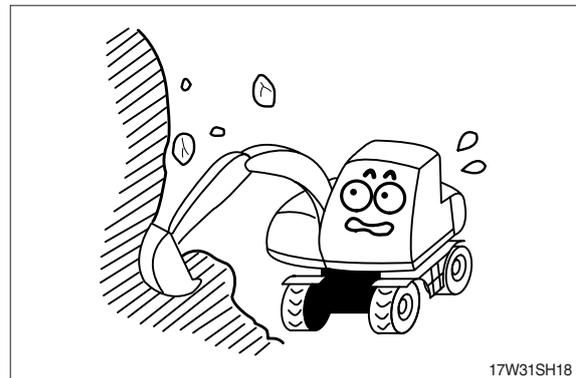


Watch out for obstacles.

Be particularly careful to check the machine clearance during the swing.

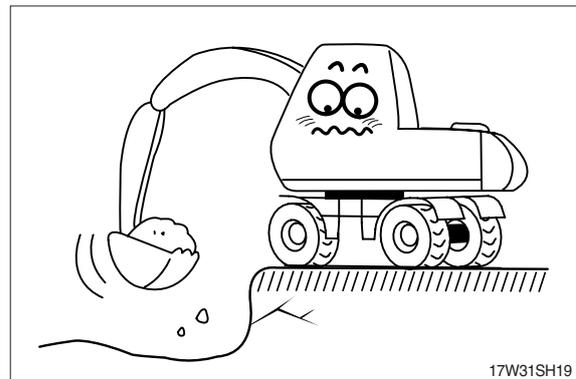


When using the machine as breaker or working in a place where stones may fall down, cab roof guard and head guard should be provided for proper protection.



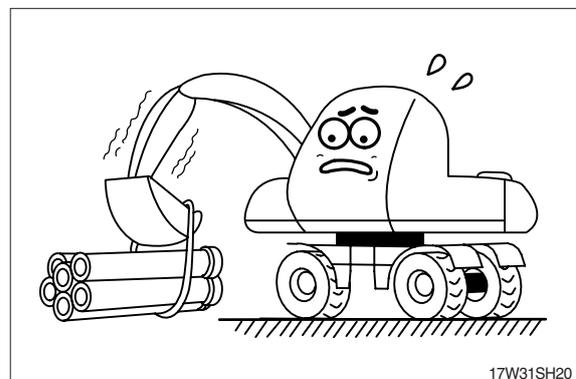
Avoid operating on a cliff or soft ground as there is danger of rolling over.

Make sure to get off easily as keeping the track at a right angle and putting the travel motor into the backward position when working on a cliff or soft ground inevitably.

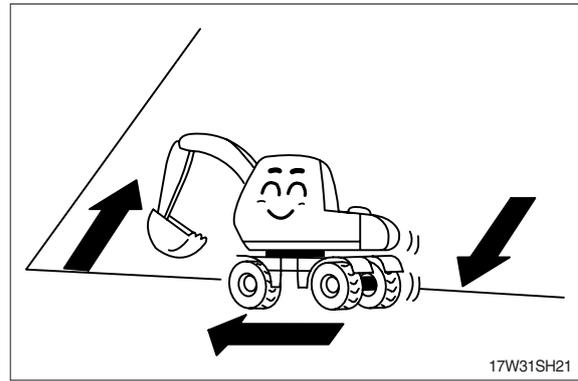


Operate for the lifting work considering the capacity of machine, weight and width of the load.

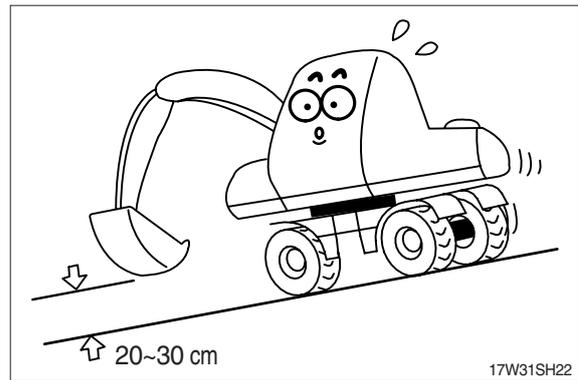
Be careful not to lift exceeding the machine capacity as it can be the cause of machine damage and safety accident.



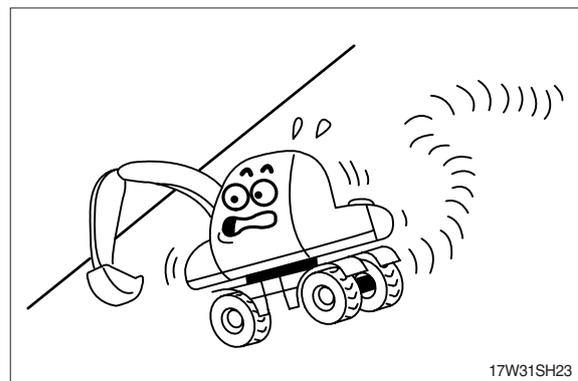
Avoid traveling in a cross direction on a slope as it can cause the danger of rolling over and sliding.



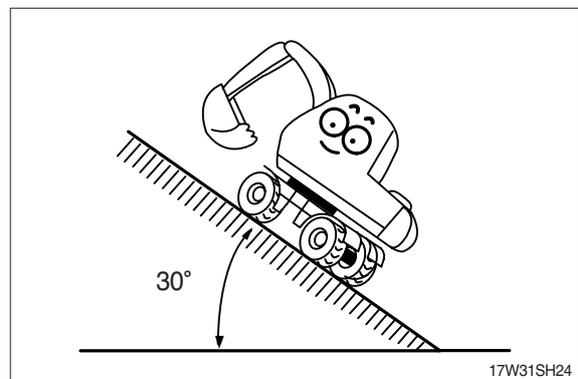
Traveling on a slope is dangerous. Be sure to operate slowly when traveling down a slope and maintain the bucket at a height of 20~30 cm (1 ft) above the ground so that it can be used as brake in an emergency.



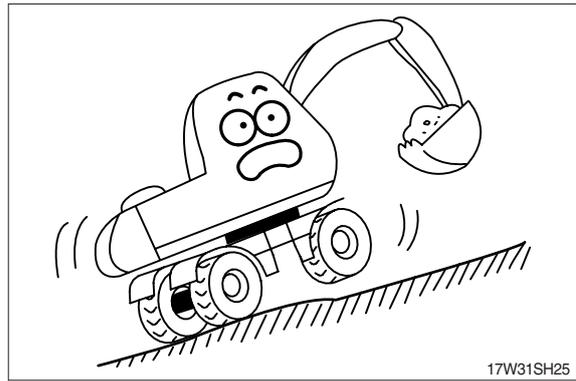
Steering of the machine while traveling on a slope is dangerous. When an inevitable turning of direction is required, turn on the flat and solid ground.



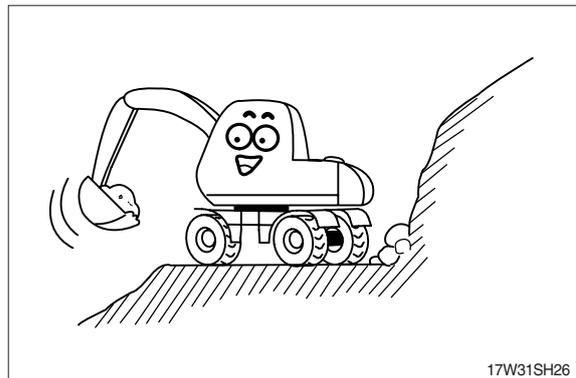
The engine angularity limits are 30 degree. Do not operate by more than the engine limits in any case.



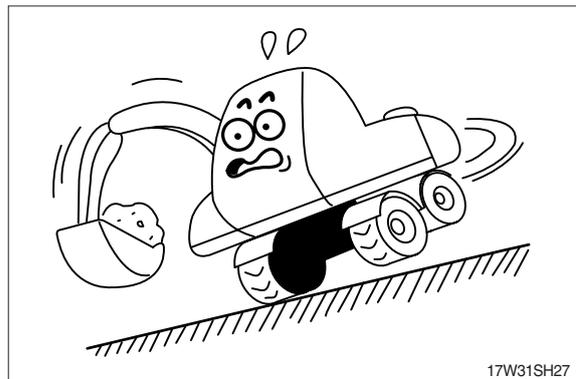
The operation on a slope is dangerous.
Avoid operating the machine on a slope of over 10 degree.



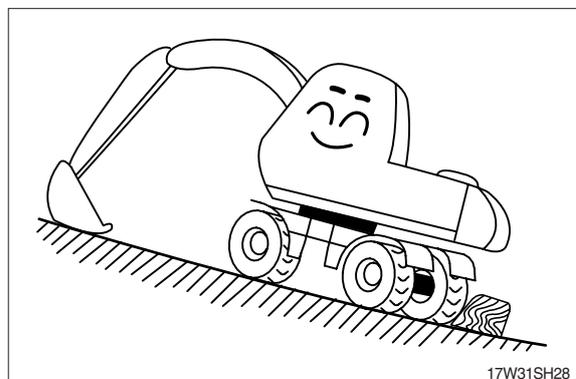
Operate the machine after making ground flat when operation is required on a slope.



The swing on the slope can be danger of rolling over.
Do not operate to swing the machine with the bucket loaded on a slope since the machine may lose its balance under such an instance.

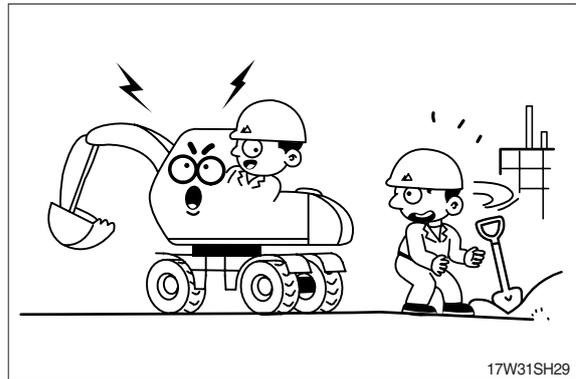


Avoid parking and stopping on a slope.
Lower the bucket to the ground and block the tires when parking.

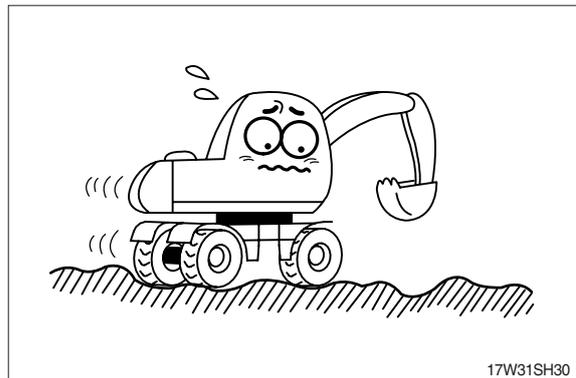


Before traveling the machine, sound the horn to warn nearby personnel.

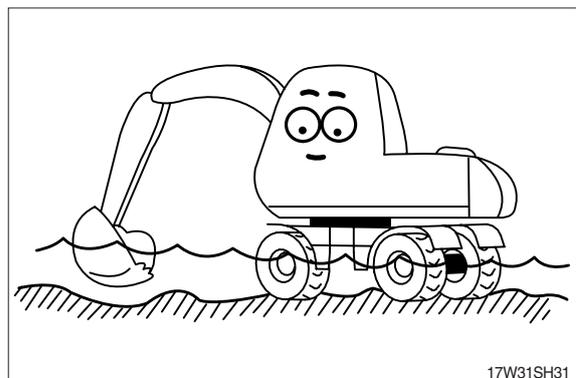
Operate forward and backward correctly with confirming the location of the travel motor.



Slow down when traveling through obstacles or uneven ground.



When operating 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 axle center.



MOUNTING AND DISMOUNTING

Never jump on or off the machine. **Never** get on or off a moving machine.

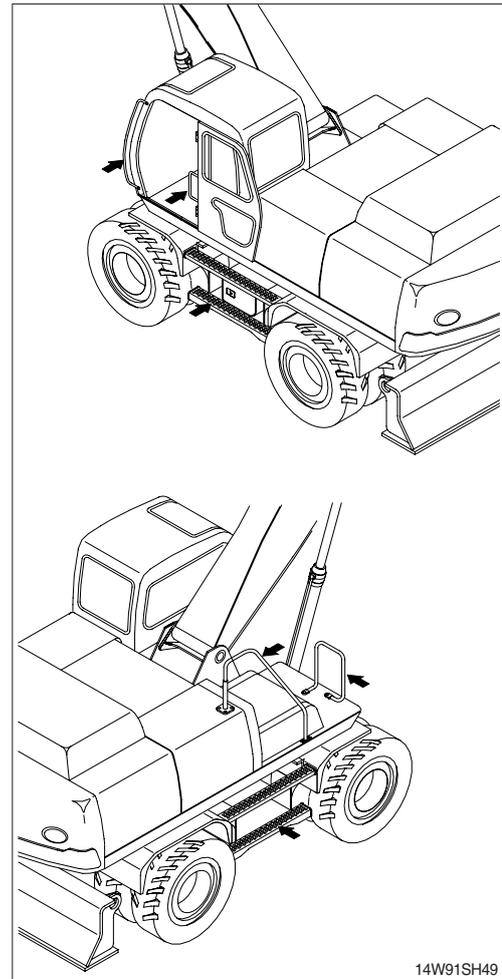
When mounting or dismounting, always face the machine and use the handrails, machine or foot steps. In this case please contact your Hyundai distributor.

Do not hold any control levers when getting on or off the machine.

Ensure safety by always maintaining at least three-point contact of hands and feet with the handrails, foot steps.

Always remove any oil or mud from the handrails, foot steps. If they are damaged, repair them and tighten any loose bolts.

If grasping the door handrail when mounting or dismounting or moving on the tires, open and lock the door securely in the open position. Otherwise, the door may move suddenly, causing you to lose balance and fall.



KEEP RIDERS OFF MACHINE

Riders on a machine are subject to injury such as being struck objects and being thrown off the machine.

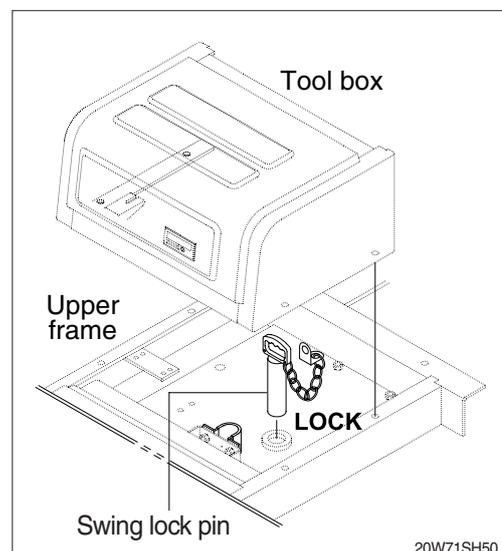
Only allow the operator on the machine. Keep riders off.

ALWAYS APPLY LOCK WHEN LEAVING MACHINE

When leaving the machine, always place the swing lock pin securely in the LOCK position.

If you accidentally touch the travel or swing lever when they are not locked, the work equipment may suddenly move and cause serious injury or damage.

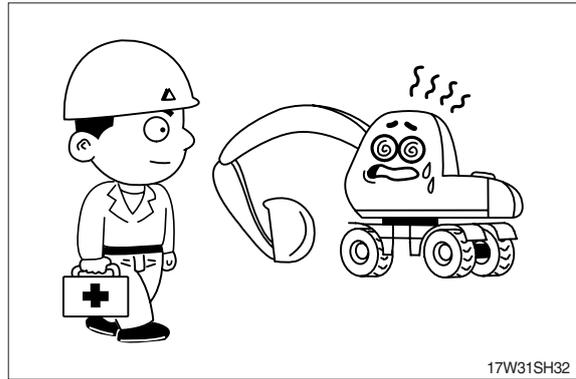
When leaving the machine, lower the work equipment completely to the ground, stop the engine and use the key to lock all the equipment. Then set the swing lock pin to the lock position. Always take the key with you.



3. DURING MAINTENANCE

Stop the engine immediately when the trouble of the machine is found.

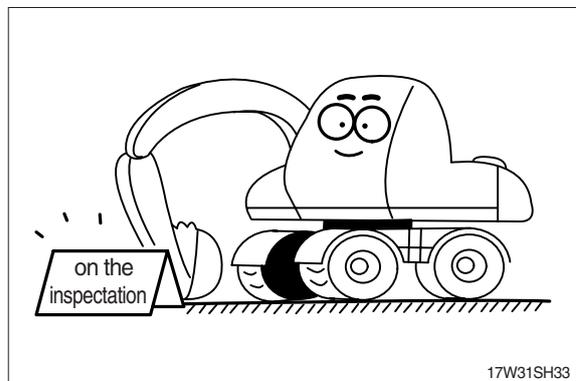
Inspect immediately the cause of trouble such as vibration, overheating and trouble in the cluster then repair.



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. Parts may require additional safe guard.

Lower the dozer blade and/or outrigger to the ground.



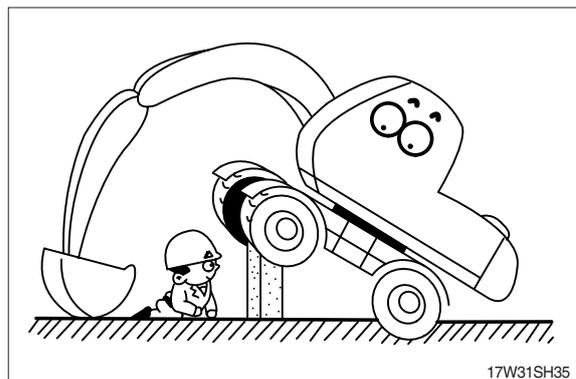
Do not remove the radiator cap from hot engine. Open the cap after the engine cools, below 50°C (122°F) to prevent personal injury from heated coolant spray or steam.



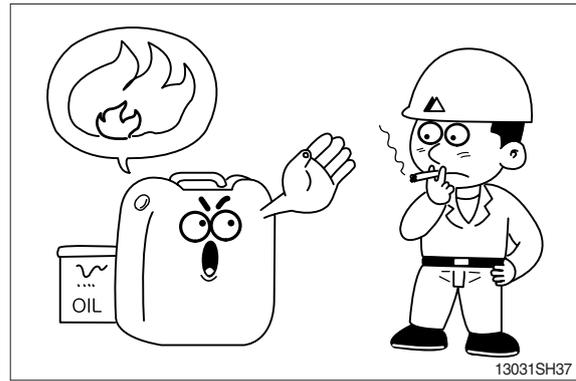
Do not work below the machine.

Be sure to work with proper safety supports.

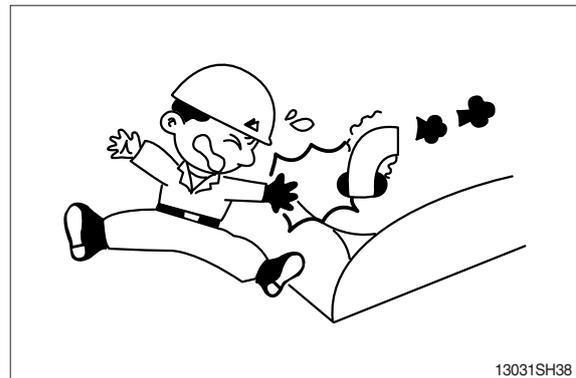
Do not depend on the hydraulic cylinders to hold up the equipment and attachment.



There is the danger of fire in fuel and oil.
Store in cool and dry area, away from any open flames.



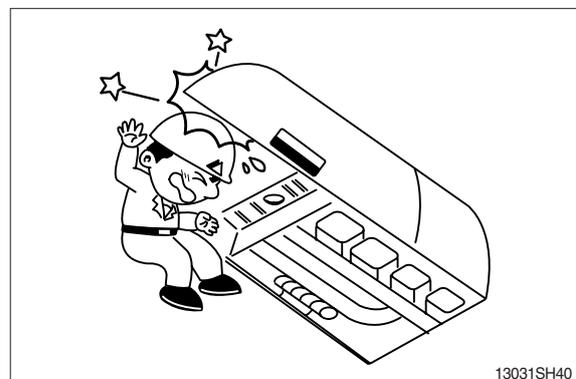
Do not touch exhaust pipe, or may cause severe burn.



Do not open the engine hood and covers while the engine is running.



Be careful of not hitting the edges when you service engine.



Be careful that the front window may be promptly closed.

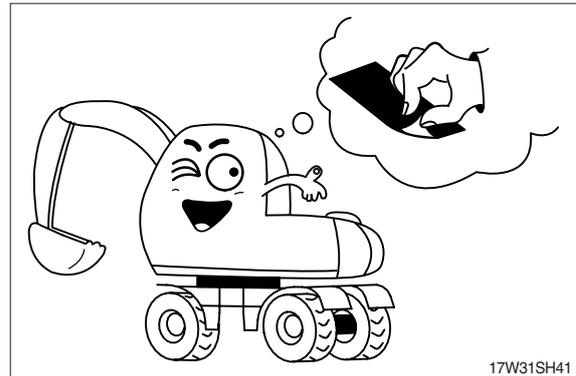
Be sure to support stay, when the side door needs to be opened.

Be careful that the open side door may closed by the external or natural force like strong wind.

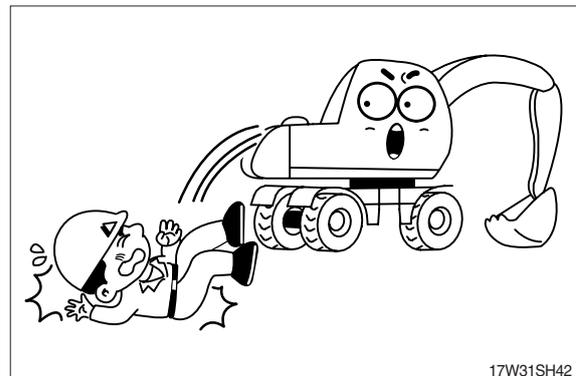


The antislip protection should be replaced if they have become worn or have been printed over.

Be sure to free of oil, water and grease etc.



Be careful of not touching slip, fall down etc., when you work at the upper frame to service engine and/or other component.

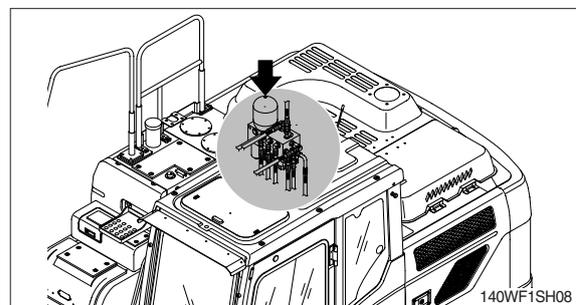


HIGH PRESSURE GAS

Contain high pressure gas.

To avoid explosion and personal injury, do not expose to fire, do not weld, do not drill.

Relieve pressure before discharging.



LIFT EYES CAN FAIL

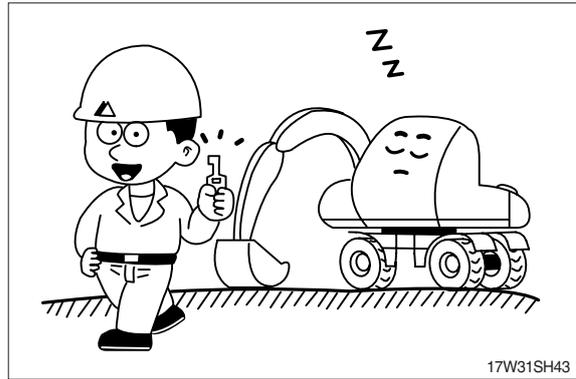
Lift eyes or tank can fail when lifting tank containing fluids resulting in possible personal injury.

Drain tank of all fluids before lifting.

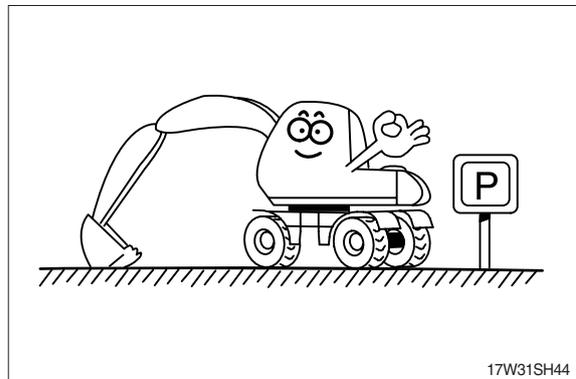
4. PARKING

When leaving the machine after parking, lower the bucket to the ground completely and put the safety lever at parking position then remove the key.

Lock the cab door.

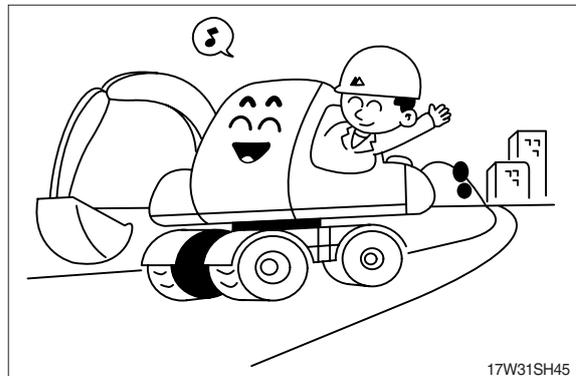


Park the machine in the flat and safe place.



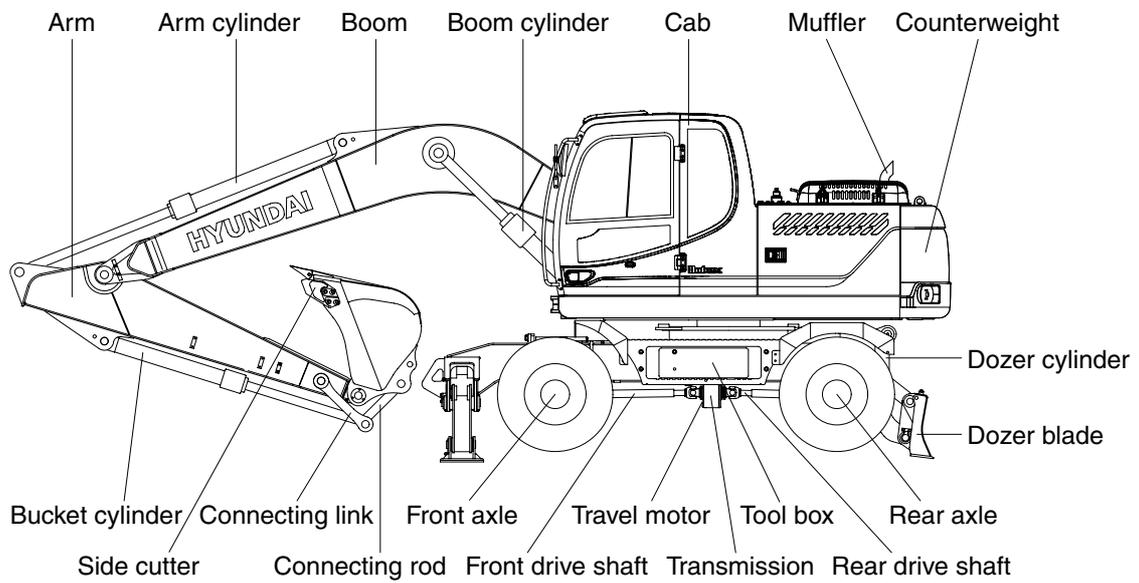
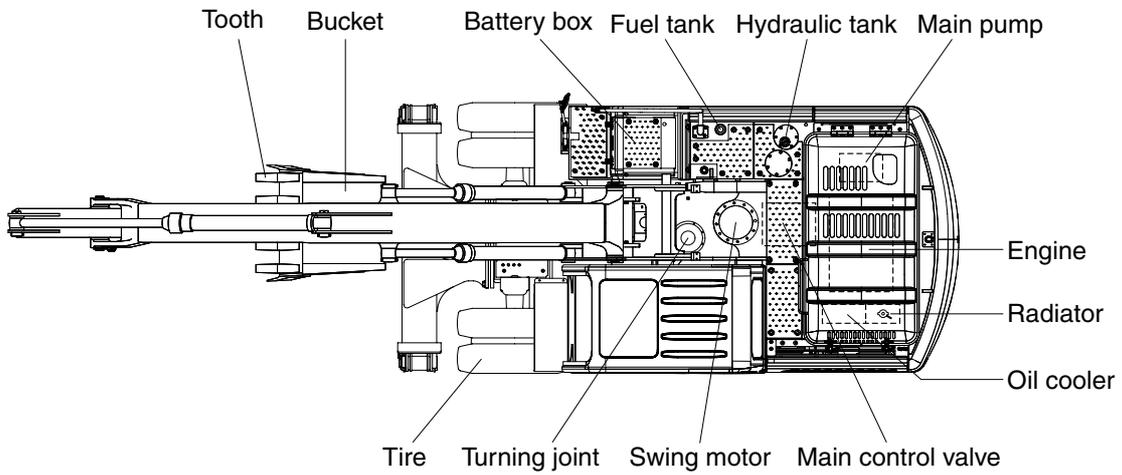
Hope you can work easily and safely observing safety rules.

For safe operation, observe all safety rules.



SPECIFICATIONS

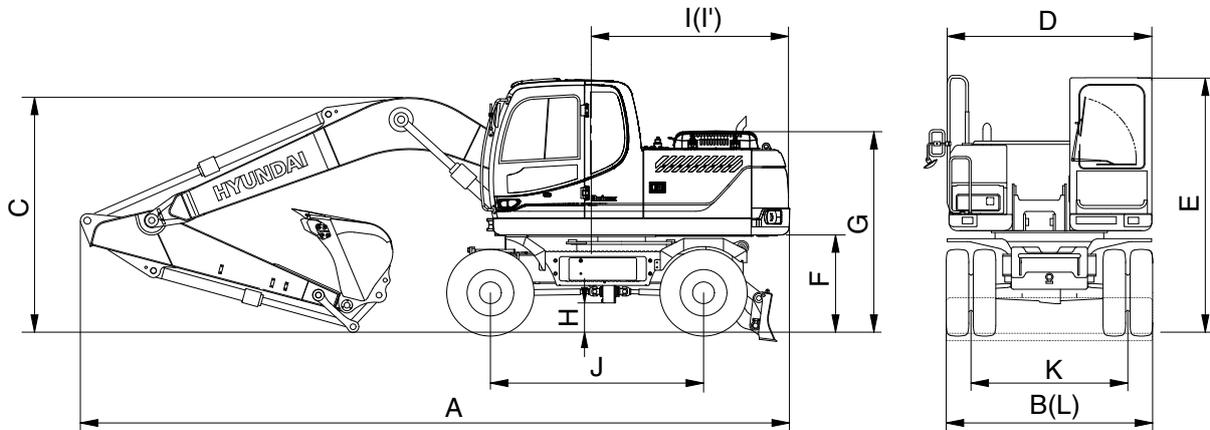
1. MAJOR COMPONENTS



17W92SP01

2. SPECIFICATIONS

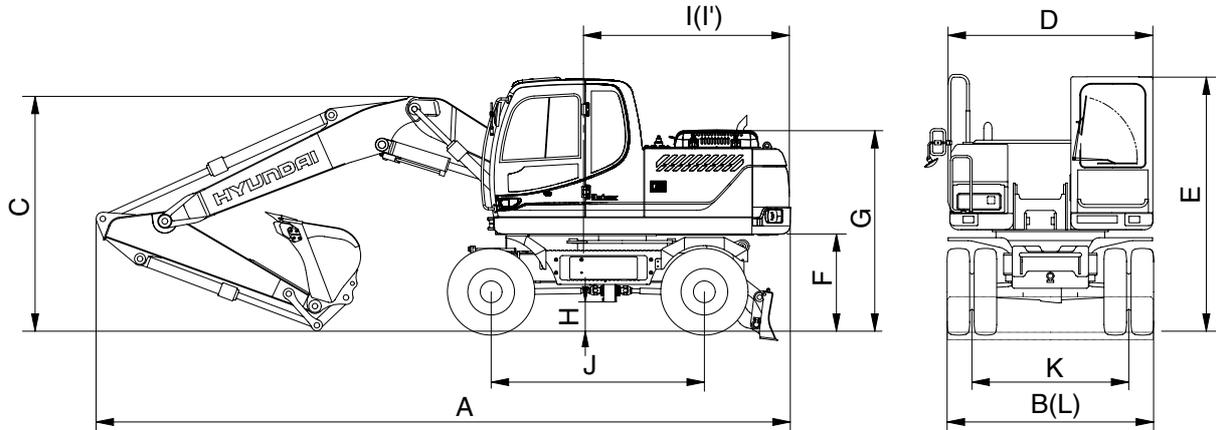
1) 5.1 m (16' 9") ONE PIECE BOOM, 2.2 m (7' 3") ARM AND REAR DOZER BLADE



17W92SP02

| Description | | Unit | Specification |
|--|------|-----------------------------------|---------------|
| Operating weight | | kg (lb) | 17300 (38140) |
| Bucket capacity (SAE heaped), standard | | m ³ (yd ³) | 0.76 (0.99) |
| Overall length | A | mm (ft-in) | 8650 (28' 5") |
| Overall width | B | | 2500 (8' 2") |
| Overall height of boom | C | | 3060 (10' 0") |
| Upperstructure width | D | | 2475 (8' 1") |
| Cab height | E | | 3190 (10' 6") |
| Ground clearance of counterweight | F | | 1270 (4' 2") |
| Engine cover height | G | | 2520 (8' 3") |
| Minimum ground clearance | H | | 340 (1' 1") |
| Rear-end distance | I | | 2480 (8' 2") |
| Rear-end swing radius | I' | | 2480 (8' 2") |
| Wheel base | J | | 2600 (8' 6") |
| Tread | K | | 1914 (6' 3") |
| Dozer blade width | L | | 2500 (8' 2") |
| Travel speed | Low | | km/hr (mph) |
| | High | 30 (18.6) | |
| Swing speed | | rpm | 11.0 |
| Gradeability | | Degree (%) | 35 (85) |
| Max traction force | | kgf (lbf) | 11000 (24250) |

2) 5.1 m (16' 9") HYDRAULIC ADJUSTABLE BOOM, 2.6 m (8' 6") ARM AND REAR DOZER BLADE

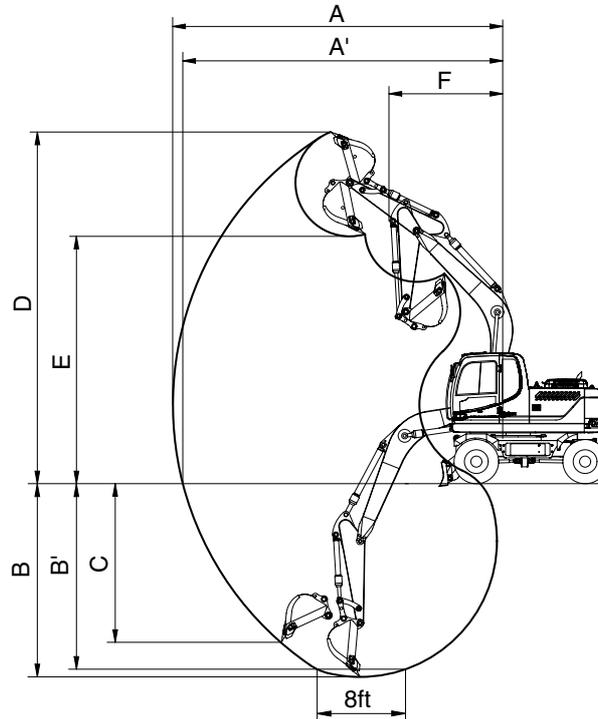


17W92SP03

| Description | | Unit | Specification |
|--|------|-----------------------------------|---------------|
| Operating weight | | kg (lb) | 17770 (39180) |
| Bucket capacity (SAE heaped), standard | | m ³ (yd ³) | 0.76 (0.99) |
| Overall length | A | mm (ft-in) | 8750 (28' 8") |
| Overall width | B | | 2500 (8' 2") |
| Overall height of boom | C | | 2920 (9' 7") |
| Upperstructure width | D | | 2475 (8' 1") |
| Cab height | E | | 3190 (10' 6") |
| Ground clearance of counterweight | F | | 1270 (4' 2") |
| Engine cover height | G | | 2520 (8' 3") |
| Minimum ground clearance | H | | 340 (1' 1") |
| Rear-end distance | I | | 2480 (8' 2") |
| Rear-end swing radius | I' | | 2480 (8' 2") |
| Wheel base | J | | 2600 (8' 6") |
| Tread | K | | 1914 (6' 3") |
| Dozer blade width | L | | 2500 (8' 2") |
| Travel speed | Low | | km/hr (mph) |
| | High | 29 (18.0) | |
| Swing speed | | rpm | 11.0 |
| Gradeability | | Degree (%) | 30 (58) |
| Max traction force | | kgf (lbf) | 11000 (24250) |

3. WORKING RANGE

1) 5.1 m (16' 9") MONO BOOM

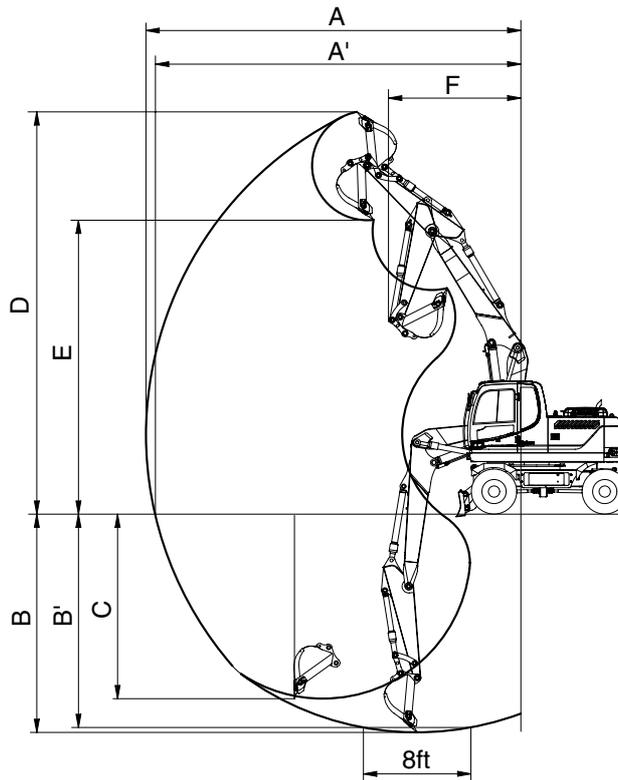


17W92SP05

| Description | | * 2.2 m (7' 3") Arm | 2.6 m (8' 6") Arm | 3.1 m (10' 2") Arm |
|---------------------------------|-----|---------------------|-------------------|--------------------|
| Max digging reach | A | 8690 mm (28' 6") | 9020 mm (29' 7") | 9450 mm (31' 0") |
| Max digging reach on ground | A' | 8480 mm (27' 10") | 8810 mm (28' 11") | 9250 mm (30' 4") |
| Max digging depth | B | 5420 mm (17' 9") | 5820 mm (19' 1") | 6320 mm (20' 9") |
| Max digging depth (8 ft level) | B' | 5200 mm (17' 1") | 5620 mm (18' 5") | 6130 mm (20' 1") |
| Max vertical wall digging depth | C | 4890 mm (16' 1") | 5140 mm (16' 10") | 5470 mm (17' 11") |
| Max digging height | D | 8990 mm (29' 6") | 9070 mm (29' 9") | 9220 mm (30' 3") |
| Max dumping height | E | 6350 mm (20' 10") | 6550 mm (21' 6") | 6730 mm (22' 1") |
| Min swing radius | F | 3180 mm (10' 5") | 3170 mm (10' 5") | 3160 mm (10' 4") |
| Bucket digging force | SAE | 107.9 [117.2] kN | 107.9 [117.2] kN | 107.9 [117.2] kN |
| | | 11000 [11940] kgf | 11000 [11940] kgf | 11000 [11940] kgf |
| | | 24250 [26330] lbf | 24250 [26330] lbf | 24250 [26330] lbf |
| | ISO | 123.6 [134.2] kN | 123.6 [134.2] kN | 123.6 [134.2] kN |
| | | 12600 [13680] kgf | 12600 [13680] kgf | 12600 [13680] kgf |
| | | 27780 [30160] lbf | 27780 [30160] lbf | 27780 [30160] lbf |
| Arm digging force | SAE | 87.2 [94.7] kN | 77.3 [83.9] kN | 69.0 [74.9] kN |
| | | 8890 [9650] kgf | 7880 [8560] kgf | 7030 [7630] kgf |
| | | 19600 [21280] lbf | 17370 [18860] lbf | 15500 [16830] lbf |
| | ISO | 91.0 [98.8] kN | 80.3 [87.2] kN | 71.4 [77.5] kN |
| | | 9280 [10080] kgf | 8190 [8890] kgf | 7280 [7900] kgf |
| | | 20460 [22210] lbf | 18060 [19600] lbf | 16050 [17430] lbf |

* : Standard [] : Power boost

2) 5.1 m (16' 9") HYDRAULIC ADJUSTABLE BOOM



17W92SP06

| Description | | 2.2 m (7' 3") Arm | 2.6 m (8' 6") Arm |
|---------------------------------|-----|-------------------|-------------------|
| Max digging reach | A | 8760 mm (28' 9") | 9110 mm (29' 11") |
| Max digging reach on ground | A' | 8550 mm (28' 1") | 8910 mm (29' 3") |
| Max digging depth | B | 5220 mm (17' 2") | 5620 mm (18' 5") |
| Max digging depth (8 ft level) | B' | 5120 mm (16' 10") | 5520 mm (18' 1") |
| Max vertical wall digging depth | C | 4430 mm (14' 6") | 4780 mm (15' 8") |
| Max digging height | D | 9630 mm (31' 7") | 9820 mm (32' 3") |
| Max dumping height | E | 6930 mm (22' 9") | 7130 mm (23' 5") |
| Min swing radius | F | 3100 mm (10' 2") | 2970 mm (9' 9") |
| Bucket digging force | SAE | 107.9 [117.2] kN | 107.9 [117.2] kN |
| | | 11000 [11940] kgf | 11000 [11940] kgf |
| | | 24250 [26330] lbf | 24250 [26330] lbf |
| | ISO | 123.6 [134.2] kN | 123.6 [134.2] kN |
| | | 12600 [13680] kgf | 12600 [13680] kgf |
| Arm digging force | SAE | 87.2 [94.7] kN | 77.3 [83.9] kN |
| | | 8890 [9650] kgf | 7880 [8560] kgf |
| | | 19600 [21280] lbf | 17370 [18860] lbf |
| | ISO | 91.0 [98.8] kN | 80.3 [87.2] kN |
| | | 9280 [10080] kgf | 8190 [8890] kgf |
| | | 20460 [22210] lbf | 18060 [19600] lbf |

[] : Power boost

4. WEIGHT

| Item | R170W-9S | |
|---|----------|---------|
| | kg | lb |
| Upperstructure assembly | 4590 | 10120 |
| Main frame weld assembly | 1430 | 3150 |
| Engine assembly | 350 | 770 |
| Fan clutch assembly | 45 | 100 |
| Main pump assembly | 100 | 220 |
| Main control valve assembly | 145 | 320 |
| Swing motor assembly | 250 | 550 |
| Hydraulic oil tank assembly | 165 | 360 |
| Fuel tank assembly | 130 | 290 |
| Counterweight | 2750 | 6060 |
| Cab assembly | 500 | 1100 |
| Lower frame weld assembly | 1640 | 3615 |
| Swing bearing | 260 | 570 |
| Travel motor assembly | 80 | 176 |
| Turning joint | 120 | 265 |
| Transmission assembly | 135 | 298 |
| Front axle assembly | 655 | 1444 |
| Rear axle assembly | 534 | 1177 |
| Front attachment assembly (5.1m boom, 2.2m arm, 0.76m ³ SAE heaped bucket) | 2990 | 6590 |
| 5.1m boom assembly | 1040 | 2290 |
| 2.2m arm assembly | 480 | 1050 |
| 0.76m ³ SAE heaped bucket assembly | 570 | 1260 |
| Boom cylinder assembly | 155x2EA | 340x2EA |
| Arm cylinder assembly | 180 | 400 |
| Bucket cylinder assembly | 125 | 260 |
| Bucket control link assembly | 120 | 265 |
| Oscillating cylinder assembly | 30 | 70 |
| Dozer blade assembly | 830 | 1830 |
| Blade cylinder assembly | 55 | 120 |
| Front outrigger assembly | 1000 | 2200 |
| Rear outrigger assembly | 1010 | 2230 |
| Outrigger cylinder assembly | 80 | 180 |

5. LIFTING CAPACITIES

1) ROBEX 170W-9S

(1) 5.1 m (16' 9") boom, 2.2 m (7' 3") arm equipped with 0.76 m³ (SAE heaped) bucket, rear dozer blade down and 2750 kg (6060 lb) counterweight.

·  : Rating over-front

·  : Rating over-side or 360 degree

| Load point height | | Load radius | | | | | | | | At max. reach | | |
|----------------------|----|---|---|---|---|---|---|---|--|---|---|--------|
| | | 1.5 m (5.0 ft) | | 3.0 m (10.0 ft) | | 4.5 m (15.0 ft) | | 6.0 m (20.0 ft) | | Capacity | | Reach |
| | |  |  |  |  |  |  |  |  |  |  | m (ft) |
| 7.0 m (25.0 ft) | kg | | | | | | | | | *3710 | 3020 | 5.89 |
| | lb | | | | | | | | | *8180 | 6660 | (19.3) |
| 6.0 m (20.0 ft) | kg | | | | | | | *3340 | 2830 | *3660 | 2080 | 7.15 |
| | lb | | | | | | | *7360 | 6240 | *8070 | 4590 | (23.5) |
| 4.5 m (15.0 ft) | kg | | | | | *4730 | 4550 | *4170 | 2770 | *3690 | 1680 | 7.86 |
| | lb | | | | | *10430 | 10030 | *9190 | 6110 | *8140 | 3700 | (25.8) |
| 3.0 m (10.0 ft) | kg | | | *9740 | 7880 | *6000 | 4190 | *4690 | 2630 | 3430 | 1500 | 8.19 |
| | lb | | | *21470 | 17370 | *13230 | 9240 | *10340 | 5800 | 7560 | 3310 | (26.9) |
| 1.5 m (5.0 ft) | kg | | | | | *7180 | 3850 | *5230 | 2470 | 3380 | 1460 | 8.19 |
| | lb | | | | | *15830 | 8490 | *11530 | 5450 | 7450 | 3220 | (26.9) |
| Ground Line | kg | | | *7660 | 6950 | *7720 | 3660 | 5520 | 2360 | 3580 | 1540 | 7.87 |
| | lb | | | *16890 | 15320 | *17020 | 8070 | 12170 | 5200 | 7890 | 3400 | (25.8) |
| -1.5 m (-5.0 ft) | kg | *7650 | *7650 | *11110 | 7010 | *7510 | 3620 | *5380 | 2330 | *3950 | 1820 | 7.18 |
| | lb | *16870 | *16870 | *24490 | 15450 | *16560 | 7980 | *11860 | 5140 | *8710 | 4010 | (23.6) |
| -3.0 m (-10.0 ft) | kg | *12010 | *12010 | *9250 | 7190 | *6410 | 3700 | | | *3660 | 2540 | 5.95 |
| | lb | *26480 | *26480 | *20390 | 15850 | *14130 | 8160 | | | *8070 | 5600 | (19.5) |

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 load point is a hook located on the back of the bucket.

4. * indicates load limited by hydraulic capacity.

(2) 5.1 m (16' 9") hydraulic adjustable boom, 2.2 m (7' 3") arm equipped with 0.76 m³ (SAE heaped) bucket, rear dozer blade down and 2750 kg (6060 lb) counterweight.

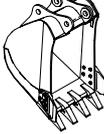
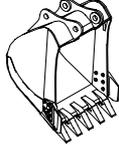
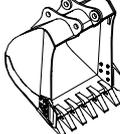
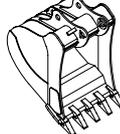
| Load point height | | Load radius | | | | | | | | | | At max. reach | | |
|-------------------|----------|-----------------|-----------------|------------------|-----------------|-----------------|----------------|-----------------|--------------|-----------------|--------------|----------------|--------------|----------------|
| | | 1.5 m (5.0 ft) | | 3.0 m (10.0 ft) | | 4.5 m (15.0 ft) | | 6.0 m (20.0 ft) | | 7.0 m (25.0 ft) | | Capacity | | Reach |
| | | | | | | | | | | | | | | m (ft) |
| 6.0 m (20.0 ft) | kg lb | | | | | | | | | | | *3710 *8180 | 2010 4430 | 7.22 (23.7) |
| 4.5 m (15.0 ft) | kg lb | | | | | | *4210 *9280 | 2760 6080 | | | | *3680 *8110 | 1620 3570 | 7.92 (26.0) |
| 3.0 m (10.0 ft) | kg lb | | | | | *6040 *13320 | 4180 9220 | *4690 *10340 | 2610 5750 | | | 3410 7520 | 1450 3200 | 8.25 (27.1) |
| 1.5 m (5.0 ft) | kg lb | | | | | *7120 *15700 | 3810 8400 | *5190 *11440 | 2440 5380 | *3430 *7560 | 1660 3660 | 3360 7410 | 1410 3110 | 8.26 (27.1) |
| Ground Line | kg lb | | | *6770 *14930 | *6770 *14930 | *7590 *16730 | 3610 7960 | *5450 *12020 | 2330 5140 | | | 3570 7870 | 1500 3310 | 7.94 (26.0) |
| -1.5 m (-5.0 ft) | kg lb | *6880 *15170 | *6880 *15170 | *10730 *23660 | 6950 15320 | *7310 *16120 | 3580 7890 | *5230 *11530 | 2300 5070 | | | *3640 *8020 | 1780 3920 | 7.26 (23.8) |
| -3.0 m (-10.0 ft) | kg lb | | | *8720 *19220 | 7160 15790 | *6110 *13470 | 3680 8110 | | | | | *3140 *6920 | 2490 5490 | 6.05 (19.8) |

(3) 5.1 m (16' 9") hydraulic adjustable boom, 2.6 m (8' 6") arm equipped with 0.76 m³ (SAE heaped) bucket, rear dozer blade down and 2750 kg (6060 lb) counterweight.

| Load point height | | Load radius | | | | | | | | | | At max. reach | | |
|-------------------|----------|------------------|------------------|------------------|-----------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|----------------|--------------|----------------|
| | | 1.5 m (5.0 ft) | | 3.0 m (10.0 ft) | | 4.5 m (15.0 ft) | | 6.0 m (20.0 ft) | | 7.0 m (25.0 ft) | | Capacity | | Reach |
| | | | | | | | | | | | | | | m (ft) |
| 6.0 m (20.0 ft) | kg lb | | | | | | | | | | | *3410 *7520 | 1810 3990 | 7.63 (25.0) |
| 4.5 m (15.0 ft) | kg lb | | | | | | | | | | | *3410 *7520 | 1470 3240 | 8.29 (27.2) |
| 3.0 m (10.0 ft) | kg lb | | | | | | | *4420 *9740 | 2620 5780 | *3380 *7450 | 1720 3790 | 3160 6970 | 1320 2910 | 8.60 (28.2) |
| 1.5 m (5.0 ft) | kg lb | | | *6600 *14550 | *6600 *14550 | *6800 *14990 | 3830 8440 | *4980 *10980 | 2430 5360 | 3900 8600 | 1640 3620 | 3110 6860 | 1280 2820 | 8.61 (28.2) |
| Ground Line | kg lb | *6550 *14440 | *6550 *14440 | *7410 *16340 | 6810 15010 | *7460 *16450 | 3580 7890 | *5340 *11770 | 2290 5050 | 3830 8440 | 1580 3480 | 3280 7230 | 1350 2980 | 8.31 (27.3) |
| -1.5 m (-5.0 ft) | kg lb | *10160 *22400 | *10160 *22400 | *10600 *23370 | 6820 15040 | *7390 *16290 | 3500 7720 | *5290 *11660 | 2240 4940 | | | *3520 *7760 | 1570 3460 | 7.66 (25.1) |
| -3.0 m (-10.0 ft) | kg lb | | | *9480 *20900 | 6980 15390 | *6500 *14330 | 3560 7850 | *4440 *9790 | 2300 5070 | | | *3240 *7140 | 2120 4670 | 6.54 (21.5) |
| -4.5 m (-15.0 ft) | kg lb | | | *6100 *13450 | *6100 *13450 | *3870 *8530 | 3820 8420 | | | | | | | |

6. BUCKET SELECTION GUIDE

1) GENERAL BUCKET

| | | | | |
|---|---|---|--|---|
|  |  |  |  |  |
| 0.39 m ³ SAE heaped bucket | 0.50 m ³ SAE heaped bucket | 0.64 m ³ , ※0.76 m ³ SAE heaped bucket | 0.89 m ³ , 1.05 m ³ SAE heaped bucket | ◆0.69 m ³ SAE heaped bucket |

| Capacity | | Width | | Weight | Recommendation | | | | |
|---|--|---------------------|--------------------|---------------------|--------------------------|-------------------|--------------------|------------------------------------|-------------------|
| | | | | | 5.1 m (16' 9") Mono boom | | | 5.1 m (16' 9") Hyd adjustable boom | |
| SAE heaped | CECE heaped | Without side cutter | With side cutter | | 2.2 m arm (7' 3") | 2.6 m arm (8' 6") | 3.1 m arm (10' 2") | 2.2 m arm (7' 3") | 2.6 m arm (8' 6") |
| 0.39 m ³ (0.51 yd ³) | 0.34 m ³ (0.44 yd ³) | 620 mm (24.4") | 740 mm (29.1") | 410 kg (900 lb) | | | | | |
| 0.50 m ³ (0.65 yd ³) | 0.44 m ³ (0.58 yd ³) | 760 mm (29.9") | 880 mm (34.6") | 470 kg (1040 lb) | | | | | |
| 0.64 m ³ (0.84 yd ³) | 0.55 m ³ (0.72 yd ³) | 920 mm (36.2") | 1040 mm (40.9") | 510 kg (1120 lb) | | | | | |
| ※0.76 m ³ (0.99 yd ³) | 0.65 m ³ (0.85 yd ³) | 1060 mm (41.7") | 1180 mm (46.5") | 570 kg (1260 lb) | | | | | |
| 0.89 m ³ (1.16 yd ³) | 0.77 m ³ (1.01 yd ³) | 1220 mm (48.0") | 1340 mm (52.8") | 610 kg (1340 lb) | | | | | |
| 1.05 m ³ (1.37 yd ³) | 0.90 m ³ (1.18 yd ³) | 1400 mm (55.1") | 1520 mm (59.8") | 680 kg (1500 lb) | | | | | |
| ◆0.69 m ³ (0.9 yd ³) | 0.62 m ³ (0.81 yd ³) | 990 mm (39.0") | - | 700 kg (1540 lb) | | | | | |

※ : Standard bucket

◆ : Heavy duty 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

7. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

| Item | Specification |
|-------------------------------------|--|
| Model | Mitsubishi S6S-DT |
| Type | 4-cycle turbocharged diesel engine, low emission |
| Cooling method | Water cooling |
| Number of cylinders and arrangement | 6 cylinders, in-line |
| Firing order | 1-5-3-6-2-4 |
| Combustion chamber type | Direct injection type |
| Cylinder bore × stroke | 94 × 120 mm (3.7" × 4.7") |
| Piston displacement | 4996 cc (305 cu in) |
| Compression ratio | 19.5 : 1 |
| Rated gross horse power (SAE J1995) | 126 Hp (94 kW) at 2100 rpm |
| Maximum torque | 42.5 kgf · m (307 lbf · ft) at 1500 rpm |
| Engine oil quantity | 16.5 l (4.4 U.S. gal) |
| Dry weight | 355 kg (783 lb) |
| High idling speed | 2200 ± 50 rpm |
| Low idling speed | 950 ± 100 rpm |
| Rated fuel consumption | 160.2 g/Hp · hr at 2100 rpm |
| Starting motor | Mitsubishi (24 V-5.0 kW) |
| Alternator | Mitsubishi (24 V-50 A) |
| Battery | 2 × 12 V × 100 Ah |

2) MAIN PUMP

| Item | Specification |
|------------------|---|
| Type | Variable displacement tandem axis piston pumps |
| Capacity | 2 × 80 cc/rev |
| Maximum pressure | 350 kgf/cm ² (4980 psi) [380 kgf/cm ² (5400 psi)] |
| Rated oil flow | 2 × 168 l/min (44.4 U.S. gpm / 37.0 U.K. gpm) |
| Rated speed | 2100 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 | 31.5 l /min (8.3 U.S. gpm/6.9 U.K. gpm) |

4) MAIN CONTROL VALVE

| Item | Specification |
|--------------------------------|---|
| Type | 11 spools two-block |
| 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 | Specification |
|------------------------|--|
| Type | Fixed displacement axial piston motor |
| Capacity | 117.8 cc/rev |
| Relief pressure | 285 kgf/cm ² (4050 psi) |
| Braking system | Automatic, spring applied hydraulic released |
| Braking torque | 59 kgf · m (427 lbf · ft) |
| Brake release pressure | 33~50 kgf/cm ² (469~711 psi) |
| Reduction gear type | 2 - stage planetary |

6) TRAVEL MOTOR

| Item | Specification |
|-----------------------|--|
| Type | Variable displacement bent-axis axial piston motor |
| Relief pressure | 380 kgf/cm ² (5400 psi) |
| Counter balance valve | Applied |
| Capacity | 140 cc/rev |

7) POWER TRAIN

| Item | Description | | Specification |
|---------------|------------------------|-----|---|
| Transmission | Type | | 2 speed power shift transmission |
| | Gear ratio | 1st | 4.87 |
| | | 2nd | 1.20 |
| Parking brake | Type | | Multi disc brake integrated in transmission |
| | Maximum braking torque | | 3044 kgf · m (22020 lbf · ft) |
| Axle | Type | | 4 wheel drive with differential |
| | Gear ratio | | 22.11 |
| | Brake | | Multi disc brake |

8) CYLINDER

| Item | | Specification |
|-----------------------------|-----------------------------|-----------------------|
| Boom cylinder | Bore dia × Rod dia × Stroke | ∅ 115 × ∅ 80 × 1090mm |
| | Cushion | Extend only |
| Arm cylinder | Bore dia × Rod dia × Stroke | ∅ 120 × ∅ 85 × 1355mm |
| | Cushion | Extend and retract |
| Bucket cylinder | Bore dia × Rod dia × Stroke | ∅ 110 × ∅ 75 × 995mm |
| | Cushion | Extend only |
| Dozer cylinder | Bore dia × Rod dia × Stroke | ∅ 110 × ∅ 65 × 235mm |
| | Cushion | Extend only |
| Outrigger cylinder | Bore dia × Rod dia × Stroke | ∅ 125 × ∅ 75 × 463mm |
| | Cushion | - |
| Boom cylinder (adjust boom) | Bore dia × Rod dia × Stroke | ∅ 115 × ∅ 80 × 960mm |
| | Cushion | Extend only |
| Adjust cylinder | Bore dia × Rod dia × Stroke | ∅ 160 × ∅ 95 × 650mm |
| | Cushion | Extended only |

9) BUCKET

| Item | Capacity | | Tooth quantity | Width | |
|----------|--|---|----------------|---------------------|------------------|
| | SAE heaped | CECE heaped | | Without side cutter | With side cutter |
| R170W-9S | 0.76 m ³ (0.99 yd ³) | 0.65 m ³ (0.85 yd ³) | 5 | 1060 mm (41.7") | 1180 mm (46.5") |
| | 0.39 m ³ (0.51 yd ³) | 0.34 m ³ (0.44 yd ³) | 3 | 620 mm (24.4") | 740 mm (29.1") |
| | 0.50 m ³ (0.65 yd ³) | 0.44 m ³ (0.58 yd ³) | 4 | 760 mm (29.9") | 880 mm (34.6") |
| | 0.64 m ³ (0.84 yd ³) | 0.55 m ³ (0.72 yd ³) | 5 | 920 mm (36.2") | 1040 mm (40.9") |
| | 0.89 m ³ (1.16 yd ³) | 0.77 m ³ (1.01 yd ³) | 6 | 1220 mm (48.0") | 1340 mm (52.8") |
| | 1.05 m ³ (1.37 yd ³) | 0.90 m ³ (1.18 yd ³) | 6 | 1400 mm (55.1") | 1520 mm (59.8") |
| | ◆0.69 m ³ (0.90 yd ³) | 0.62 m ³ (0.81 yd ³) | 5 | 990 mm (39.0") | - |

◆ : Heavy duty bucket

8. RECOMMENDED OILS

Use only oils listed below or equivalent.
Do not mix different brand oil.

| 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 | 16.5 (4.4) | ★SAE 5W-40 | | | | | SAE 30 | | | |
| Transmission case | | | 3.0 (0.79) | SAE 10W | | | | | SAE 10W-30 | | |
| | | | | | | | | | SAE 15W-40 | | |
| Swing drive | Gear oil | 5.0 (1.3) | ★SAE 75W-90 | | | | | SAE 85W-140 | | | |
| | Grease | | 1.2 (0.32) | ★NLGI NO.1 | | | | | NLGI NO.2 | | |
| Front axle | Gear oil | Center : 10.5 (2.77) Hub : 2.5×2 (0.66×2) | | SAE 85W-90 LSD or UTTO | | | | | | | |
| Rear axle | | Center : 15.1 (4.0) Hub : 2.5×2 (0.66×2) | | | | | | | | | |
| Hydraulic tank | Hydraulic oil | Tank: 160 (42.3) System: 270 (71.3) | ★ISO VG 15 | | | | | | | | |
| | | | ISO VG 32 | | | | | | | | |
| | | | ISO VG 46 | | | | | | | | |
| | | | ISO VG 68 | | | | | | | | |
| Fuel tank | Diesel fuel | 260 (68.7) | ★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★1 | 17.5 (4.6) | 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 Materia

UTTO : Universal Tractor Transmission Oil

★ : Cold region

Russia, CIS, Mongolia

★1 : Soft water

City water or distilled water

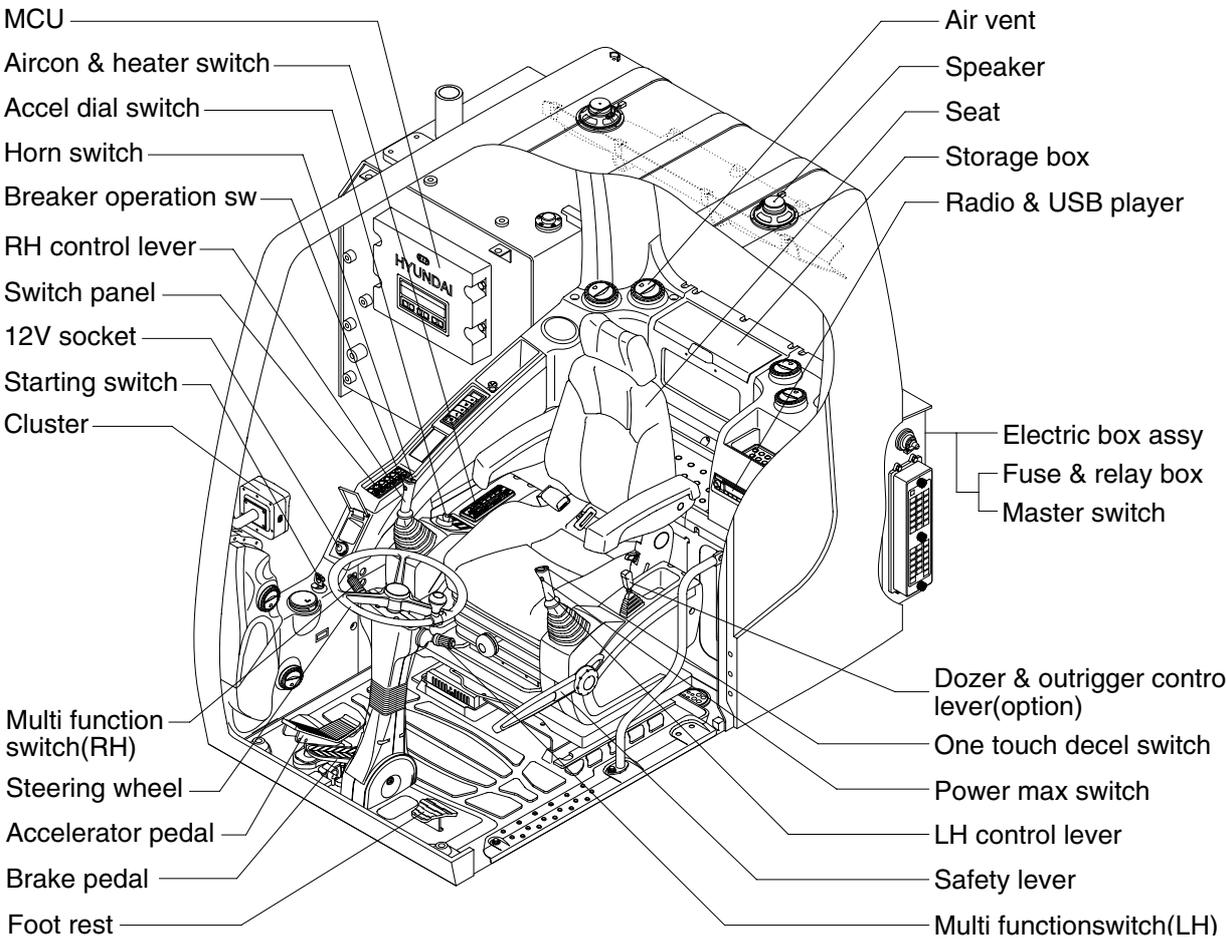
CONTROL DEVICES

1. CAB DEVICES

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

2) ELECTRONIC MONITOR SYSTEM

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



17W9S3CD01

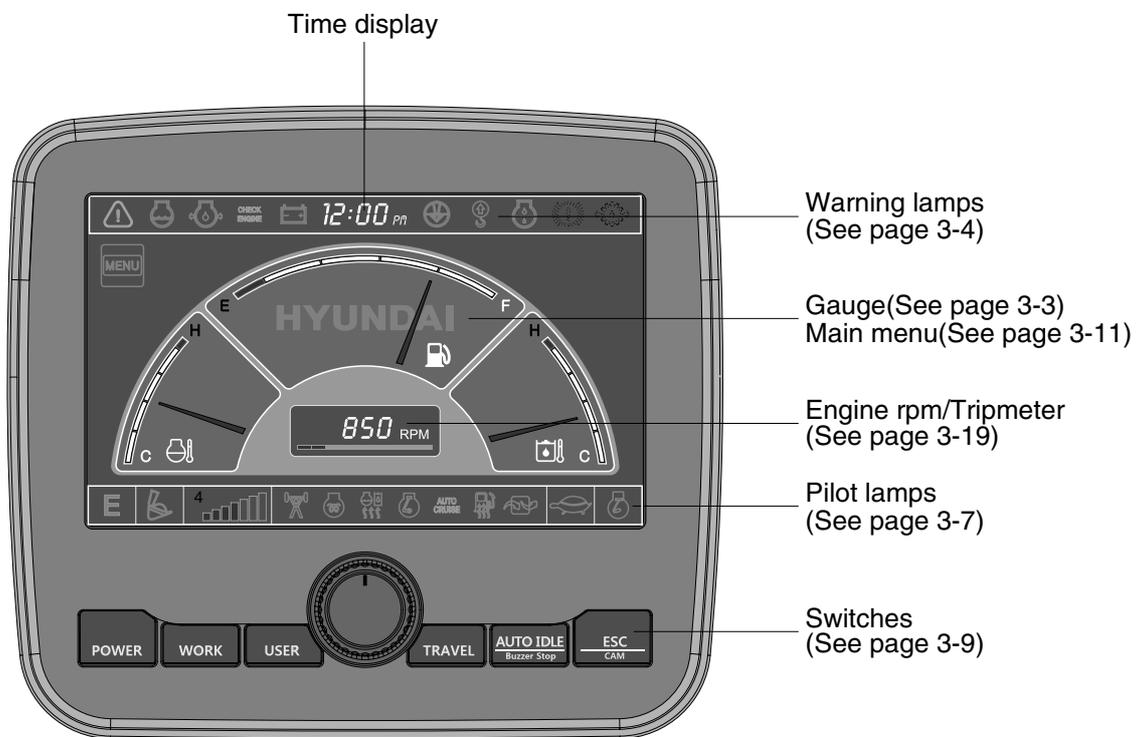
2. CLUSTER (TYPE 1)

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 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.**

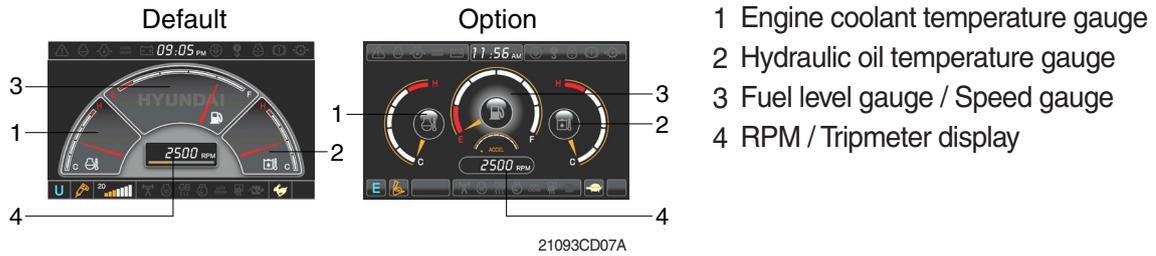


21093CD07

- ※ **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 3-4 for details.

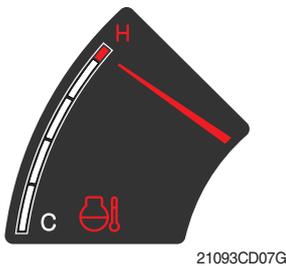
2) GAUGE

(1) Operation screen



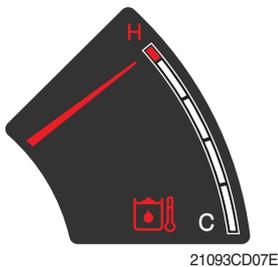
※ Operation screen type can be set by the screen type menu of the display.
Refer to page 3-21 for details.

(2) Engine coolant temperature gauge



- ① This gauge indicates the temperature of coolant.
 - 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 blinks in red, 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.

(3) Hydraulic oil temperature gauge



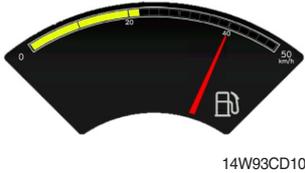
- ① This gauge indicates the temperature of hydraulic oil.
 - White range : 40-105°C(104-221°F)
 - Red range : Above 105°C(221°F)
 - ② If the indicator is in the red range or  lamp blinks is red, reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause 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.

(4) Fuel level gauge / Speed gauge



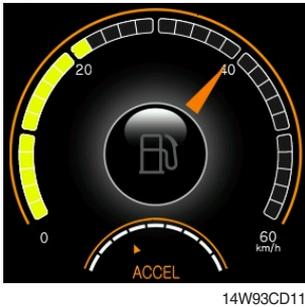
- ① This gauge indicates the amount of fuel in the fuel tank.
- ② Fill the fuel when the red range, or  lamp blinks in red.
- ※ If the gauge indicates the red range or  lamp blinks in red even though the machine is on the normal condition, check the electric device as that can be caused by the poor connection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

Standard



- ③ When traveling, the speed gauge is displayed.

Option

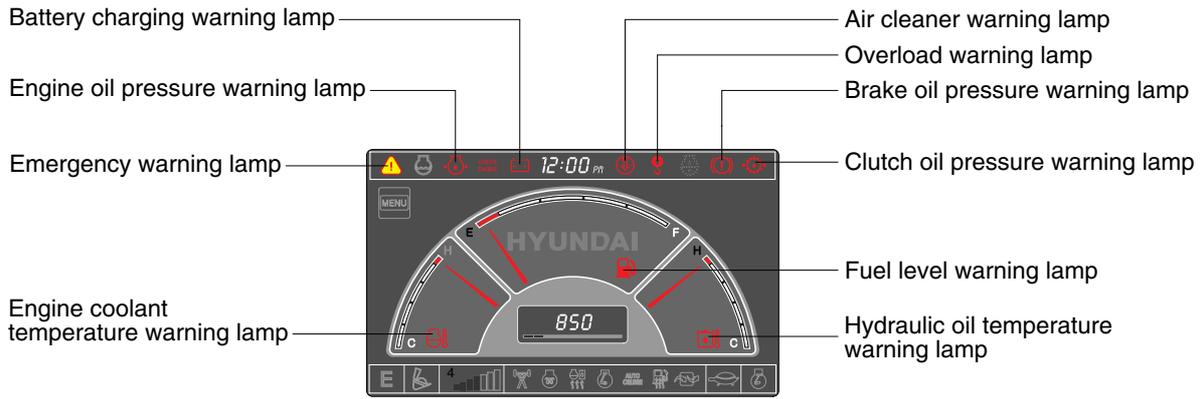


(5) RPM / Tripmeter display



- ① This displays the engine speed or the tripmeter.
- ※ Refer to page 3-19 for details.

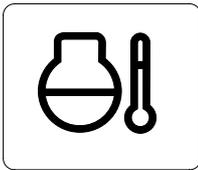
3) WARNING LAMPS



17W9S3CD08

- ※ Each warning lamp on the top of the LCD pops up on the center of LCD and the buzzer sounds when the each warning is happened. The pop-up warning lamp moves to the original position and blinks when the select switch is pushed. And the buzzer stops. Refer to page 3-10 for the select switch.

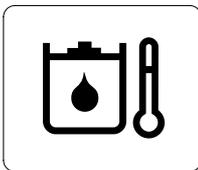
(1) Engine coolant temperature



21093CD08A

- ① Engine coolant temperature warning is indicated two steps.
 - 100°C over : The lamp blinks and the buzzer sounds.
 - 105°C over : The lamp pops up on the center of LCD and the buzzer sounds.
- ② The pop-up lamp moves to the original position and blinks when the select switch is pushed. Also, the buzzer stops and lamp keeps blink.
- ③ Check the cooling system when the lamp keeps ON.

(2) Hydraulic oil temperature



21093CD08C

- ① Hydraulic oil temperature warning is indicated two steps.
 - 100°C over : The lamp blinks and the buzzer sounds.
 - 105°C over : The lamp pops up on the center of LCD and the buzzer sounds.
- ② The pop-up lamp moves to the original position and blinks when the select switch is pushed. Also, the buzzer stops and lamp keeps blink.
- ③ Check the hydraulic oil level and hydraulic oil cooling system.

(3) Fuel level



21093CD08B

- ① This warning lamp blinks and the buzzer sounds when the level of fuel is below 31 ˆ (8.2 U.S. gal).
- ② Fill the fuel immediately when the lamp blinks.

(4) Emergency warning lamp



21093CD30

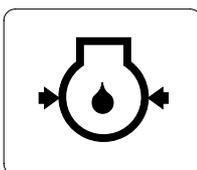
① This lamp pops up and the buzzer sounds when each of the below warnings is happened.

- Engine coolant overheating (over 105°C)
- Hydraulic oil overheating (over 105°C)
- Pump EPPR circuit abnormal or open
- Attachment flow EPPR circuit abnormal or open
- MCU input voltage abnormal
- Accel dial circuit abnormal or open
- Cluster communication data error

※ **The pop-up warning lamp moves to the original position and blinks when the select switch is pushed. Also the buzzer stops. This is same as following warning lamps.**

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

(5) Engine oil pressure warning lamp

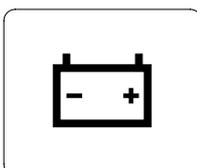


21093CD32

① This lamp blinks when the engine oil pressure is low.

② If the lamp blinks, shut OFF the engine immediately. Check oil level.

(6) Battery charging warning lamp



21093CD34

① This lamp blinks when the battery charging voltage is low.

② Check the battery charging circuit when this lamp blinks.

(7) Air cleaner warning lamp

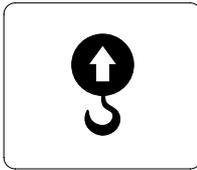


21093CD35

① This lamp blinks when the filter of air cleaner is clogged.

② Check the filter and clean or replace it.

(8) Overload warning lamp (opt)



21093CD36

- ① When the machine is overload, the overload warning lamp blinks during the overload switch is ON. (if equipped)
- ② Reduce the machine load.

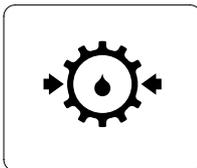
(9) Brake oil pressure warning lamp



14W93CD95

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

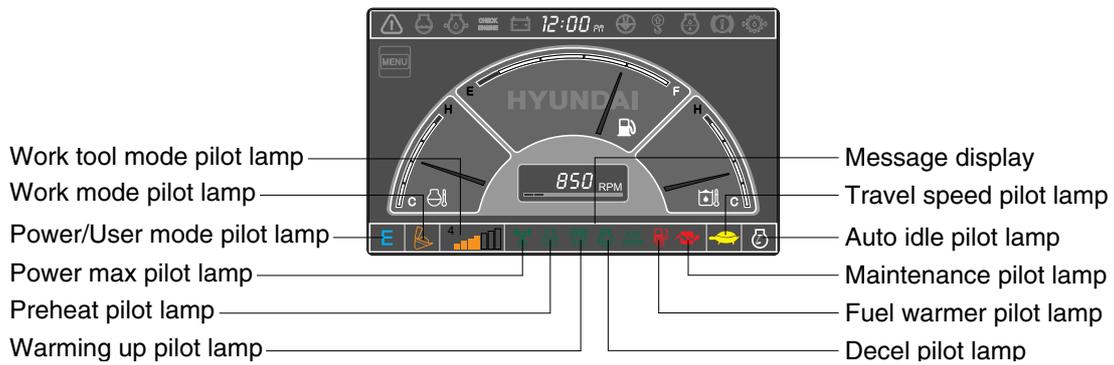
(10) Clutch oil pressure warning lamp



14W93CD96

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

4) PILOT LAMPS



17W9S3CD09

(1) Mode pilot lamps

| No | Mode | Pilot lamp | Selected mode |
|----|-----------------|------------|--|
| 1 | Power mode | | Heavy duty power work mode |
| | | | Standard power mode |
| | | | Economy power mode |
| 2 | User mode | | User preferable power mode |
| 3 | Work mode | | General operation mode |
| | | | Breaker operation mode |
| | | | Crusher operation mode |
| 4 | Travel mode | | Low speed traveling |
| | | | High speed traveling |
| 5 | Auto idle mode | | Auto idle |
| 6 | Work tool mode | | Oil flow level of breaker or crusher mode |
| 7 | Message display | | "Setting is completed" display after selection |

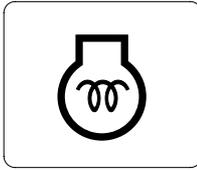
(2) Power max pilot lamp



21093CD38

- 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 3-37 for power max function.

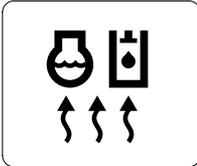
(3) Preheat pilot lamp



21093CD39

- 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



21093CD40

- 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.

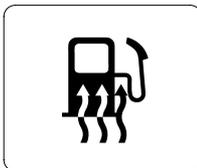
(5) Decel pilot lamp



21093CD41

- 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 3-37.**

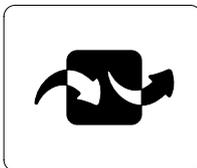
(6) Fuel warmer pilot lamp



21093CD43

- 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, or the hydraulic oil temperature is above 45°C since the start switch was ON position.

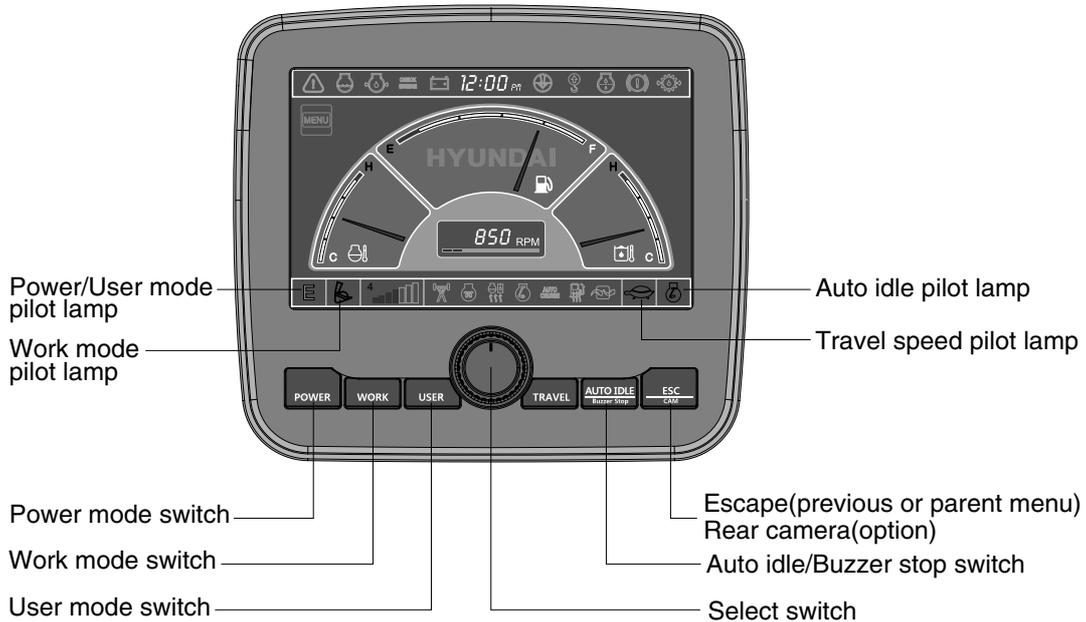
(7) Maintenance pilot lamp



21093CD44

- 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.

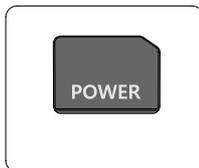
5) SWITCHES



14W93CD45

※ When the switches are selected, the pilot lamps are displayed on the LCD. Refer to the page 3-7 for details.

(1) Power mode switch



21093CD45A

- 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

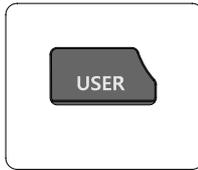


21093CD45C

- 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 4-10 for details.

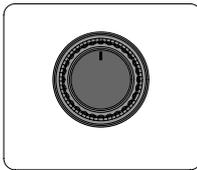
(3) User mode switch



21093CD45D

- ① This switch is used to memorize the current machine operating status in the MCU and activate the memorized user mode.
 - Memory : Push more than 2 seconds.
 - Action : Push within 2 seconds.
 - Cancel : Push this switch once more within 2 seconds.
- ② Refer to the page 3-12 for another set of user mode.

(4) Select switch



21093CD45E

- ① This switch is used to select or change the menu and input value.
- ② Knob push
 - Long (over 2 sec) : Return to the operation screen
 - Medium (0.5~2 sec) : Return to the previous screen
 - Short (below 0.5 sec) : Select menu
- ③ Knob rotation

This knob changes menu and input value.

 - Right turning : Down direction / Increase input value
 - Left turning : Up direction / Decreased input value

(5) Auto idle/ buzzer stop switch

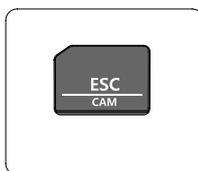


21093CD45F

- 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



21093CD45H

- 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).

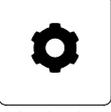
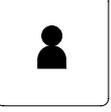
Please refer to page 3-22 for the camera.
- ③ If the camera is not installed, this switch is used only ESC function.

6) MAIN MENU



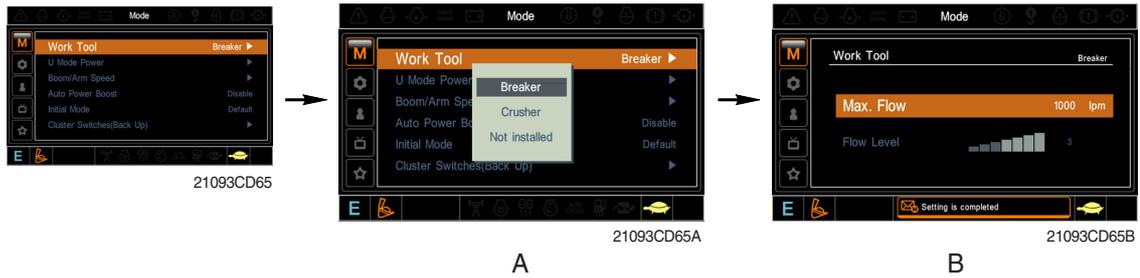
※ Please refer to select switch, page 3-10 for selection and change of menu and input value.

(1) Structure

| No | Main menu | Sub menu | Description |
|----|---|---|---|
| 1 |  Mode 21093CD64D | Work tool U mode power Boom/Arm speed Auto power boost Initial mode Cluster switch (back up) | Breaker, Crusher, Not installed User mode only Boom speed, Arm speed Enable, Disable Default, U mode Switch function |
| 2 |  Monitoring 21093CD64E | Active fault Logged fault Delete logged fault Monitoring (analog) Monitoring (digital) Operating hours | MCU MCU All logged fault delete, Initialization canceled Machine information Switch status, Output status Operating hours for each mode |
| 3 |  Management 21093CD64F | Maintenance information Machine security Machine Information A/S phone number Service menu | Replacement, Change interval oils and filters ESL mode setting, Password change Cluster, MCU, Engine, Machine A/S phone number, A/S phone number change Power shift, Hourmeter, Replacement history, Update |
| 4 |  Display 21093CD64G | Display item Clock Brightness Unit Language Screen type | Engine speed, Tripmeter A, Tripmeter B, Tripmeter C Clock Manual, Auto Temperature, Pressure, Flow, Date format Korean, English, Chinese A type, B type |
| 5 |  Utilities 21093CD64H | Tripmeter DMB (-#0304) Entertainment (-#0304) Camera setting Message box | 3 kinds (A, B, C) DMB select, DAB select, Channel scan, Exit Play MP4, codec. Basic direction, Display switching, Full screen Record for fault, attachment etc. |

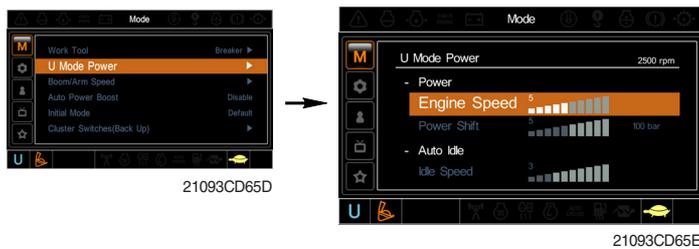
(2) Mode setup

① Work tool



- A : Select one installed optional attachment.
 - B : Max flow - Set the maximum flow for the attachment.
 Flow level - Reduce the operating flow from maximum flow.
 Breaker - Max 7 steps, Reduced 10 lpm each step.
 Crusher - Max 4 steps, Reduced 20 lpm each step.
- ※ The flow level is displayed with the work mode pilot lamp.

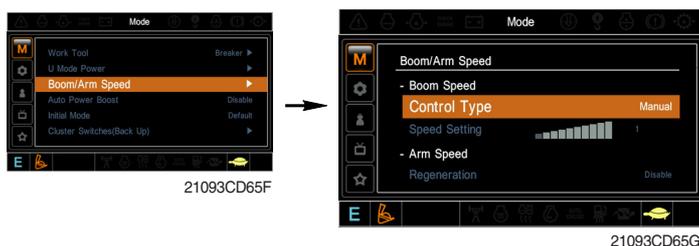
② U mode power



- 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.

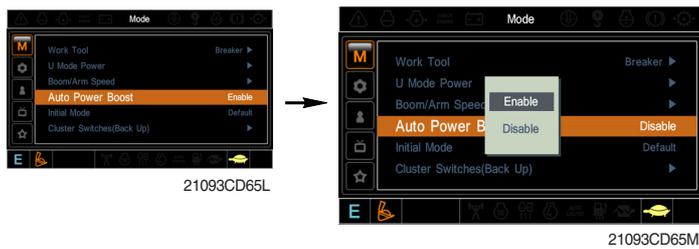
| Step (█) | Engine speed (rpm) | Idle speed (rpm) | Power shift (bar) |
|----------|--------------------|------------------|-------------------|
| 1 | 1500 | 850 | 0 |
| 2 | 1600 | 900 (low idle) | 3 |
| 3 | 1700 | 950 | 6 |
| 4 | 1800 | 1000 | 9 |
| 5 | 1850 | 1050 | 12 |
| 6 | 1900 | 1100 (decel rpm) | 16 |
| 7 | 1950 | 1150 | 20 |
| 8 | 2000 | 1200 | 26 |
| 9 | 2050 | 1250 | 32 |
| 10 | 2100 | 1300 | 38 |

③ Boom/Arm speed



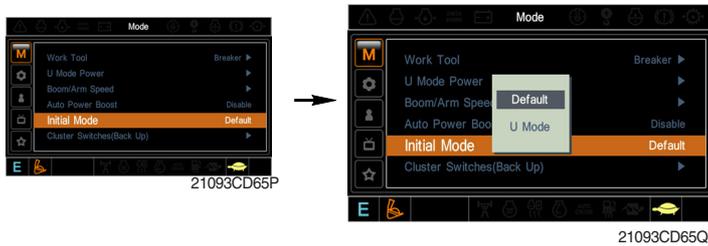
- Boom speed
 - Control type
 Manual - Boom up speed is fixed as set steps.
 Auto - Boom up speed is automatically adjusted as working conditions by the MCU.
 - Speed setting - Boom up speed is increased as much as activated steps.
- Arm speed
 - Regeneration - Arm regeneration function can be activated or cancelled.
 Enable - Arm in speed is up.
 Disable - Fine operation.

④ Auto power boost



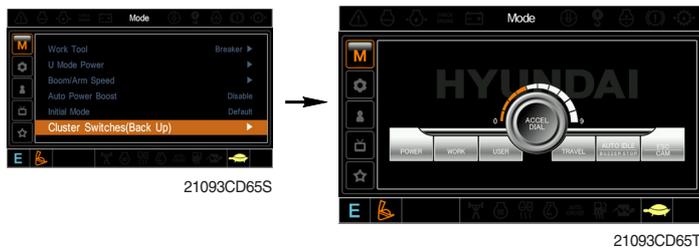
- The power boost function can be activated or cancelled.
- Enable - The digging power is automatically increased as working conditions by the MCU. It is operated max 8 seconds.
- Disable - Not operated.

⑤ Initial mode



- Default - The initial power mode is set E mode when the engine is started.
- U mode - The initial power mode is set U mode when the engine is started.

⑥ Cluster switch (back up)



- The cluster switch can be selected and changed by this menu when the switches are abnormal on the cluster.
- In order to exit "Cluster switch" mode, please put the cursor on the ESC/CAM switch by turning the select switch and push the select switch.
- In "Cluster switch", other switches except "Select switch" do not work.

(3) Monitoring

① Active fault



- The active faults of the MCU can be checked by this menu.

② Logged fault



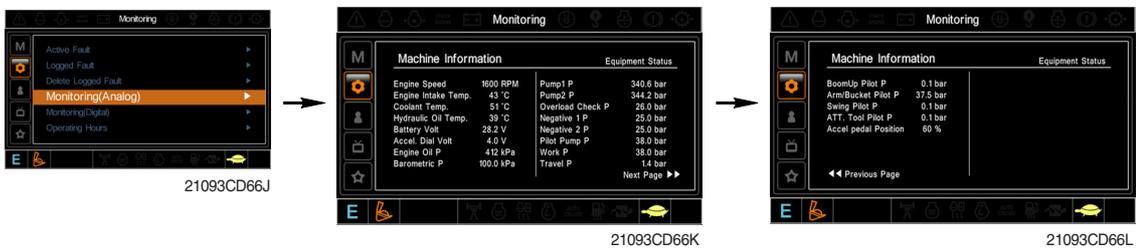
- The logged faults of the MCU can be checked by this menu.

③ Delete logged fault



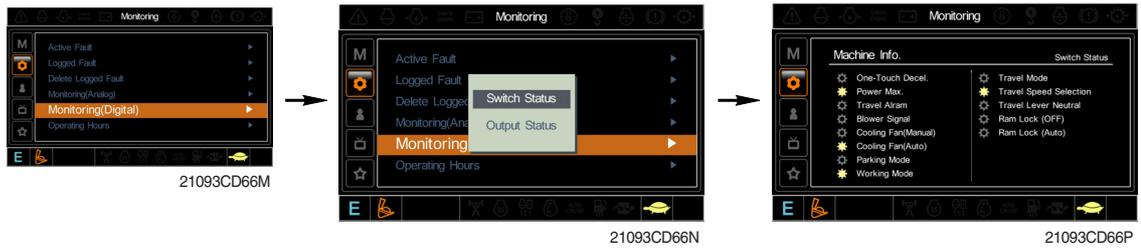
- The logged faults of the MCU can be deleted by this menu.

④ Monitoring(analog)



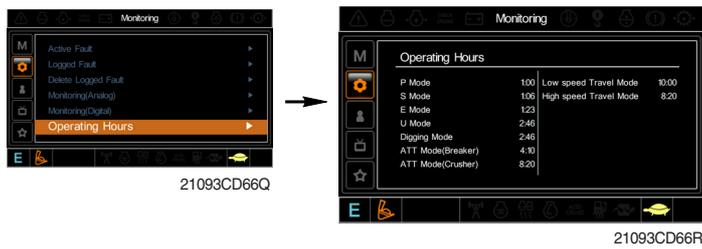
- The machine status such as the engine rpm, oil temperature, voltage and pressure etc. can be checked by this menu.

⑤ Monitoring (digital)



- The switch status or output status can be confirmed by this menu.
- The activated switch or output pilot lamps ☀ are light ON.

⑥ Operating hours



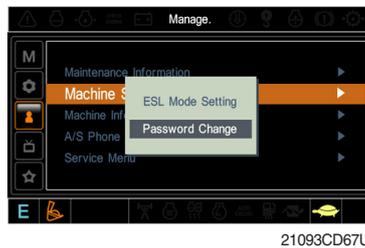
- The operating hour of each mode can be confirmed by this menu.

② Machine security



• ESL mode

- ESL : Engine Starting Limit
- ESL mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
- If the ESL mode was selected Enable, the password will be required when the start switch is turned ON.
- Disable : Not used ESL function
- Enable (always) : The password is required whenever the operator start engine.
- Enable (interval) : The password is required when the operator start engine first. But the operator can restart the engine within the interval time without inputting the password. The interval time can be set maximum 4 hours.



• Password change

- The password is 5~10 digits.

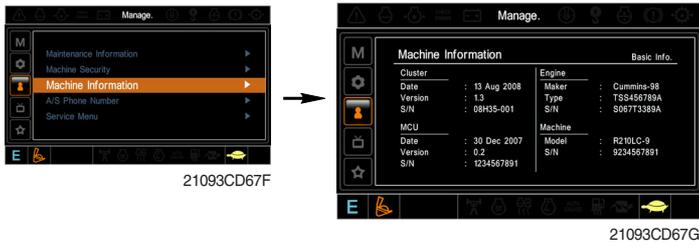


The new password is stored in the MCU.



Enter the new password again

③ Machine Information

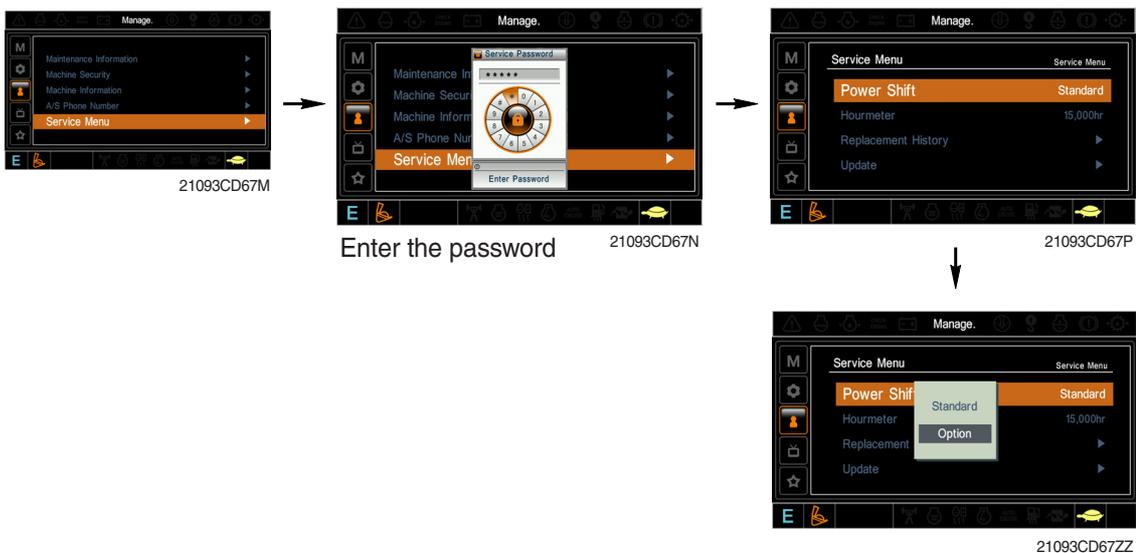


- This can confirm the identification of the cluster, MCU, engine and machine.

④ A/S phone number



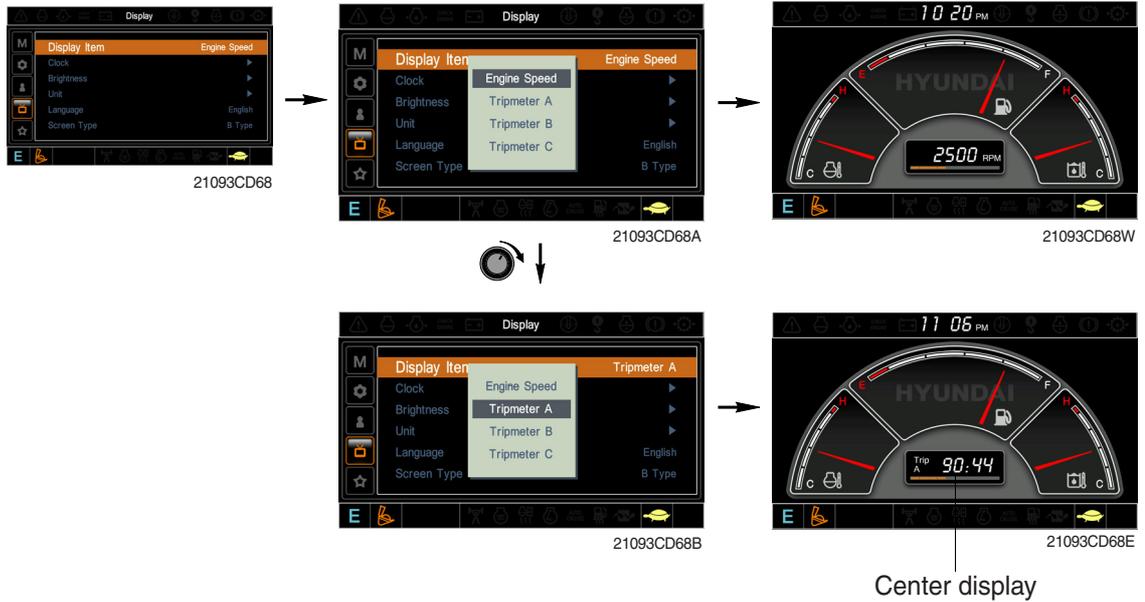
⑤ Service menu



- Power shift (standard/option) : Power shift pressure can be set by option menu.
- Hourmeter : Operating hours since the machine line out can be checked by this menu.
- Replacement history : Replacement history of the MCU and cluster can be checked by this menu.
- Update : Firm ware can be upgraded by this menu. (the USB port is located under the cluster)

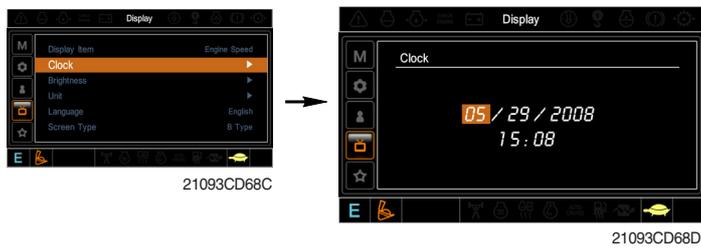
(5) Display

① Display item



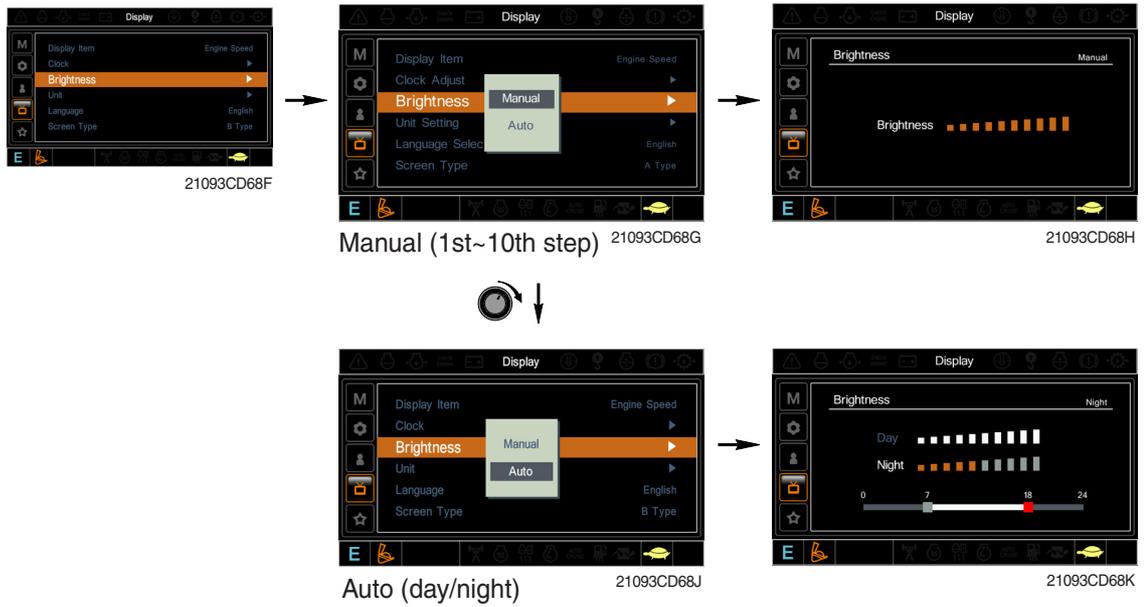
- The center display type of the LCD can be selected by this menu.
- The engine speed or each of the tripmeter (A,B,C) is displayed on the center display.

② Clock



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

③ Brightness



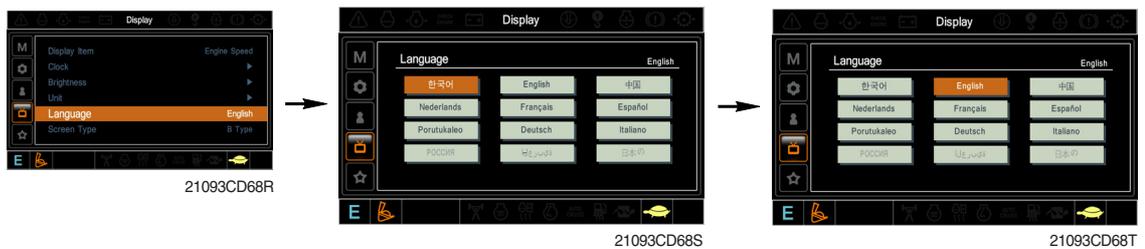
※ If "Auto" is chosen, brightness for day and night can be differently set up. Also by using the bar in lower side, users can define which time interval belongs to day and night. (in bar figure, gray area represents night time while white shows day time)

④ Unit



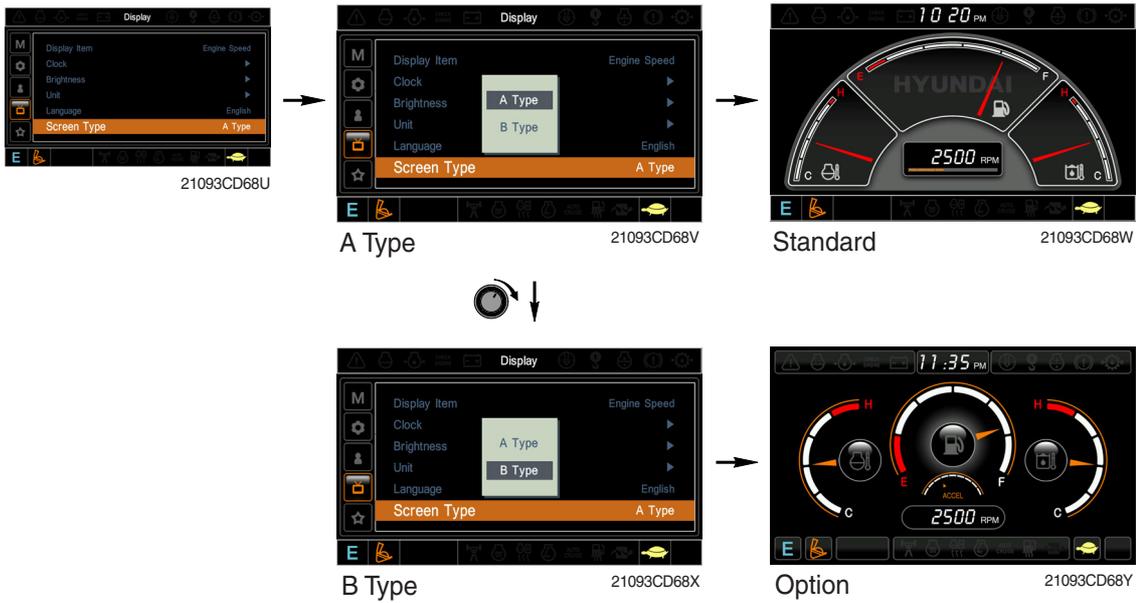
- Temperature : °C ↔ °F
- Pressure : bar ↔ MPa ↔ kgf/cm²
- Flow : lpm ↔ gpm
- Date format : yy/mm/dd ↔ mm/dd/yy ↔ dd-Mar-yy

⑤ Language



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

⑥ Screen type



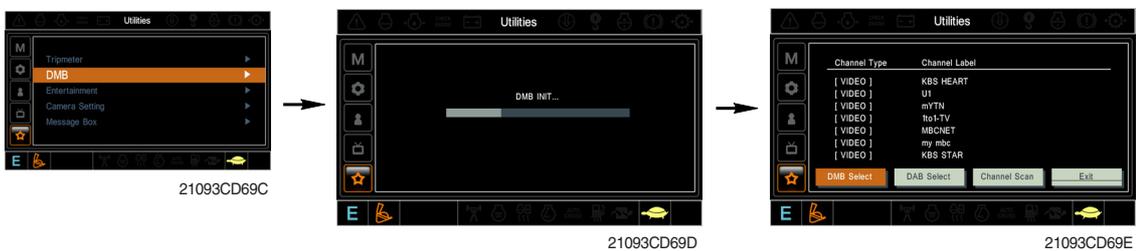
(6) Utilities

① Tripmeter



- 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.

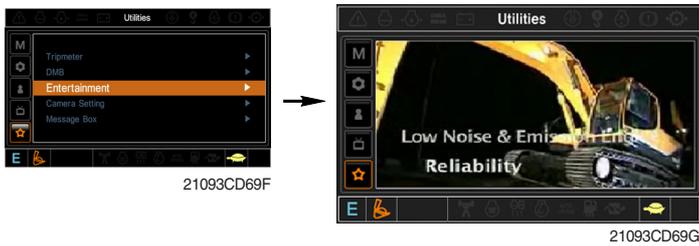
② DMB (-#0304)



- DMB select : TV channel can be selected by this menu.
- DAB select : Audio channel can be selected by this menu.
- Channel scan : This menu can be used other region for TV/Audio.
- Exit : Exit DMB menu

③ Entertainment (-#0304)

- Play MP4 or codec file of external hard disk through USB port.
- The USB port is located under the cluster.



④ Camera setting



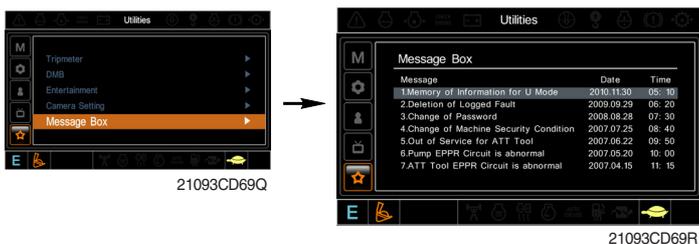
- Three cameras can be installed on the machine.
- The display order can be set by this menu.



- If the camera was not equipped, this menu is not useful.
- In the operation screen, if the ESC/CAM switch is pushed, the first ordered display camera will be viewed.
- Turning the select switch in clockwise direction, the next ordered will be shown and in counter-clockwise direction, the previously ordered will be shown.
- Push the select switch, the displayed screen will be enlargement.

⑤ Message box

- The history of the machine operating status can be checked by this menu.



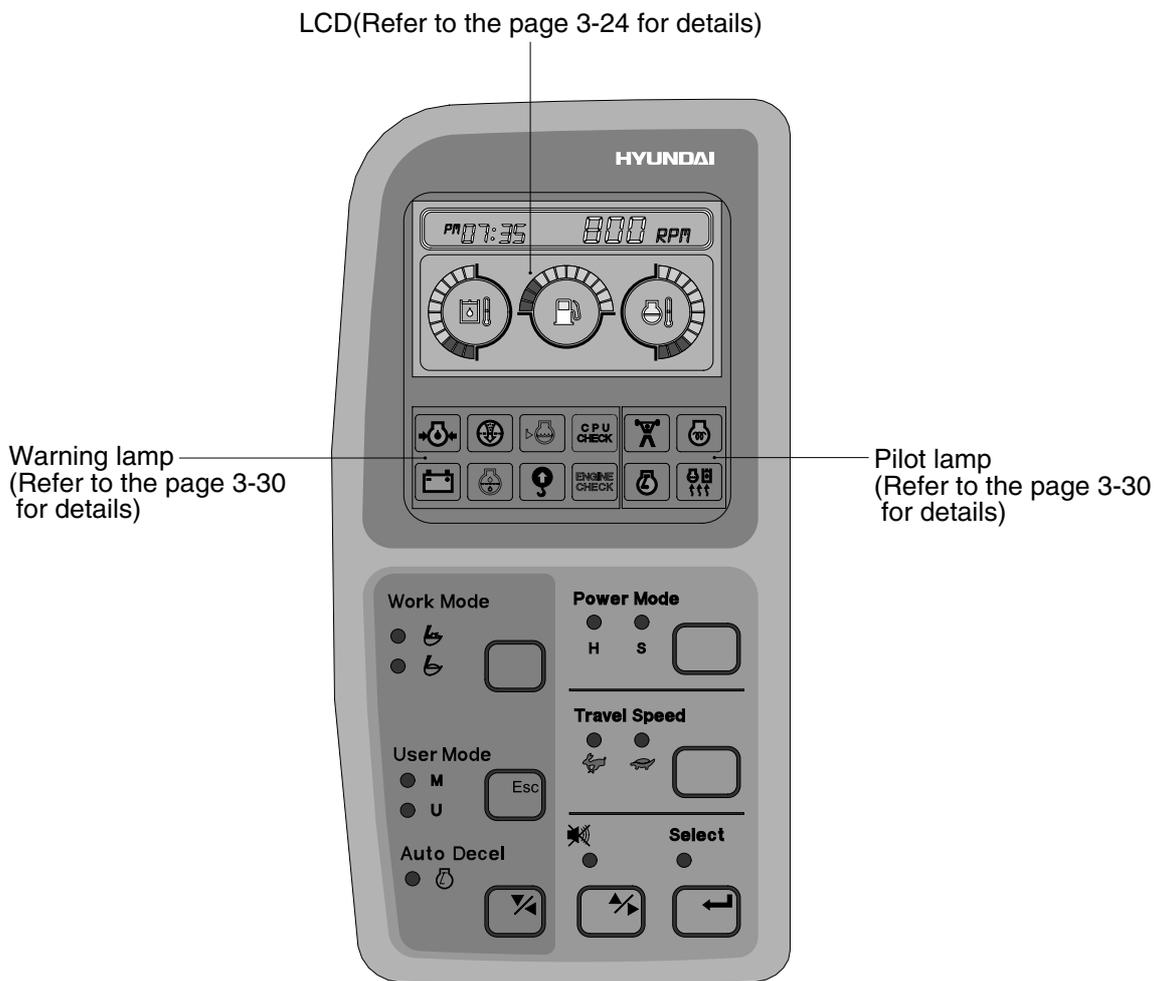
■ CLUSTER (TYPE 2)

1) MONITOR PANEL

The monitor panel consists of LCD and lamps as shown below, to warn the operator in case of abnormal machine operation or conditions for the appropriate operation and inspection.

- LCD : Indicate operating status of the machine.
- Warning lamp : Indicate abnormality of the machine (red).
- Pilot lamp : Indicate operating status of the machine (amber).

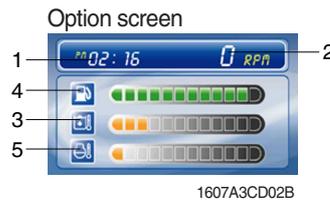
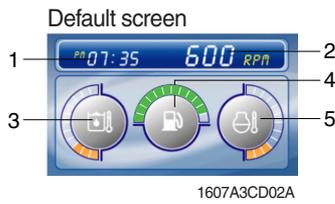
- ※ The monitor installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to chapter 6, Maintenance.
- ※ When the monitor provides a warning immediately check the problem, and perform the required action.



2209S3CD02

- ※ The warning lamp lights ON and the buzzer sounds when the machine has a problem. In this case, press the buzzer stop switch and buzzer stop, but the warning lamp lights until the problem is cleared.

2) LCD main operation display



- 1 Time display
- 2 RPM display
- 3 Hydraulic oil temperature gauge
- 4 Fuel level gauge
- 5 Engine coolant temperature gauge

(1) Time display



- ① This displays the current time.

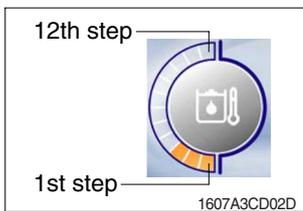
※ Refer to the page 3-28 to set time for details.

(2) RPM display



- ① This displays the engine rpm.

(3) Hydraulic oil temperature gauge



- ① This gauge indicates the temperature of hydraulic oil in 12 step gauge.

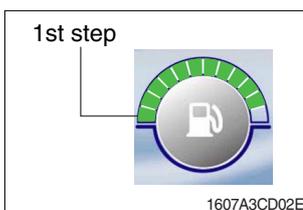
- 1st step : Below 30°C (86°F)
- 2nd~10th step : 30-105°C (86-221°F)
- 11th~12th step : Above 105°C (221°F)

- ② The gauge between 2nd and 10th steps illuminates when operating.

- ③ Keep idling engine at low speed until the gauge between 2nd and 10th steps illuminates, before operation of machine.

- ④ When the gauge of 11th and 12th steps illuminates, reduce the load on the system. If the gauge stays in the 11th~12th steps, stop the machine and check the cause of the problem.

(4) Fuel level gauge

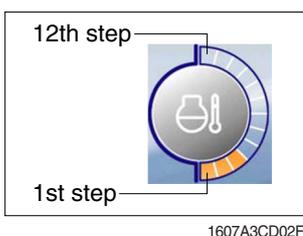


- ① This gauge indicates the amount of fuel in the fuel tank.

- ② Fill the fuel when the 1st step or fuel icon blinks in red.

※ If the gauge illuminates the 1st step or fuel icon 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) Engine coolant temperature gauge



- ① This gauge indicates the temperature of coolant in 12 step gauge.

- 1st step : Below 30°C (86°F)
- 2nd~10th step : 30-105°C (86-221°F)
- 11th~12th step : Above 105°C (221°F)

- ② The gauge between 2nd and 10th steps illuminates when operating.

- ③ Keep idling engine at low speed until the gauge between 2nd and 10th steps illuminates, before operation of machine.

- ④ When the gauge of 11th and 12th steps illuminates, turn OFF the engine, check the radiator and engine.

3) Warning of main operation screen

(1) Warning display

① Engine coolant temperature



- This lamp blinks and the buzzer sounds when the temperature of coolant is over the normal temperature 105°C (221°F).
- Check the cooling system when the lamp blinks.

② Fuel level



- This lamp blinks and the buzzer sounds when the level of fuel is below 31 l (8.2 U.S. gal).
- Fill the fuel immediately when the lamp blinks.

③ Hydraulic oil temperature



- This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 105°C (221°F).
- Check the hydraulic oil level when the lamp blinks.
- Check for debris between oil cooler and radiator.

④ All gauge



- This lamp blinks and the buzzer sounds when the all gauge is abnormal.
- Check the each system when the lamp blinks.

⑤ Communication error



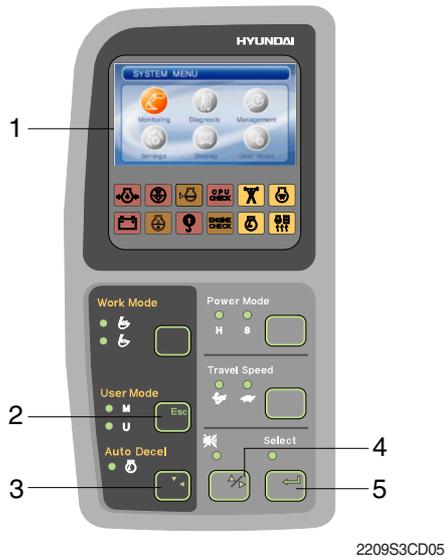
- Communication problem between MCU and cluster makes the lamp blinks and the buzzer sounds.
- Check if any fuse for MCU burnt off. If not check the communication line between them.

(2) Pop-up icon display

| No | Switch | Selected mode | Interval |
|----|-------------------|--------------------------|----------|
| 1 | Work mode switch | General work mode | |
| | | Heavy duty work mode | |
| 2 | Power mode switch | High power work mode | |
| | | Standard power work mode | |

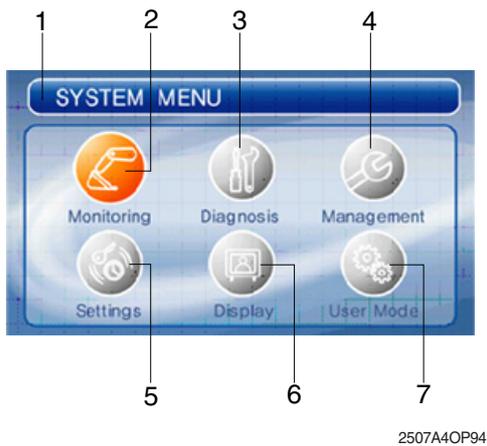
| No | Switch | Selected mode | Interval |
|----|-----------------------------|---------------|----------|
| 3 | Auto deceleration switch | Light ON | |
| | | Light OFF | |
| 4 | Travel speed control switch | Low speed | |
| | | High speed | |

4) LCD



- 1  : LCD
- 2  : Escape,
Return to the previous menu
- 3  : Down / Left Direction
- 4  : Up/Right Direction
- 5  : Select (enter)
Activate the currently chosen item

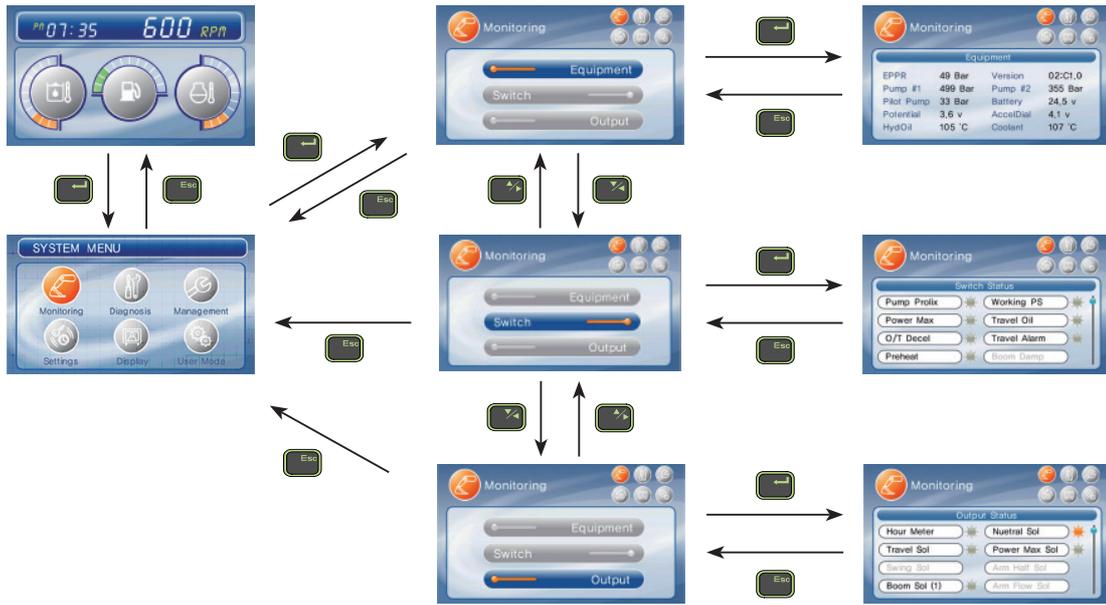
(1) Main menu



- 1  : Menu information
- 2  : Monitoring
- Equipment, Switch, Output
- 3  : Diagnosis
- Current error, Recorded error
- 4  : Maintenance
- 5  : Settings
- Time set, Dual mode
- System lock (reserved)
- 6  : Display
- Operation skin, Brightness, Language
- 7  : User mode

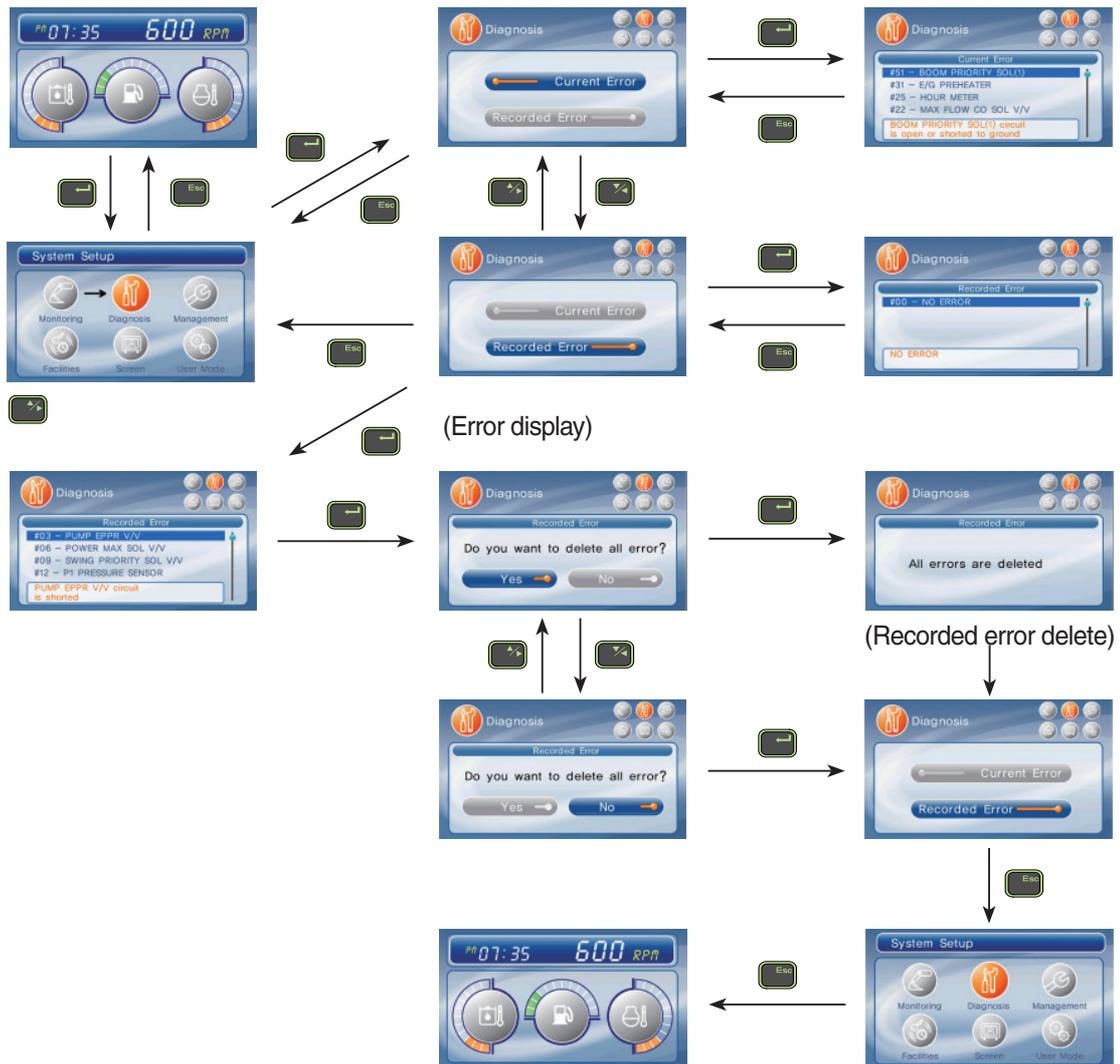
(2) Display map

① Monitoring



② Diagnosis

a. Protocol type 1



c. Dual mode
- Changing the MCU mode

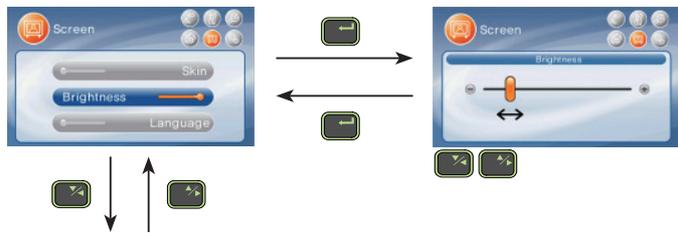


⑤ Display

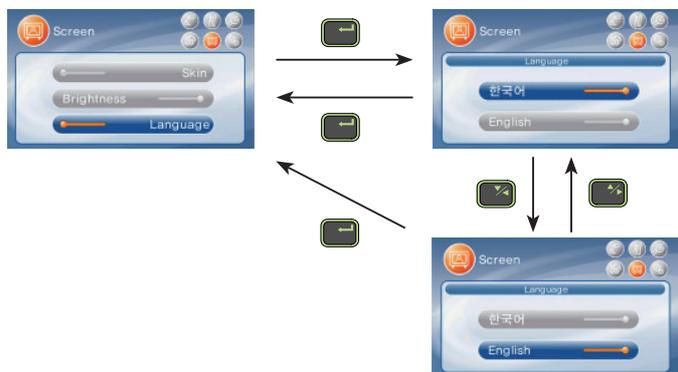
a. Operation skin



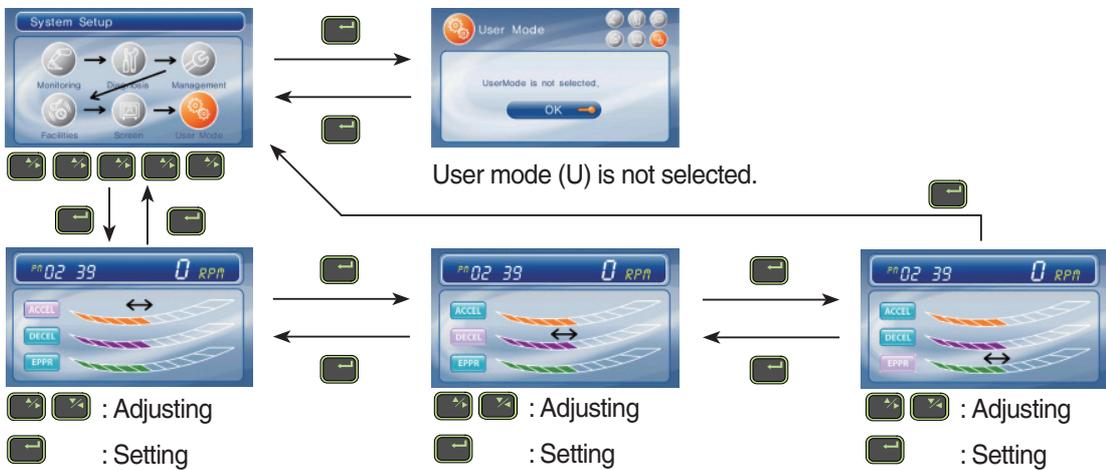
b. Brightness



c. Language

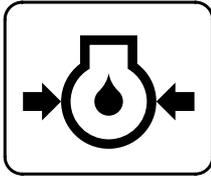


⑥ User mode



5) Warning and pilot lamp

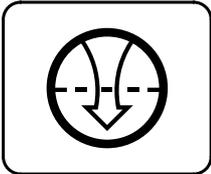
(1) Engine oil pressure warning lamp



21073CD07

- ① This lamp blinks and the buzzer sounds after starting the engine because of the low oil pressure.
- ② If the lamp blinks during engine operation, shut OFF engine immediately. Check oil level.

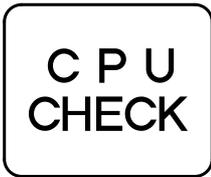
(2) Air cleaner warning lamp



21073CD08

- ① This lamp blinks and the buzzer sounds when the filter of air cleaner is clogged.
- ② Check the filter and clean or replace it.

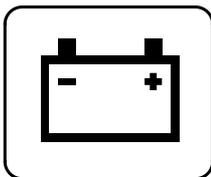
(3) MCU check warning lamp



21073CD10

- ① If any fault code is received from MCU, this lamp blinks and the buzzer sounds.
- ② Check the communication line between MCU and cluster.

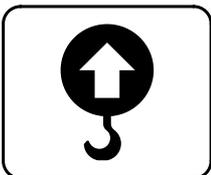
(4) Battery charging warning lamp



21073CD13

- ① This lamp blinks and the buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
- ② Check the battery charging circuit when this lamp blinks during engine operation.

(5) Overload warning lamp (opt)



21073CD15

- ① When the machine is overload, the overload warning lamp blinks during the overload switch is ON.

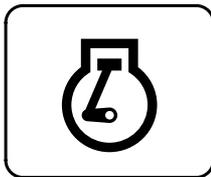
(6) Power max pilot lamp



21073CD11

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

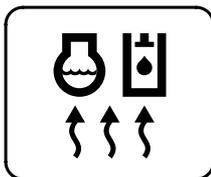
(7) Decel pilot lamp



21073CD17

- ① Operating auto decel or one touch decel makes the lamp ON.
- ② The lamp will be ON when pushing one touch decel switch on the LH RCV lever.

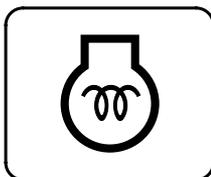
(8) Warming up pilot lamp



21073CD18

- 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.

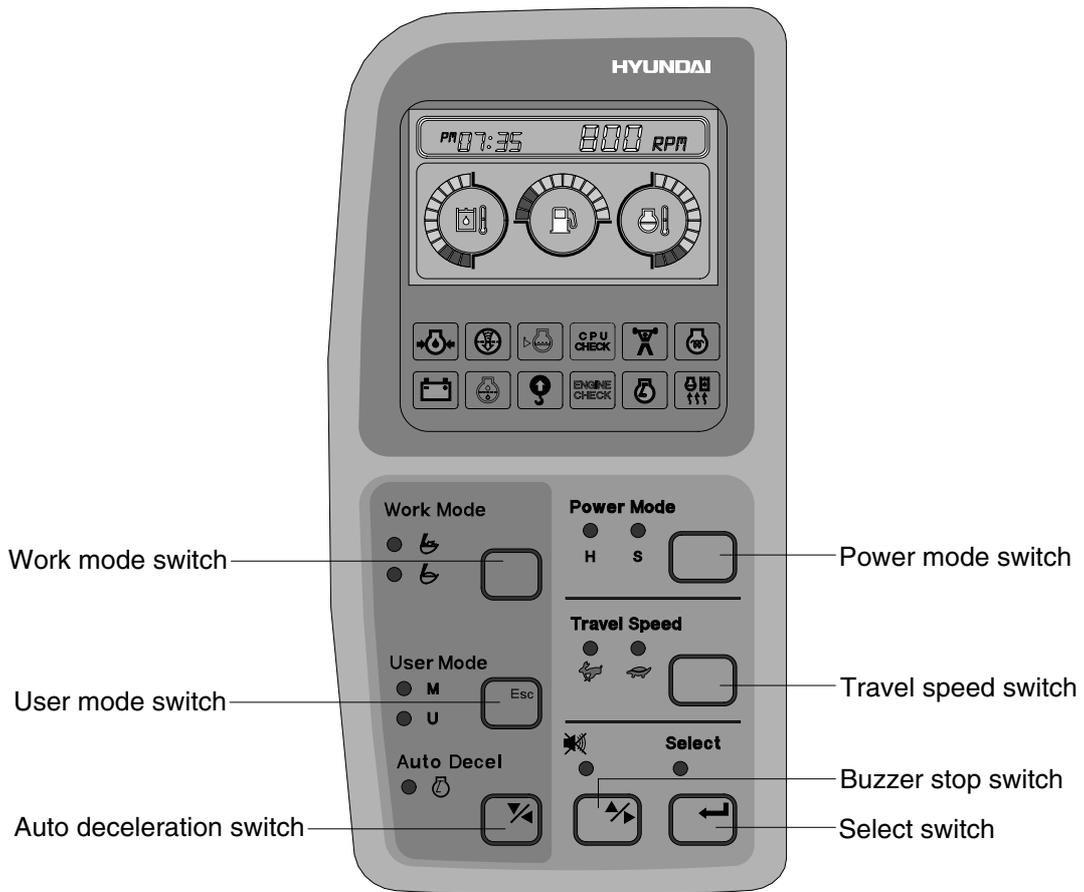
(9) Preheat pilot lamp



21073CD12

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

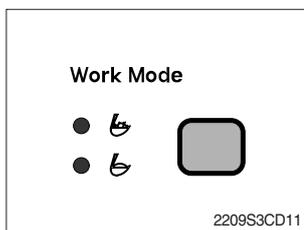
6) SWITCH PANEL



2209S3CD10

※ When the switches (Work mode, Power mode, Auto decel, Travel speed control) are selected, the pop-up icon is displayed on the LCD.
Refer to the page 3-25 for details.

(1) Work mode switch

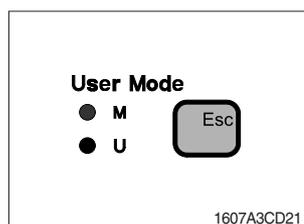


① This switch is to select the machine operation mode, which shifts from general operation mode to heavy duty operation mode by pressing the switch.

- : Heavy duty work mode
- : General work mode

※ Refer to the page 4-15 for details.

(2) User mode switch

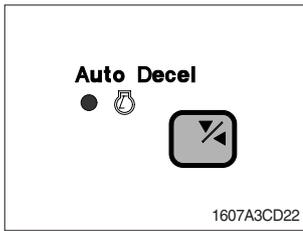


① This switch is to select the maximum power or user mode.

- M : Maximum power
- U : Memorizing operators preferable power setting.

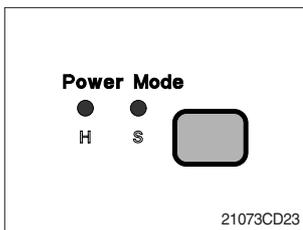
※ Refer to the page 4-15 for details.

(3) Auto deceleration switch



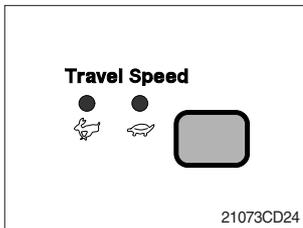
- ① This switch is used to actuate or cancel the auto deceleration function.
- ② When the switch actuated and all control levers and pedals are at neutral position, engine speed will be lowered automatically to save fuel consumption.
 - Light ON : Auto deceleration function is selected.
 - Light OFF : a. Auto deceleration function is cancelled so that the engine speed increased to previous setting value.
b. One touch decel function is available.

(4) Power mode switch



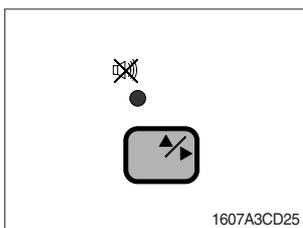
- ① The lamp of selected mode is turned ON by pressing the switch ().
 - H : High power work.
 - S : Standard power work.

(5) Travel speed control switch



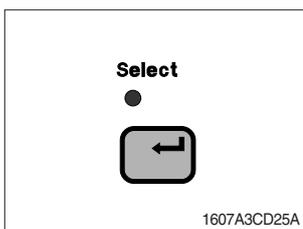
- ① This switch is to control the travel speed which is changed to high speed (rabbit mark) by pressing the switch and low speed (turtle mark) by pressing it again.

(6) Buzzer stop switch



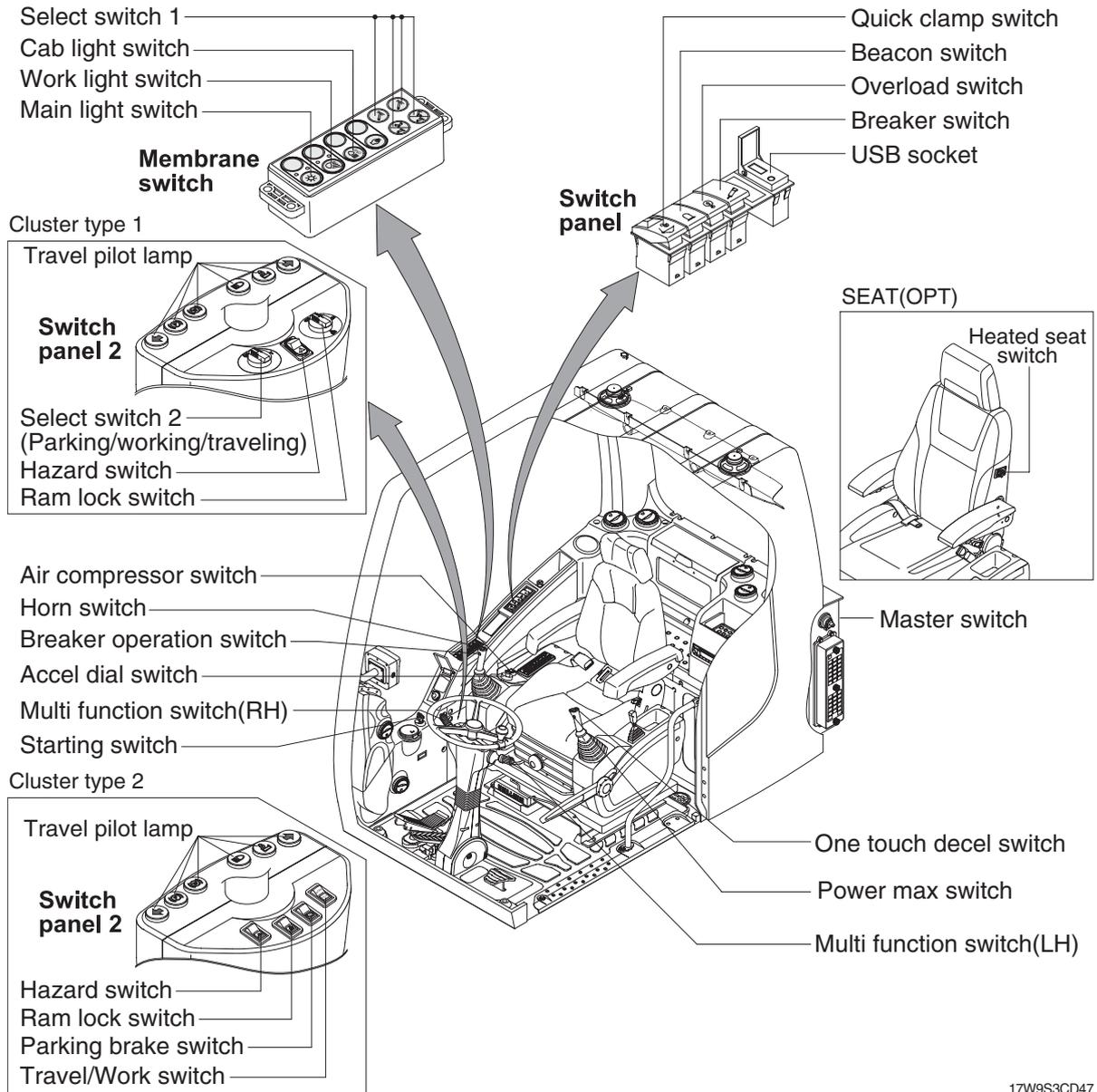
- ① When the starting switch is turned ON first, normally the alarm buzzer sounds for 2 seconds during lamp check operation.
- ② The red lamp lights ON and the buzzer sounds when the machine has a problem.
In this case, press this switch and buzzer stops, but the red lamp lights until the problem is cleared.

(7) Select switch



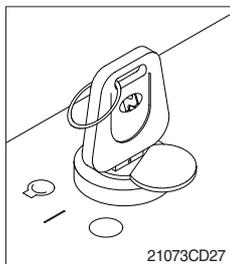
- ① This switch is used to enter main menu and sub menu of LCD.
※ Refer to the page 3-26 for details.

3. SWITCHES



17W9S3CD47

1) STARTING SWITCH



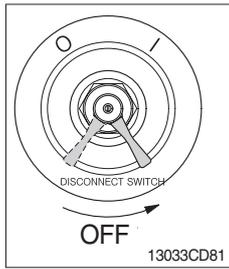
(1) There are three positions, OFF, ON and START.

- ○ (OFF) : None of electrical circuits activate.
- | (ON) : All the systems of machine operate.
- ◉ (START) : Use when starting the engine.

Release key immediately after starting.

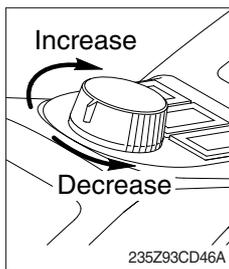
- ※ If you turn ON the starting switch in cold weather, the fuel warmer is automatically operated to heat the fuel by sensing the coolant temperature. Start the engine in 1~2 minutes after turning ON the starting switch. More time may take according to ambient temperature.
- ※ Key must be in the ON position with engine running to maintain electrical and hydraulic function and prevent serious machine damage.

2) MASTER SWITCH



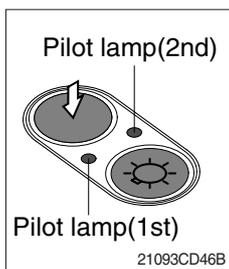
- (1) This switch is used to shut off the entire electrical system.
 - (2) I : The battery remains connected to the electrical system.
O : The battery is disconnected to the electrical system.
- ※ **Never turn the master switch to O (OFF) with the engine running. Engine and electrical system damage could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

3) ACCEL DIAL SWITCH



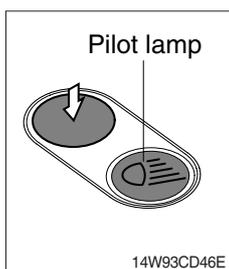
- (1) There are 10 dial setting.
- (2) Setting 1 is low idle and setting 10 is high idle.
 - By rotating the accel dial to right : Engine speed increases
 - By rotating the accel dial to left : Engine speed decreases

4) MAIN LIGHT SWITCH



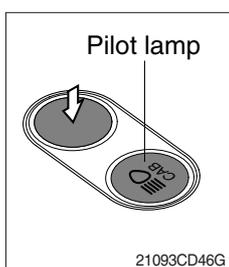
- (1) This switch used to operate the head light and work light.
 - Press the switch once, the head light comes ON and the 1st pilot lamp ON.
 - Press the switch once more, the work light comes ON and the 2nd pilot lamp ON.
 - Press the switch again, return to a first step position.
 - Press the switch more than one second to turn off lights.

5) WORK LIGHT SWITCH



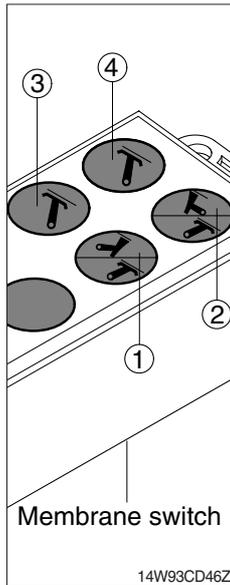
- (1) This switch used to operate the work light.
- (2) The pilot lamp is turned ON when operating this switch.

6) CAB LIGHT SWITCH (option)



- (1) This switch turns ON the cab light on the cab.

7) SELECT SWITCH 1 (outrigger / dozer, option)



(1) This switch is used to select dozer blade or outrigger operation.

| Switch | Operation |
|--------|---|
| ① | Front left outrigger or front dozer blade |
| ② | Rear left outrigger or rear dozer blade |
| ③ | Front right outrigger |
| ④ | Rear right outrigger |

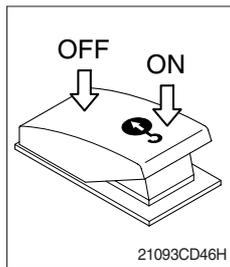
※ **Please check the installed equipment (outrigger or dozer) on your machine before selecting the switches.**

(2) The lamps are turned ON when selecting these switches.

(3) If the dozer and outrigger lever is moved forward position, the dozer blade or outrigger is downed, if the lever is moved backward, the dozer blade or outrigger moved upward.

Please refer to the dozer and outrigger lever at page 3-46.

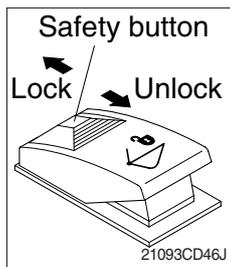
8) OVERLOAD SWITCH (option)



(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.

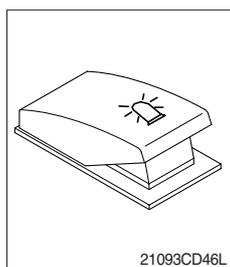
9) QUICK CLAMP SWITCH (option)



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

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

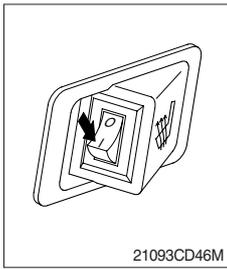
10) BEACON SWITCH (option)



(1) This switch turns ON the rotary light on the cab.

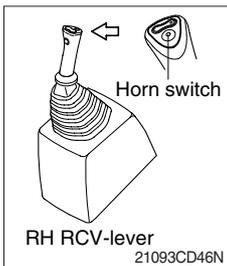
(2) The indicator lamp is turned ON when operating this switch.

11) HEATED SEAT SWITCH (option)



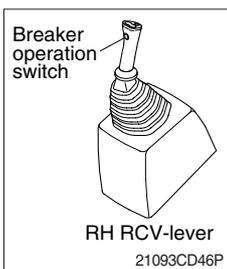
- (1) This switch is used to heat the seat.
 - Heater ON (I) : $10 \pm 3.5^{\circ}\text{C}$
 - Heater OFF (O) : $20 \pm 3^{\circ}\text{C}$
- (2) On pressing the switch, the indicator lamp is turned ON.

12) HORN SWITCH



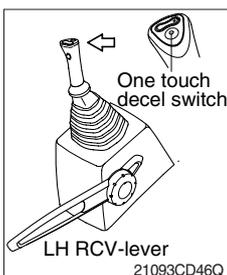
- (1) This switch is at the top of right side control lever.
On pressing, the horn sounds.

13) BREAKER OPERATION SWITCH



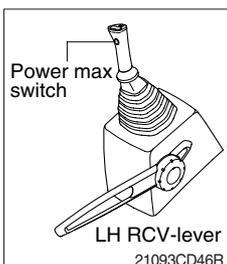
- (1) On pressing this switch, the breaker operates only when the breaker operation mode is selected.

14) ONE TOUCH DECEL SWITCH



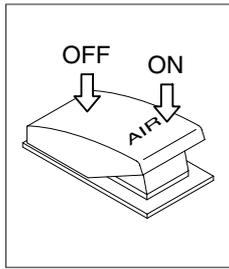
- (1) This switch is used to actuate the deceleration function quickly.
- (2) The engine speed is increased to previous setting value by pressing the switch again.
- (3) One touch decel function is available only when the auto idle pilot lamp is turned OFF.

15) 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.**

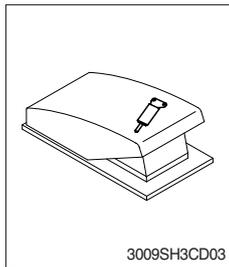
16) AIR COMPRESSOR SWITCH (option)



17W93CD46N

- (1) This switch is used to activate the air compressor.
- (2) The indicator lamp is turned on when operating this switch

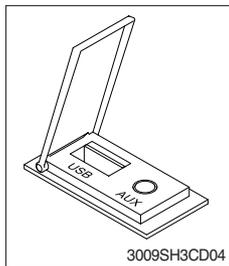
17) BREAKER SELECTION SWITCH (option)



3009SH3CD03

- (1) This switch is used to select breaker.
- ※ **The breaker operates only when this switch is selected.**

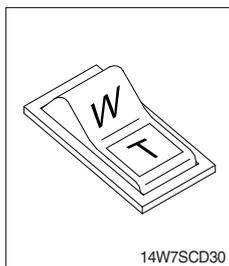
18) USB SOCKET



3009SH3CD04

- (1) MP3 files are played when a USB device is connected to the USB port.
- (2) In addition, the AUX port enables headphone and other devices.

19) TRAVEL/WORKING SWITCH (option, CLUSTER TYPE 2)

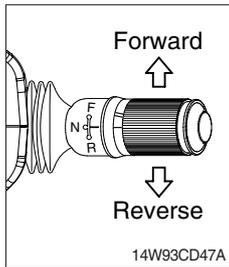


14W7SCD30

- (1) This switch is used to select mode between travel and work.
- (2) Travel (T)**
 - ① Only traveling is possible to operate.
 - ② The engine RPM and travel speed can be controlled by accel pedal.
- (3) Work (W)**
 - ① All the working functions including traveling are possible to operate.
 - ② Engine RPM and work & travel speed can be controlled by accel pedal.

20) RH MULTI FUNCTION SWITCH

(1) FNR lever



① This lever changes travel direction of machine.

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

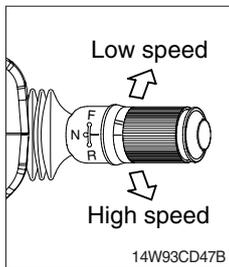
▲ Travel direction will be reversed if lower structure is positioned with dozer in front.

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

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

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

(2) Travel speed switch

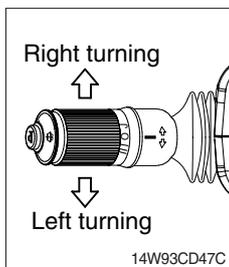


① This switch is for selecting travelling speed between high and low.

- Low speed (—) : 8 km/hr (5.0 mph)
- High speed (=) : 29 km/hr (18.0 mph)

21) LH MULTI FUNCTION SWITCH

(1) Direction indication lamp switch

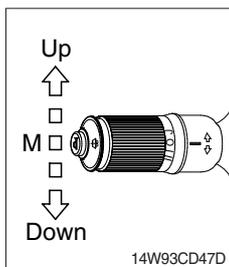


① This switch is used to warn or signal the turning direction of the machine to other machines or equipment.

② Push the lever to forward for turning right (↗), pull the lever to backward for turning left (↖).

③ The turning pilot lamp comes ON at the travel pilot lamp on the steering column.

(2) Dimmer switch



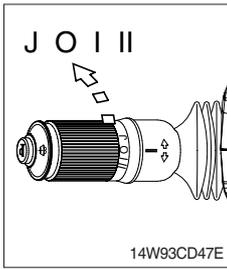
① This switch is used to turn the head lights direction.

② Switch positions.

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

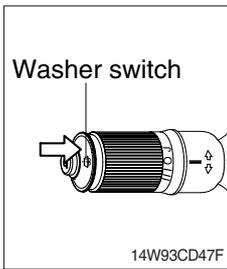
③ If you release the switch when it's in up position, the switch will return to middle.

(3) WIPER SWITCH



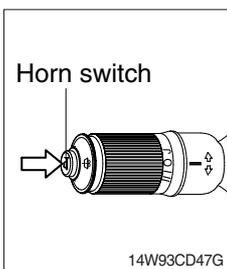
- ① When the switch is in J position, the wiper moves intermittently.
- ② When placed in I or II position, the wiper moves continuously.

(4) WASHER SWITCH



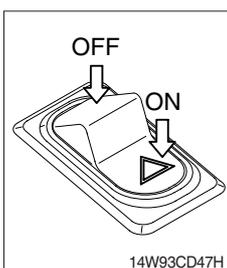
- ① If you push the grip of the lever, washer liquid will be sprayed and the wiper will be activated 2-3 times.
- ※ **Check the quantity of washer liquid in the tank. If the level of the washer liquid is LOW, add the washer liquid (in cold, winter days) or water. The capacity of tank is 1.5 liter.**

(5) HORN SWITCH



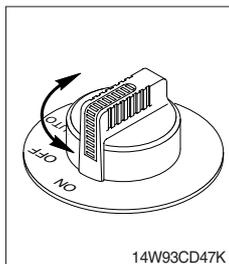
- ① This switch is at the end of left side multifunction switch. On pressing, the horn sounds.

22) HAZARD SWITCH



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

23) RAM LOCK SWITCH (CLUSTER TYPE 1)

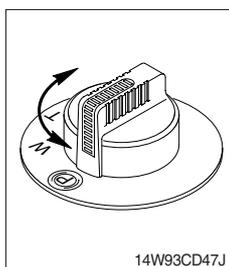


(1) This switch activate front axle oscillation cylinder to locking position for increase of stability.

- ON : Set front axle to locking position for excavation work or travels even ground. Also, the ram lock pilot lamp comes ON at the travel pilot lamp.
- OFF : Front axle will be oscillate depend on ground condition when the machine travel uneven ground.
- AUTO : Set front axle to locking or unlocking as table.

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

24) SELECT SWITCH 2 (parking / working / traveling, CLUSTER TYPE 1)

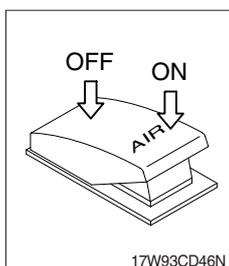


(1) This switch is used to select the operation mode as below.

- Parking (P) : The parking brake is applied.
- Working (W) : The machine needs to be working.
- Traveling (T) : The machine needs to be traveling.

(2) When you set this switch to parking or working, the parking or working lock pilot lamp comes ON at the travel pilot lamp.

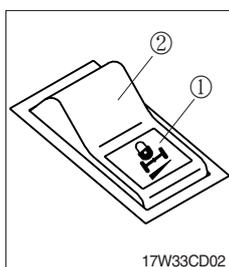
25) AIR COMPRESSOR SWITCH (option)



(1) This switch is used to activate the air compressor.

(2) The indicator lamp is turned on when operating this switch.

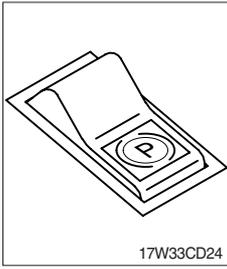
26) RAM LOCK SWITCH (CLUSTER TYPE 2)



(1) This switch activate front axle oscillation cylinder to locking position for increase of stability.

- Push rear(1) : Set front axle to locking position for excavation work or travels even ground. Also, the ram lock warning lamp comes ON at the warning indicator.
- Push front(2) : Front axle will be oscillate depend on ground condition when the machine travel uneven ground.

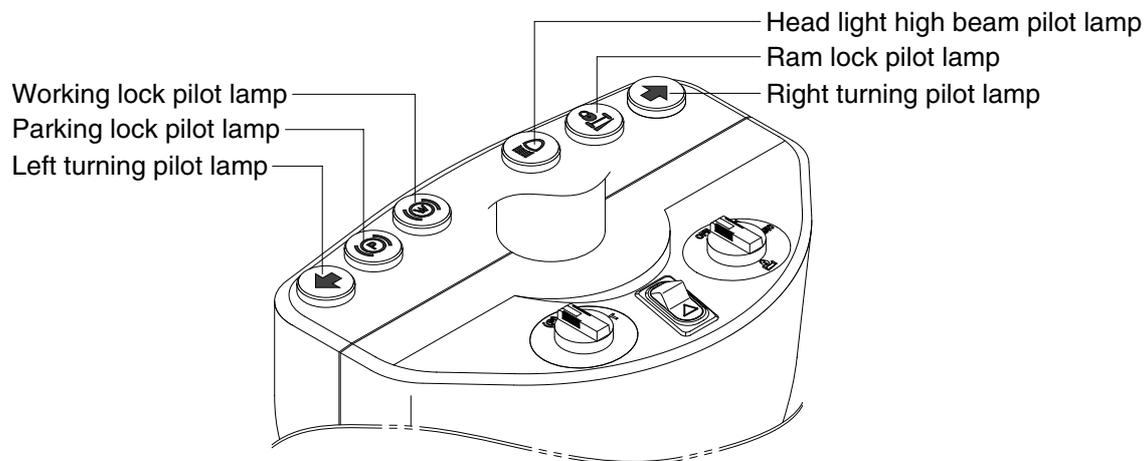
27) PARKING BRAKE SWITCH (CLUSTER TYPE 2)



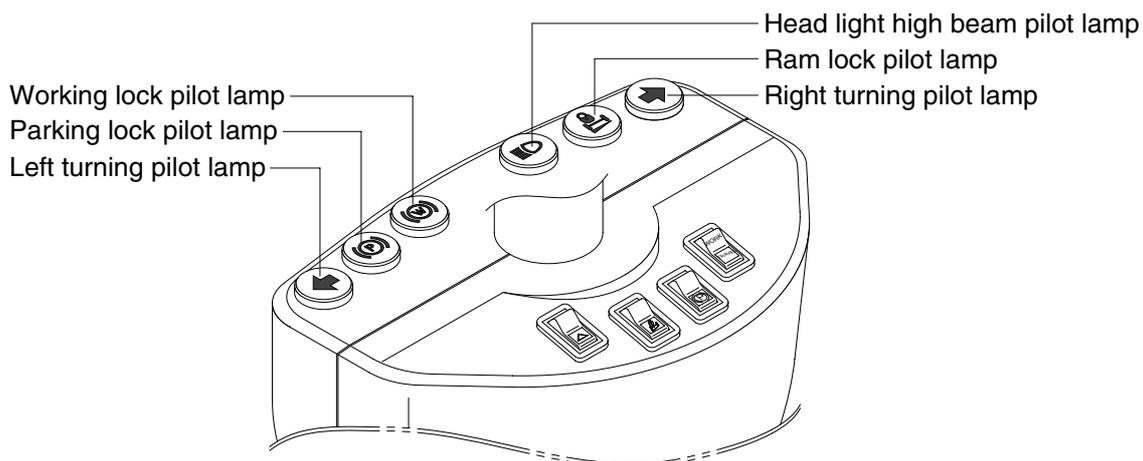
- (1) This switch is used to operate parking brake.
- (2) On pressing the switch, the below indicator lamp is turned ON and the pilot lamp comes ON at the warning indicator.

28) TRAVEL PILOT LAMP

■ Switch panel 2(CLUSTER TYPE 1)

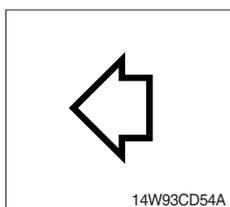


■ Switch panel 2(CLUSTER TYPE 2)



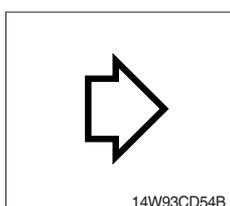
17W9S3CD54

(1) Left turning pilot lamp



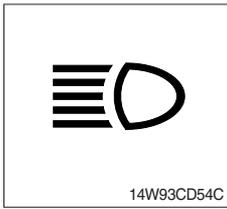
- ① This lamp flashes with sound when the LH multifunction switch is move to backward position.

(2) Right turning pilot lamp



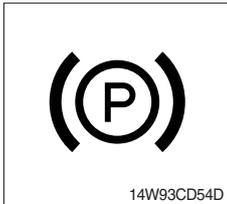
- ① This lamp flashes with sound when the LH multifunction switch is move to forward position.

(3) Head light high beam pilot lamp



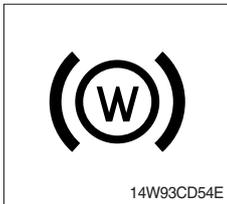
- ① This lamp is ON when the head light switch is high beam position or passing function.
- ② When passing other machines ahead, this lamp must be used for a few seconds to give other machines warning for a few seconds.

(4) Parking lock pilot lamp



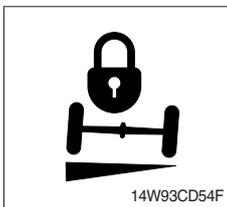
- ① This lamp lights ON when the select switch 2 (parking / working / traveling) is set to parking.
- ② Please refer to select switch 2 at page 3-29 for details.
- ※ **Check the lamp is OFF before driving.**

(5) Working lock pilot lamp



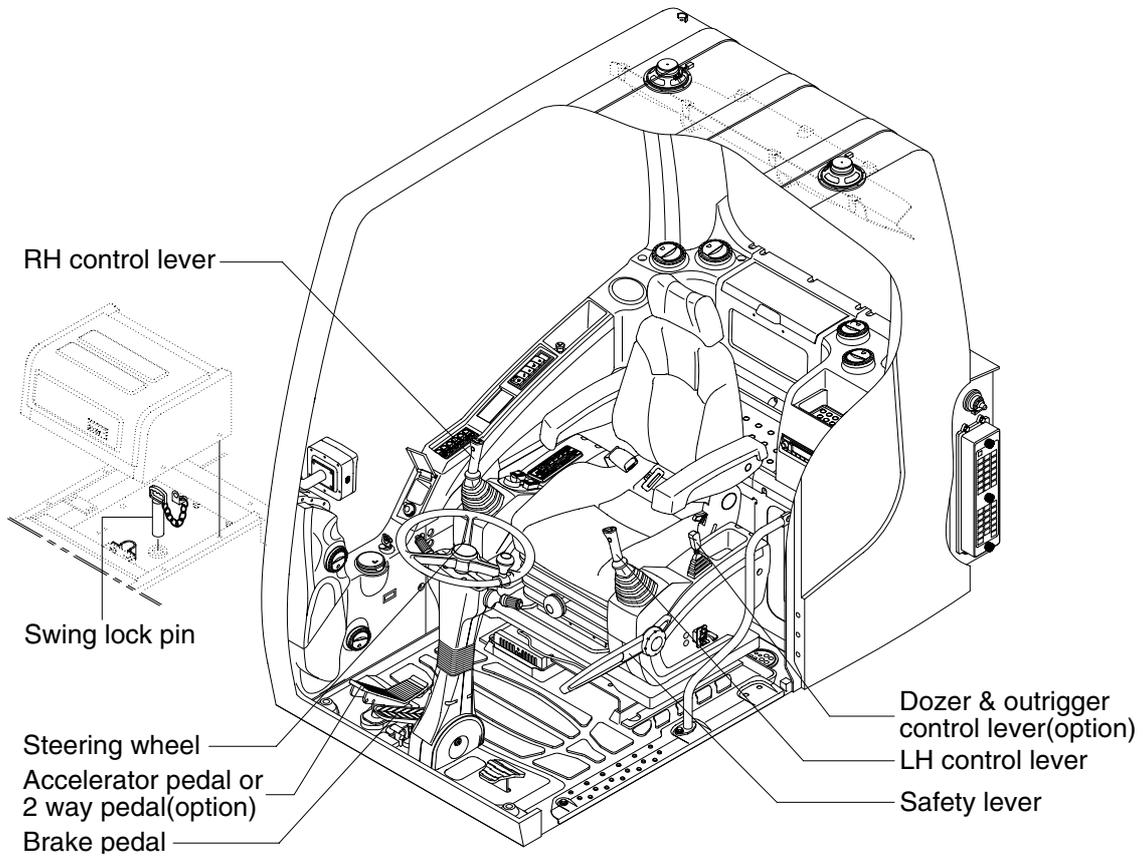
- ① This lamp lights ON when the select switch 2 (parking / working / traveling) is set to working.
- ※ **Please refer to select switch 2 at page 3-29 for details.**

(6) Ram lock pilot lamp



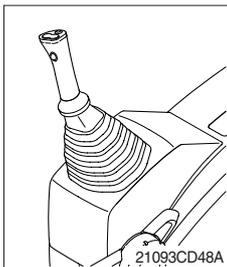
- ① This pilot lamp lights ON when ram lock is activated.
- ※ **Please refer to ram lock switch at page 3-29 for details.**

4. LEVERS AND PEDALS



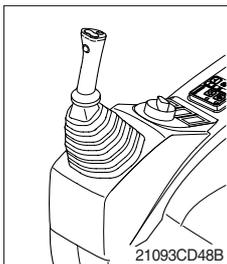
17W9S3CD48

1) LH CONTROL LEVER



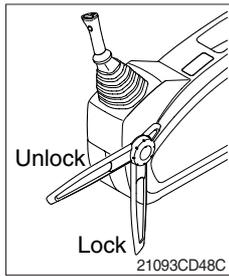
- (1) This joystick is used to control the swing and the arm.
- (2) Refer to operation of working device in chapter 4 for details.

2) RH CONTROL LEVER



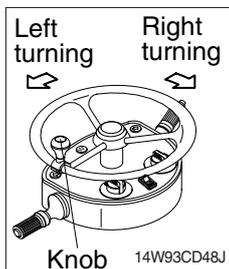
- (1) This joystick is used to control the boom and the bucket.
- (2) Refer to operation of working device in chapter 4 for details.

3) SAFETY LEVER



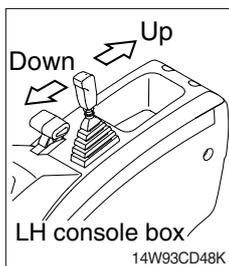
- (1) All control levers and pedals are disabled from operation by locating the lever to lock position as shown.
 - ※ **Be sure to lower the lever to LOCK position when leaving from operator's seat.**
 - (2) By pull lever to UNLOCK position, the machine is operational.
 - ※ **Do not use the safety lever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

4) STEERING WHEEL



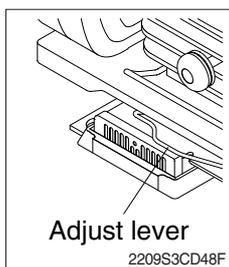
- (1) If the steering wheel is turned to left, the machine will move to the left and turn it to the right, the machine will move to the right.
- (2) As the handle is equipped with a knob, it is convenient to operate with one hand or quickly.

5) DOZER AND OUTRIGGER LEVER



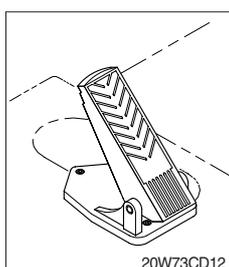
- (1) This lever is used to operate dozer blade or outrigger by selecting the select switch 1 (dozer / outrigger).
 - ※ **Please refer to the select switch 1 (dozer / outrigger) at page 3-36.**
- (2) If the lever is pushed forward, the dozer blade or outrigger will be going down. And if the lever is pulled back, the dozer blade or outrigger will be going up the dozer blade.

6) SEAT AND CONSOLE BOX ADJUST LEVER



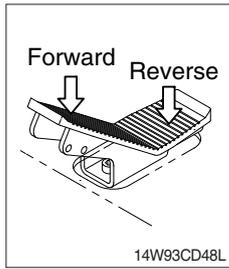
- (1) This lever is used to move the seat and console box to fit the contours of the operator's body.
- (2) Pull the lever to adjust forward or backward over 170 mm (6.7").

7) ACCELATOR PEDAL



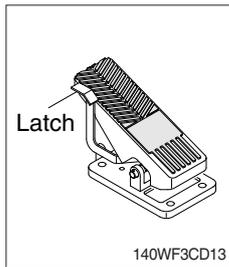
- (1) When this pedal is stepped, the machine starts traveling.
 - ▲ **Before starting the machine with stepping on the pedal, check if the underframe is certainly in the traveling direction.**

8) 2 WAY PEDAL (option)



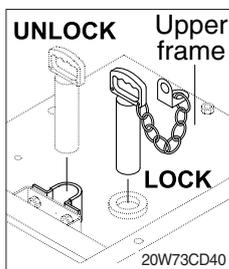
- (1) This pedal is used to select traveling direction and to accelerate of the machine.
- (2) Push the pedal to front for forward traveling, push the pedal to rear for reverse traveling regardless RNR lever at working mode of select switch 2.

9) BRAKE PEDAL



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

10) SWING LOCK LEVER



- (1) This is the system to lock the swing by connecting the upper swing part and the lower frame mechanically.
- (2) The swing is locked when the lever is down and unlocked when the lever is up.
※ Before operating the machine, be sure to unlock the swing lock device.

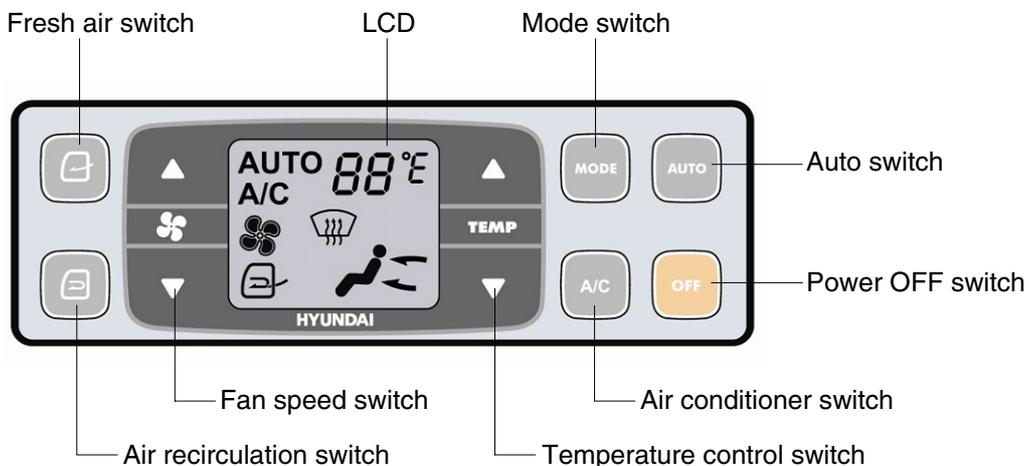
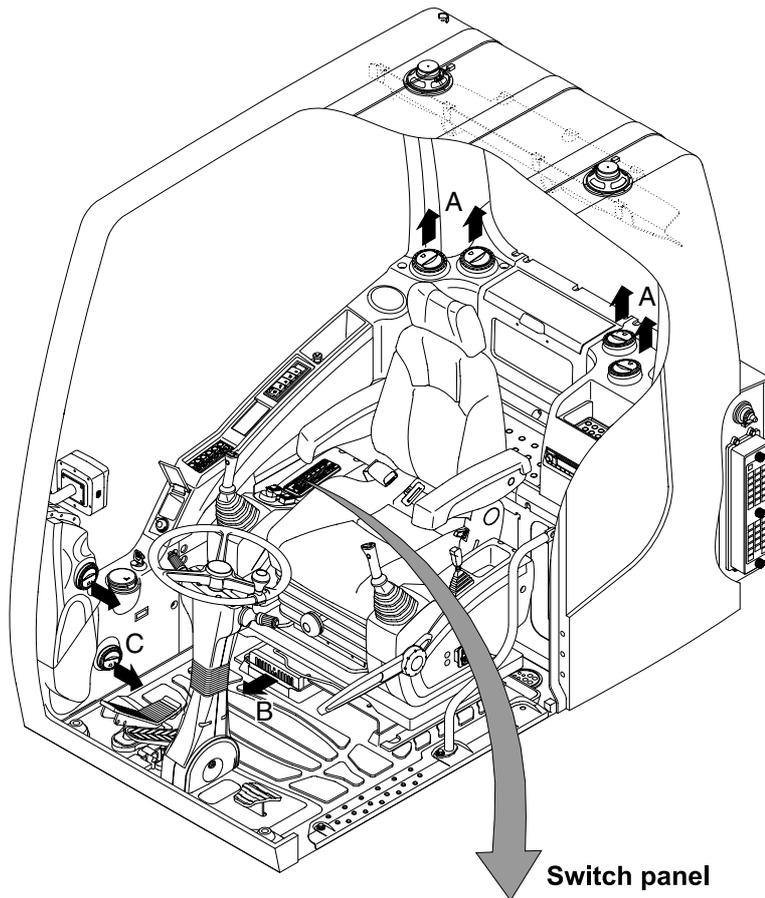
5. AIR CONDITIONER AND HEATER

■ FULL AUTO AIR CONDITIONER AND HEATER (standard)

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.

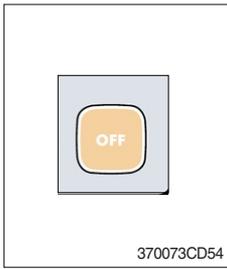
※ Refer to the page 3-52 for semi auto air conditioner and heater.

· Location of air flow ducts



17W9S3CD49

1) POWER OFF SWITCH

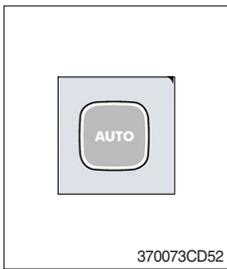


- (1) This switch makes the system and the LED OFF.
Just before the power OFF, set values are stored.

(2) Default setting values

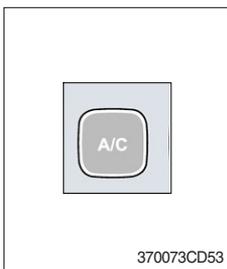
| Function | Air conditioner | In/outlet | LCD | Temperature | Mode |
|----------|-----------------|-----------|-----|-----------------|-----------------|
| Value | OFF | Inlet | OFF | Previous sw OFF | Previous sw OFF |

2) AUTO SWITCH



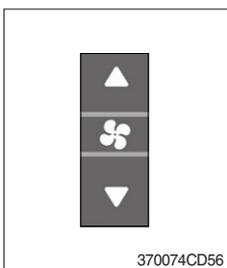
- (1) Turn the starting switch to ON position, LCD lights ON.
Auto air conditioner and heater system automatically keeps the optimum condition in accordance with operator's temperature configuration sensing ambient and cabin inside temperature.
- (2) This switch can restart system after system OFF.

3) AIR CONDITIONER SWITCH (compressor switch)



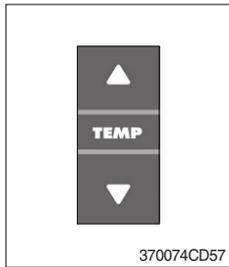
- (1) This switch turns the compressor and the LCD ON.
- (2) In accordance with the temperature sensed by duct (evaporator) sensor, compressor turns ON or OFF automatically.
- ※ **Air conditioner operates to remove vapor and drains water through a drain hose. Water can be sprayed into the cab in case 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 set temperature.
- (2) This switch controls fan speed manually.
 - There are 8 up/down steps to control fan speed.
 - The maximum step or the minimum step beeps 5 times.
- (3) This switch makes the system ON.

5) TEMPERATURE CONTROL SWITCH

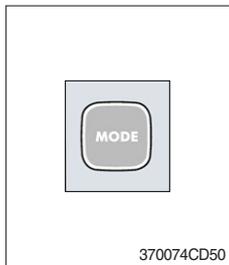


- (1) Setting temperature indication (Lo, 18~31°C, Hi, scale : 1°C)
- (2) Max cool and max warm beeps 5 times.
- (3) The max cool or the max warm position operates as following table.

| 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.

· A type : Vent → Vent/Foot → Foot → Foot/Def → Vent

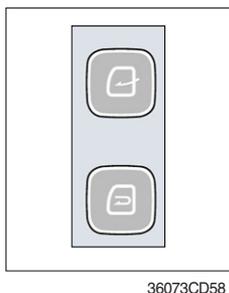
| Mode switch | | Vent | Vent/Foot | Foot | Foot/Def |
|-------------|---|------|-----------|------|----------|
| | | | | | |
| Outlet | A | ● | ● | | |
| | B | | ● | ● | ● |
| | C | | | | ● |

· B type : 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** ()

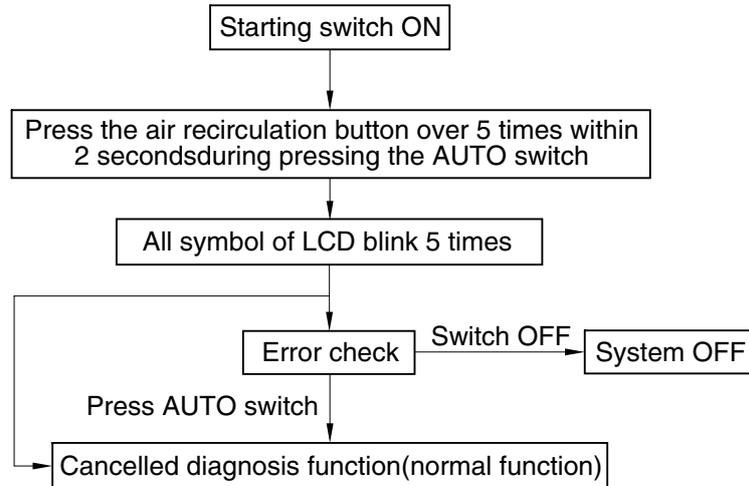
It recycles the heated or cooled air to increase the energy efficiency.

※ **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



3607A3CD69

(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

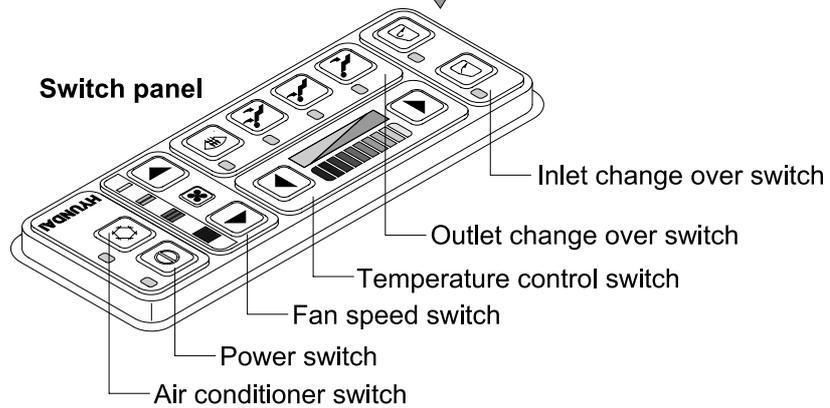
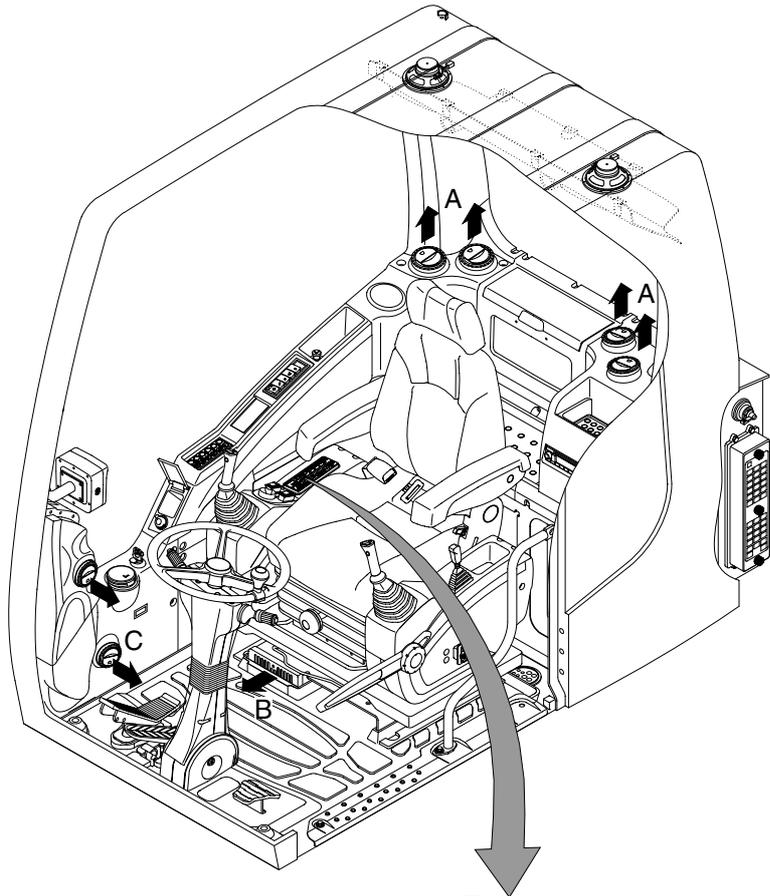
| Error description | Fail safe function |
|-------------------------------|--|
| Cabin inside sensor (11) | 25°C alternate value control |
| Ambient sensor (12) | 20°C alternate value control |
| Duct (evaporator) sensor (14) | 1°C alternate value control |
| Temp actuator (15) | If opening amount is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

■ SEMI AUTO AIR CONDITIONER AND HEATER (option)

Semi auto air conditioner and heater are equipped for pleasant operation against outside temperature and defrost on window glass.

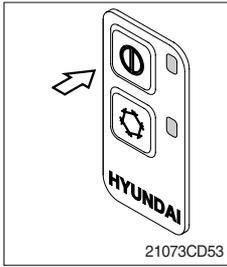
※ Refer to the page 3-48 for full auto air conditioner and heater.

· Location of air flow ducts



17W9S3CD53

1) POWER SWITCH

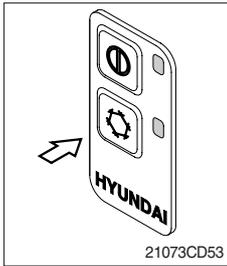


(1) This switch makes the system and the LED simultaneously ON or OFF.

(2) Default setting values

| Function | Air conditioner | Fan speed | Temperature | Outlet | Inlet |
|----------|-----------------|-----------|-------------|--------|---------------|
| Value | OFF | 1 | Max cool | Face | Recirculation |

2) AIR CONDITIONER SWITCH (compressor switch)

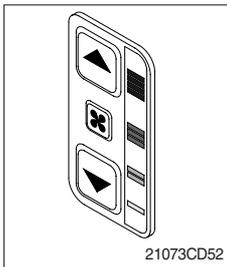


(1) Operating this switch turns the compressor and the LED simultaneously ON or OFF.

(2) In accordance with the evaporator temperature, compressor turns on or off automatically without changing LED state.

※ **Air conditioner operates to remove vapor and drains water through a drain hose. Water can be sprayed into the cab in case that the vacuum valve of drain hose has a problem. In this case, exchange the vacuum valve.**

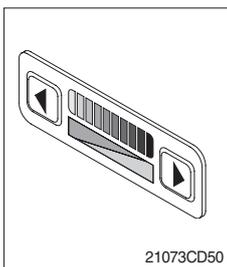
3) FAN SPEED SWITCH



(1) It is possible to control the fan to four steps.

(2) The first step or the fourth step gives 5 times beeps.

4) TEMPERATURE CONTROL SWITCH



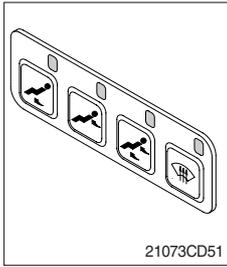
(1) There are 9 steps to control temperature from max cool to max warm controlled up and down by 1 step.

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

(3) For the max warm or the max cool it's better to be configured as following table.

| Temperature | Air conditioner | Fan speed | Outlet | Inlet |
|-------------|-----------------|-----------|--------|---------------|
| Max cool | ON | 4 | Face | Recirculation |
| Max warm | OFF | 3 | Foot | Fresh |

5) OUTLET CHANGE OVER SWITCH



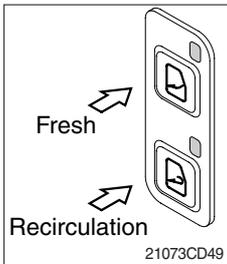
(1) There are four steps of air flow.

| Switch position | | Mode | | | |
|-----------------|---|------|---|---|---|
| | | | | | |
| Outlet | A | | ● | ● | |
| | B | ● | | ● | ● |
| | C | | | | ● |

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

(3) In case of heating range (5~Max warm), air conditioner won't turn ON.

6) INLET CHANGE OVER SWITCH



(1) It is possible to change the air-inlet method.

① Fresh

Inhaling air from the outside to pressurize cab inside.

※ **Check out the fresh air filter periodically to keep a good efficiency.**

② Recirculation

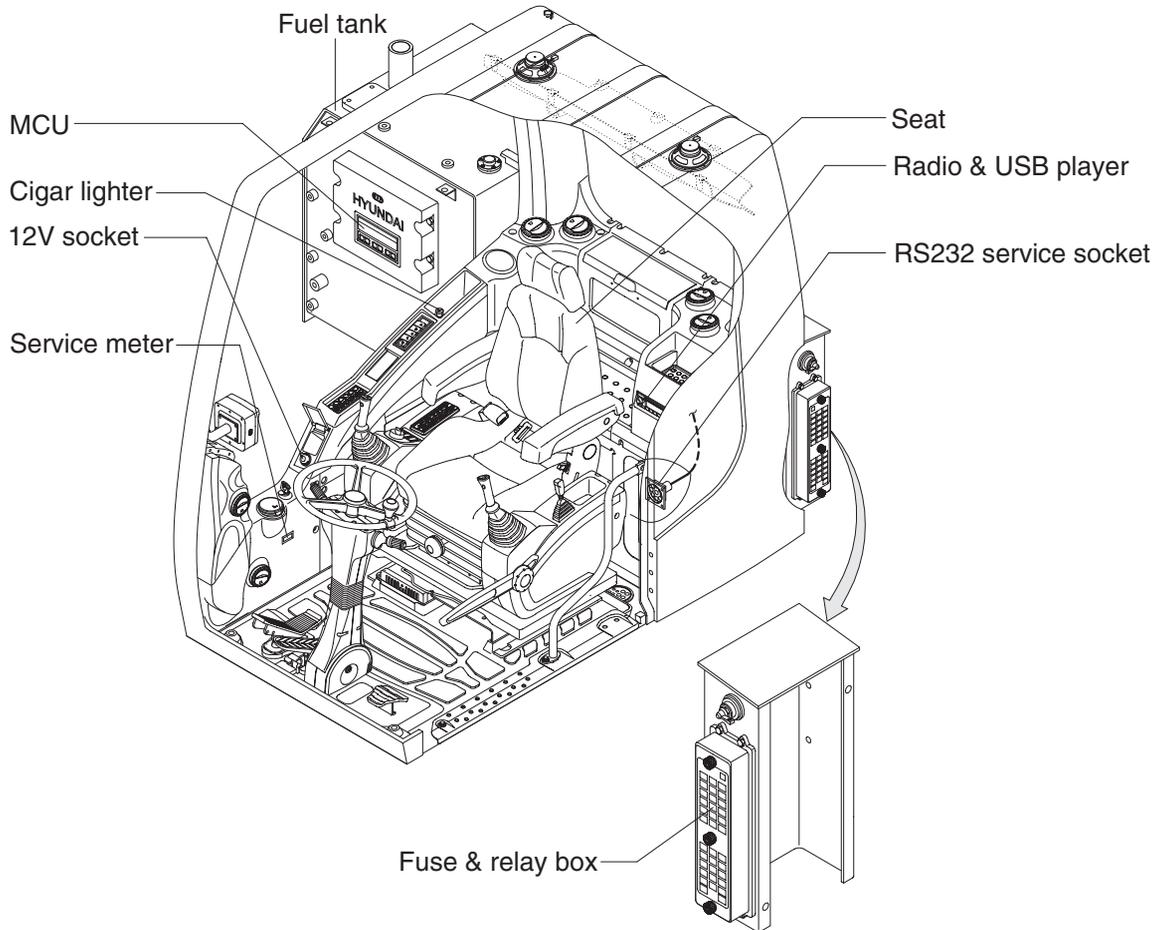
It recycles the heated or cooled air to increase the energy efficiency.

※ **Change air occasionally when using recirculation for a long time.**

※ **Check out the recirculation filter periodically to keep a good efficiency.**

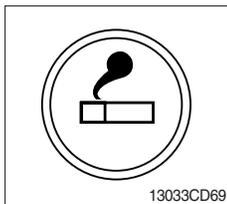
(2) Recirculation function operates when the system is OFF but it can be changed whenever needed.

6. OTHERS



17W9S3CD50

1) CIGAR LIGHTER



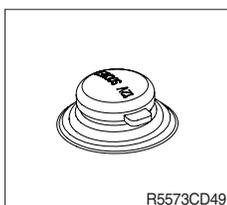
- (1) This can be used when the engine starting switch is ON.
- (2) The lighter can be used when it springs out in a short while after being pressed down.

※ **Service socket**

Use cigar lighter socket when you need emergency power.

Do not use the lighter exceeding 24V, 100W.

2) 12V SOCKET



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

3) RADIO AND USB PLAYER



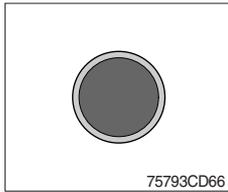
75793CD62

■ FRONT PANEL PRESENTATION

- | | |
|--|---|
| <p>1  Sound function selection button (audio selection)</p> <p>2  Power and volume button</p> <p>3  Mode button (select RADIO / USB / AUX)</p> <p>4  UP / DOWN tuning button</p> <p>5  Preset memory button 1 DISP ID3 v2 display</p> <p>6  Preset memory button 2 SCN File scan</p> <p>7  Preset memory button 3 RPT Repeat play selector</p> <p>8  Preset memory button 4 RDM Random play selector</p> <p>9  Preset memory button 5 D- Directory down</p> | <p>10  Preset memory button 6 D+ Directory up</p> <p>11  Aux function</p> <p>12  Preset scan (PS) Best station memory (BSM)</p> <p>13  Audio mute button</p> <p>14  AM / FM button (radio)</p> |
|--|---|

■ GENERAL

(1) Power and volume button



① Power ON/OFF button

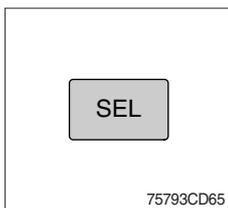
Press power button to turn the unit ON or OFF shortly.

When the power is ON, the previous mode (last memory) will appear.

② Volume up / down control

Turn volume up / down button right to increase the volume level. The level will be shown in VOLUME xx on the LCD display. Turn it left to decrease the volume level. After 5 seconds of volume indication, display will return to the previous mode.

(2) Sound function selection button (audio selection)



① This button is to adjust the sound. Each time you press power button shortly, LCD displays each mode as follows :

BASS → TREBLE → BAL → BEEP → LOUD → VOLUME
↑

※ When this button is pressed, LCD display shows selected function for 5 seconds and then returns back to the previous mode. On selected function, level can be controlled by turning this button. The display will automatically return to normal indication in 5 seconds after the last adjustment is made or when another function is activated.

② Bass control

To adjust the bass level, first select the bass mode by pressing the select button  until BASS indication appears on the LCD display. Within 5 seconds of choosing the bass mode, turn power button right / left to adjust the bass level as desired.

The bass level will be shown on the LCD display from a minimum of BASS -10 to a maximum of BASS +10.

The display will automatically return to the normal indication in 5 seconds after the last adjustment or when another function is activated.

③ Treble control

To adjust the treble level, first select the treble mode by pressing the select button  until TREBLE indication appears on the LCD display. Within 5 seconds of choosing the treble mode, turn power button right / left to adjust the treble level as desired.

The treble level will be shown on the LCD display from a minimum of TREBLE -10 to a maximum of TREBLE +10.

The display will automatically return to the normal indication in 5 seconds after the last adjustment or when another function is activated.

④ Balance control

To adjust the left-right speaker balance, first select the balance mode by pressing the select button  until the BAL indication appears on the LCD display.

Within 5 seconds of choosing the balance mode, turn power button right / left to adjust the balance as desired.

The balance position will be shown on the LCD display from BAL 10L (full left) to BAL 10R (full right).

When the volume level between the left and right speakers is equal, BAL L=R will be shown on the LCD display panel.

The display will automatically return to the normal indication in 5 seconds after the last adjustment or when another function is activated.

⑤ Beep control

To adjust the beep mode, first select the beep mode by pressing the select button  until BEEP indication appears on the LCD display.

The beep mode will be shown on the LCD display from BEEP 2ND, BEEP OFF and BEEP ON by turning power button right / left.

The display will automatically return to the normal indication in 5 seconds after the last adjustment or when another function is activated.

Select BEEP ON when you wish to hear the BEEP sound whenever any function button is pressed.

Select BEEP 2ND when you wish to hear the BEEP sound whenever any tuner pre-set button and/or tune seek buttons are pressed for more than 3 seconds.

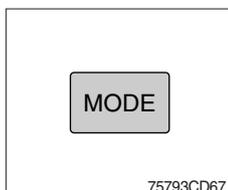
⑥ Loud control

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.

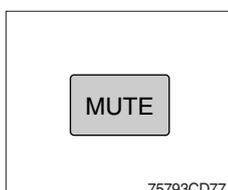
To select the loudness feature, press select button  until LOUD ON or LOUD OFF is displayed, then turn power button left or right to activate or deactivate loudness.

(3) Mode button



- ① Press mode button to select RADIO / USB / AUX.

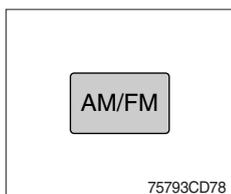
(4) Audio mute button



- ① Press mute button momentarily to mute volume and MUTE mark will blink on the LCD display. Press the button again to return to the mode in use before the mute mode was activated.

■ RADIO

(1) AM / FM / LW band selector

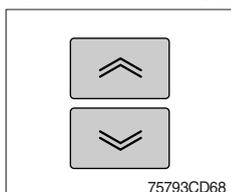


- ① Each time this button is pressed, the radio band is changed. Each time this button is pressed, LCD displays each band as follows :

FM1 → FM2 → FM3 → AM → LW

※ LW band is only available for Europe.

(2) Up / down tuning

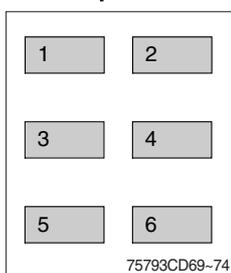


- ① To automatically select a radio station, momentarily press the up tune seek button ∧ or down tune seek button ∨ for less than 3 seconds to search for the closest radio station.

To manually select a radio station, press the up tuning & down tuning button for longer than 3 seconds.

The radio frequency will move up or down step by step each time you press button.

(3) Station pre-set button

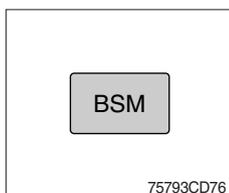


- ① Pressing these buttons shortly will recall your favorite pre-set radio stations.

To store your favorite stations into any of the 6 pre-set memories in each band (AM/FM/LW), use the following procedure :

- a. Turn the radio ON and select the desired band.
- b. Select the first station to be pre-set using the manual up/down or automatic seek tuning control button.
- c. Press the chosen pre-set button to store your selected station into and continue to hold it in. The beep sound will be momentarily heard and the pre-set number will appear on the LCD display indicating that the station is now set into that pre-set memory position and can be recalled at any time, by pressing that pre-set button.

(4) Pre-set scan (PS) / Best station memory (BSM) button



① Pre-set scan (PS)

Press BSM button shortly to scan the 6 pre-set station stored the memories on each band (AM/FM/LW).

The unit will stop at each pre-set station (the pre-set number on the LCD display will flash during pre-set scan operation) and remain on the selected frequency. Press the button momentarily again to remain on the station currently being heard.

② Best station memory (BSM)

Pressing BSM button for longer than 2 seconds will activate the BSM tuning feature which will automatically scan and enter each station into memory.

If you have already set the pre-set memories to your favorite stations, activating the BSM tuning feature will erase those stations and enter the new ones.

This BSM feature is most useful when traveling in a new area where you are not familiar with the local stations.

■ USB PLAYER

(1) USB function

There are two ways to play mp3 files in a USB device : using USB socket in the cab and the USB/AUX cable connected to the front side of the player.

· Use of USB socket

- ① Connect a USB device, which saves mp3 files, to USB socket in the cabin.
- ② If a USB device has not been connected, MP3 files are automatically played when you insert it into the USB port.
- ③ If a USB device has connected, MP3 files are played when you press mode for USB.

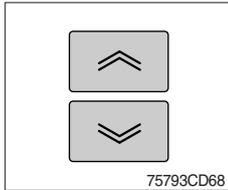
· Use of USB/AUX cable (option)



75793CD81

- ① Connect the USB/AUX cable to the player in order to play MP3 files in a USB device.
- ② If a USB device has not been connected, MP3 files are automatically played when you insert it into the cable.
- ③ If a USB device has connected, MP3 files are played when you press mode for USB.

(2) File selection & cue / review button



① File selection function

This button is used to select file up / down. Each time the forward file select \rightrightarrows is pressed, file number is increased.

Each time the backward file select \leftrightsquigarrow is pressed, file number is decreased.

② Cue / review functions

High-speed audible search of file on a USB can be made by this button (the cue and review functions).

Press and hold the cue button \rightrightarrows to advance rapidly in the forward direction or the review button \leftrightsquigarrow to advance rapidly in the backward direction.

(3) MP3 directory / file searching

① The power button is used to select a particular directory and file.

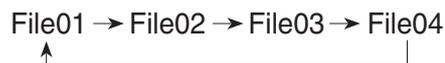
Press and hold for more than 3 seconds while playing MP3 file.

Turn right / left the power button to search the directory. Press the button when you find the wanted directory.

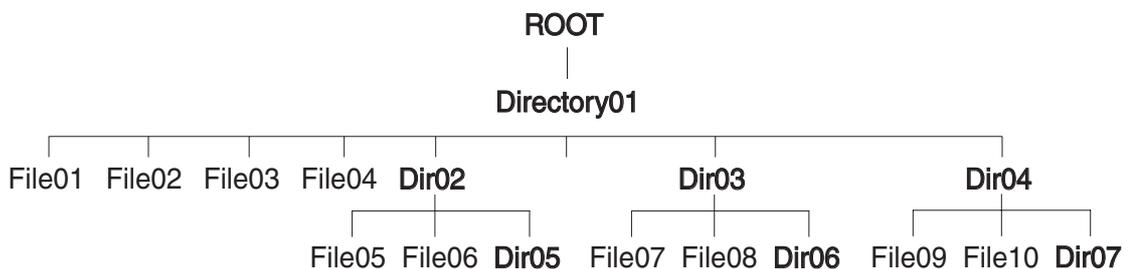
For example, the directory search generally changes in two methods depending on the order of writing as follows.

- Method 1 : ROOT → Dir01 → Dir02 → Dir03 → Dir04 → Dir05 → Dir06 → Dir07
- Method 2 : ROOT → Dir01 → Dir02 → Dir05 → Dir03 → Dir06 → Dir04 → Dir07

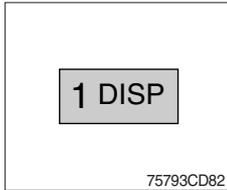
If you want to search the file in the located directory, turn right / left the power button consecutively. Press the button when you find the wanted file. The unit will then play the selected file. For instance, the file search changes in Dir01 as follows.



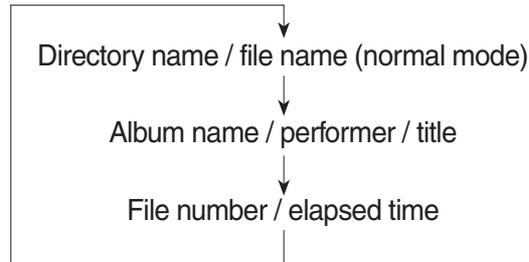
※ MP3 direction / file configuration



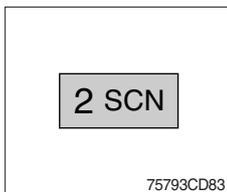
(4) ID3 v2 display



- ① Disp button is used to change the display information. While playing an MP3 file, you can change the file information shown on the LCD display. Each time you press DISP (display), the display changes to show the following.
- ※ If the MP3 disc does not have any ID3 information, the display will show NO ID3 on LCD display.

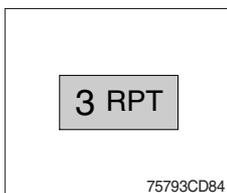


(5) File scan (SCN)



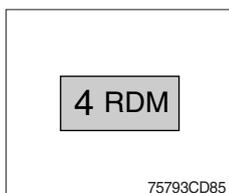
- ① During USB play, press SCN button to play the first 10 seconds of each file on the whole file on the USB (SCN mark will appear on the LCD display). When a desired file is reached, press the SCN button again to cancel the function. The unit will then play the selected file.
- ※ In case of playing MP3 file, when the SCN (scan) button is pressed and held for longer than 2 seconds, the SCN mark will blink on the LCD display and all files in the selected directory will be introduced until the file scan mode is cancelled by pressing the SCN button again or by activating the random or repeat functions.

(6) Repeat play selector (RPT)



- ① During USB play, press RPT button to play the selected file repeatedly (RPT will appear on the LCD display). Play of the file will continue to repeat until this button is pressed again and the RPT disappears from the LCD display.
- ※ In case of playing MP3 file, when the RPT button is pressed and held longer than 2 seconds, the RPT mark will blink on the LCD display and play all files in the selected directory and will be repeated until the directory repeat mode is cancelled by pressing the repeat button again or by activating the scan or random functions (RPT mark will disappear from LCD display).

(7) Random play selector (RDM)

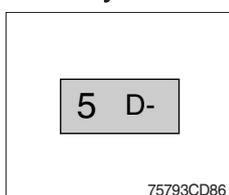


- ① During USB play, press RDM button to play the files on the USB in a random shuffled order (RDM will appear on the LCD display). The file select function will also select file in the random order instead of the normal process.

The random play mode can be cancelled by this button again.

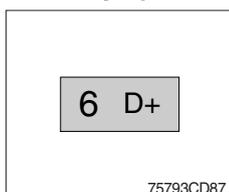
- ※ In case of MP3 file, when the random button is pressed and held longer than 2 seconds, the RDM mark will blink on the LCD display and play all files in directory randomly until the directory random mode is cancelled by pressing the random button again or by activating the scan or repeat functions (RDM mark will disappear from LCD display).

(8) Directory down



- ① Press D- button briefly while playing MP3. The previous directory is located each time you press this button.

(9) Directory up



- ① Press D+ button briefly while playing MP3. The next directory is located each time you press this button.

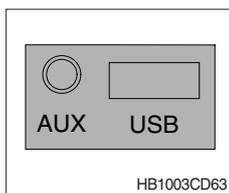
- ※ If the MP3 file does not have a directory, the unit play MP3 at 10-file intervals.

- ※ If any MP3 file does not exist in USB, this button can not operate.

■ AUX PLAYER

(1) Aux function

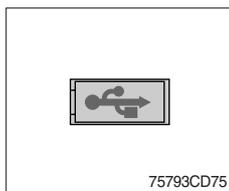
· Use of USB socket



- ① If you want to listen to music of a external audio device, connect a external audio device into the USB port.

- ② Press mode button to change a current mode for AUX. If audio file of audio device is playing, you can listen to music through speaker.

· Use of USB/AUX cable (option)

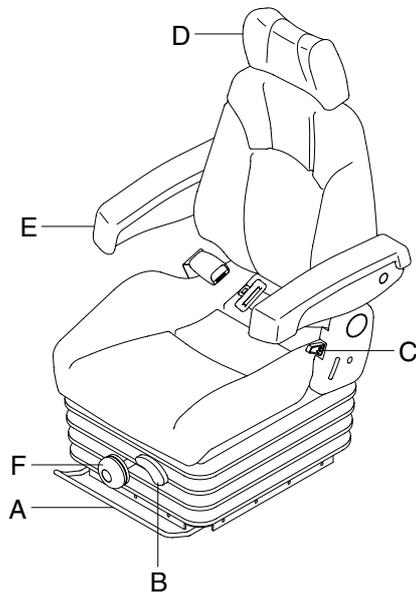


- ① If you want to listen to music of a external audio device, connect a external audio device through USB/AUX cable.

- ② Press mode button to change a current mode for AUX. If audio file of audio device is playing, you can listen to music through speaker.

4) SEAT (standard)

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.



2209S3CD54

(1) Horizontal adjustment (A)

- ① Pull lever A to adjust seat forward or backward.
- ② The seat can be moved forward and backward over 169 mm (6.7") in 13 steps.

(2) Tilt adjustment (B)

Pull or push lever B to adjust seat cushion upward or downward.

(3) Adjustable Backrest

Pull lever C to adjust seat backrest.

(4) Arm rest adjustment (E)

This can be adjusted by turning the knob E.

(5) Head rest adjustment (D)

This is adjustable vertically to fit operator's requirements, over a 75 mm (3.0") height range and 79.5° angle.

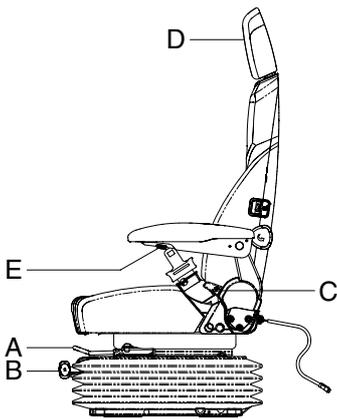
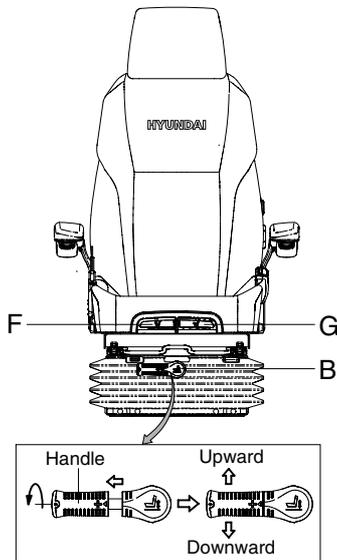
(6) Weight adjustment (F)

Adjust the handle to the operator's weight (50~130 kg).

- ▲ 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.

5) SEAT (heated, option)

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)

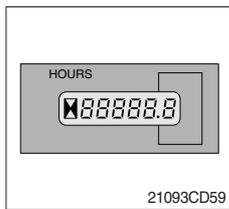
Pull lever F to adjust seat cushion tilting angle.

(7) Seat cushion length adjustment (G)

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

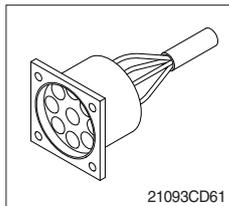
▲ Always check the condition of the seat belt and mounting hardware before operating the machine. Replace the seat belt at least once every three years, regardless of appearance.

8) SERVICE METER



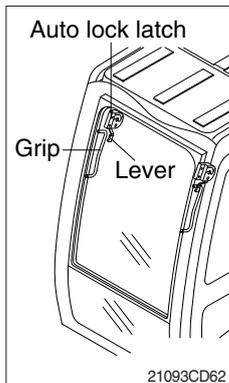
- (1) This meter shows the total operation hours of the machine.
- (2) Always ensure the operating condition of the meter during the machine operation. Inspect and service the machine based on hours as indicated in chapter 6, maintenance.

9) RS232 SERVICE SOCKET



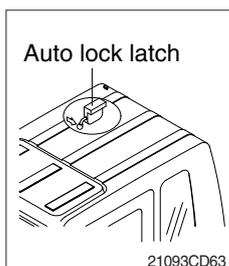
- (1) MCU communicates the machine data with Laptop computer through RS232 service socket.

10) 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 lever locked position.

⚠ When working, without having locked the windshield by the auto lock (by pushing the windshield to the rear until it's completely fixed), please be careful as it can cause personal injury if the windshield is not fixed or falls off.



- (2) Perform the following procedure in order to close the upper windshield.
 - ① Pull the lever of the 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.**

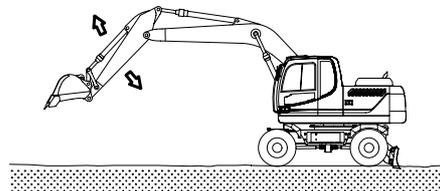
3) Be careful during the initial 100 hours operation

- (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 operation hours.

| Checking items | Hours |
|---|-------|
| Engine oil | 50 |
| Engine oil filter element | |
| Fuel filter | |
| Prefilter | |
| Transmission oil | 100 |
| Hydraulic oil return filter element | 250 |
| Hydraulic oil tank drain filter cartridge | |
| Pilot line filter element | |
| Swing reduction gear oil | |
| Axle oil | 500 |

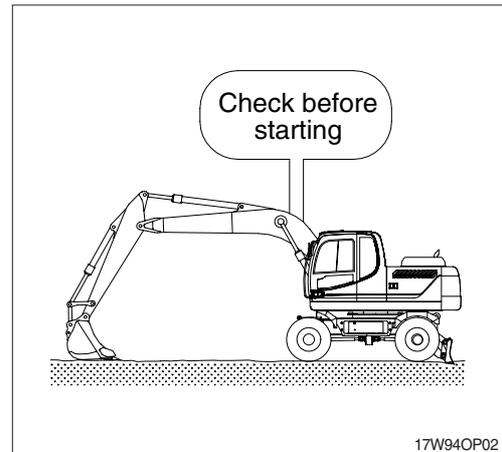
Avoid excessive operation for initial 100 hours



17W94OP01

2. CHECK BEFORE STARTING THE ENGINE

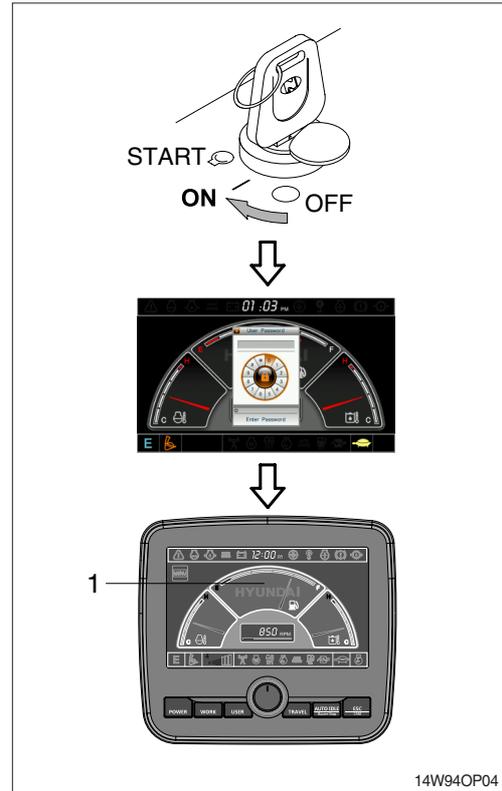
- 1) Look around the machine and under the machine to check for loosen nut or bolts, collection of dirt, or leakage of oil, fuel or coolant and check the condition of the work equipment and hydraulic system. Check also loosen wiring, and collection of dust at places which reach high temperature.
※ **Refer to the daily check on the chapter 6, maintenance.**
- 2) After checking air pressure of tire, make sure that around the machine is clear.
- 3) Adjust seat to fit the contours of the operator's body for the pleasant operation.
- 4) Adjust the rear view mirror.



3. STARTING AND STOP THE ENGINE (CLUSTER TYPE 1)

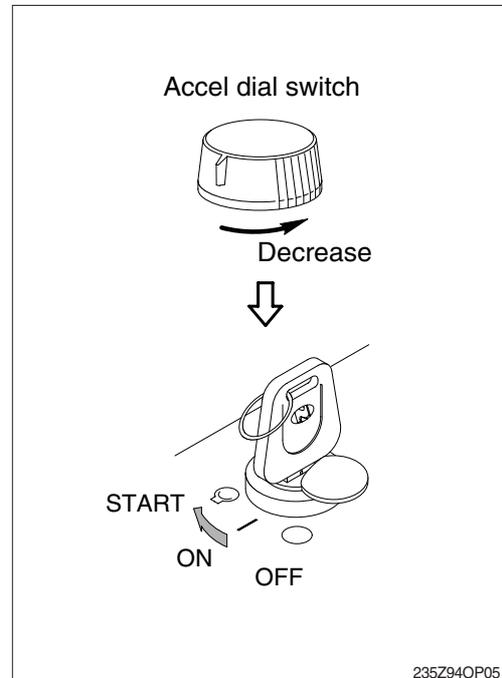
1) CHECK INDICATOR LIGHTS

- (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 3-17 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

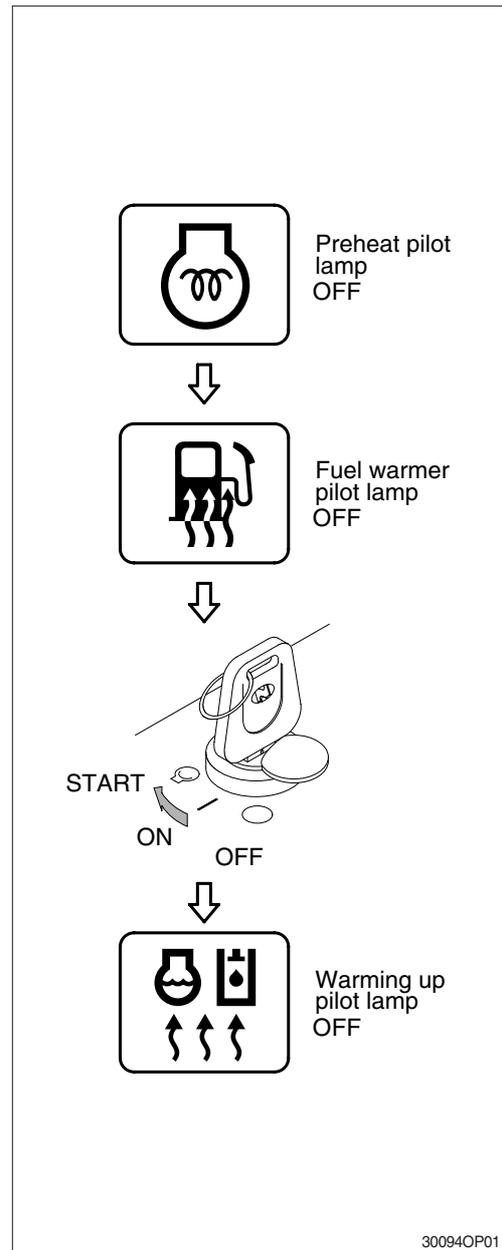
- ※ Sound the horn to warn the surroundings after checking if personnel or obstacles are in the area.
- (1) Turn the accel dial switch to low idle position.
 - (2) Turn the starting switch to START position to start the engine.
 - ※ Do not hold the starting switch in the START position for longer than 20 seconds.
The start system may be seriously damaged.
 - ※ If the engine does not start, allow the starter 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 2-13.
- ※ 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.

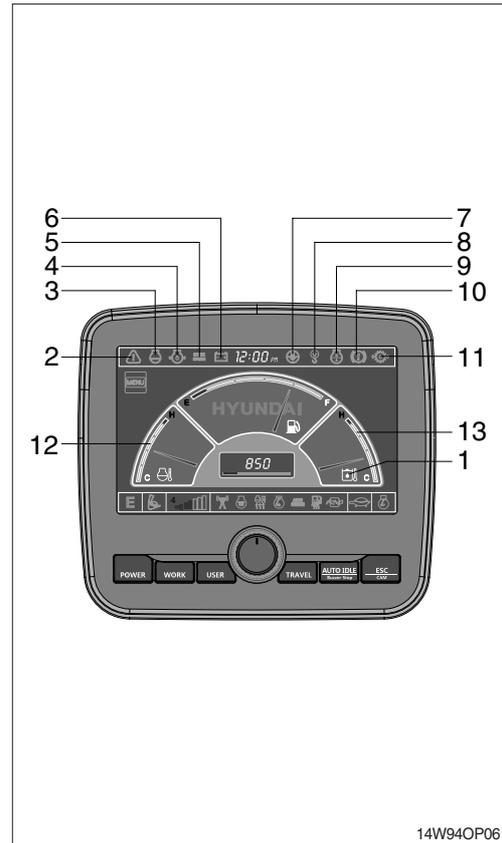
- (1) Check if all the levers are in the neutral position.
- (2) Turn the accel dial switch to low idle position.
- (3) Turn the starting switch to the ON position, and wait 1~2 minutes. More time may take according to ambient temperature.
- (4) Wait for five minutes to warm up the engine after the preheating pilot lamp off, and then turn the starting switch to the START position to start the engine.
 - ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (5) Release the starting switch immediately after starting engine.
- (6) If the temperature of the coolant is lower than 30°C 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.

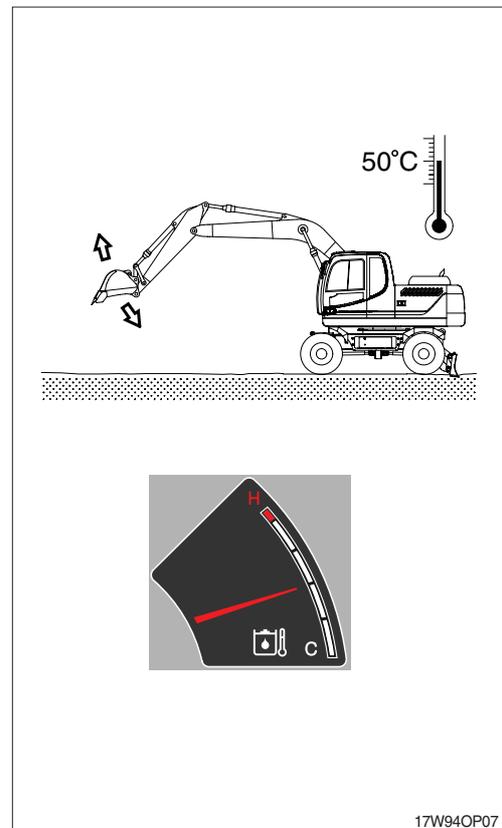
- (1) Is the level gauge of hydraulic oil tank in the normal level?
 - (2) Are there leakages of oil or water?
 - (3) Are all the warning lamps turned OFF (1-11)?
 - (4) Are the indicator of water temperature gauge (12) and hydraulic temperature gauge (13) in the operating range?
 - (5) Are the engine 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.**



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.**

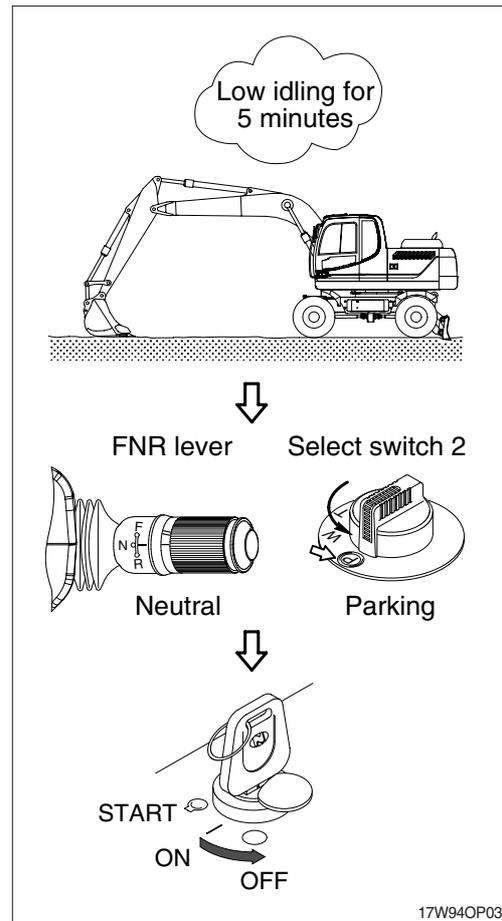
- (1) Run the engine at low idle speed for 5 minutes.
- (2) Speed up the engine by accel dial and run the engine at mid-range speed.
- (3) Operate bucket lever for 5 minutes.
 - ※ **Do not operate anything except bucket lever.**
- (4) Run the engine at the high speed and operate the bucket lever and 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.
 - ※ **Increase the time for warming-up during winter.**



6) TO STOP THE ENGINE

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

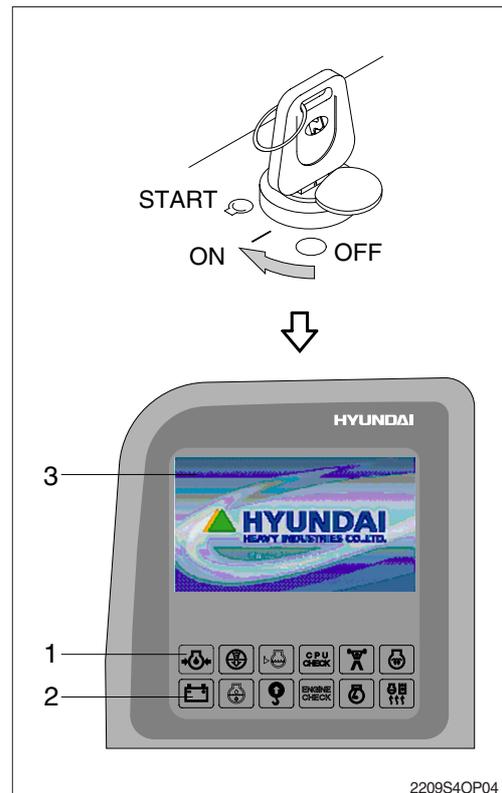
- (1) Place the FNR lever in the neutral.
- (2) Down the bucket, outrigger and dozer blade on the ground then put all the levers in the neutral position.
- (3) Put the select switch 2 in the parking position.
- (4) Run the engine at low idling speed for about 5 minutes.
- (5) Return the key of starting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



■ STARTING AND STOP THE ENGINE (CLUSTER TYPE 2)

1) CHECK INDICATOR LIGHTS

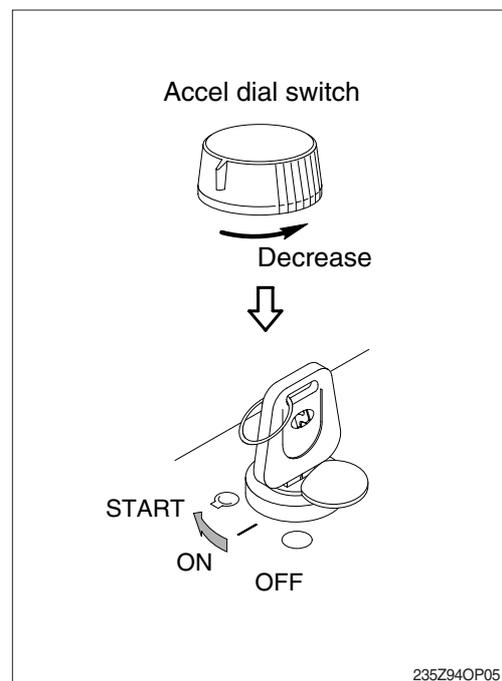
- (1) Check if all the operating lever is on the neutral position.
- (2) Turn the starting switch to the ON position, and check following.
 - ① If all the lamps light ON and buzzer sounding for 2 seconds.
 - ② After lamp check 「1.00」, the version of cluster program, is displayed on 「LCD (3)」 for 5 seconds and the cluster returns to default.
 - ③ Only below lamps will light ON and all the other lights will turn OFF after 2 seconds.
 - Engine oil pressure warning lamp (1)
 - Battery charging warning lamp (2)



2) STARTING ENGINE IN NORMAL TEMPERATURE

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

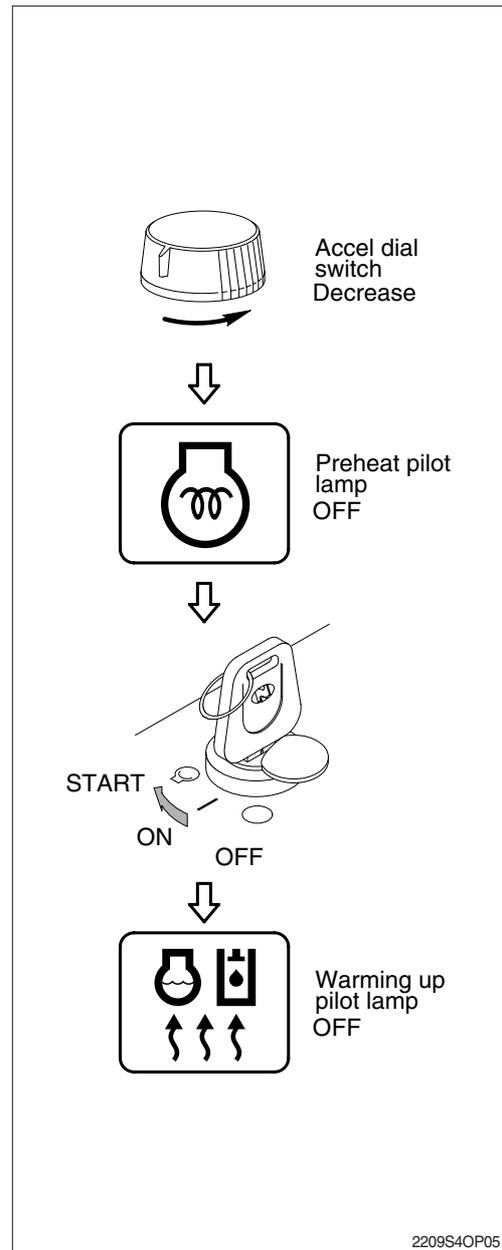
- (1) Turn the starting switch to START position to start the engine.
 - ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (2) Release the starting switch instantly after the engine starts to avoid possible damage to the starting 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 2-13.
- ※ 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.

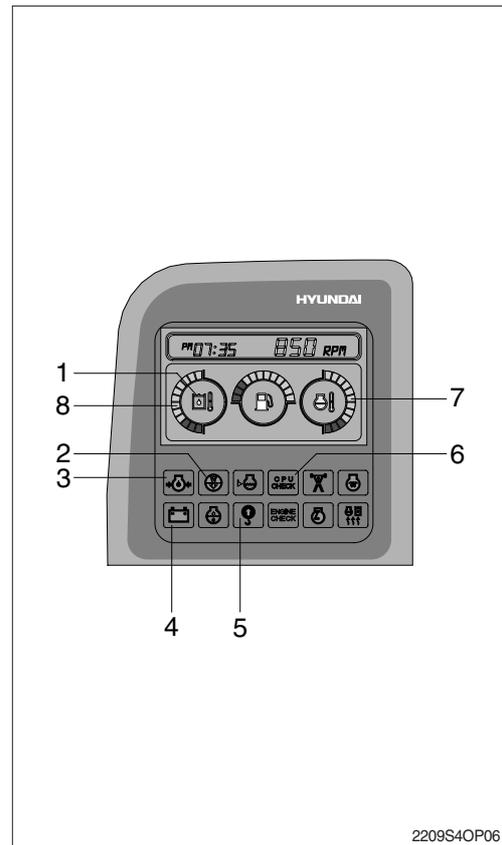
- (1) Check if all the levers are in the neutral position.
- (2) Turn the accel dial switch to low idle position.
- (3) Turn the starting switch to the ON position, and wait 1~2 minutes. More time may take according to ambient temperature.
- (4) Wait for five minutes to warm up the engine after the preheat pilot lamp OFF, and then turn the starting switch to the START position to start the engine.
 - ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (5) Release the starting switch immediately after starting engine.
- (6) If the temperature of the coolant is lower than 30°C 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.

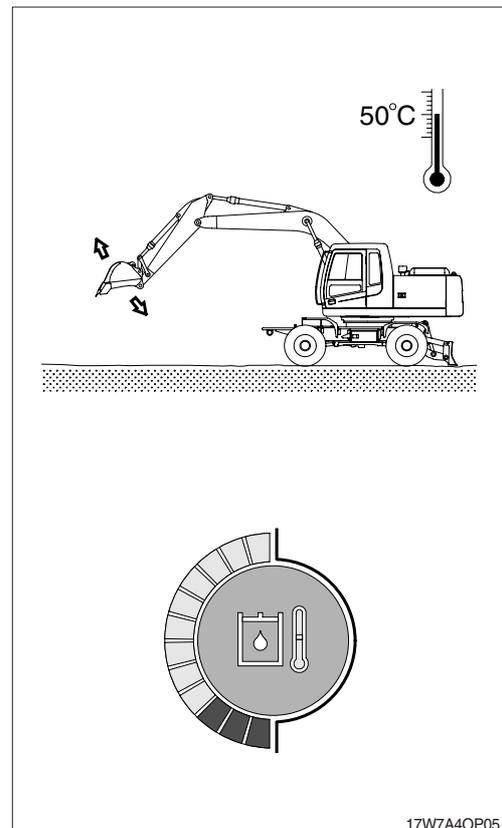
- (1) Is the level gauge of hydraulic oil tank in the normal level?
 - (2) Are there leakages of oil or water?
 - (3) Are all the warning lamps turned OFF (1-6)?
 - (4) Are the indicator of water temperature gauge (7) and hydraulic temperature gauge (8) in the green zone?
 - (5) Are the engine sound 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 control panel, stop the engine immediately and correct problem as required.**



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 idling for 5 minutes.
- (2) Speed up the idling 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.



4. MODE SELECTION SYSTEM (CLUSTER TYPE 1)

1) STRUCTURE OF MECHATRONICS SYSTEM

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

※ 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.

(3) User mode

① User mode is useful for setting the user preferable power quickly.

(engine speed, power shift and idle speed)

② There are two methods for use of user mode.

a. In operation screen

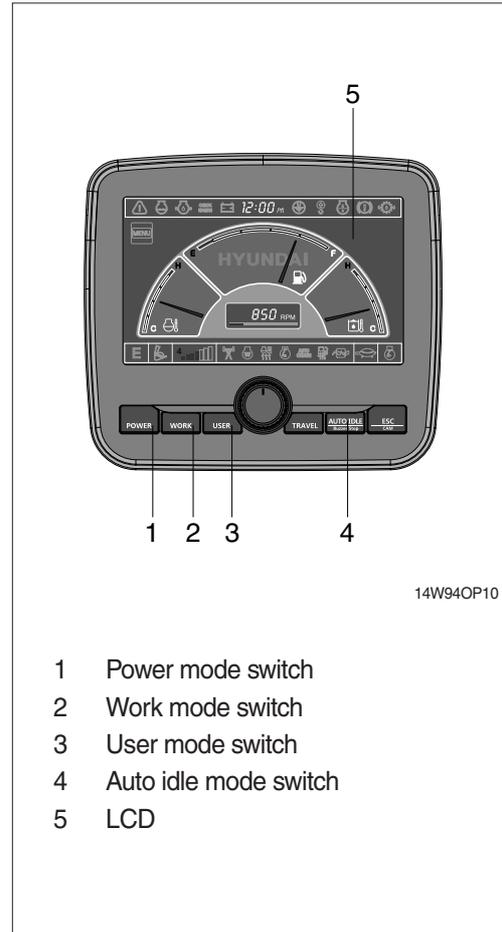
User mode switch is used to memorize the current machine operating status and activate the memorized user mode.

Refer to page 3-10.

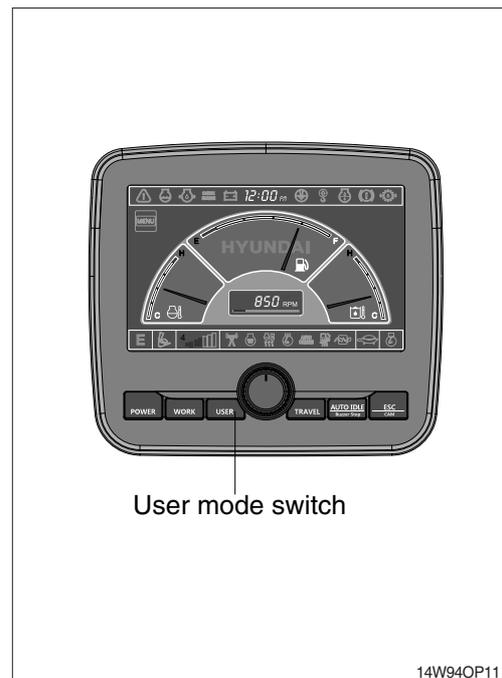
b. In menu

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.



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

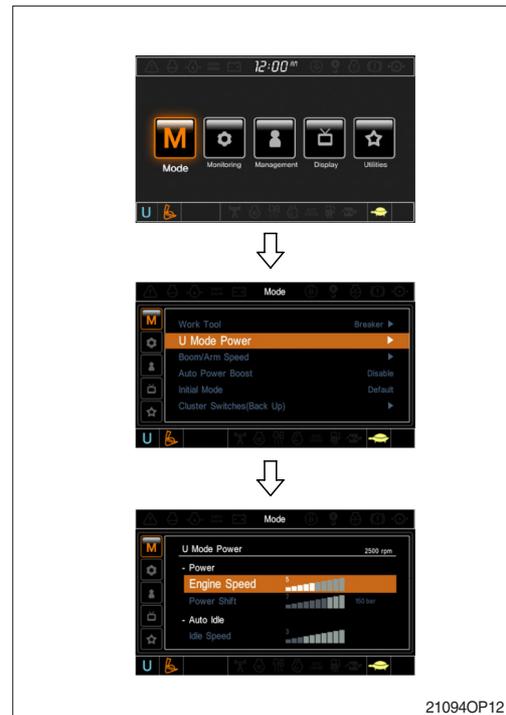


- High idle rpm, auto idle rpm and EPPR pressure can be adjusted and memorized in the U-mode.

※ Refer to the page 3-12 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 | 1500 | 850 | 0 |
| 2 | 1600 | 900 (low idle) | 3 |
| 3 | 1700 | 950 | 6 |
| 4 | 1800 | 1000 | 9 |
| 5 | 1850 | 1050 | 12 |
| 6 | 1900 | 1100 (decel idle) | 16 |
| 7 | 1950 | 1150 | 20 |
| 8 | 2000 | 1200 | 26 |
| 9 | 2050 | 1250 | 32 |
| 10 | 2100 | 1300 | 38 |



(4) Auto idle mode

Pilot lamp ON : Auto idle function is activated.

Pilot lamp OFF : Auto idle function is canceled.

(5) Monitoring system

Information of machine performance as monitored by the MCU can be displayed on the LCD. Refer to the page 3-11.

(6) Self diagnostic system

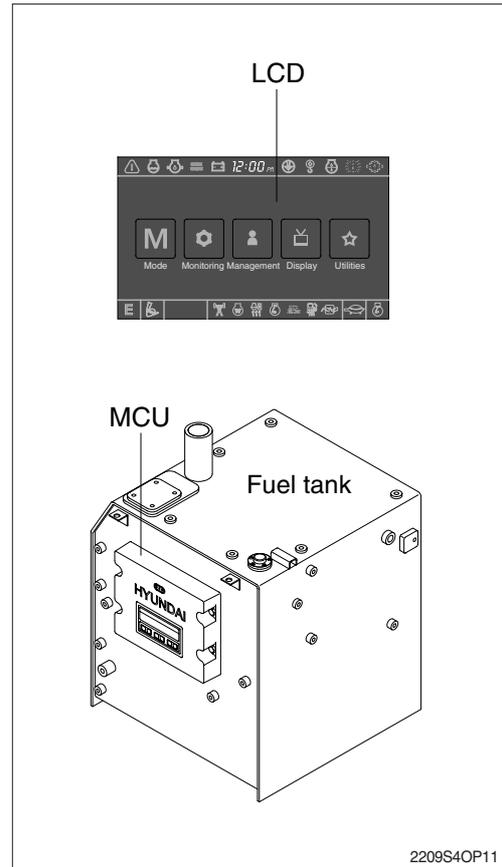
MCU (Machine Control Unit)

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).

※ Refer to the page 3-11 for LCD display.

(7) Anti-restart system

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



2) HOW TO OPERATE MODE SELECTION SYSTEM

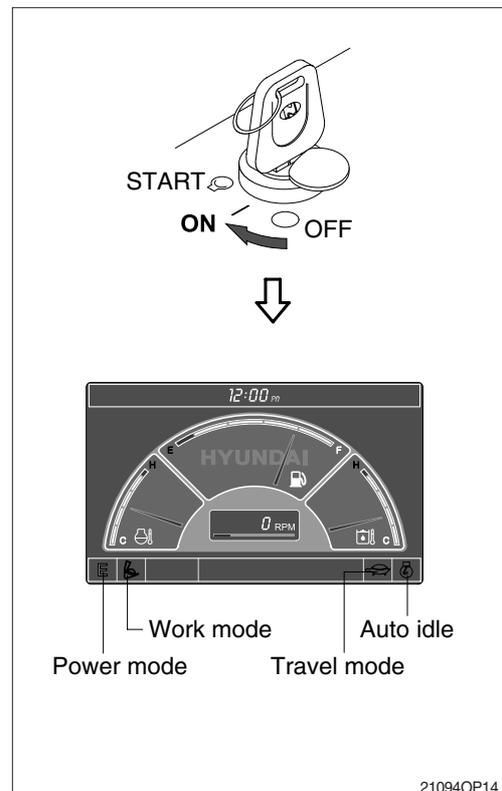
(1) When start key switch is turned ON

- 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 |

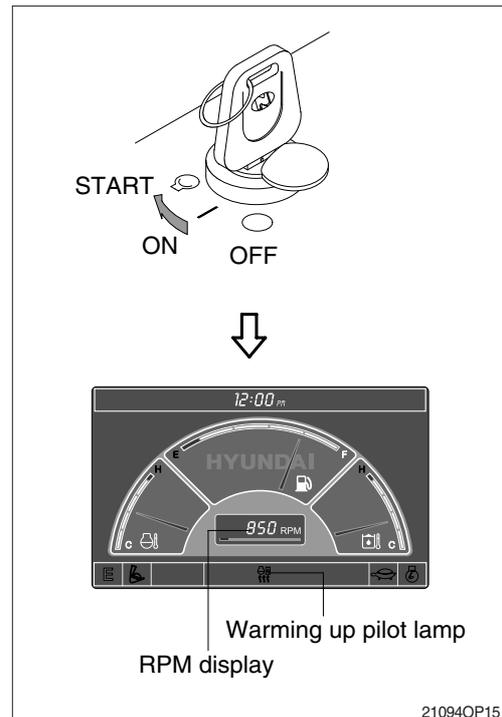
※ These setting can be changed at U mode.

- 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, 900 ± 100 rpm.
- ② If coolant temperature is below 30°C , the warming up pilot lamp lights ON and after 4 seconds the engine speed increases to 1100 ± 100 rpm automatically to warm up the machine.
 - After 2-3 minutes, you can select any mode depending on job requirement.



21094OP15

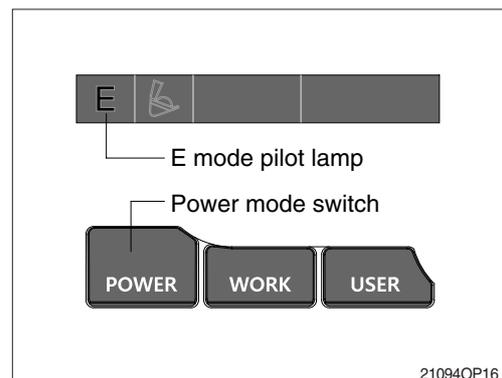
3) SELECTION OF POWER MODE

(1) E mode

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

| Engine rpm | Effect |
|---------------|--|
| 1950 ± 50 | Variable power control in proportion to lever stroke (improvement in fuel efficiency) ※ Same power as S mode in full lever operation. |

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



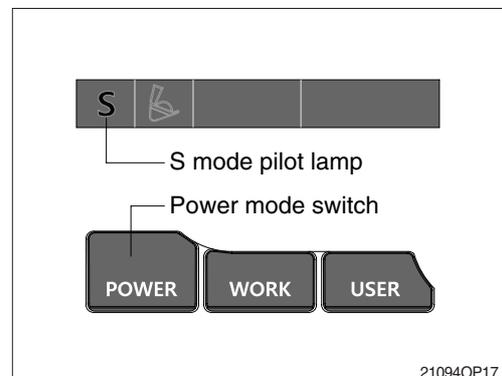
21094OP16

(2) S mode

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

| Engine rpm | Effect |
|---------------|----------------|
| 2050 ± 50 | Standard power |

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



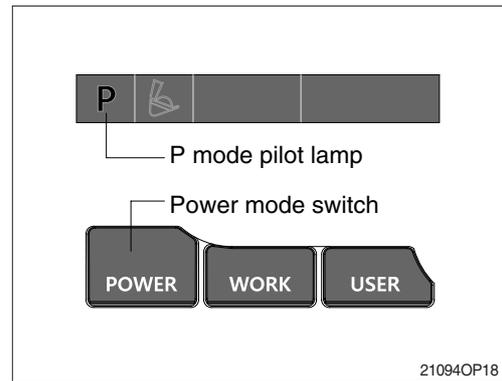
21094OP17

(3) P mode

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

| Engine rpm | Effect |
|------------|---|
| 2150 ± 50 | Approximately 120 % of power and speed available than S mode. |

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



■ **MODE SELECTION SYSTEM (CLUSTER TYPE 2)**

1) **STRUCTURE OF CAPO SYSTEM**

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

(1) **Work mode**

2 work modes can be selected for the optimal work speed of the machine operation.

① **Heavy duty work mode**

The boom priority solenoid is activated to make the boom operation speed faster.

② **General work mode**

When key switch is turned ON, this mode is selected automatically and swing operation speed is faster than heavy duty work mode.

(2) **Power mode**

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

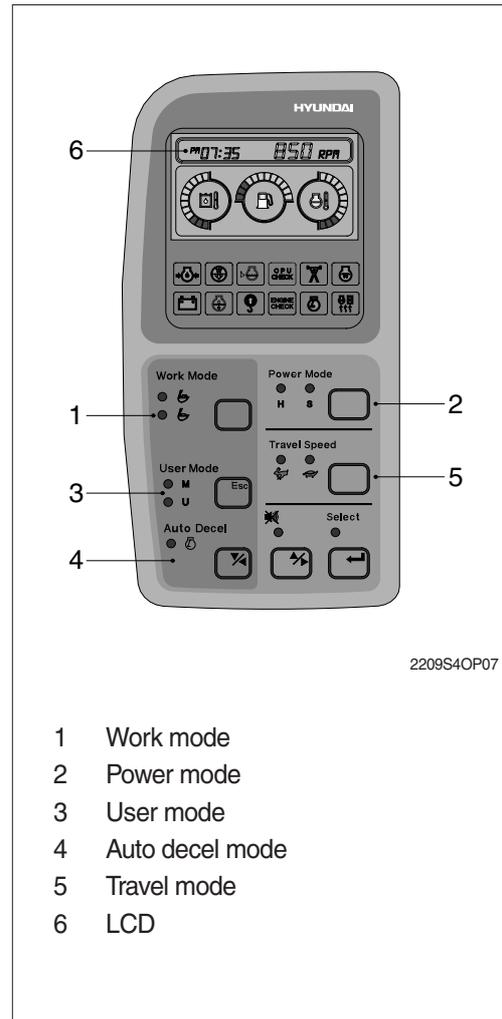
- H mode : High power
- S mode : Standard power

(3) **User mode**

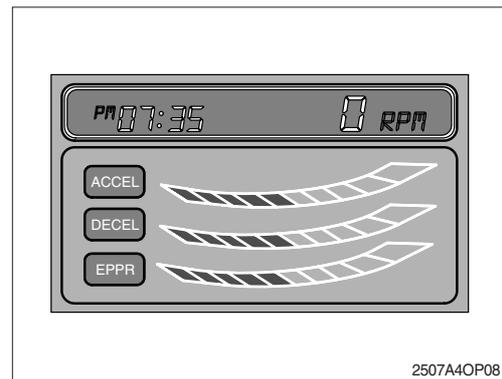
- M : Maximum power
- U : You can change the engine and pump power and memorize it for your preference

How to modulate the memory set

- ① Each memory mode has a initial set which are mid-range of max engine speed, auto decel rpm, and EPPR valve input current.



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



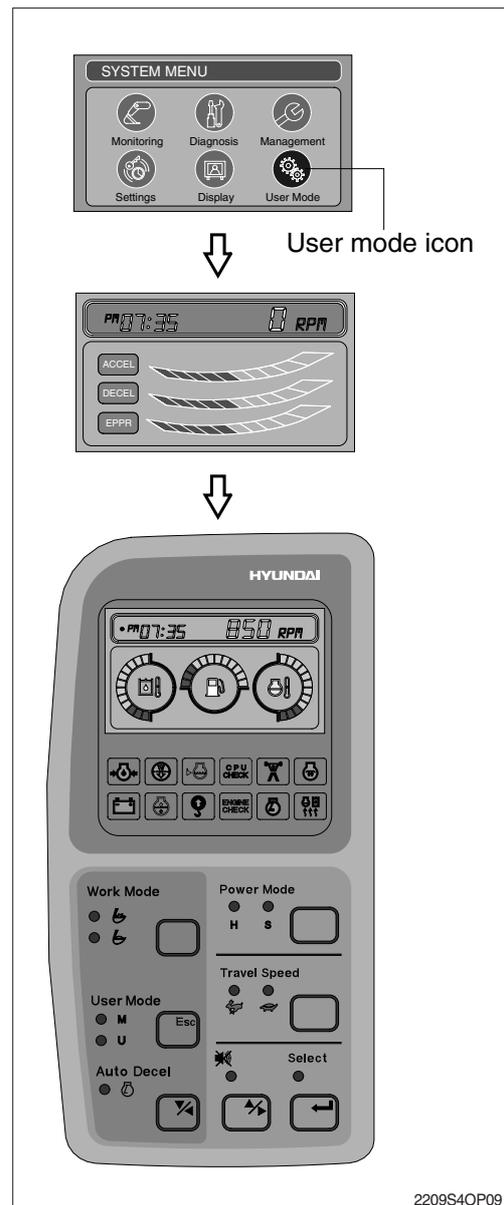
② High idle rpm, auto decel rpm, EPPR pressure can be modulated and memorized separately in the U-mode.

※ Refer to the page 3-29 for set of user mode.

· LCD segment vs parameter setting

| Step () | Engine speed (rpm) | Idle speed (rpm) | EPPR (mA) |
|-------------|-----------------------|---------------------|-----------|
| 1 | 1500 | 1000 | 150 |
| 2 | 1600 | 1050 | 200 |
| 3 | 1700 | 1100 (decel rpm) | 250 |
| 4 | 1800 | 1150 | 300 |
| 5 | 1850 | 1200 | 350 |
| 6 | 1900 | 1250 | 400 |
| 7 | 1950 | 1300 | 450 |
| 8 | 2000 | 1350 | 500 |
| 9 | 2050 | 1400 | 550 |
| 10 | 2100 | 1450 | 600 |

※ Low idle speed : 900 rpm.



2209S4OP09

(4) Auto decel mode

Engine quick deceleration.

(5) Travel mode

 : Low speed traveling.

 : High speed traveling.

(6) Monitoring system

Information of machine performance as monitored by the MCU can be displayed on the LCD. Refer to the page 3-26.

(7) Self diagnostic system

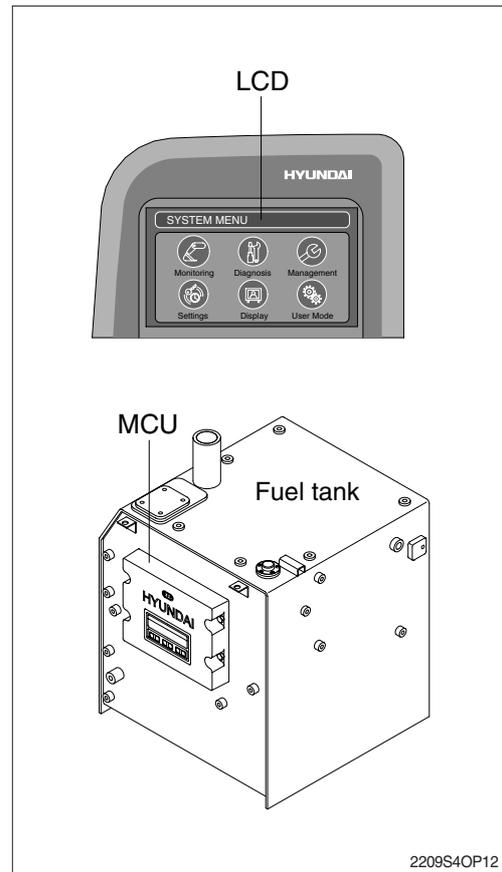
① MCU (Machine Control Unit)

The MCU diagnoses problems in the CAPO system caused by electric parts' malfunction and by open or short circuit, which are displayed on the LCD as error codes (2 digit).

- ※ Consult hyundai or huyn dai dealer for details.
- ※ Refer to the page 3-26 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 is turned ON, all illumination lamps are ON and all lamps are OFF automatically after 5 seconds. But a battery charging warning lamp and an engine oil pressure warning lamp keep turned ON until engine starting.
- ② After lamp check 「1.00」, the version of cluster program, is displayed on LCD for 2 seconds.
- ③ After the version of program is displayed, the cluster returns to default. Exactly engine rpm, battery charging warning lamp and engine oil pressure warning lamp are turned ON and S mode, auto decel, low travel speed (turtle mark) are displayed.
- ④ In default condition self-diagnostic function including trouble detecting of electric system can be carried out.



(2) After engine start

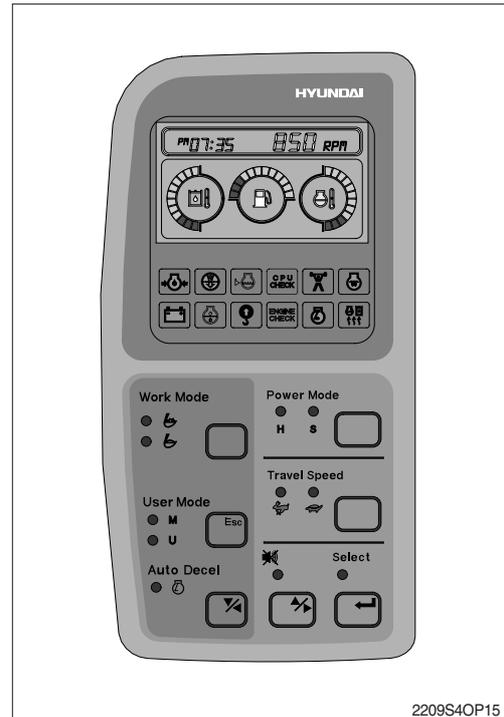
- ① When the engine is started, three lamps are ON as below.

| Mode | | Status |
|-----------------|---|--------|
| Work mode |  | ON |
| Power mode | S | ON |
| Travel mode | Low () | ON |
| Auto decel mode | | ON |

- In this condition, tachometer indicates low idle, 900 ± 100 rpm.
- If coolant temperature is below 30°C , after 10 seconds the engine speed increases to 1100 ± 100 rpm automatically to warm up the machine.
- After 2-3 minutes, you can select any mode depending on job requirement.

- ② Self-diagnostic function can be carried out the same as start key is ON.

※ Refer to the page 3-27 for details.



2209S4OP15

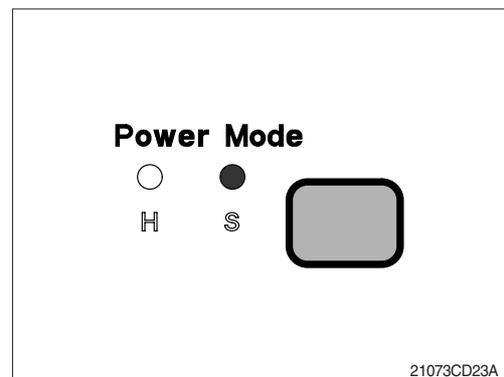
3) SELECTION OF POWER MODE

(1) S mode

When the accel dial is at setting 10 and auto decel mode is cancelled and S mode is selected.

| Engine rpm | Effect |
|---------------|--------------------------------------|
| 1950 ± 50 | Same power as non mode type machine. |

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



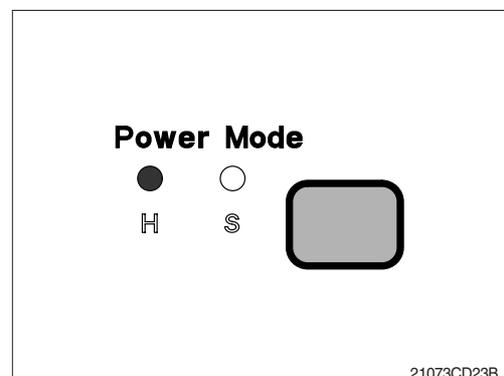
21073CD23A

(2) H mode

When the accel dial is at setting 10 and auto decel mode is cancelled and H mode is selected.

| Engine rpm | Effect |
|---------------|---|
| 2050 ± 50 | Approximately 110% of power and speed available than non mode type machine or S mode. |

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



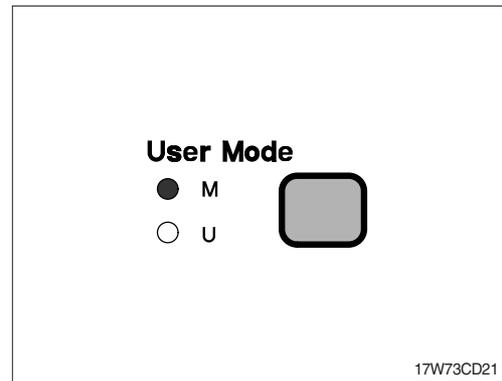
21073CD23B

(3) M mode

When the accel dial is at setting 10 and auto decel mode is cancelled and M mode is selected.

| Engine rpm | Effect |
|------------|---|
| 2150 ± 50 | Approximately 130% of power and speed available than non mode type machine or S mode. |

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



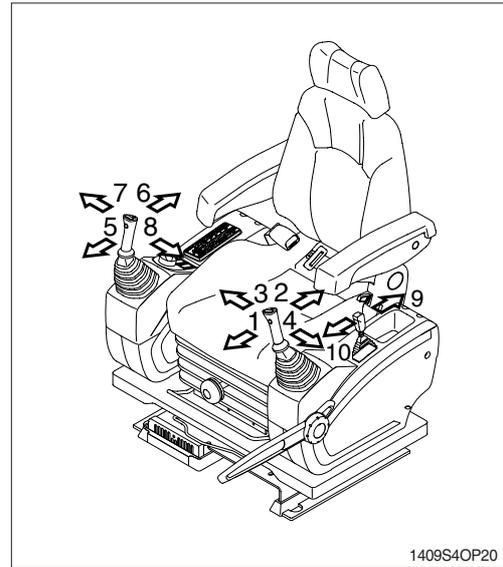
5. OPERATION OF WORKING DEVICE

※ 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.

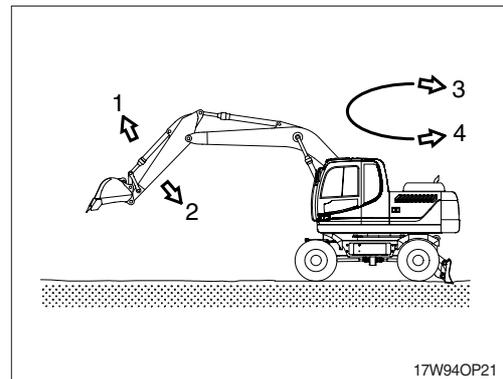
※ When operating swing, consider the swing distance by inertia.

※ Refer to the switching method at page 3-36, when installed dozer or outrigger.



※ Left control lever

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

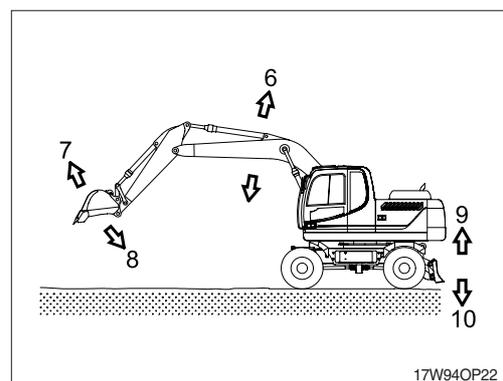


※ Right control lever

- 5 Boom lower
- 6 Boom raise
- 7 Bucket roll-out
- 8 Bucket roll-in

※ Dozer and outrigger control lever

- 9 Dozer blade or outrigger up
- 10 Dozer blade or outrigger down



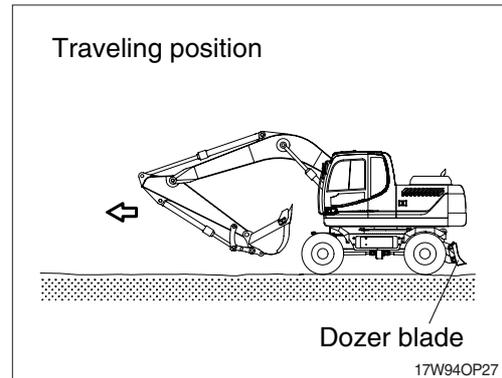
6. TRAVELING OF THE MACHINE

1) BASIC OPERATION

(1) Traveling position

It is the position which the dozer and rear axle is in the rear and the working device is forward.

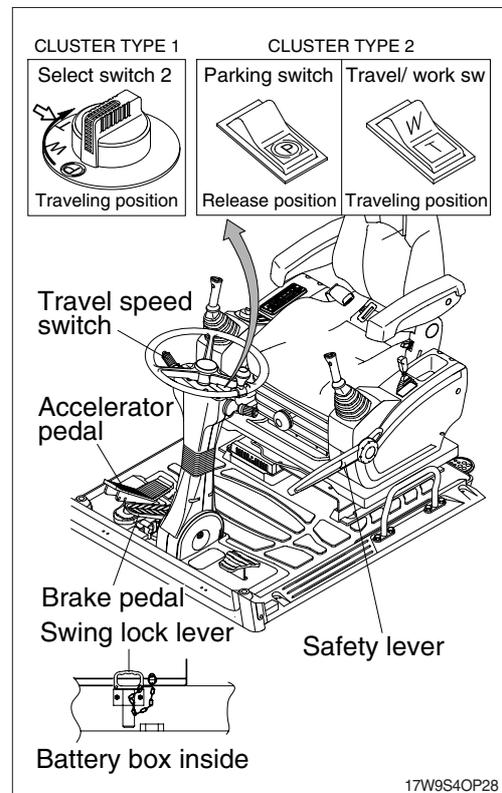
- ▲ **Travel directions will be reversed if lower structure is positioned with dozer in front.**



(2) Traveling operation

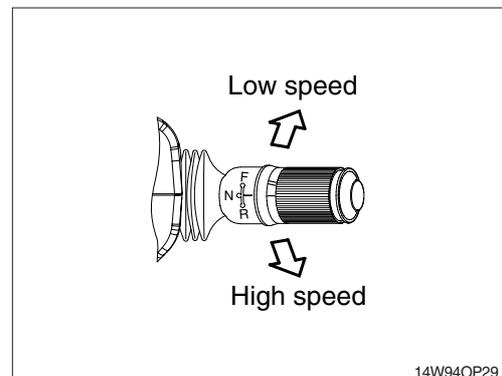
When warm-up operation is completed after the engine is started, move the machine according to the following procedure.

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



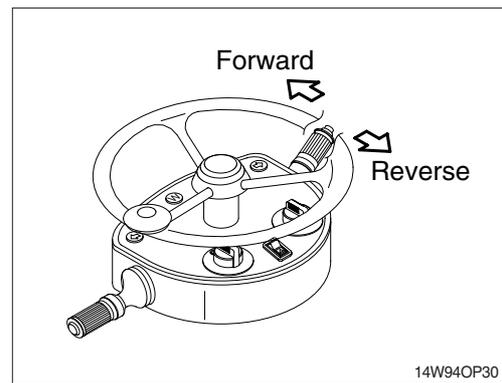
(3) Changing speed

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



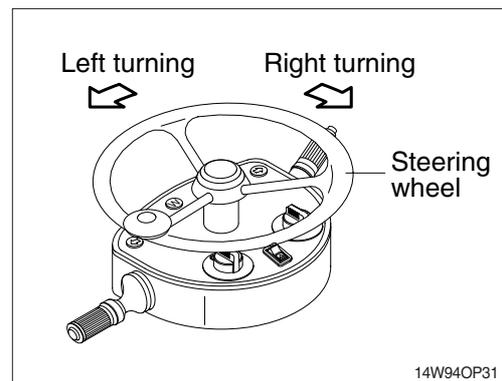
(4) Changing direction (forward/reverse)

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



(5) Turning the machine

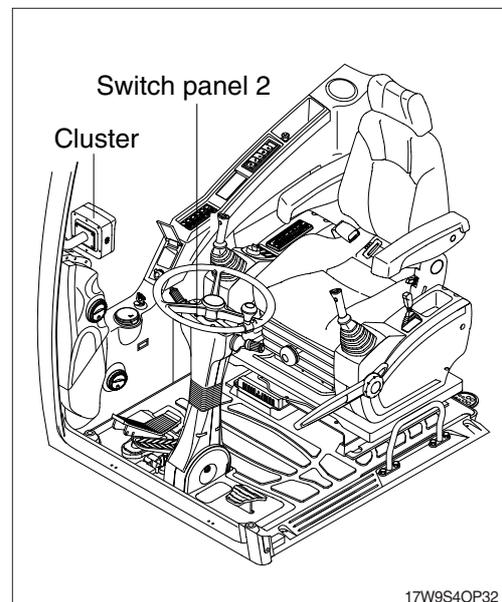
- ① Turn the machine by moving the steering wheel into the desired direction.
 - ② You can turn the machine to the left or right.
- ※ **Do not turn the machine abruptly when traveling at high speed and avoid turn on a slope.**
- ▲ **Steering does not function with engine OFF.**



(6) Precautions when driving

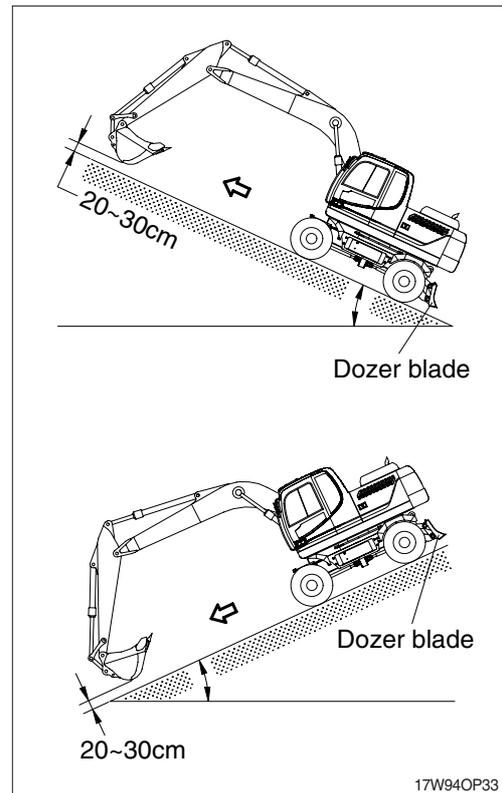
The operators must be familiar with the following precautions including general safety hints.

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



2) TRAVELING ON A SLOPE

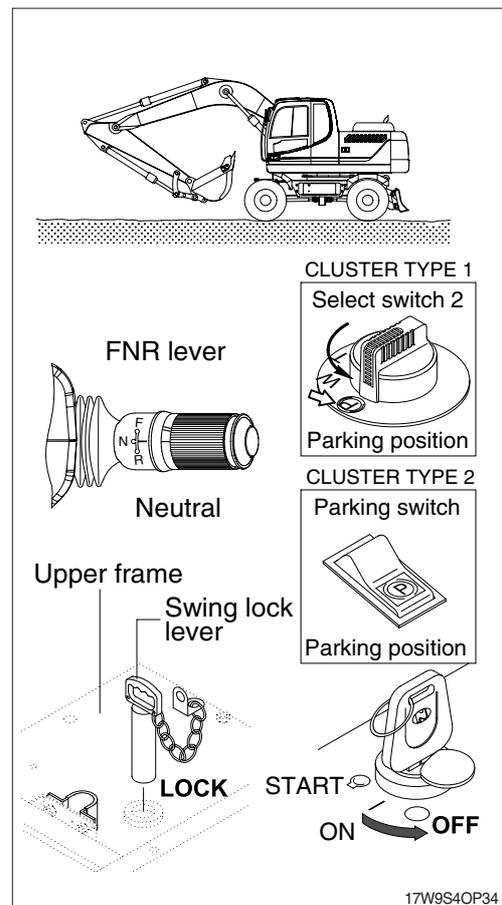
- (1) Never travel down a slope in neutral.
 - (2) Lower the bucket 20 to 30 cm (1 ft) to the ground so that it can be used as a brake in an emergency.
 - (3) If the machine starts to slide or loses stability, lower the bucket immediately and brake the machine.
 - (4) When parking on a slope, use the bucket as a brake and place blocks behind the tires to prevent sliding.
- ※ **Machine can not travel effectively on a slope when the oil temperature is low. Do the warming-up operation when it is going to travel on a slope.**
 - ※ **Be careful when working on slopes. It may cause the machine to lose its balance and turn over.**



3) PARKING THE MACHINE

To park the machine, keep the steps below.

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



4) TOWING THE MACHINE

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

(1) General

① Parking brake cylinder of the machine is operated by the spring force and released by hydraulic pressure.

If the engine does not operate, the brake will be operated to stop the machine.

② When the machine is towed move it for a repair to nearby place at the low speed.

Transport it on a trailer, if it has to be moved for a long distance.

③ When the steering device and the brake of the machine to be towed can not be operated, transport by trailer.

▲ Injury or death could result if a disabled machine is towed incorrectly.

▲ If your machine is towed by another machine, ALWAYS use a wire rope with a sufficient towing capacity.

▲ NEVER allow a disabled machine to be towed on a slope.

▲ When connecting up a towing machine, do not let anyone enter the area between the towing machine and the equipment being towed.

▲ Set the towing machine and the towing connection of the equipment being towed in a straight line when connecting it.

▲ Never tow machine using a light-duty towing hook.

(2) Towing the machine

- ① The emergency device is to interrupt the power flow between input and output in case of control pressure failure or a travel motor defect and thus allows an emergency towing of the machine.

Towing speed : Max 10km/h

Towing distance : Max 5km

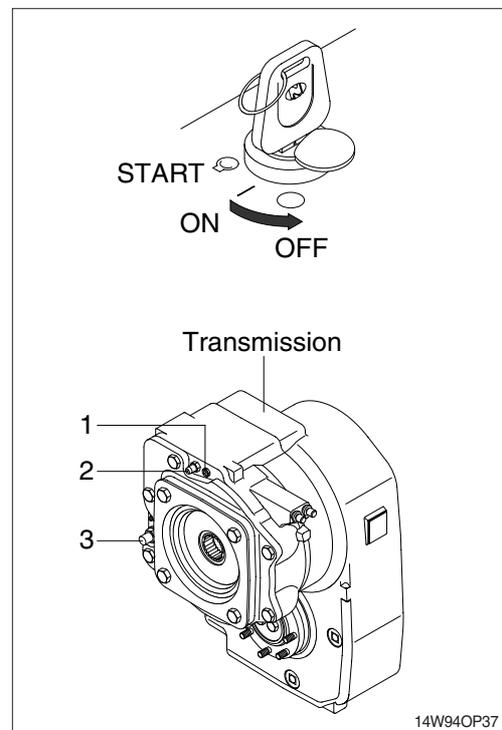
- ② Since there is no transmission lubrication, damages may occur due to lacking oil supply if the instruction are no observed. For a long distance it is best to have transported the defective machine on a trailer.

③ Activate the emergency device

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

④ Deactivate the emergency device

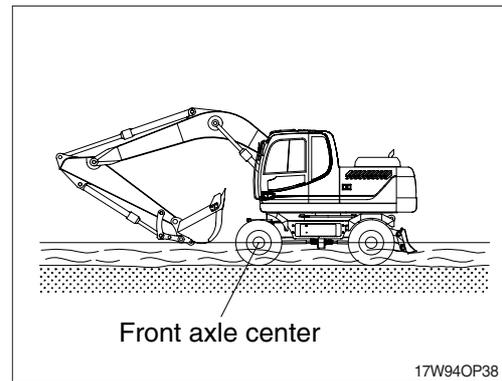
- The bleeder(2) of the emergency device must be opened and then shift into the road speed(apply a control pressure of 30 to 35 bar at the connection of the brake).
- Then close the bleeder again.



5) PRECAUTIONS FOR OPERATION

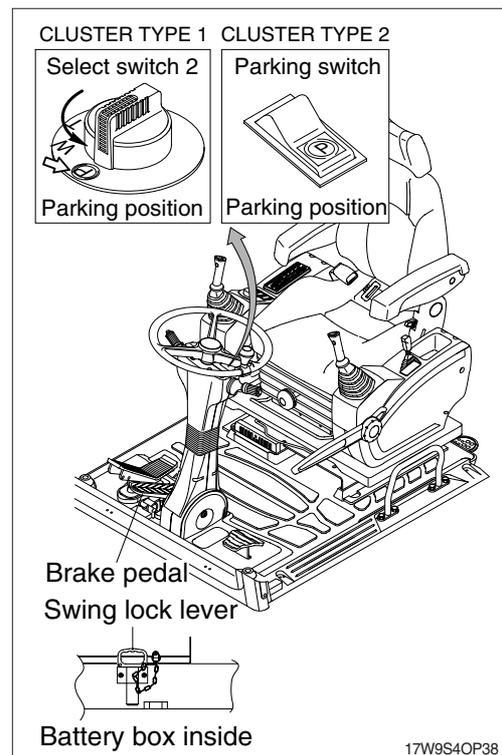
(1) Permissible water depth

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



(2) When the brake does not operate

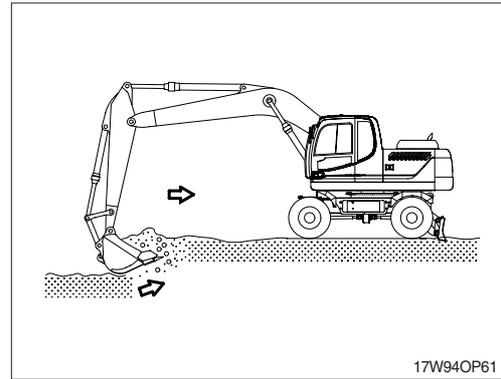
- ① If the machine does not stop even though the brake pedal is applied, put the parking position to activate the emergency brake by select switch 2.
- ※ **After using the parking brake as an emergency brake, ask Hyundai dealer to check complete brake system.**
- ▲ **Never use emergency brake, except when the service brake fails.**



7. EFFICIENT WORKING METHOD

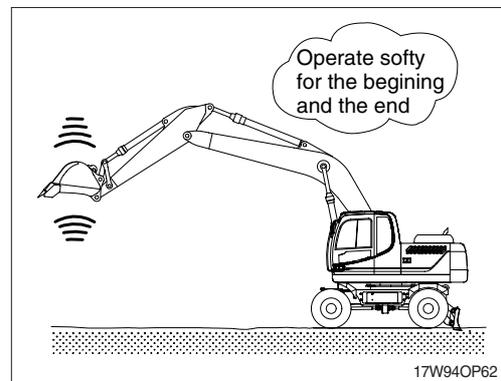
- 1) Do the digging work by arm.

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

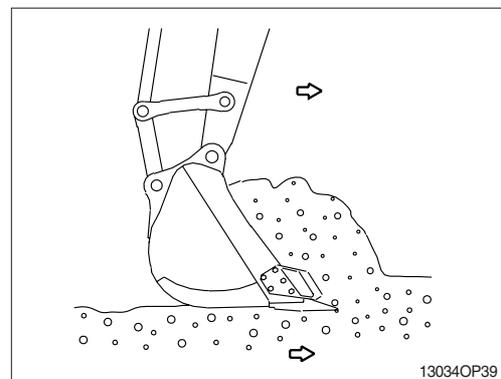


- 2) When lowering and raising the boom operate softly for the beginning and the end.

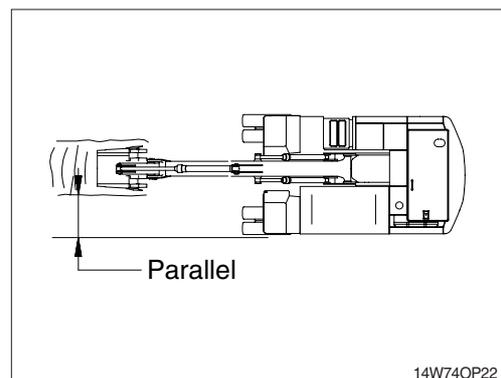
In particularly, sudden stops while lowering the boom may cause damage to the machine.



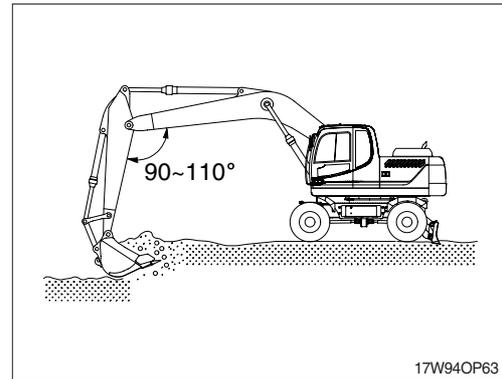
- 3) The digging resistance and wearing of tooth can be reduced by putting the end of bucket tooth to the digging direction.



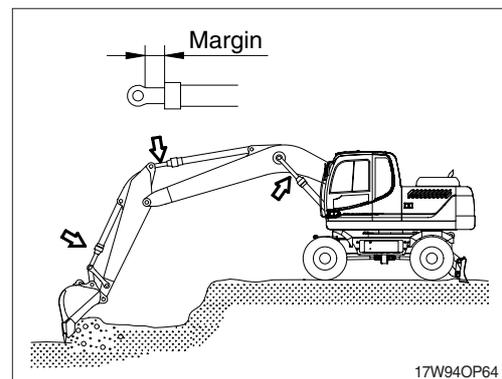
- 4) Set the tracks parallel to the line of the ditch to be excavated when digging ditch. Do not swing while digging.



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

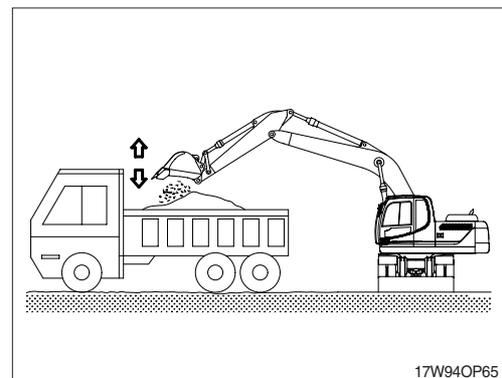


- 6) Operate leaving a small safety margin of cylinder stroke to prevent damage of cylinder when working with the machine.

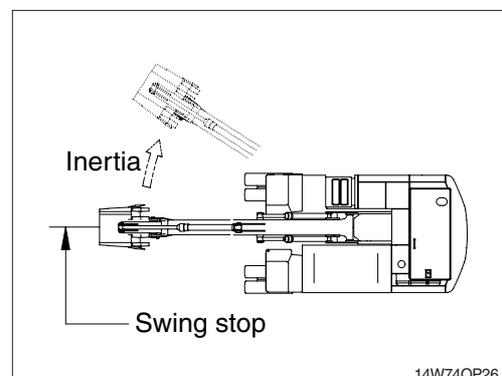


- 7) Keep the bucket to the dumping position and the arm horizontal when dumping the soil from the bucket.
Operate bucket lever 2 or 3 times when hard to dump.

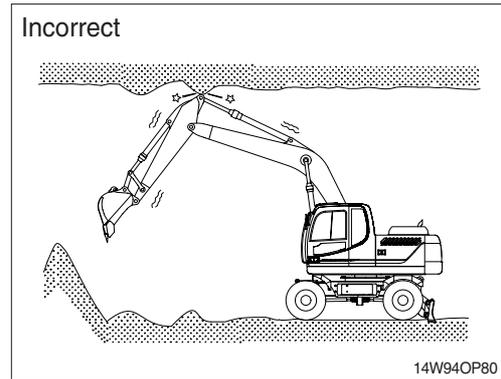
※ Do not use the impact of bucket tooth when dumping.



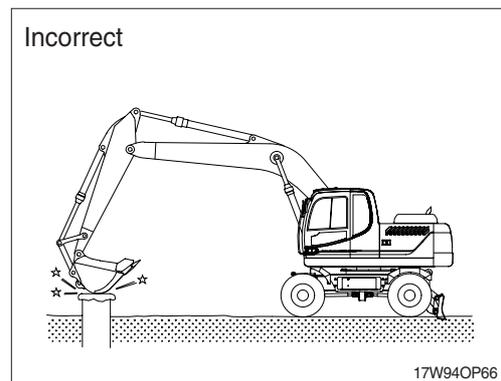
- 8) Operate stop of swing considering the swing slip distance is created by inertia after neutralizing the swing lever.



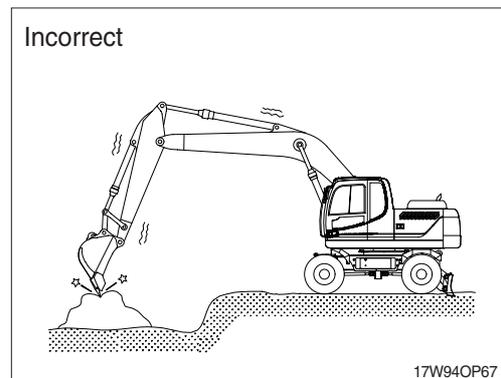
9) If the excavation is in an underground location or in a building, make sure that there is adequate overhead clearance and that there is adequate ventilation.



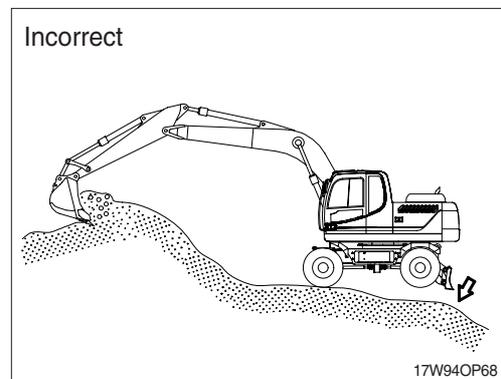
10) Do not use the dropping force of the work equipment for digging. The machine can be damaged by the impact.



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



13) NEVER CARRY OUT EXCESSIVE OPERATIONS

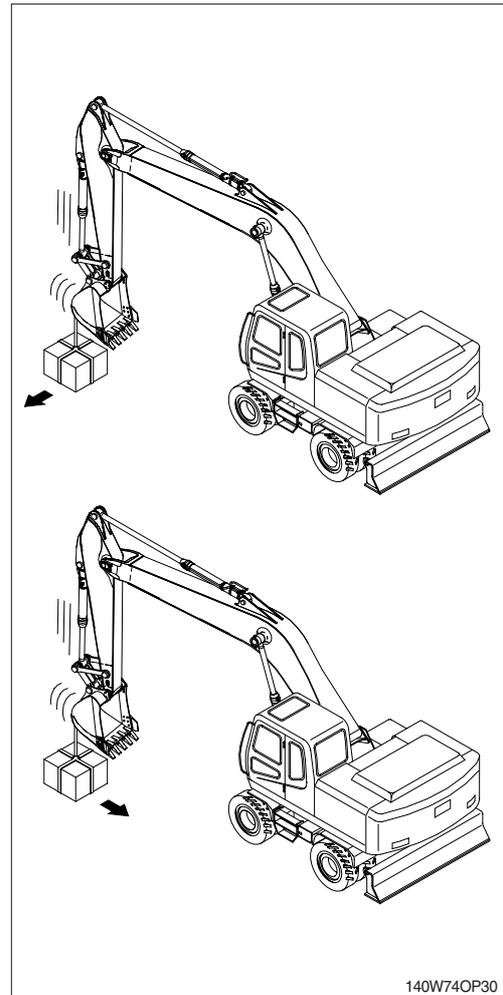
Operation exceeding machine performance may result in accident or failure.

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 Hyundai distributor.



14) BUCKET WITH HOOK

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

The following operations are prohibited.

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

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

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

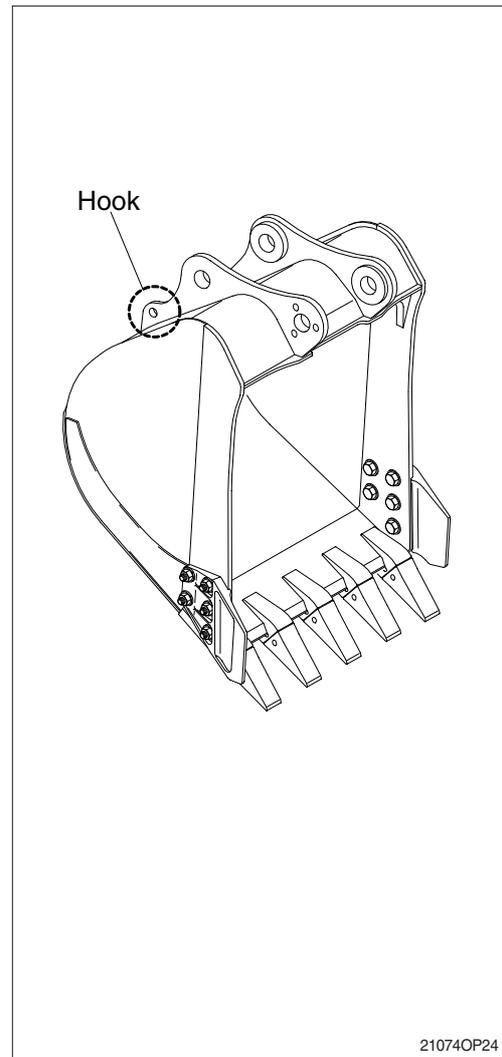
Due to the possible danger of the load falling or of collision with the load, no persons shall be allowed in the working area.

Before performing lifting operation, designate an operation supervisor.

Always execute operation according to this instructions.

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

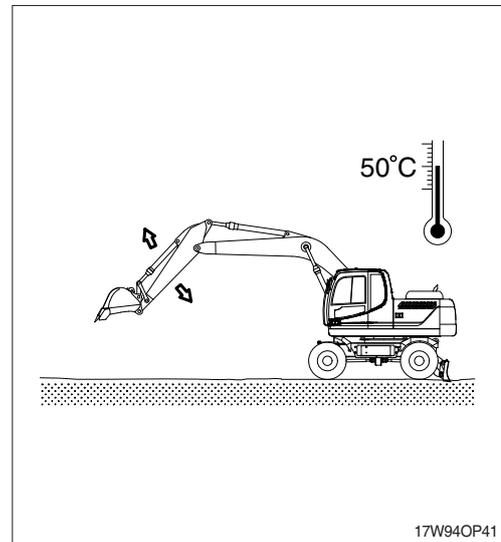
Never leave the operator's seat while lifting a load.



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.

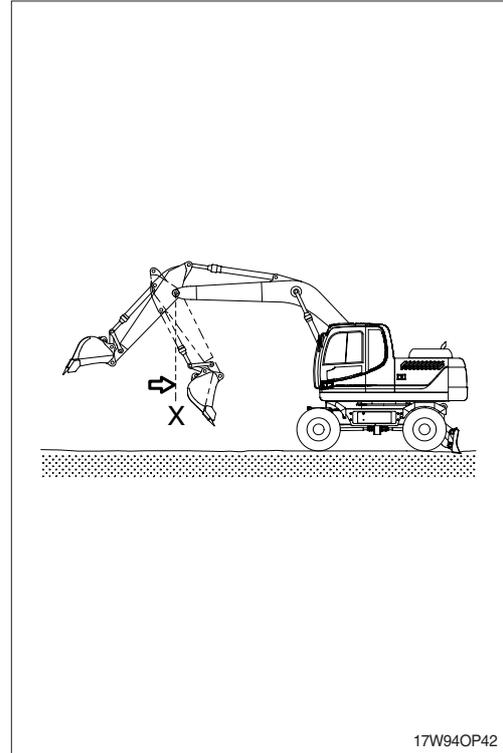
5) OPERATION IN ROCKY WORK SITES

- (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 2 minutes) after the engine is stopped, the attachment will lower under its own weight when the attachment control lever is shifted to LOWER. That happens only starting switch ON position and safety lever UNLOCK position. After the engine is stopped, set the safety lever to the LOCK position.

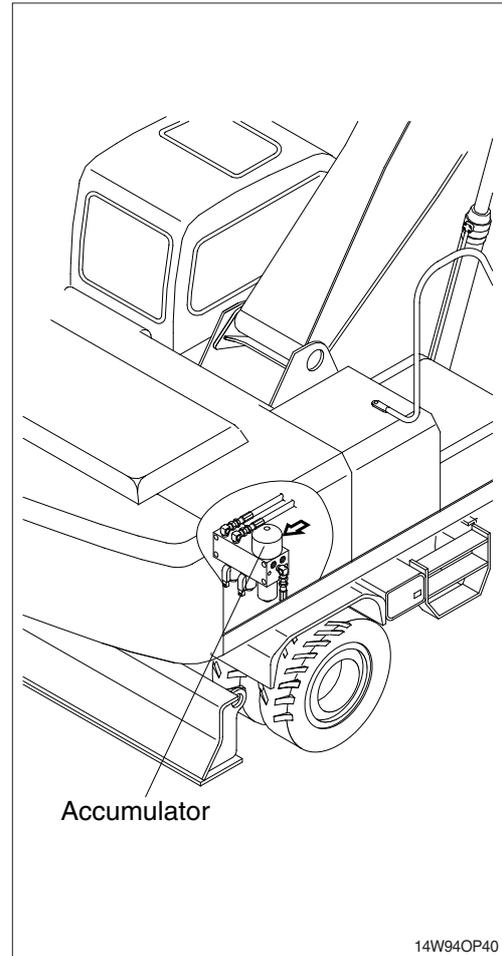
▲ Be sure no one is under or near the attachment before lowering the boom.

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 Hyundai distributor.



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 and dried.
Grease each lubrication part.

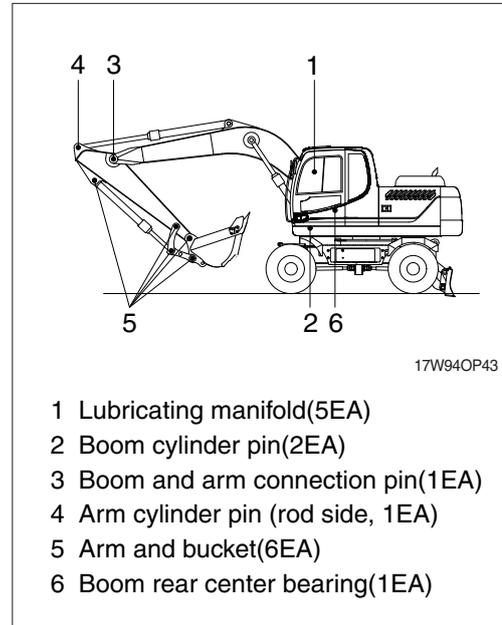
(2) Lubrication position of each part

Change all oil.

※ **Be particularly careful when you reuse the machine.**

As oil can be diluted during storage.

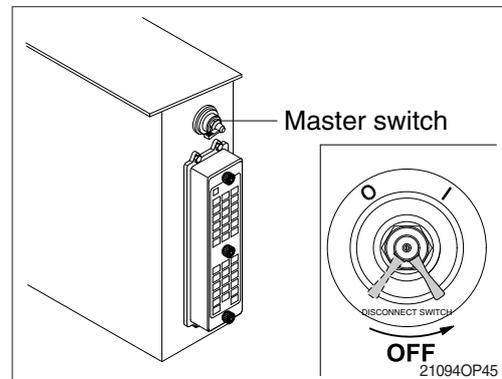
Apply an anticorrosive lubricant on the exposed part of piston rod of cylinder and in places where the machine rusts easily.



(3) Master switch

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

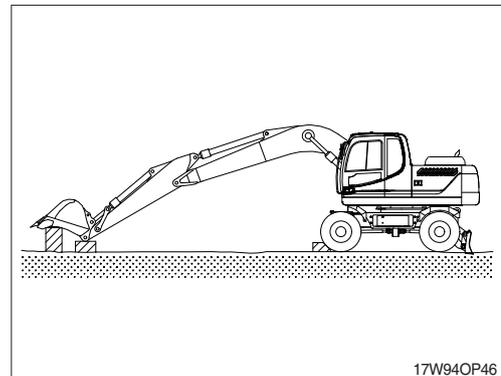
(4) Be sure to mix anticorrosive antifreezing solution in the radiator.



(5) Prevention of dust and moisture

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

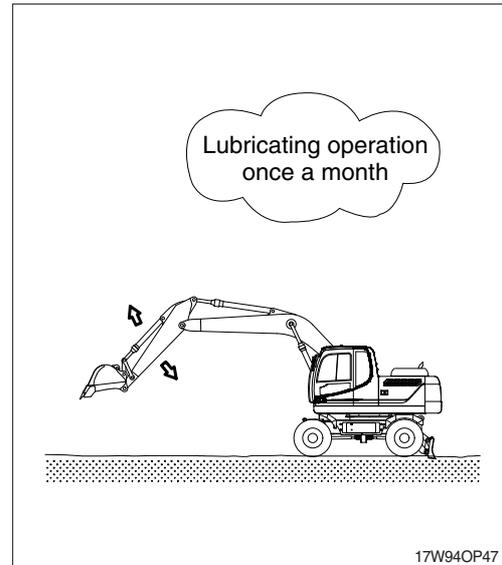
- ※ **Cover exposed part of piston rod of cylinder.**
- ※ **Lower the bucket to the ground and set a support under track.**



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

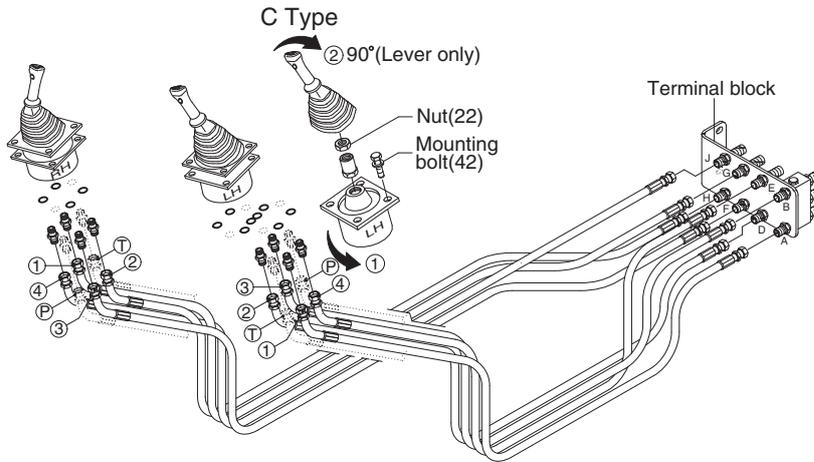
If the machine stock period is over 6 months, carry out the following procedure.

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 Hyundai 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.

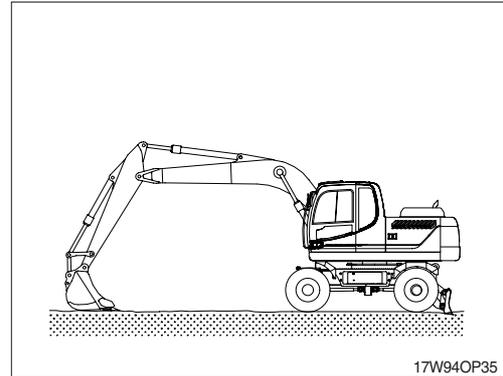
※ The hose modification works must be carried out between RCV lever and terminal block (Not between terminal block and MCV).

17W9S4OP50

| Pattern | Operation | | Control function | Hose connection (port) | | | |
|-------------------------|----------------|-----------------|------------------|--|--------------------------|----|---|
| | Left RCV lever | Right RCV lever | | RCV lever | Change of Terminal block | | |
| | | | | | From | To | |
| ISO Type Hyundai | | | Left | 1 Arm out | ② | D | - |
| | | | | 2 Arm in | ④ | E | - |
| | | | | 3 Swing right | ③ | B | - |
| | | | | 4 Swing left | ① | A | - |
| | | | Right | 5 Boom lower | ④ | J | - |
| | | | | 6 Boom raise | ② | H | - |
| | | | | 7 Bucket out | ① | G | - |
| | | | | 8 Bucket in | ③ | F | - |
| A Type | | | Left | 1 Boom lower | ② | D | J |
| | | | | 2 Boom raise | ④ | E | H |
| | | | | 3 Swing right | ③ | B | - |
| | | | | 4 Swing left | ① | A | - |
| | | | Right | 5 Arm out | ④ | J | D |
| | | | | 6 Arm in | ② | H | E |
| | | | | 7 Bucket out | ① | G | - |
| | | | | 8 Bucket in | ③ | F | - |
| B Type | | | Left | 1 Boom lower | ② | D | J |
| | | | | 2 Boom raise | ④ | E | H |
| | | | | 3 Bucket in | ③ | B | F |
| | | | | 4 Bucket out | ① | A | G |
| | | | Right | 5 Arm out | ④ | J | D |
| | | | | 6 Arm in | ② | H | E |
| | | | | 7 Swing right | ① | G | B |
| | | | | 8 Swing left | ③ | F | A |
| C Type | | | Left | ① Loosen the RCV lever mounting bolt (42) 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 | | | |

13. SWITCHING HYDRAULIC ATTACHMENT CIRCUIT

- 1) The combined hydraulic attachment circuit is capable of providing single action or double action.
- 2) The position of 3 way valve selects the single action hydraulic attachment circuit or the double action hydraulic attachment circuit.
- 3) Before you change the flow mode of hydraulic attachment circuit, place the machine in the servicing position as shown. Stop the engine.



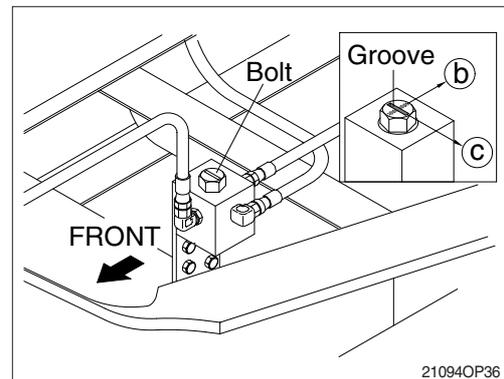
- 4) Use the spanner to turn the bolt of 3 way valve. Make sure that you turn the bolt between (b) and (c).

(1) One way flow (hydraulic breaker)

Position the groove parallel to the piping (b).

(2) Two way flow (clamshell or shear)

Position the groove perpendicular to the piping (c).



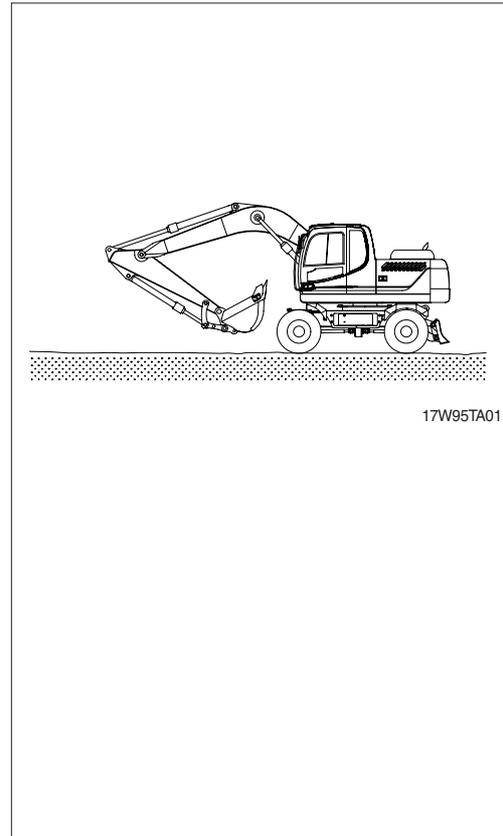
1. ROAD TRAVELING

As this machine can run at the maximum speed of 31 km/h, it is not necessary to transport the machine on trailer in a short distance.

But the transportation by the trailer is convenient in a long distance.

If it is necessary to travel on a road, observe the followings.

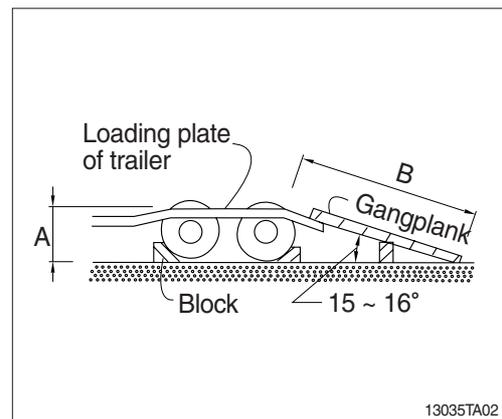
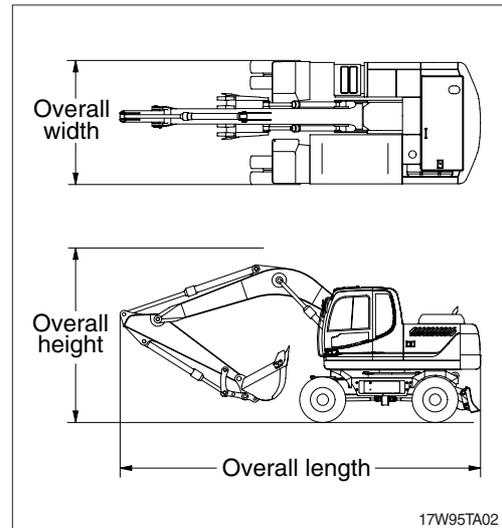
- 1) Comply with regulations regarding this machine for the sake of safety.
- 2) Perform daily inspection before starting the machine.
- 3) Cross the bridge after checking that it will safely support the machine weight. If the bridge can not support, a detour must be prepared or the bridge must be reinforced.
- 4) When traveling for a long distance, stop every hour to allow tires and other components to cool down and check any abnormality.
- 5) Drive with the bucket empty.



2. PREPARATION FOR TRANSPORTATION

- 1) When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc.
- 2) Select proper trailer after confirming the weight and dimension from the chapter 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 |



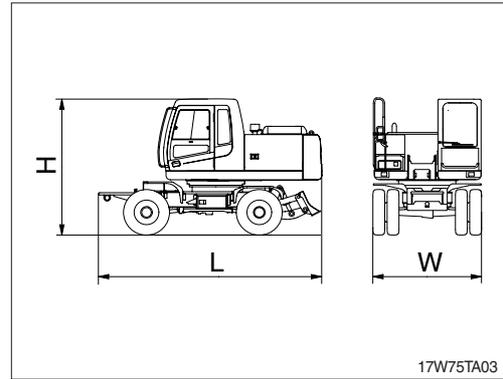
3. DIMENSION AND WEIGHT

1) ROBEX 170W-9S

(1) Base machine

| Mark | Description | Unit | Specification |
|------|-------------|------------|---------------|
| L | Length | mm (ft-in) | 5220 (17' 2") |
| H | Height | mm (ft-in) | 3150 (10' 4") |
| W | Width | mm (ft-in) | 2500 (8' 2") |
| Wt | Weight | kg (lb) | 13310 (29340) |

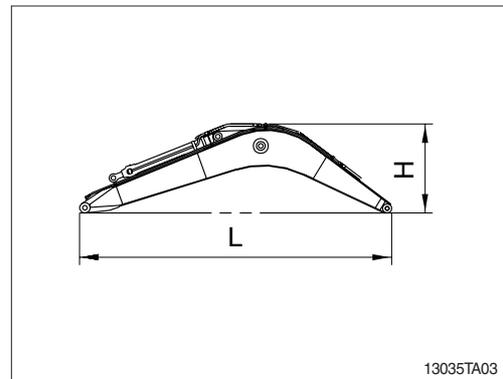
※ 2750 kg (6060 lb) counterweight.



(2) Boom assembly

| Mark | Description | Unit | Specification |
|------|-------------|------------|---------------|
| L | Length | mm (ft-in) | 5290 (17' 4") |
| H | Height | mm (ft-in) | 1460 (4' 9") |
| W | Width | mm (ft-in) | 590 (1'11") |
| Wt | Weight | kg (lb) | 1250 (2760) |

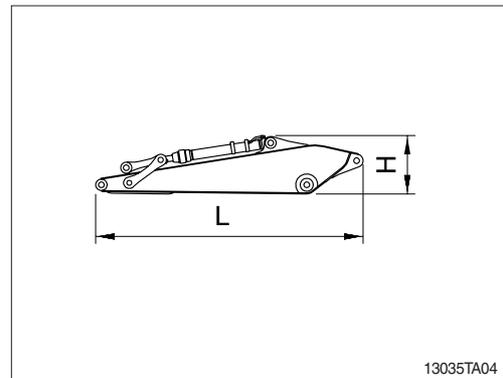
※ 5.1 m (16' 9") mono boom with arm cylinder (included piping and pins).



(3) Arm assembly

| Mark | Description | Unit | Specification |
|------|-------------|------------|---------------|
| L | Length | mm (ft-in) | 3080 (10' 1") |
| H | Height | mm (ft-in) | 790 (2' 7") |
| W | Width | mm (ft-in) | 450 (1' 6") |
| Wt | Weight | kg (lb) | 750 (1650) |

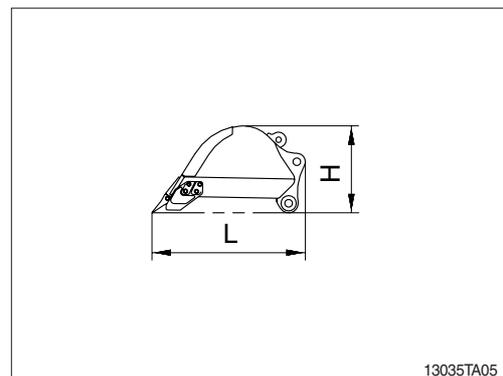
※ 2.2 m (7' 3") arm with bucket cylinder (included linkage and pins).



(4) Bucket assembly

| Mark | Description | Unit | Specification |
|------|-------------|------------|----------------|
| L | Length | mm (ft-in) | 1510 (4'11") |
| H | Height | mm (ft-in) | 940 (3' 3") |
| W | Width | mm (ft-in) | 1180 (3' 10") |
| Wt | Weight | kg (lb) | 570 (1260) |

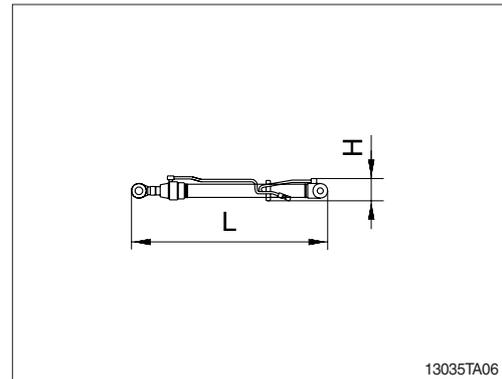
※ 0.76 m³ (0.99 yd³) SAE heaped bucket (included tooth and side cutters).



(5) Boom cylinder

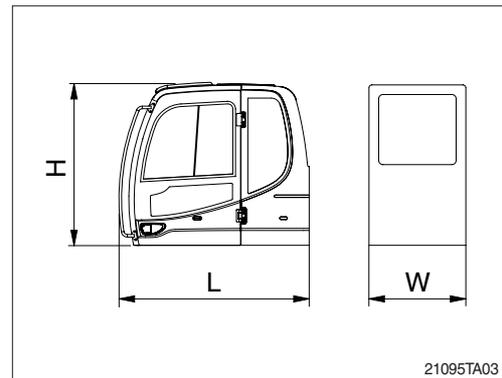
| Mark | Description | Unit | Specification |
|------|-------------|------------|---------------|
| L | Length | mm (ft-in) | 1780 (5'10" |
| H | Height | mm (ft-in) | 230 (0' 9" |
| W | Width | mm (ft-in) | 330 (1' 1" |
| Wt | Weight | kg (lb) | 320 (705) |

※ Included piping.



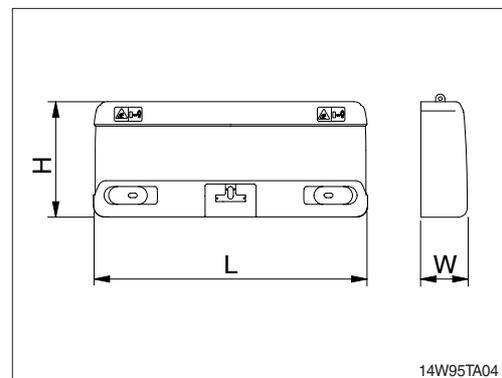
(6) Cab assembly

| Mark | Description | Unit | Specification |
|------|-------------|------------|---------------|
| L | Length | mm (ft-in) | 2000 (6' 7" |
| H | Height | mm (ft-in) | 1740 (5' 9" |
| W | Width | mm (ft-in) | 1288 (4' 2" |
| Wt | Weight | kg (lb) | 440 (970) |



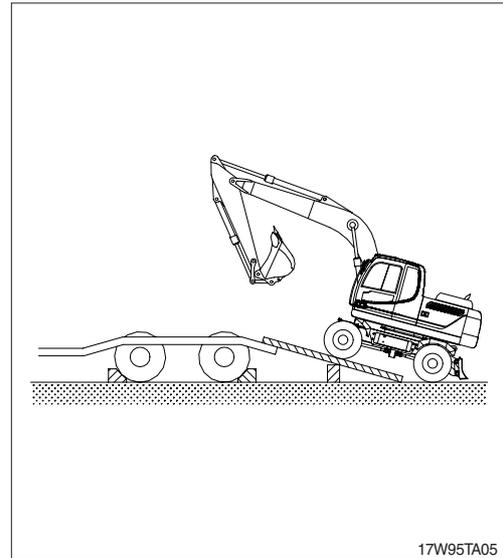
(7) Counterweight

| Mark | Description | Unit | Specification |
|------|-------------|------------|---------------|
| L | Length | mm (ft-in) | 2475 (8' 1" |
| H | Height | mm (ft-in) | 1050 (3' 5" |
| W | Width | mm (ft-in) | 460 (1' 6" |
| Wt | Weight | kg (lb) | 2650 (5840) |

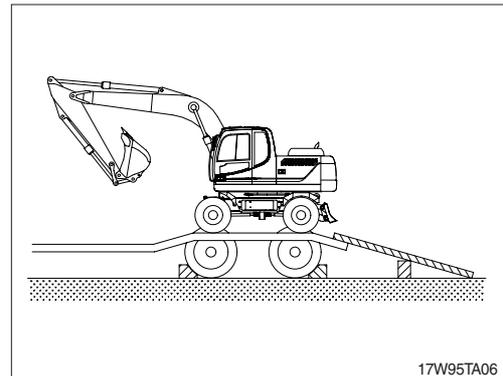


4. LOADING THE MACHINE

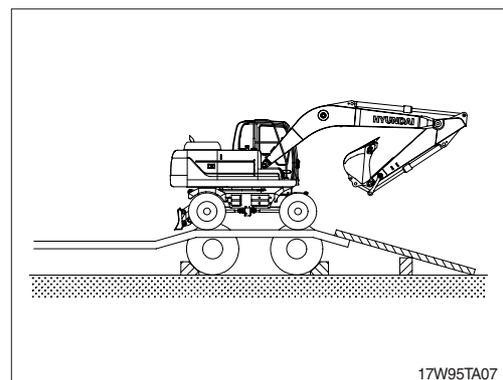
- 1) Load and unload the machine on a flat ground.
- 2) Use the gangplank with sufficient length, width, thickness and gradient.
- 3) Place block tires of the truck and the trailer not to move the trailer.
- 4) Place the swing lock device to the **LOCK** position before fixing the machine at the bed of trailer and confirm if the machine parallels the bed of trailer.
- 5) Drive straight and depress the acceleration pedal slowly on the gangplank with the two speed switch positioned as low speed.



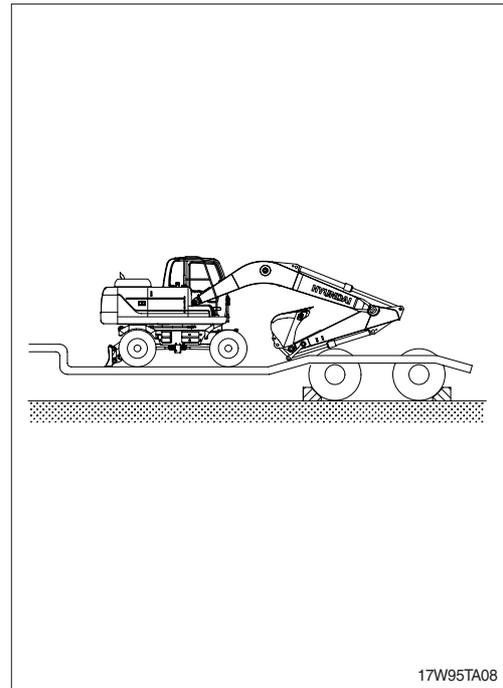
- 6) Do the following after loading the machine to the trailer.
 - (1) Stop loading when the machine is located horizontally with the rear wheel of trailer.



- (2) Place the swing lock device to the **LOCK** position after the swing the machine 180 degree.

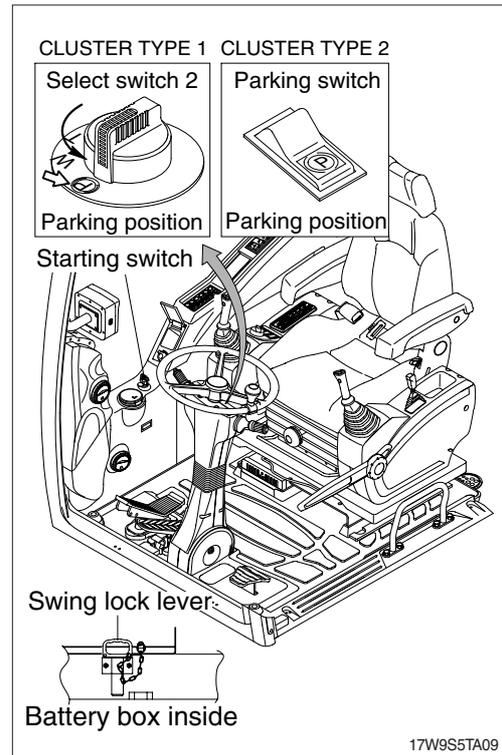


- (3) Lower the working equipment gently after the location is determined.
- ※ Place rectangular timber under the bucket cylinder to prevent the damage of it during transportation.
 - ▲ Be sure to keep the travel speed switch on the low speed while loading and unloading the machine.
 - ▲ Avoid using the working equipment for loading and unloading 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.

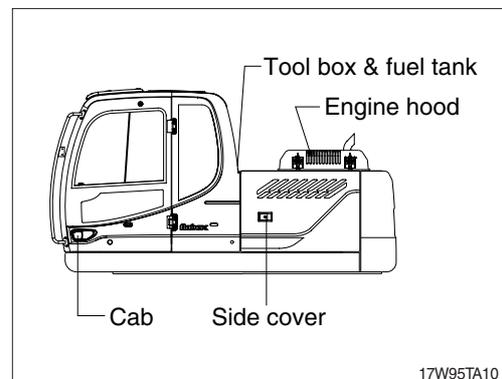


5. FIXING THE MACHINE

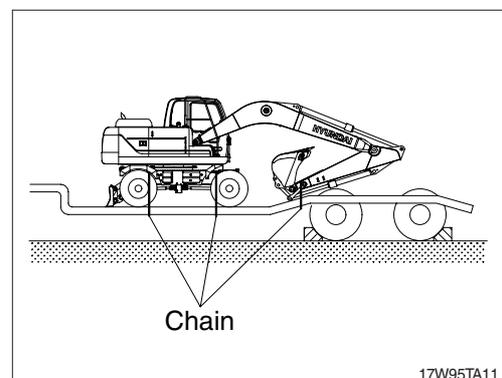
- 1) Place the swing lock device on the LOCK position.
- 2) Place the select switch 2 to the parking position.
(CLUSTER TYPE 1)
Place the parking switch to the parking position.
(CLUSTER TYPE 2)
- 3) Keep the safety lever on the SAFETY position.
- 4) Turn OFF all the switches and remove the key.



- 5) Secure all locks.



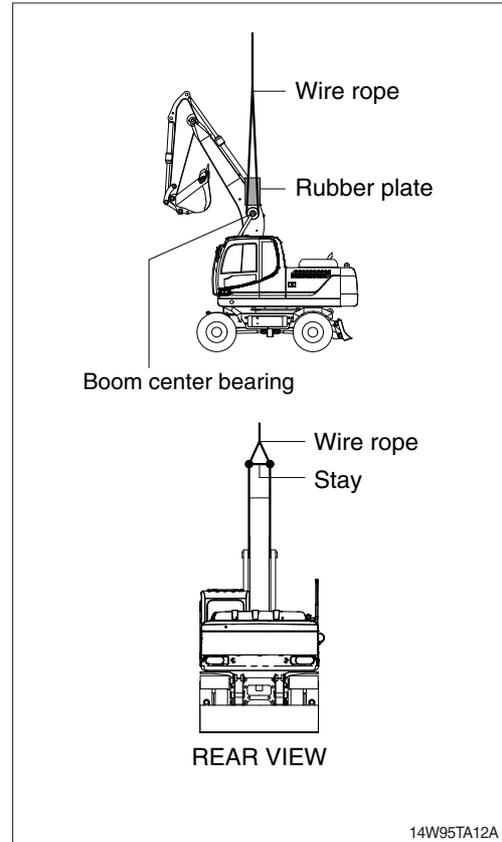
- 6) Place timber underneath of the tires and fix firmly with wire rope to prevent the machine from moving forward, backward, right or left.



6. 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 where the wire rop contact with the machine's body to prevent damage.
- 4) Place crane on the proper place.
- 5) After the boom is raised to the maximum high, install the wire rope and stay like the illustration.

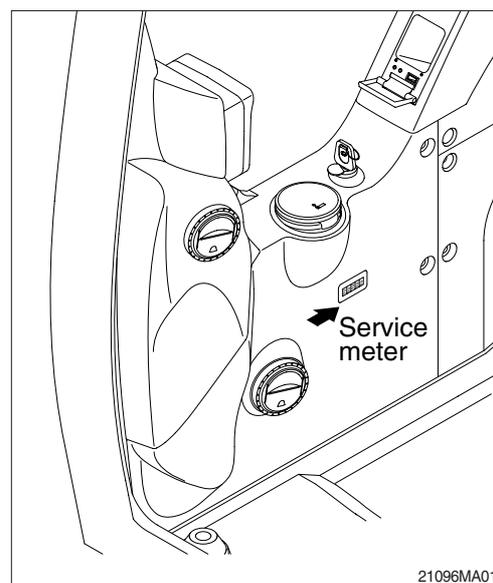
- ▲ **Make sure wire rope is proper size.**
- ▲ **Place the safety lever to LOCK position to prevent the machine moving when hoisting the machine.**
- ▲ **The wrong hoisting method or installation of wire rope can cause damage to the machine.**
- ▲ **Do not load abruptly.**
- ▲ **Keep area clear of personnel.**
- ▲ **Recommend to manufacture the stays separately as per lifting conditions.**



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) Ask to your local dealer or Hyundai for the maintenance advice if unknown.
- (5) 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.

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.

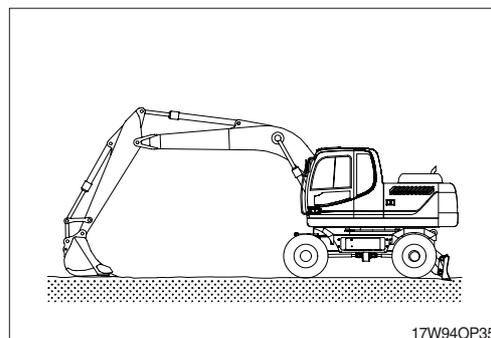
Replace damaged or worn parts at proper time to keep the performance of machine.

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

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

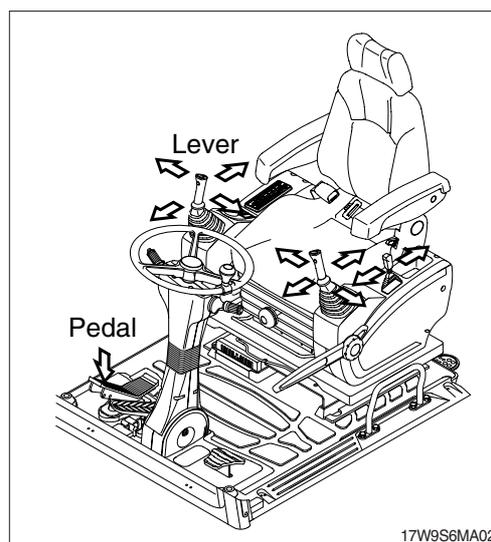
- ※ Spouting of oil can cause the accident when loosening the cap or hose right after the operating of machine as the machine or oil is on the high pressure on the condition. Be sure to relieve the pressure in the system before repairing hydraulic system.

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

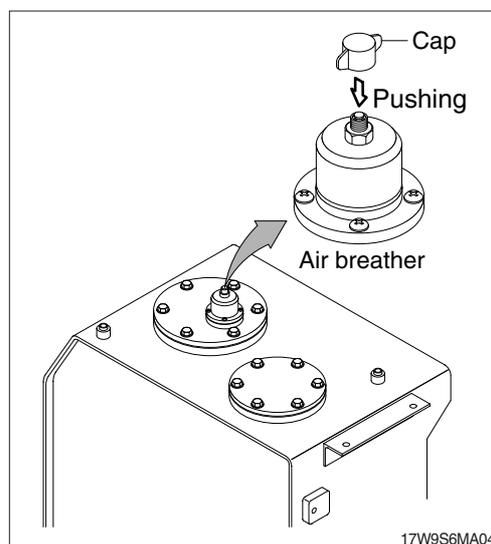


- (2) Set the safety lever completely in the release position, operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

- ※ 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.

| Periodical replacement of safety parts | | | Interval |
|--|----------------|-----------------------------|---------------|
| Engine | | Fuel hose (tank-engine) | Every 2 years |
| | | Heater hose (heater-engine) | |
| Hydraulic system | Main circuit | Pump suction hose | Every 2 years |
| | | Pump delivery hose | |
| | | Swing hose | |
| | Working device | Boom cylinder line hose | Every 2 years |
| | | Arm cylinder line hose | |
| | | Bucket cylinder line hose | |
| | Brake line | Service brake line hose | Every 2 years |
| | | Parking brake line hose | |
| | | Steering line hose | |

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

Replace clamp at the same time if the hose clamp is cracked when checking and replacing the hose.

2. TIGHTENING TORQUE

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

| Bolt size | 8T | | 10T | |
|------------|-------------|-------------|-------------|-------------|
| | kg · m | lb · ft | kg · m | lb · ft |
| M 6 × 1.0 | 0.9 ~ 1.3 | 6.5 ~ 9.4 | 1.1 ~ 1.7 | 8.0 ~ 12.3 |
| M 8 × 1.25 | 2.0 ~ 3.0 | 14.5 ~ 21.7 | 2.7 ~ 4.1 | 19.5 ~ 29.7 |
| M10 × 1.5 | 4.0 ~ 6.0 | 28.9 ~ 43.4 | 5.5 ~ 8.3 | 39.8 ~ 60.0 |
| M12 × 1.75 | 7.4 ~ 11.2 | 53.5 ~ 81.0 | 9.8 ~ 15.8 | 70.9 ~ 114 |
| M14 × 2.0 | 12.2 ~ 16.6 | 88.2 ~ 120 | 16.7 ~ 22.5 | 121 ~ 163 |
| M16 × 2.0 | 18.6 ~ 25.2 | 135 ~ 182 | 25.2 ~ 34.2 | 182 ~ 247 |
| M18 × 2.5 | 25.8 ~ 35.0 | 187 ~ 253 | 35.1 ~ 47.5 | 254 ~ 344 |
| M20 × 2.5 | 36.2 ~ 49.0 | 262 ~ 354 | 49.2 ~ 66.6 | 356 ~ 482 |
| M22 × 2.5 | 48.3 ~ 63.3 | 349 ~ 458 | 65.8 ~ 98.0 | 476 ~ 709 |
| M24 × 3.0 | 62.5 ~ 84.5 | 452 ~ 611 | 85.0 ~ 115 | 615 ~ 832 |
| M30 × 3.0 | 124 ~ 168 | 898 ~ 1214 | 169 ~ 229 | 1223 ~ 1656 |
| M36 × 4.0 | 174 ~ 236 | 1261 ~ 1704 | 250 ~ 310 | 1808 ~ 2242 |

(2) Fine thread

| Bolt size | 8T | | 10T | |
|------------|-------------|-------------|-------------|-------------|
| | kg · m | lb · ft | kg · m | lb · ft |
| M 8 × 1.0 | 2.2 ~ 3.4 | 15.9 ~ 24.6 | 3.0 ~ 4.4 | 21.7 ~ 31.8 |
| M10 × 1.2 | 4.5 ~ 6.7 | 32.5 ~ 48.5 | 5.9 ~ 8.9 | 42.7 ~ 64.4 |
| M12 × 1.25 | 7.8 ~ 11.6 | 56.4 ~ 83.9 | 10.6 ~ 16.0 | 76.7 ~ 116 |
| M14 × 1.5 | 13.3 ~ 18.1 | 96.2 ~ 131 | 17.9 ~ 24.1 | 130 ~ 174 |
| M16 × 1.5 | 19.9 ~ 26.9 | 144 ~ 195 | 26.6 ~ 36.0 | 192 ~ 260 |
| M18 × 1.5 | 28.6 ~ 43.6 | 207 ~ 315 | 38.4 ~ 52.0 | 278 ~ 376 |
| M20 × 1.5 | 40.0 ~ 54.0 | 289 ~ 391 | 53.4 ~ 72.2 | 386 ~ 522 |
| M22 × 1.5 | 52.7 ~ 71.3 | 381 ~ 516 | 70.7 ~ 95.7 | 511 ~ 692 |
| M24 × 2.0 | 67.9 ~ 91.9 | 491 ~ 665 | 90.9 ~ 123 | 658 ~ 890 |
| M30 × 2.0 | 137 ~ 185 | 990 ~ 1339 | 182 ~ 248 | 1314 ~ 1796 |
| M36 × 3.0 | 192 ~ 260 | 1390 ~ 1880 | 262 ~ 354 | 1894 ~ 2562 |

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 | 130.2 |
| 1" | 41 | 21 | 151.9 |
| 1-1/4" | 50 | 35 | 253.2 |

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 | 130.2 |
| 1-7/16-12 | 41 | 21 | 151.9 |
| 1-11/16-12 | 50 | 35 | 253.2 |

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 | 130.2 |
| 1" | 41 | 21 | 151.9 |
| 1-1/4" | 50 | 35 | 253.2 |

4) TIGHTENING TORQUE OF MAJOR COMPONENT

| No. | Descriptions | Bolt size | Torque | | |
|-----|--|--|------------|-------------------------------|-----------------------------------|
| | | | kgf · m | lbf · ft | |
| 1 | Engine | Engine mounting bolt (bracket-frame, FR) | M20 × 2.5 | 55±3.5 | 398±25.3 |
| 2 | | Engine mounting bolt (bracket-frame, RR) | M20 × 2.5 | 55±3.5 | 398±25.3 |
| 3 | | Engine mounting bolt (engine-bracket) | M12 × 1.75 | 10.0±1.0 | 72.3±7.2 |
| 4 | | Radiator mounting bolt, nut | M16 × 2.0 | 29.7±4.5 | 215±32.5 |
| 5 | | Coupling mounting bolt | M16 × 2.0 | 22±1.0 | 159±7.2 |
| 6 | Hydraulic system Power train system | Main pump housing mounting bolt | M10 × 1.5 | 6.0±1.5 | 43.4±10.8 |
| 7 | | Main pump mounting bolt | M16 × 2.0 | 22±1.0 | 159±7.2 |
| 8 | | Main control valve mounting bolt | M12 × 1.75 | 12.2±1.3 | 88.2±9.4 |
| 9 | | Travel motor mounting bolt | M16 × 2.0 | 29.6±3.2 | 214±23.1 |
| 10 | | Fuel tank mounting bolt | M20 × 2.5 | 46±5.1 | 333±36.9 |
| 11 | | Hydraulic oil tank mounting bolt | M20 × 2.5 | 46±5.1 | 333±36.9 |
| 12 | | Turning joint mounting bolt, nut | M12 × 1.75 | 12.3±1.3 | 89±9.4 |
| 13 | Under carriage | Swing motor mounting bolt | M20 × 2.5 | 57.9±8.7 | 419±62.9 |
| 14 | | Swing bearing upper mounting bolt | M20 × 2.5 | 57.9±6.0 | 419±43.4 |
| 15 | | Swing bearing lower mounting bolt | M20 × 2.5 | 57.9±6.0 | 419±43.4 |
| 16 | | Real axle mounting bolt, nut | M20 × 1.5 | 58±6.3 | 420±45.6 |
| 17 | | Transmission bracket mounting bolt | M20 × 2.5 | 58±6.3 | 420±45.6 |
| 18 | | Transmission mounting bolt | M16 × 2.0 | 29.7±4.5 | 215±32.5 |
| 19 | | Oscillating cylinder mounting bolt | M22 × 1.5 | 83.2±9.2 | 602±66.5 |
| 20 | | Oscillating cylinder support mounting bolt | M16 × 2.0 | 29.6±3.2 | 214±23.1 |
| 21 | | Wheel nut | M22 × 1.5 | 60 ⁰ ₋₅ | 433 ⁰ _{-36.2} |
| 22 | | Front drive shaft mounting bolt, nut | M10 × 1.25 | 5.9±0.6 | 42.7±4.3 |
| 23 | | Rear drive shaft mounting bolt, nut | M10 × 1.25 | 5.9±0.6 | 42.7±4.3 |
| 24 | Others | Counterweight mounting bolt | M30 × 3.0 | 199±30 | 1439±217 |
| 25 | | Cab mounting bolt, nut | M12 × 1.75 | 12.8±3.0 | 92.6±21.7 |
| 26 | | 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 | SAE 15W-40 (API CH-4), ★SAE 5W-40 (API CH-4) |
| Hydraulic oil | Hyundai genuine long life hydraulic oil (ISO VG32, VG46, VG68 only) Conventional hydraulic oil (ISO VG15★) |
| Swing reduction gear oil | SAE 85W-140 (API GL-5) |
| Transmission oil | SAE 10W-30 (API CF-4) |
| Axle oil | SAE 85W-90 LSD-Additive(API GL-5) or UTTO |
| Grease | Lithium base grease NLGI No. 2 |
| Fuel | ASTM D975-No. 2 |
| Coolant | Mixture of 50% ethylene glycol base antifreeze and 50% water. Mixture of 60% ethylene glycol base antifreeze and 50% water.★ |

SAE : Society of Automotive Engineers

★ : Cold region

API : American Petroleum Institute

Russia, CIS, Mongolia

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material

UTTO : Universal Tractor Transmission Oil

2) RECOMMENDED OILS

Use only oils listed below or equivalent.

Do not mix different brand oil.

| 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 | 16.5 (4.4) | ★SAE 5W-40 | | | | | SAE 30 | | | | |
| Transmission case | | | 3.0 (0.79) | SAE 10W | | | | | SAE 10W-30 | | | |
| | | | | SAE 15W-40 | | | | | | | | |
| Swing drive | Gear oil | 5.0 (1.3) | ★SAE 75W-90 | | | | | SAE 85W-140 | | | | |
| | Grease | | 1.2 (0.32) | ★NLGI NO.1 | | | | | NLGI NO.2 | | | |
| Front axle | Gear oil | Center : 10.5 (2.77) Hub : 2.5 × 2 (0.66 × 2) | | SAE 85W-90 LSD or UTTO | | | | | | | | |
| Rear axle | | Center : 15.1 (4.0) Hub : 2.5 × 2 (0.66 × 2) | | | | | | | | | | |
| Hydraulic tank | Hydraulic oil | Tank: 160 (42.3) System: 270 (71.3) | ★ISO VG 15 | | | | | ISO VG 32 | | | | |
| | | | ISO VG 46 | | | | | ISO VG 68 | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Fuel tank | Diesel fuel | 260 (68.7) | ★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★1 | 17.5 (4.6) | 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

UTTO : Universal Tractor Transmission Oil

★ : Cold region

Russia, CIS, Mongolia

★1 : Soft water

City water or distilled water

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 | 6-28 |
| Engine oil level | Check, Add | 6-18 |
| Coolant level | Check, Add | 6-20 |
| Control panel & pilot lamp | Check, Clean | 6-42 |
| Prefilter | Check, Clean | 6-26 |
| Fan belt tension & damage | Check, Adjust | 6-24 |
| ★ Attachment pin and bushing | Lubricate | 6-41 |
| · 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 |
| Swing bearing grease | Check, Add | 6-31 |
| Drive shaft grease (flange bearing) | Check, Add | 6-33 |
| Swing reduction gear oil | Check, Add | 6-31 |
| Transmission case oil | Check, Add | 6-37 |
| Wheel nuts | Check, Tighten | 6-34 |
| Tires (air pressure) | Check, Inflate | 6-34 |
| Front axle pivot pin bushing | Check, Lubricate | 6-33 |
| Lubricate pin and bushing | Lubricate | 6-41 |
| · Bucket cylinder rod end | | |
| · Arm + Bucket connecting | | |
| · Arm + Bucket control link | | |
| · Bucket control rod | | |
| · Bucket link connecting | | |
| · Dozer blade cylinder (rod end, tub end) | | 6-33 |
| · Dozer blade pivot pin | | 6-33 |
| · Outrigger (pivot pin, cylinder pin) | | 6-33 |

3) INITIAL 50 HOURS SERVICE

| Check items | Service | Page |
|---|--------------|------|
| Bolts & Nuts · Power train mounting bolts · Swing motor mounting bolts · Swing bearing mounting bolts · Engine mounting bolts · Counterweight mounting bolts · Turning joint locating bolts · Hydraulic pump mounting bolts | Check, Tight | 6-8 |

4) EVERY 100 HOURS SERVICE

| Check items | Service | Page |
|---------------------------------|----------------|------|
| Front axle steering case grease | Add, Lubricate | 6-33 |

5) EVERY 200 HOURS SERVICE

| Check items | Service | Page |
|--------------------------|---------|------|
| ★ Return filter | Replace | 6-29 |
| ★ Pilot line filter | Replace | 6-30 |
| ★ Drain filter cartridge | Replace | 6-30 |

★ **Replace 3 filters for continuous hydraulic breaker operation only.**

6) INITIAL 250 HOURS SERVICE

| Check items | Service | Page |
|-----------------------------|------------|----------|
| Engine oil | Change | 6-18, 19 |
| Engine oil filter | Replace | 6-18, 19 |
| Prefilter (water, element) | Replace | 6-26 |
| Fuel filter element | Replace | 6-27 |
| Swing reduction gear oil | Change | 6-31 |
| Swing reduction gear grease | Check, Add | 6-31 |
| Pilot line filter | Replace | 6-30 |
| Hydraulic return filter | Replace | 6-29 |
| Drain filter cartridge | Replace | 6-30 |
| Transmission oil | Change | 6-37 |

7) EVERY 250 HOURS SERVICE

| Check items | Service | Page |
|---|----------------|----------|
| ★ Engine oil | Change | 6-18, 19 |
| ★ Engine oil filter | Replace | 6-18, 19 |
| Battery (voltage) | Check | 6-42 |
| Aircon & heater fresh air filter | Check, Clean | 6-46 |
| Air breather element | Replace | 6-30 |
| Front & rear axle differential gear oil | Add, Lubricate | 6-35 |
| Axle planetary gear oil (front, rear) | Add, Lubricate | 6-35 |
| Bolts & Nuts | Check, Tight | 6-8 |
| · Power train mounting bolts | | |
| · Swing motor mounting bolts | | |
| · Swing bearing mounting bolts | | |
| · Engine mounting bolts | | |
| · Counterweight mounting bolts | | |
| · Turning joint locating bolts | | |
| · Hydraulic pump mounting bolts | | |
| Attachment pin and bushing | Lubricate | 6-40 |
| · 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 | | |

★ If you use high sulfur containing fuel above than 0.5% or use low grade of engine oil reduce change interval.

8) INITIAL 500 HOURS SERVICE

| Check items | Service | Page |
|---|---------|------|
| Front & rear axle differential gear oil | Change | 6-36 |
| Axle planetary gear oil (front, rear) | Change | 6-36 |

9) EVERY 500 HOURS SERVICE

| Check items | Service | Page |
|--|--------------|------|
| Prefilter | Change | 6-26 |
| Radiator, cooler fin and charge air cooler | Check, Clean | 6-23 |
| ☆ Air cleaner element (primary) | Check, Clean | 6-25 |
| Fuel filter element | Replace | 6-27 |

☆ Clean the primary element only after 500 hours operation or when the air cleaner warning lamp blinks. Replace primary element and safety element after 4 times cleanings of primary element.

10) EVERY 1000 HOURS SERVICE

| Check items | Service | Page |
|---------------------------------|---------|------|
| Swing reduction gear oil | Change | 6-31 |
| Swing reduction gear grease | Change | 6-31 |
| Grease in swing gear and pinion | Change | 6-31 |
| Transmission oil | Change | 6-37 |
| Hydraulic oil return filter | Replace | 6-29 |
| Pilot line filter | Replace | 6-30 |
| Drain filter cartridge | Replace | 6-30 |

11) EVERY 1500 HOURS SERVICE

| Check items | Service | Page |
|---|---------|------|
| Front & rear axle differential gear oil | Change | 6-36 |
| Axle planetary gear oil (front, rear) | Change | 6-36 |

12) EVERY 2000 HOURS SERVICE

| Check items | Service | Page |
|--|---------------------------|------------------|
| Hydraulic tank | | |
| ★ Oil * ¹ | Change | 6-28 |
| · Suction strainer | Check, Clean | 6-29 |
| Coolant | Change | 6-20, 21, 22, 23 |
| Hoses, fittings, clamps (fuel, coolant, hydraulic) | Check, Retighten, Replace | - |

*¹ Conventional hydraulic oil

★ **Change oil every 600 hours of continuous hydraulic breaker operation.**

13) EVERY 5000 HOURS SERVICE

| Check items | Service | Page |
|----------------------|---------|------|
| Hydraulic tank | | |
| ★ Oil * ² | Change | 6-28 |

*² Hyundai genuine long life hydraulic oil

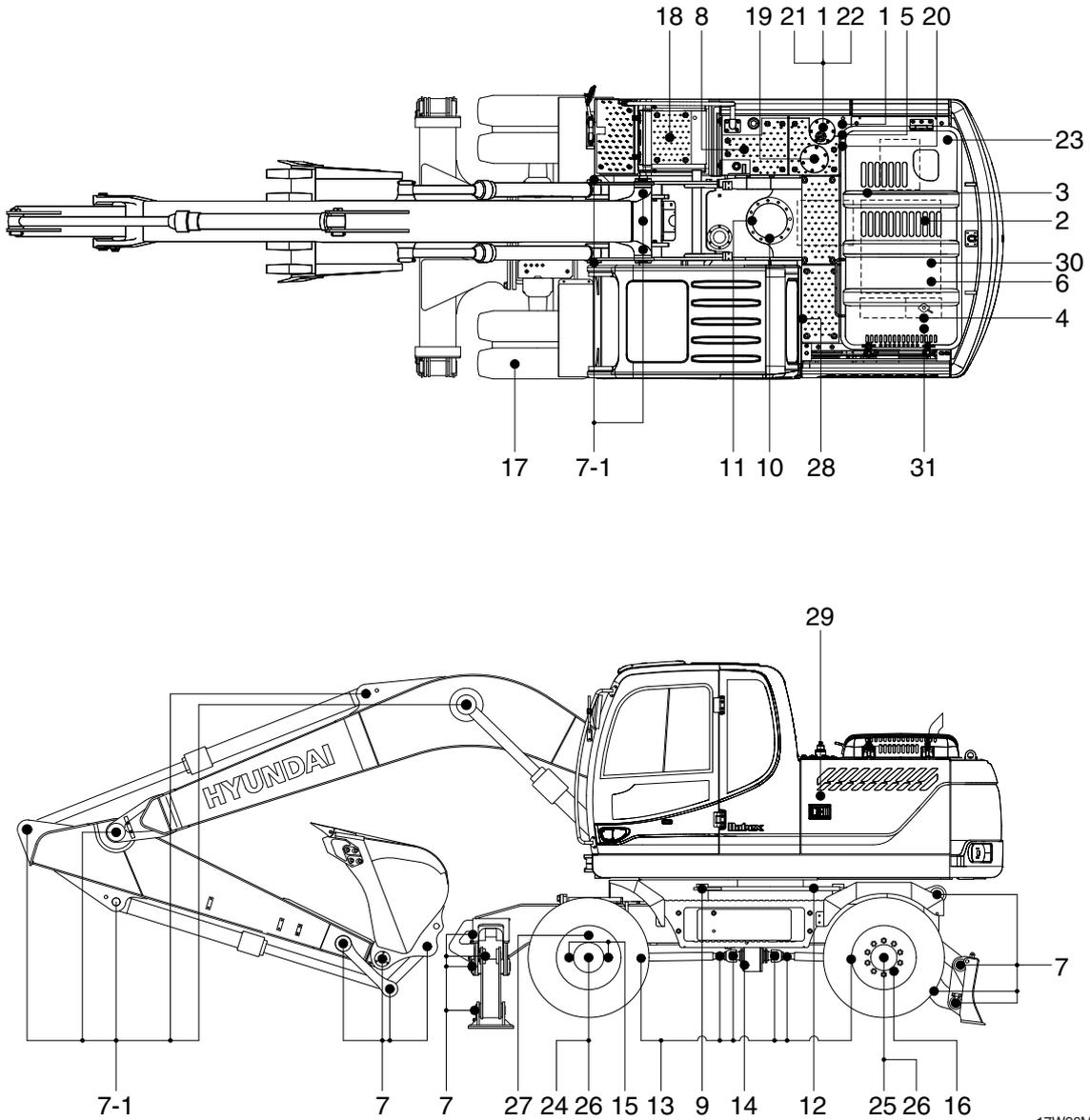
★ **Change oil every 1000 hours of continuous hydraulic breaker operation.**

12) 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 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 | Replace | 6-25 |
| Hydraulic system | | |
| · Hydraulic oil | Add or Change | 6-28 |
| · Return filter | Replace | 6-29 |
| · Drain filter cartridge | Replace | 6-30 |
| · Pilot line filter | Replace | 6-30 |
| · Air breather element | Replace | 6-30 |
| · Suction strainer | Clean | 6-29 |
| Tire pressure | Check, Inflate | 6-34 |
| Bucket | | |
| · Tooth | Replace | 6-39 |
| · Side cutter | Replace | 6-39 |
| · Linkage | Adjust | 6-38 |
| · Bucket assy | Replace | 6-38 |
| Air conditioner and heater | | |
| · Fresh filter | Clean, Replace | 6-45 |
| · Recirculation filter | Clean | 6-46 |

5. MAINTENANCE CHART



17W96MA05

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.
4. For other details, refer to the service manual.

| 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 | 160 (42.3) | 1 |
| | 2 | Engine oil level | Check, Add | EO | 16.5 (4.4) | 1 |
| | 4 | Radiator coolant level | Check, Add | C | 17.5 (4.6) | 1 |
| | 5 | Prefilter (water, element) | Check, Clean | - | - | 1 |
| | 6 | Fan belt tension & damage | Check, Clean | - | - | 1 |

| Service interval | No. | Description | Service action | Oil symbol | Capacity ℓ (U.S.gal) | Service points No. |
|--------------------|-----|--|---------------------------|------------|----------------------|--------------------|
| 50 Hours or weekly | 7 | Attachment pins & bushing | Check, Add | PGL | - | 12 |
| | 8 | Fuel tank (water, sediment) | Check, Clean | DF | - | 1 |
| | 9 | Swing bearing grease | Check, Add | PGL | - | 3 |
| | 10 | Swing reduction gear case | Check, Add | GO | 5.0 (1.3) | 1 |
| | 13 | Drive shaft grease (flange bearing) | Check, Add | PGL | - | 6 |
| | 14 | Transmission case | Check, Add | EO | 3.0 (0.79) | 1 |
| | 15 | Front axle pivot pin bushing | Check, Add | PGL | - | 1 |
| | 16 | Wheel nuts | Check, Tighten | - | - | 40 |
| | 17 | Tire (air pressure) | Check, Add | - | - | 8 |
| 100 Hours | 27 | Front axle steering case | Add, Lubricate | PGL | - | 4 |
| 250 Hours | 2 | Engine oil | Change | EO | 16.5 (4.4) | 1 |
| | 3 | Engine oil filter | Replace | - | - | 1 |
| | 7-1 | Attachment pins & bushing | Check, Add | PGL | - | 5 |
| | 11 | Swing reduction gear grease | Check, Add | PGL | 1.2 (0.32) | 1 |
| | 18 | Battery (voltage) | Check | - | - | 1 |
| | 21 | Air breather element | Replace | - | - | 1 |
| | 24 | Front axle differential gear case | Add, Lubricate | GO | 10.5 (2.77) | 1 |
| | 25 | Rear axle differential gear case | Add, Lubricate | GO | 15.1 (4.0) | 1 |
| | 26 | Axle planetary gear case (front, rear) | Add, Lubricate | GO | 2.5 (0.66) | 4 |
| | 28 | Aircon & heater fresh air filter | Check, Clean | - | - | 1 |
| 500 Hours | 5 | Prefilter (water, element) | Replace | - | - | 1 |
| | 29 | Air cleaner element (primary) | Check, Clean | - | - | 1 |
| | 30 | Fuel filter element | Replace | - | - | 1 |
| | 31 | Radiator, oil cooler, charge air cooler | Check, Clean | - | - | 3 |
| 1000 Hours | 10 | Swing reduction gear case | Change | GO | 5.0 (1.3) | 1 |
| | 11 | Swing reduction gear grease | Change | PGL | 1.2 (0.32) | 1 |
| | 12 | Swing gear and pinion grease | Change | PGL | 8 kg (17.6 lb) | 1 |
| | 14 | Transmission case | Change | EO | 3.0 (0.79) | 1 |
| | 19 | Hydraulic oil return filter | Replace | - | - | 1 |
| | 20 | Drain filter cartridge | Replace | - | - | 1 |
| | 23 | Pilot line filter element | Replace | - | - | 1 |
| 1500 Hours | 24 | Front axle differential gear case | Change | GO | 10.5 (2.77) | 1 |
| | 25 | Rear axle differential gear case | Change | GO | 15.1 (4.0) | 1 |
| | 26 | Axle planetary gear case (front, rear) | Change | GO | 2.5 (0.66) | 4 |
| 2000 Hours | 1 | Hydraulic oil * ¹ | Change | HO | 160 (42.3) | 1 |
| | 4 | Radiator coolant | Change | C | 17.5 (4.6) | 1 |
| | 22 | Hydraulic oil suction strainer | Check, Clean | - | - | 1 |
| | - | Hoses, fittings, clamps (fuel, coolant, hydraulic) | Check, Retighten, Replace | - | - | - |
| 5000 Hours | 1 | Hydraulic oil * ² | Change | HO | 160 (42.3) | 1 |
| As required | 28 | Aircon & heater fresh filter | Replace | - | - | 1 |
| | 28 | Aircon & heater recirculation filter | Clean, Replace | - | - | 1 |
| | 29 | Air cleaner element (safety) | Replace | - | - | 1 |
| | 29 | Air cleaner element (primary) | Replace | - | - | 1 |

*¹ Conventional hydraulic oil

*² Hyundai genuine long life hydraulic oil

※ Oil symbol

Please refer to the recommended lubricants for specification.

DF : Diesel fuel

GO : Gear oil

HO : Hydraulic oil

C : Coolant

PGL : Grease

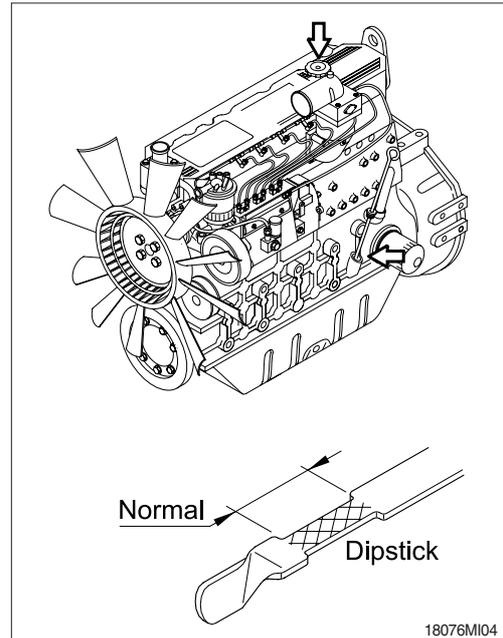
EO : Engine oil

6. SERVICE INSTRUCTION

1) CHECK ENGINE OIL LEVEL

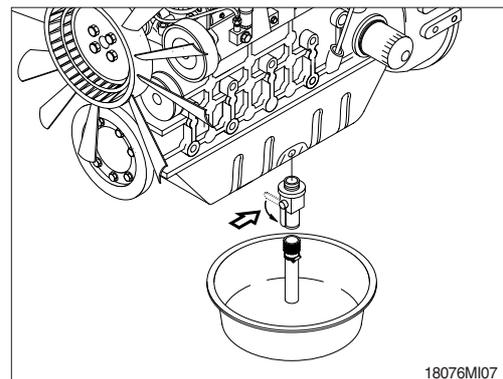
Check the oil level with the machine on a flat ground before starting engine.

- (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.**

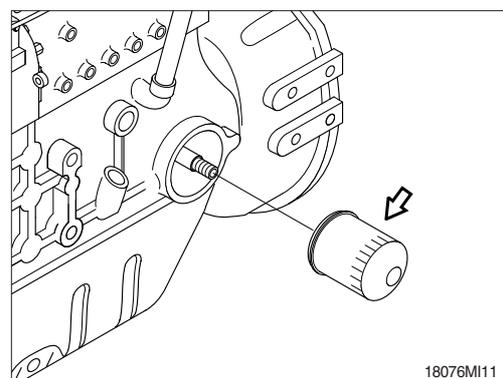


2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

- (1) Warm up the engine.
- (2) Turn the lever to open position.
 - ※ **A drain pan with a capacity of 20 liters (6.3 U.S. gallons) will be adequate.**

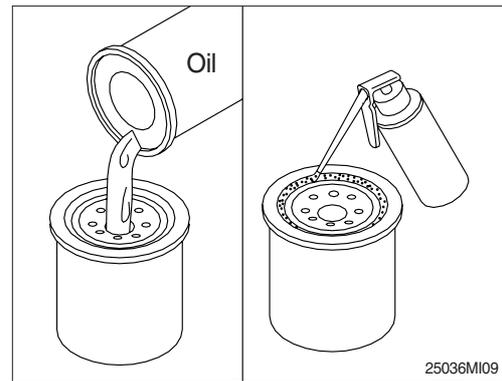


- (3) Clean around the filter head, remove the filter with a filter wrench and clean the gasket surface.



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

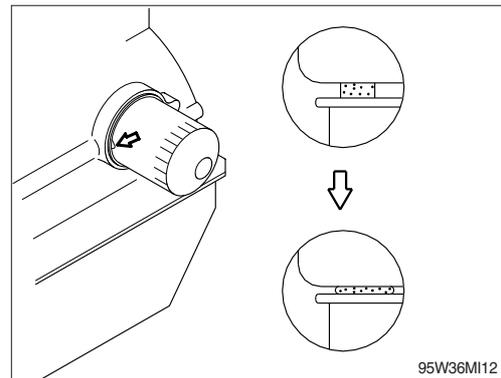
※ **Fill the filters with clean lubricating oil.**



(5) Install the filter to the filter head.

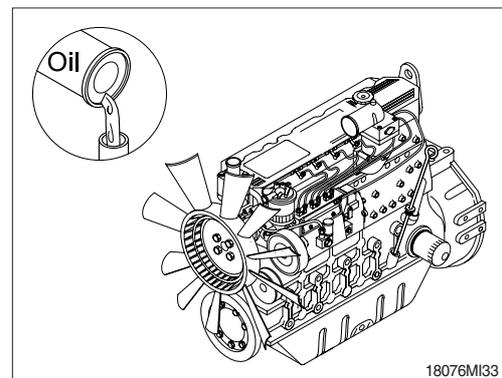
※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**

· Install the filter as specified by the filter manufacturer.



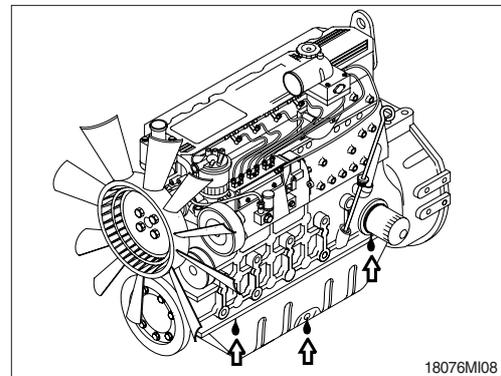
(6) Fill the engine with clean oil to the proper level.

· Quantity : 16.5 l (4.4 U.S. gallons)



(7) Operate the engine at low idle and inspect for leaks at the filters and the drain plug.

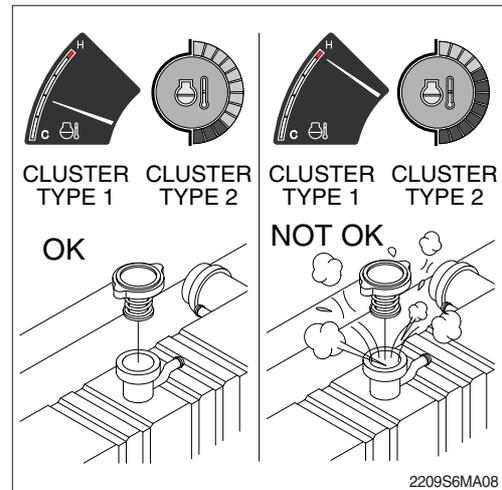
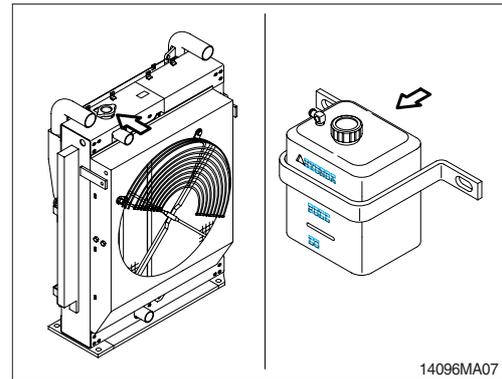
Shut the engine off and check the oil level with the dipstick. Allow 15minutes for oil to drain down before checking.



3) CHECK COOLANT

- (1) Check if the level of coolant in reservoir tank is between FULL and LOW.
- (2) Add the mixture of antifreeze and water after removing the cap of the reservoir tank if coolant is not sufficient.
- (3) Be sure to add the coolant by opening the cap of radiator when coolant level is below LOW.
- (4) Replace gasket of radiator cap when it is damaged.

▲ Hot coolant can spray out if radiator cap is removed while engine is hot. Remove the cap after the engine has cooled down.



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.

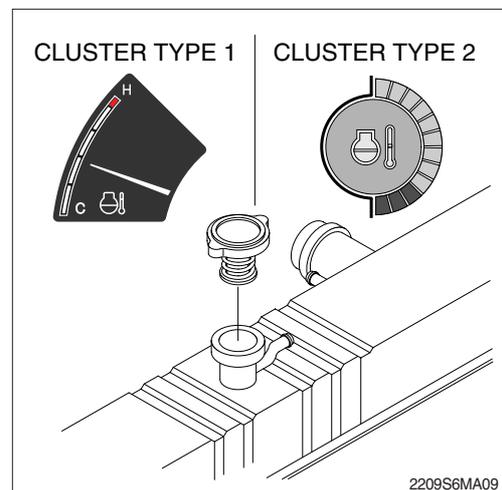
Avoid excessive contact-wash thoroughly after contact.

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.

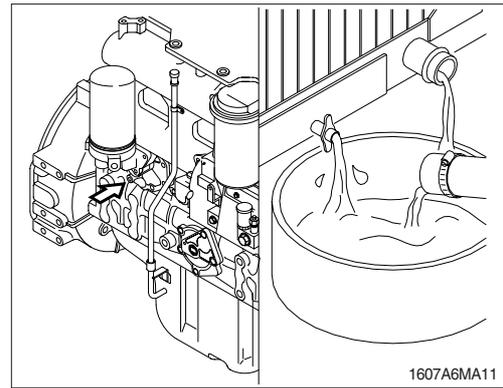
If in doubt, contact your local authorities for guidance as to proper handling of used antifreeze.



▲ 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 valve on the radiator and removing the plug in the bottom of the water inlet. A drain pan with a capacity of 40 liters (10 U.S. gallons) will be adequate in most applications.

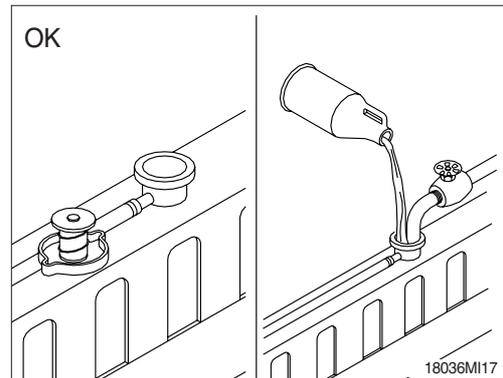


(2) Flushing of cooling system

① Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

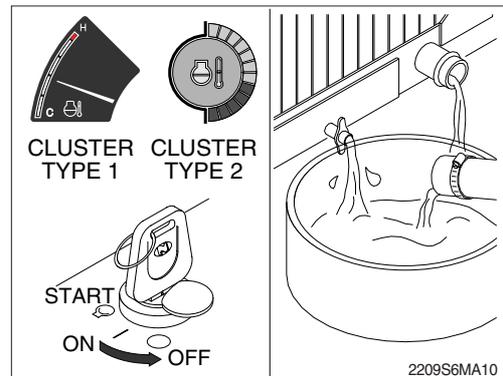
※ Use 0.5kg (1.0 pound) of sodium carbonate for every 23 liters (6.0 U.S. gallons) of water.

※ Do not install the radiator cap. The engine is to be operated without the cap for this process.



② Operate the engine for 5 minutes with the coolant temperature above 80 °C (176 °F).

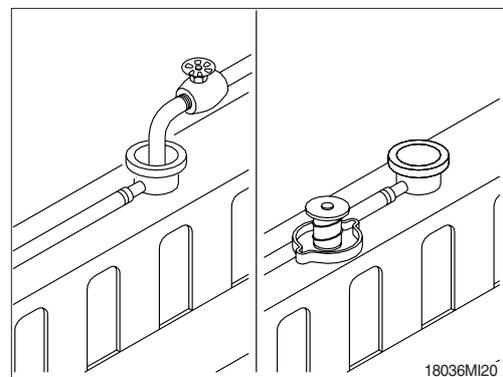
Shut the engine off, and drain the cooling system.



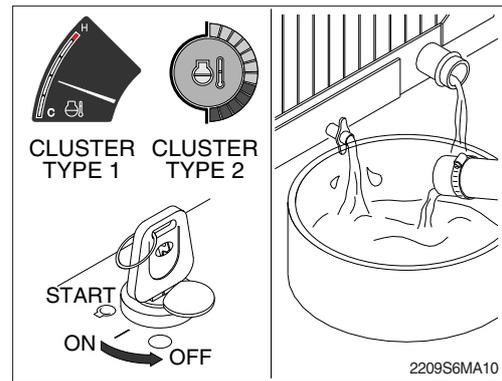
③ Fill the cooling system with clean water.

※ Be sure to vent the engine and aftercooler for complete filling.

※ Do not install the radiator cap or the new coolant filter.

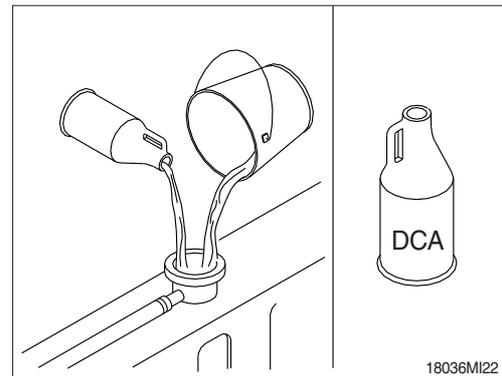


- ④ Operate the engine for 5 minutes with the coolant temperature above 80 °C (176 °F). Shut the engine off, and drain the cooling system.
- ※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**

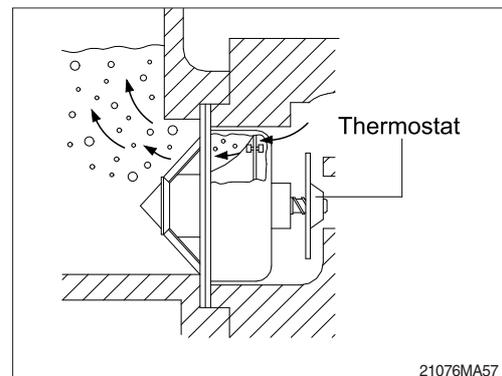


(3) Cooling system filling

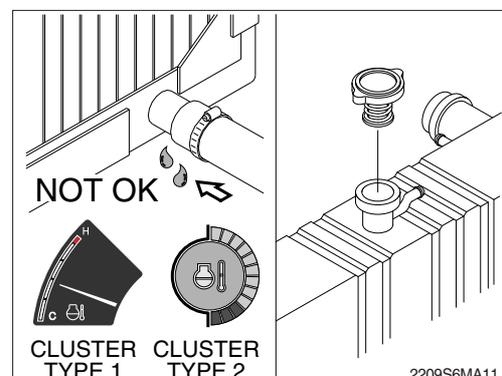
- ① Use a mixture of 50 percent soft water and 50 percent ethylene glycol antifreeze to fill the cooling system. Refer to the page 6-10. Coolant capacity (engine only) : 9 l (2.4 U.S. gallons)
- ※ **Do not use hard water such as river water or well water.**



- ② The system has a maximum fill rate of 14 liters (3.5 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.



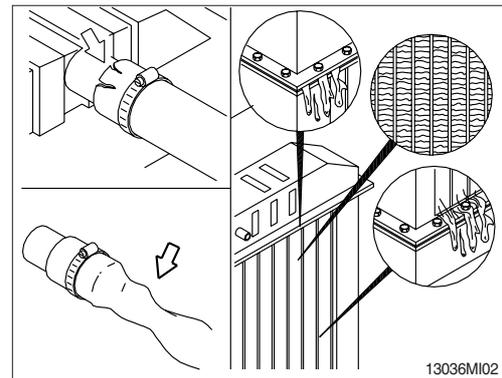
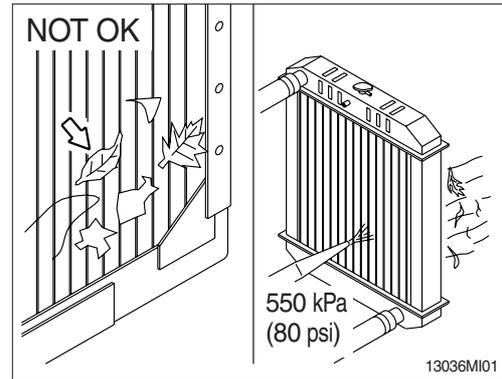
- ③ Install the pressure cap. Operate the engine until it reaches a temperature 80 °C (176 °F), and check for coolant leaks. Check the coolant level again to make sure the system is full of coolant.



5) CLEAN RADIATOR AND OIL COOLER

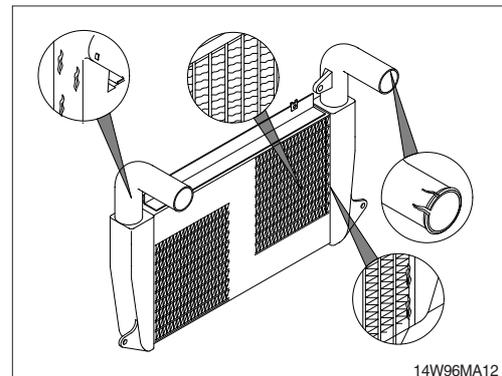
Check, and if necessary, clean and dry outside of radiator and oil cooler. After working in a dusty place, clean radiator more frequently.

- (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.



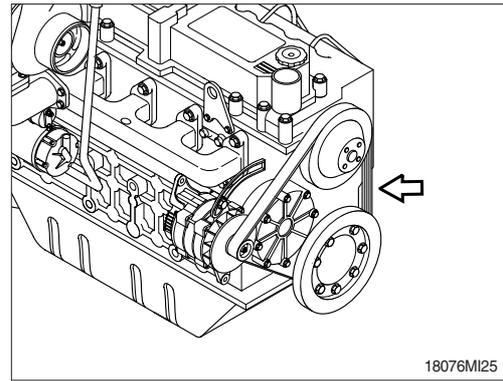
6) CHECK CHARGE AIR COOLER

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 Hyundai distributor.

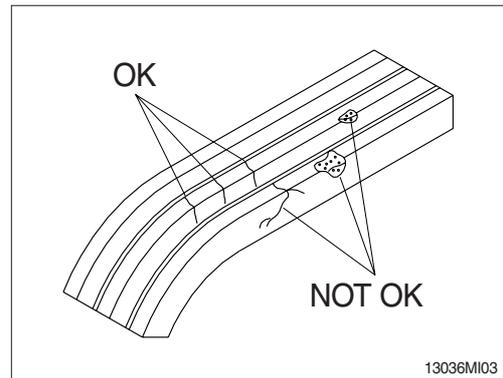


7) FAN BELT TENSION

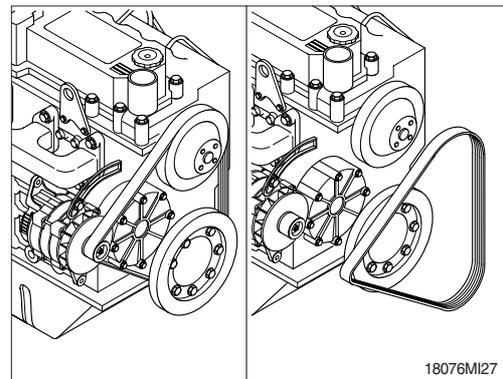
- (1) Measure the belt deflection at the longest span of the belt.
 - Maximum deflection : 12 mm (0.5 in)



- (2) Inspect the drive for damage.



- (3) Inspect the drive belt, tension bearing and fan hub.



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.

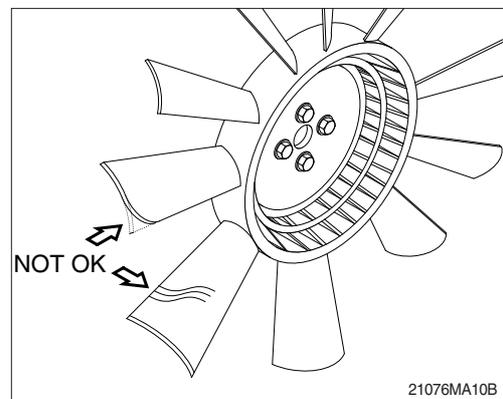
※ Rotate the crankshaft by using the engine barring gear.

※ 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.



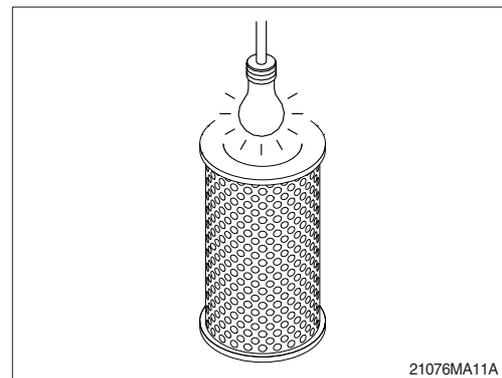
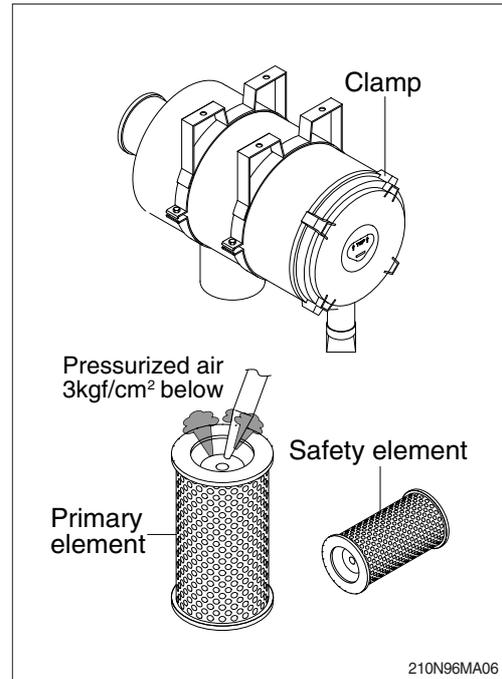
9) CLEANING OF AIR CLEANER

(1) Primary element

- ① Loosen the clamps 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 tighten wing nut.
- ※ **Replace the primary element after 4 times cleanings.**

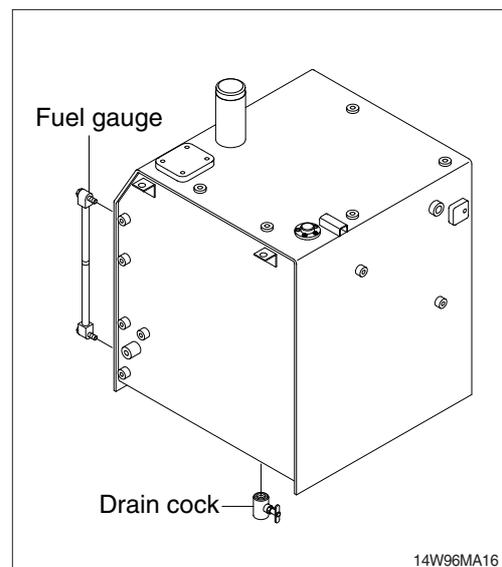
(2) Safety element

- ※ **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.**



10) 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.

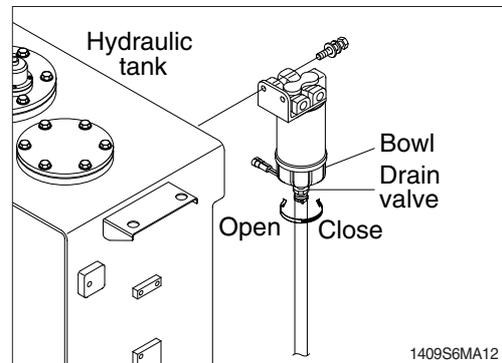


11) PREFILTER

※ Inspect or drain the collection bowl of water daily and replace the element every 500 hours.

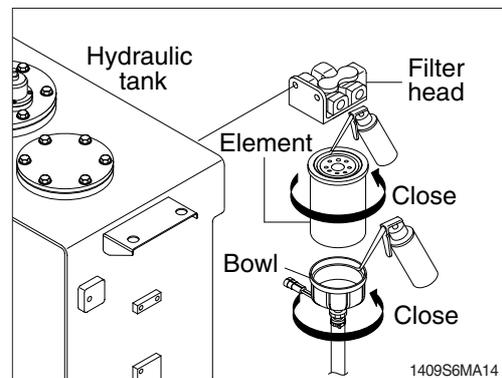
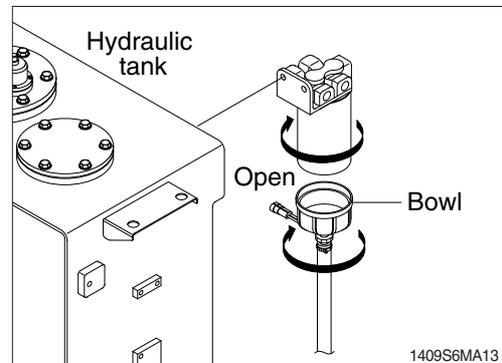
(1) Drain water

- ① Open bowl drain valve to evacuate water.
- ② Close drain valve.



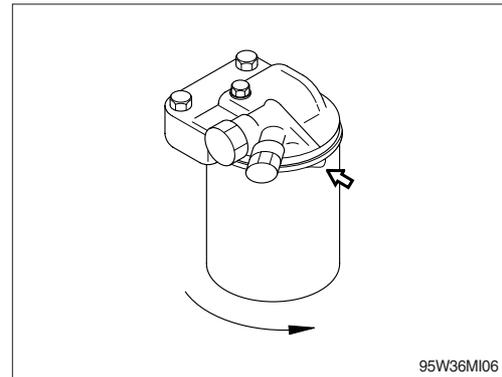
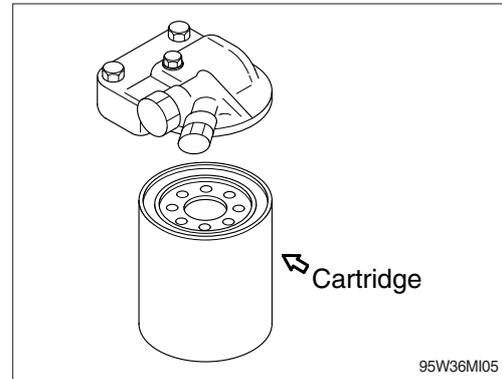
(2) Replace element

- ① Drain the unit of fuel. Follow "Drain water" instructions above.
- ② Remove element and bowl from filter head.
- ※ **The bowl is reusable, do not damage or discard.**
- ③ Separate element from bowl. Clean bowl and seal gland.
- ④ Lubricate new bowl seal with clean fuel or motor oil and place in bowl gland.
- ⑤ Attach bowl to new element firmly by hand.
- ⑥ Lubricate new element seal and place in element top gland.
- ⑦ Attach the element and bowl to the head.



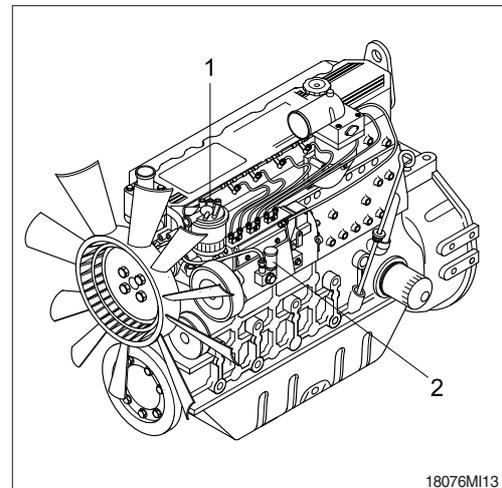
12) REPLACEMENT OF FUEL FILTER

- (1) Clean around the filter head, remove the filter with a filter wrench and clean the gasket surface.
- (2) Apply a small amount of fuel to the O-ring of new cartridge.
- (3) Install new cartridge by hand.
 - ※ **Do not add fuel to the new cartridge. Invisible particles of dirt which might get inside the injection pump can damage its finely finished parts.**
- (4) Relieve the air after mounting.
 - ※ **Check for fuel leakage after the engine starts.**
 - ※ **If air is in the fuel system, the engine will not start. Start engine after bleeding the air according to the method of bleeding air.**



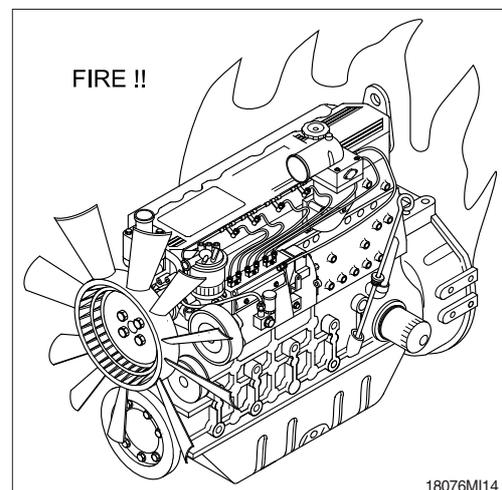
13) BLEEDING THE FUEL SYSTEM

- (1) Loosen air vent plug 1 (Approximately 1.5 turns).
- (2) Unlock priming pump plunger 2 and operate the pump.
- (3) When the fuel flows free of air bubbles, lock the priming pump, then tighten the plug.
 - ※ **If the vent plug is dosed before the priming pump plunger is locked, fuel pressure acts on the feed pump, resulting in inability to restore the plunger.**
 - ※ **Clean up fuel spillage.**



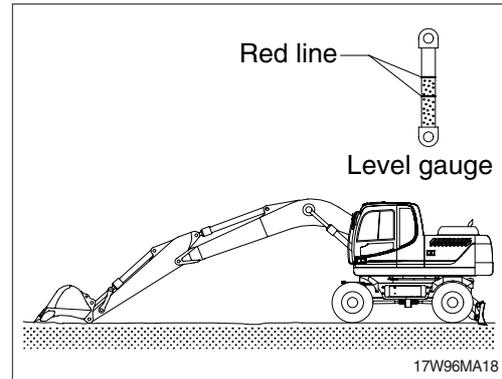
14) LEAKAGE OF FUEL

- ▲ **Be careful and clean the fuel hose, injection pump, fuel filter and other connections as the leakage from these part can cause fire.**



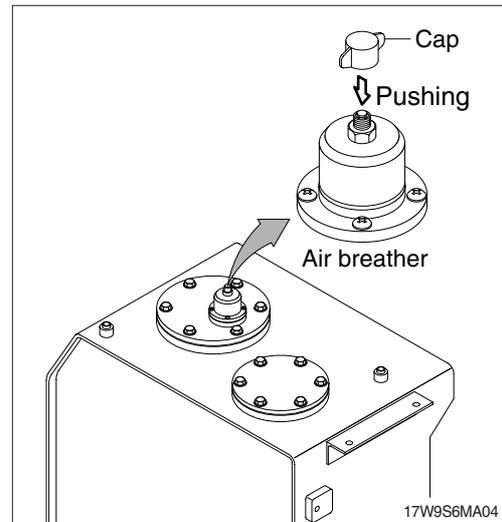
15) HYDRAULIC OIL CHECK

- (1) Stop the engine after retract the arm and bucket cylinders, then lower the boom and set the bucket on the ground at a flat location as in the illustration.
- (2) Check the oil level at the level gauge of hydraulic oil tank.
- (3) The oil level is normal if between the red lines.



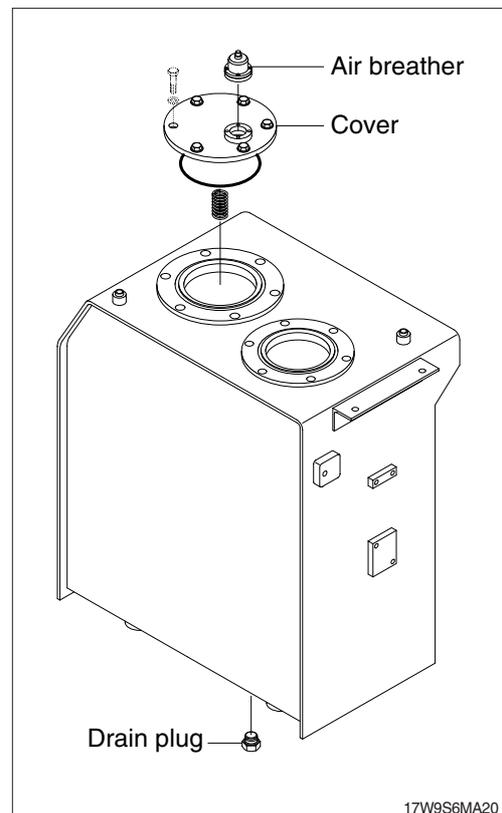
16) FILLING HYDRAULIC OIL

- (1) Stop the engine to the position of level check.
- (2) Loosen the cap 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.
 - Tightening torque : $1.44 \pm 0.3 \text{ kgf} \cdot \text{m}$
($10.4 \pm 2.1 \text{ lbf} \cdot \text{ft}$)
- (4) Start engine after filling and operate the work equipment several times.
- (5) Check the oil level at the level check position after engine stops.



17) CHANGE HYDRAULIC OIL

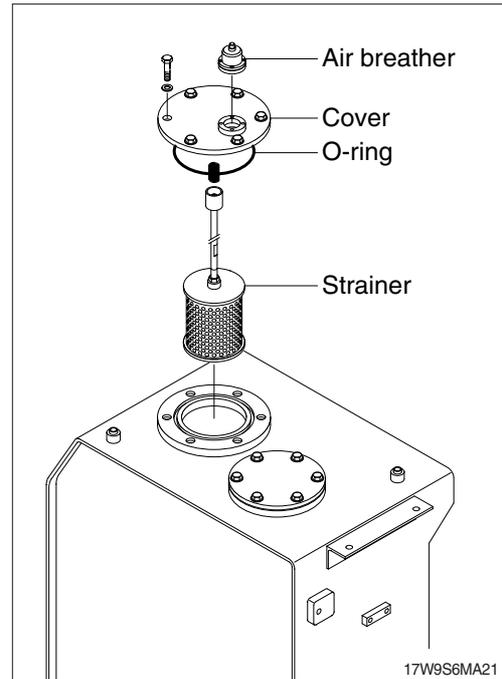
- (1) Lower the bucket on the ground pulling the arm and bucket cylinder to the maximum.
- (2) Loosen the cap and relieve the pressure in the tank by pushing the top of the air breather.
- (3) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
- (4) Prepare a suitable container.
- (5) To drain the oil loosen the drain plug 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.



18) CLEAN SUCTION STRAINER

Clean suction strainer as follows paying attention to the cause to be kept during oil filling.

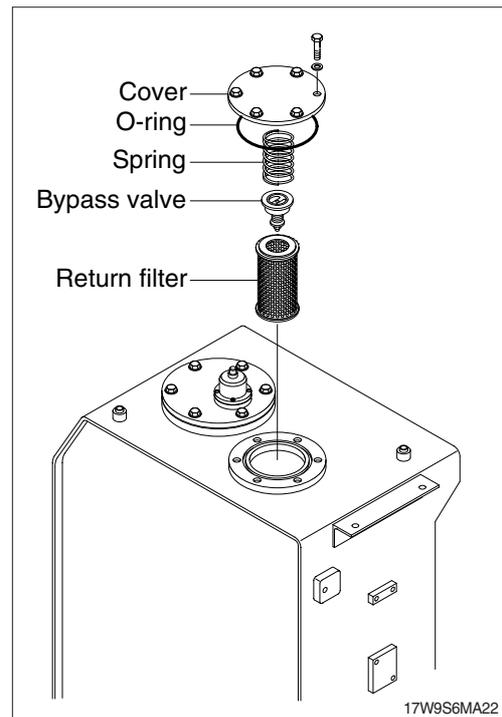
- (1) Remove the cover on the top of the oil tank.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
 - (2) Pull out the strainer in the tank.
 - (3) Wash the foreign material on the suction strainer with gasoline or cleaning oil.
 - (4) Replace 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.**



19) REPLACEMENT OF RETURN FILTER

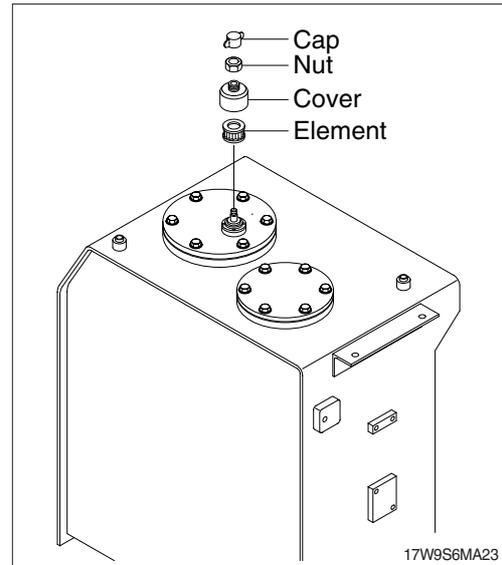
Replace as follows paying attention to the cause to be kept during the replacement.

- (1) Remove the cover.
 - Tightening torque : $6.9 \pm 1.4 \text{ kgf} \cdot \text{m}$
($50 \pm 10 \text{ lbf} \cdot \text{ft}$)
- (2) Remove the spring, by-pass valve, and return filter in the tank.
- (3) Replace the element with new one.



20) REPLACEMENT OF ELEMENT IN HYDRAULIC TANK BREATHER

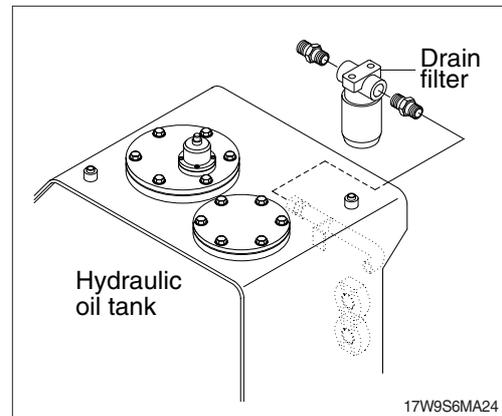
- (1) Loosen the cap and relieve the pressure in the tank by pushing the top of the air breather.
- (2) Loosen the lock nut and remove the cover.
- (3) Pull out the filter element.
- (4) Replace the filter element new one.
- (5) Reassemble by reverse order of disassembly.
 - Tightening torque : 0.2~0.3 kgf · m
(1.4~2.1 lbf · ft)



21) REPLACE OF DRAIN FILTER CARTRIDGE

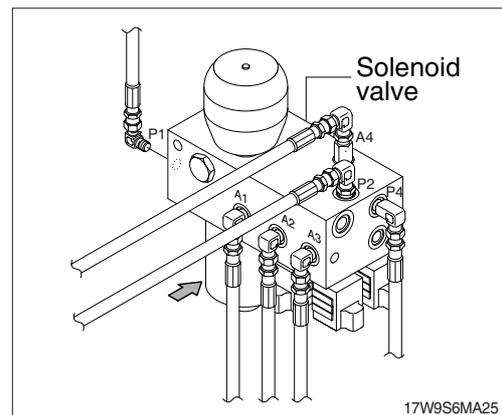
Clean the dust around filter and replace with new one after removing the cartridge.

- ※ **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.**



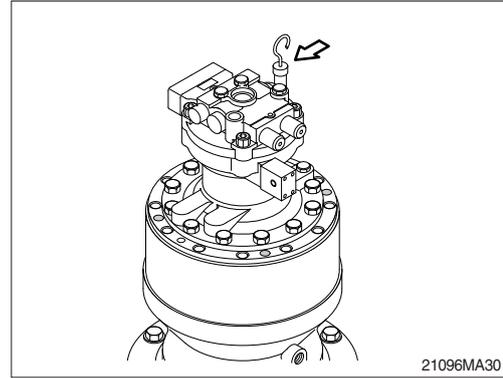
22) REPLACE OF PILOT LINE FILTER

- (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.**



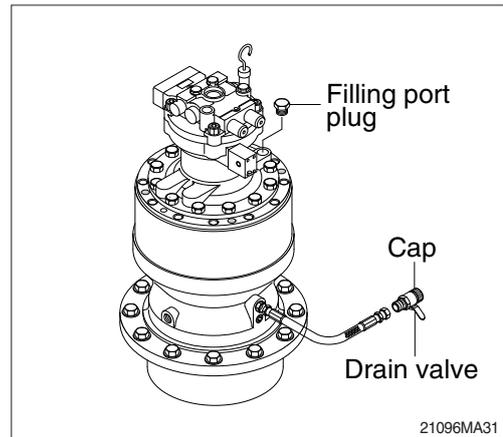
23) CHECK THE SWING REDUCTION GEAR OIL

- (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.



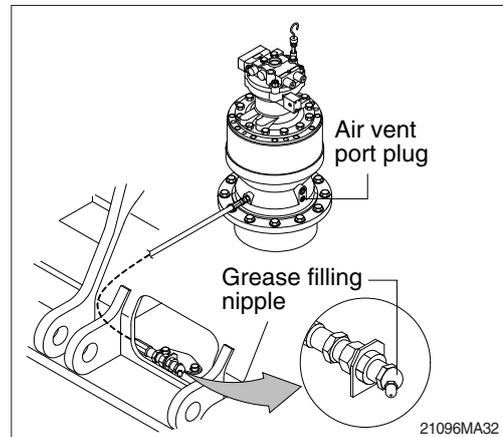
24) CHANGE SWING REDUCTION GEAR OIL

- (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) Remove the cap and open the drain valve.
- (4) Clean around the valve and close the drain valve and cap.
- (5) Fill proper amount of recommended oil.
 - Amount of oil : 5.0 l (1.32 U.S.gal)



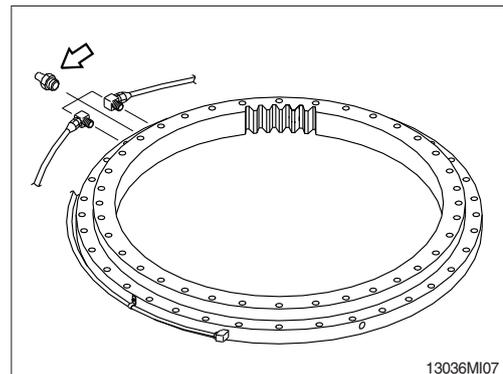
25) LUBRICATE BEARING OF OUTPUT SHAFT IN REDUCTION GEAR

- (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 : 1.1 kg (2.4 lb)



26) LUBRICATE SWING BEARING

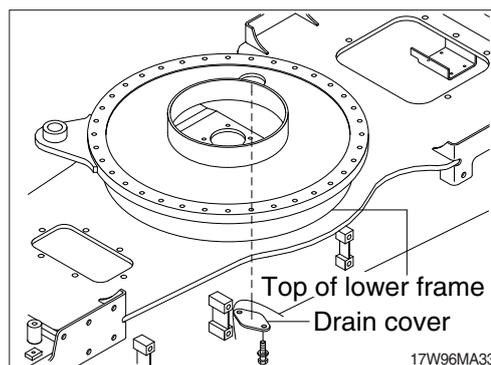
- (1) Grease at 3 fitting.
 - ※ Lubricate every 250 hours.



27) SWING GEAR AND PINION

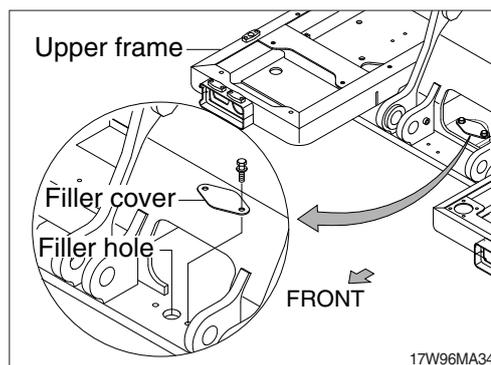
(1) Drain old grease

- 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.



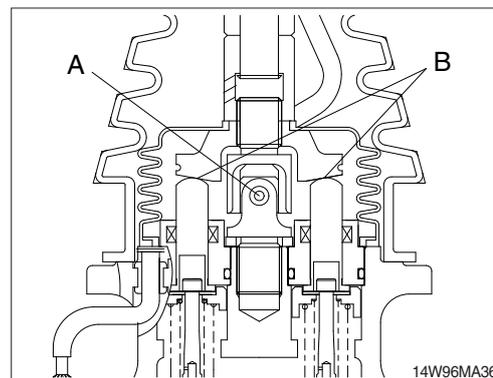
(2) Refill new grease

- ① Install drain cover.
- ② Fill with new grease.
- ③ Install filler cover.
 - Capacity : 8 kg (17.6 lb)



28) LUBRICATE RCV LEVER

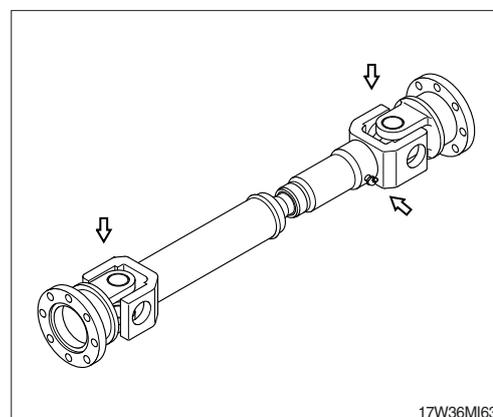
Remove the bellows and with a grease gun grease the joint part (A) and sliding parts (B).



29) LUBRICATE

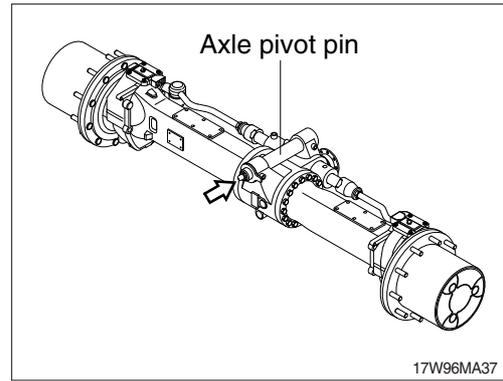
(1) Drive shaft

- ① Front drive shaft : 3 point
- ② Rear drive shaft : 3 point

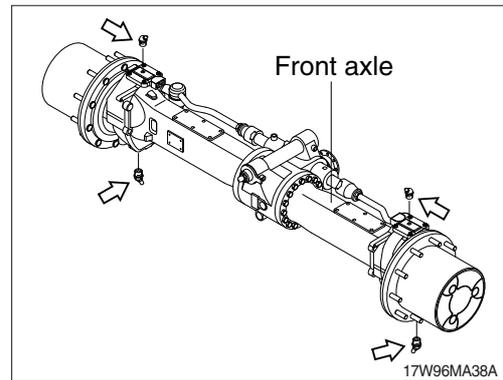


(2) Axle

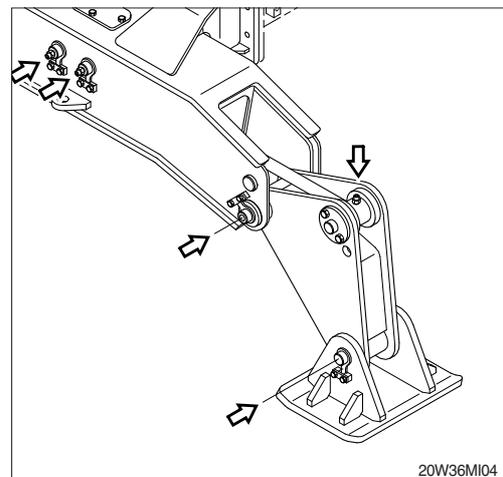
- ① Front axle : 1 point



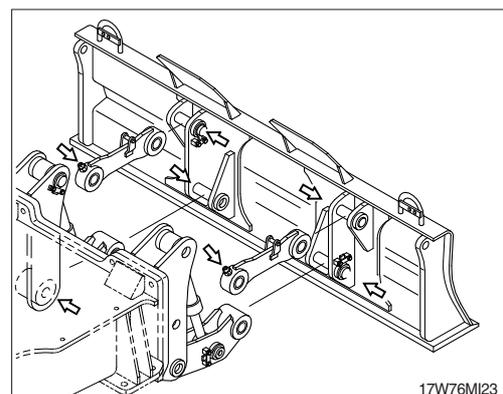
(3) Steering case : 4 point



(4) Outrigger : 8 point



(5) Dozer blade : 12 point



30) TIRE

(1) Air pressure

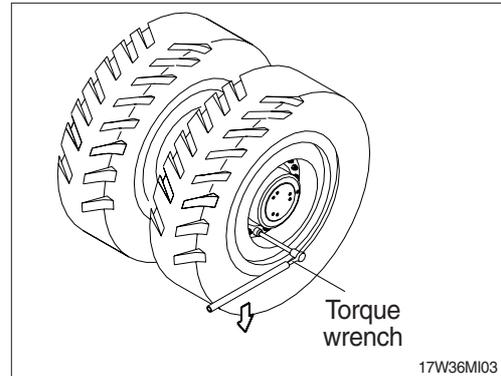
It is important to keep air pressure properly for maximizing tire life. Both excessive and insufficient air pressure of tires should be avoided not to damage tires.

Specification : 7.0 kgf/cm² (100 psi)

(2) Handling of tire

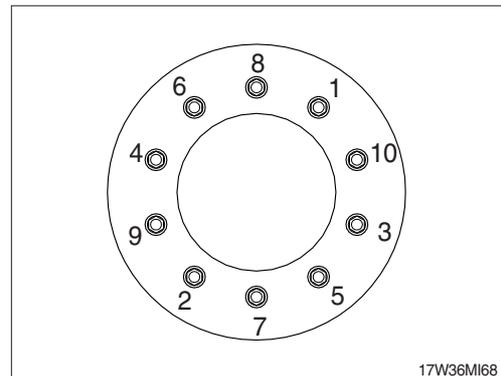
① Removal of tire

- Lift the main body until a tire separate from the ground, and place the block under front and rear axle.
- Loosen wheel nut with torque wrench and remove tire.



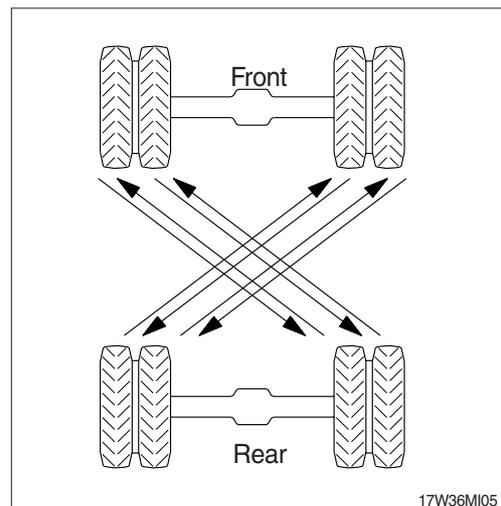
② Installation of tire

- Coat some grease on wheel stud and nut screw.
- Install the tires and tighten a nut slightly and get down a tire on the ground, and then tighten the torque in the order as figure.
 - Tightening torque : $60 \begin{smallmatrix} 0 \\ -5 \end{smallmatrix} \text{ kgf} \cdot \text{m}$
($433 \begin{smallmatrix} 0 \\ -36.2 \end{smallmatrix} \text{ lbf} \cdot \text{ft}$)



③ Position change of tire

- Tire is worn out differently part by part according to installing position, so change position regularly as figure.
- ※ **Keep air pressure at standard.**
- ※ **Use same pattern of groove and same maker's tire.**
- ※ **Always check the tire before operation.**

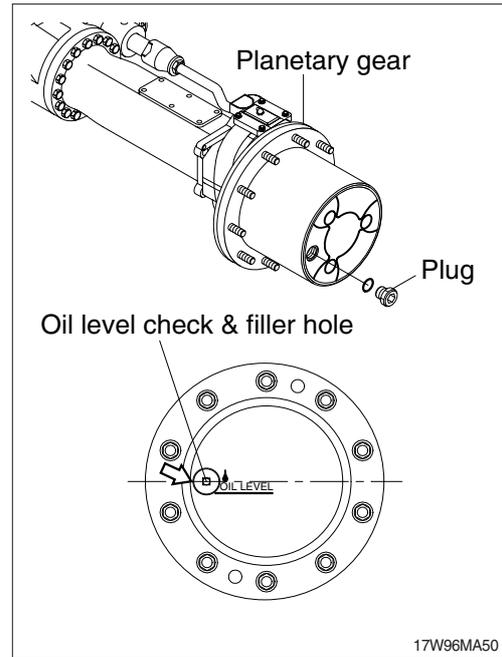


(3) Tire size

Specification : 10.00×20 - 14PR

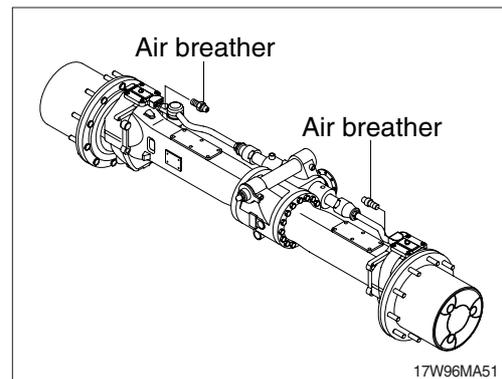
31) CHECK AND SUPPLYING PLANETARY GEAR OIL

- (1) Move the machine to flat ground.
- (2) Remove the plug and check the oil amount.
 ※ **Set the oil level check line of planetary gear in parallel to the around.**
- (3) If the oil level is below the plug hole, supply oil through a plug hole.
- (4) After checking, install plug.

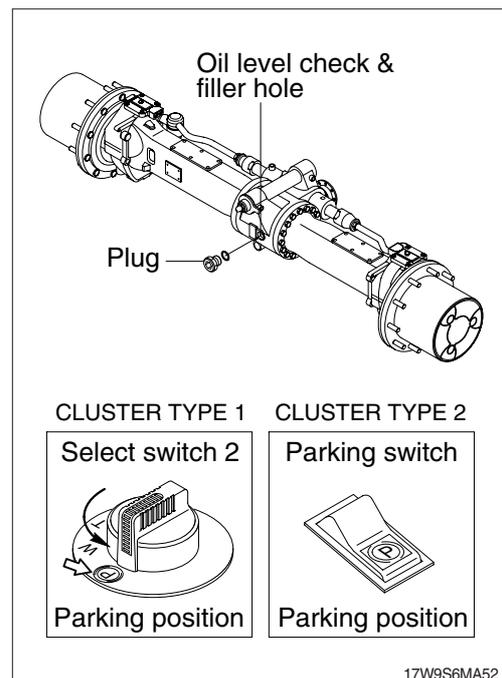


32) CHECK AND SUPPLYING DIFFERENTIAL GEAR OIL

- (1) Move the machine to flat ground.
- (2) Open the axle air breather to relieve internal air pressure.

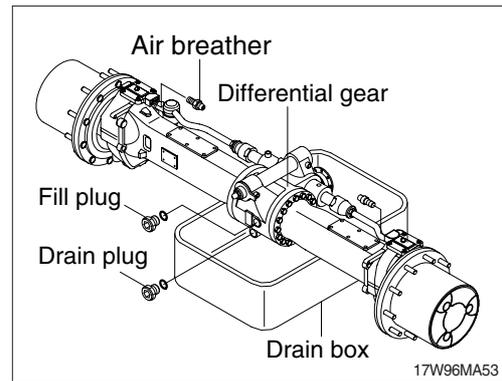


- (3) Remove the plug and check the oil amount.
 If the oil level is at the hole of the plug, it is normal.
 - (4) If the oil level is below the plug hole, supply oil through a plug hole.
- ▲ **When checking the oil level, set the select switch 2 to parking position.**
- ▲ **As the machine is hot after operation, wait until the oil temperature has dropped.**



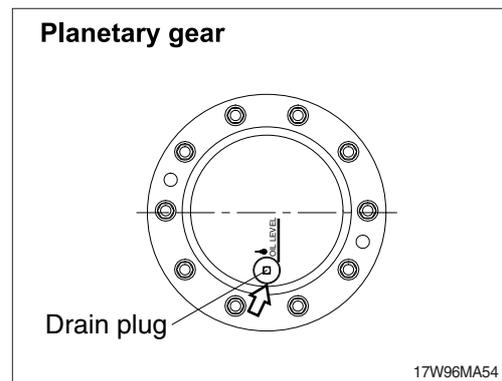
33) CHANGE THE AXLE OIL

- (1) Place a drain box under drain plug to catch oil.
- (2) Remove the air breather to relieve internal pressure.
- (3) **Drain oil the differential gear**
 - ① Remove the filling plug and remove the drain plug to drain oil off.
 - ② Wash drain plug and install it.



(4) Drain oil planetary gear

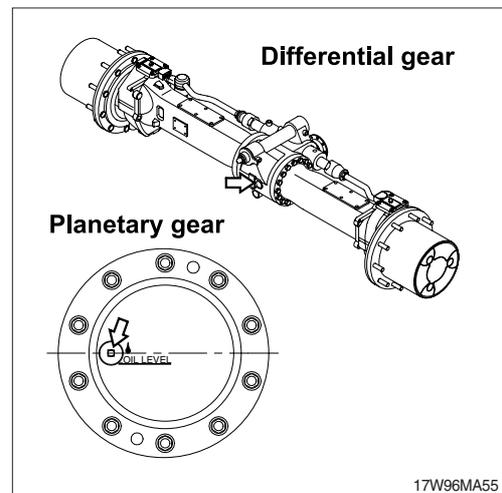
- ① Drain oil by removing drain plug.
- ※ **The drain plug should be facing the ground.**



- (5) Supply oil into the differential gear and the planetary gear.
 - Oil amount

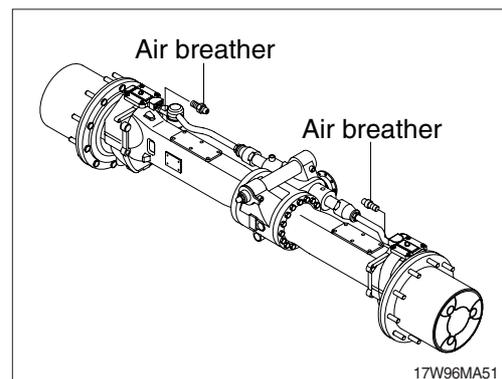
| Description | Capacity |
|------------------------------|------------------------|
| Front axle differential gear | 10.5 l (2.77 U.S. gal) |
| Rear axle differential gear | 15.1 l (4.0 U.S. gal) |
| Planetary gear case (each) | 2.5 l (0.66 U.S. gal) |

- (6) Supply oil until it overflows from the oil filler, then install the plug.
 - ▲ **As the machine is hot after operation, wait until the temperature has dropped.**
 - ※ **If a work requires frequent use of brake, replace it earlier than normal change interval.**



34) CLEANING AXLE BREATHER

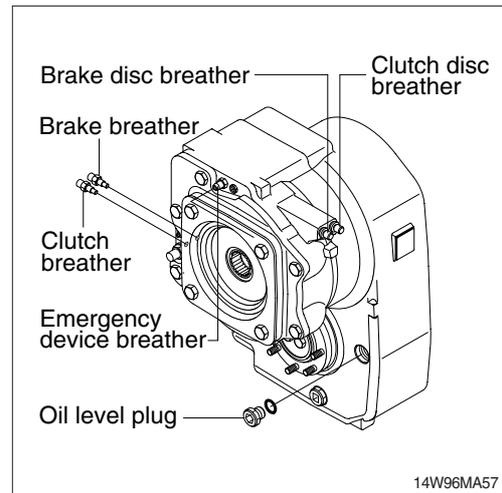
- (1) Remove dust or debris around the breather.
- (2) Remove the breather and wash it with cleaning oil.



35) CHECK AND SUPPLYING TRANSMISSION OIL

- (1) Move the machine to flat ground.
- (2) Open the transmission air breather to relieve internal air pressure.
- (3) Remove the plug and check the oil amount.
If the oil level is at the hole of the plug, it is normal.
- (4) If the oil level is below the plug hole, supply oil through a plug hole.

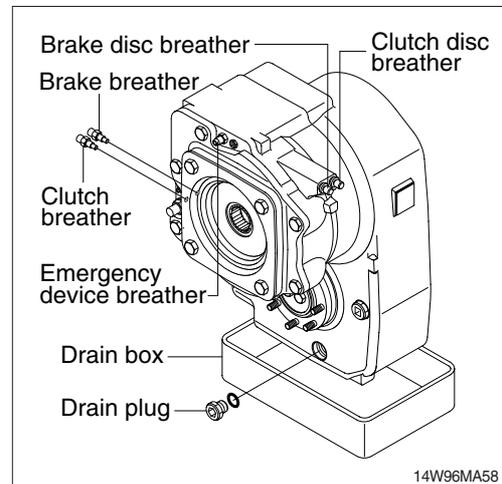
▲ As the machine is hot after operation, wait until the oil temperature has dropped.



36) CHANGE THE TRANSMISSION OIL

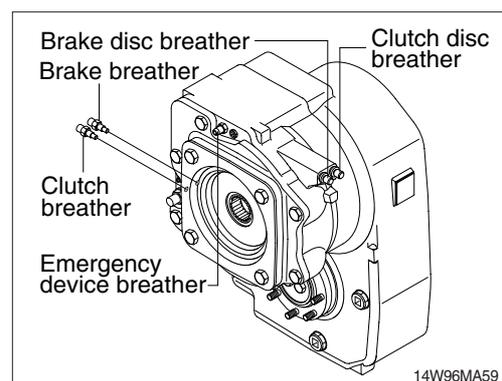
- (1) Place a drain box under drain plug to catch oil.
- (2) Open the transmission air breather to relieve internal air pressure.
- (3) Remove the drain plug to drain oil.
- (4) Wash drain plug and install it.
- (5) Supply oil into the transmission case.
· Oil amount : 3.0 l (0.79 U.S. gal)

▲ As the machine is hot after operation, wait until the temperature has dropped.



37) CLEANING TRANSMISSION AIR BREATHER

- (1) Remove dust or debris around the air breather.
- (2) Remove the air breather and wash it with cleaning oil.



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.

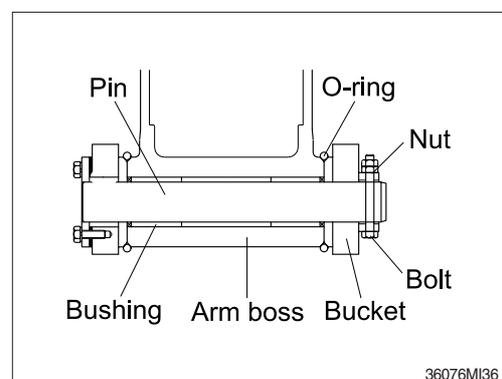
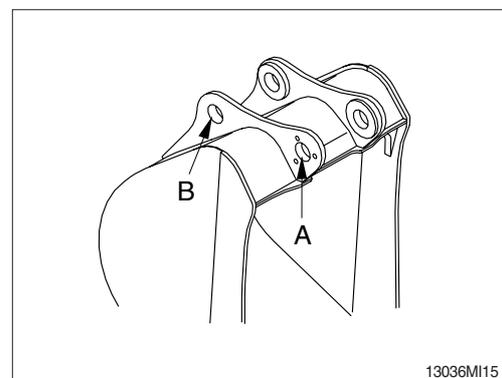
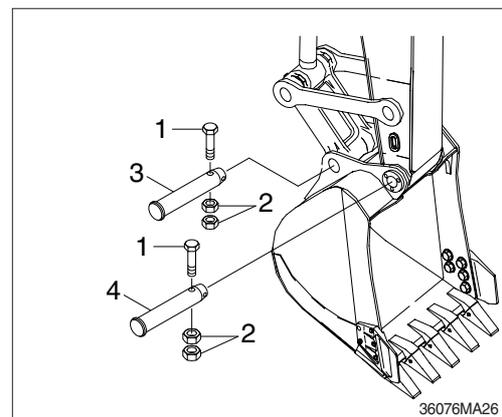
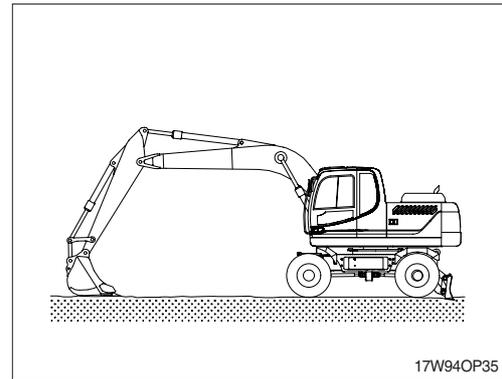
※ After remove the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

(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.

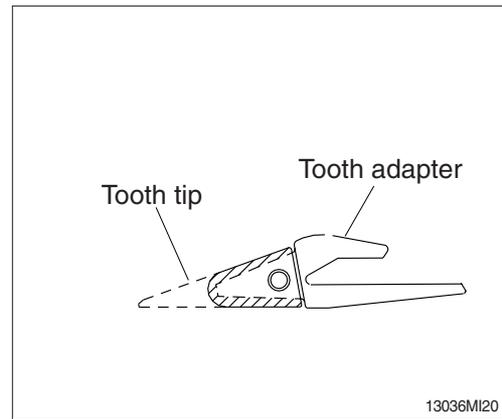
(5) Install the stopper bolt (1) and nuts (2) for each pin, then grease the pin.



39) REPLACEMENT OF BUCKET TOOTH

(1) Timing of replacement

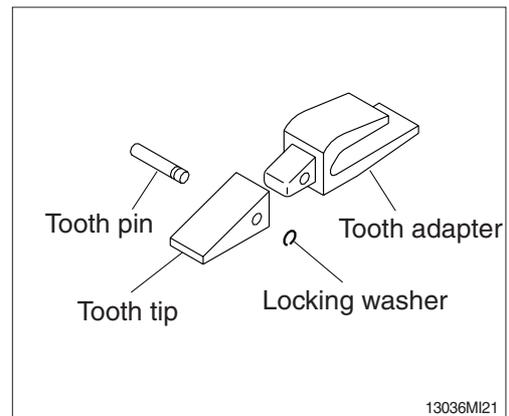
- ① Check wearing condition as shown in the illustration and replace tooth tip before adapter starts to wear.
- ② If excessive use, tooth adapter has worn out, replacement may become impossible.



(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.



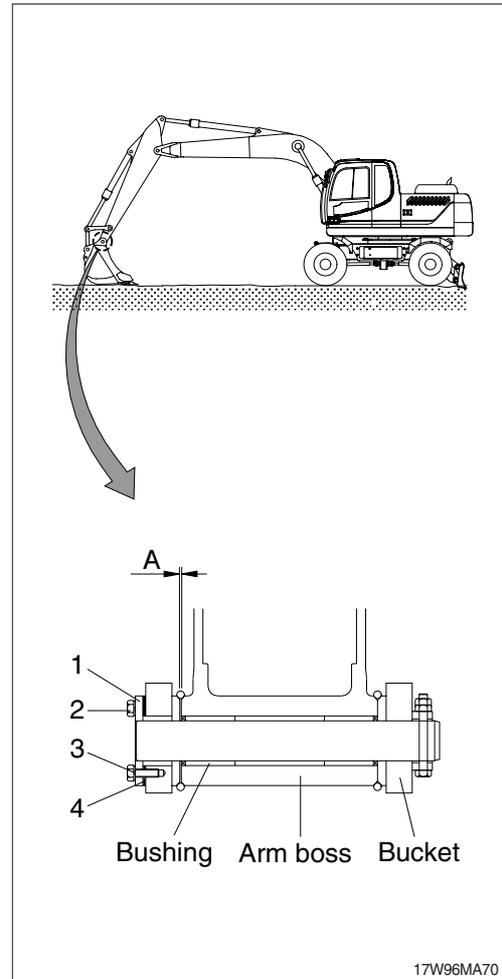
40) ADJUSTMENT OF BUCKET CLEARANCE

- (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 : $29.6 \pm 3.2 \text{ kgf} \cdot \text{m}$
($214.0 \pm 23.1 \text{ lbf} \cdot \text{ft}$)
 - Normal clearance : $0.5 \sim 1.0 \text{ mm}$
($0.02 \sim 0.04 \text{ in}$)

※ If the bucket is not adjusted correctly, noise and vibration created during operation, and damaged O-ring, pin and bushing quickly.



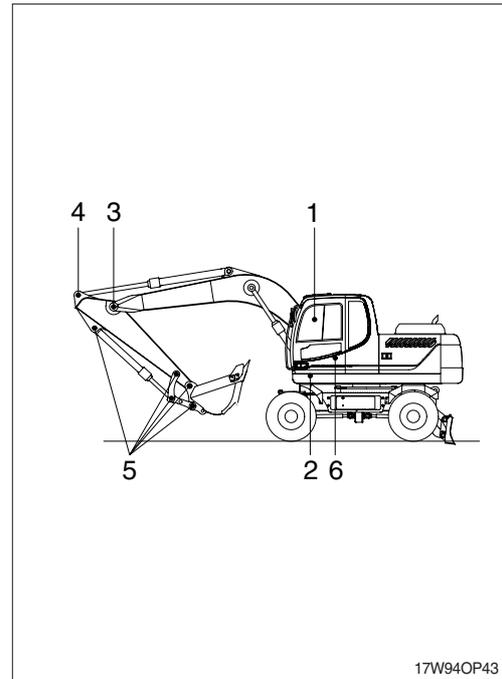
41) LUBRICATE PIN AND BUSHING

(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, rod) | 2 |
| | Bucket link (Control rod) | 3 |
| | Arm and control link connection pin | 1 |
| | Arm and bucket connection pin | 1 |
| 6 | Boom rear bearing center | 1 |

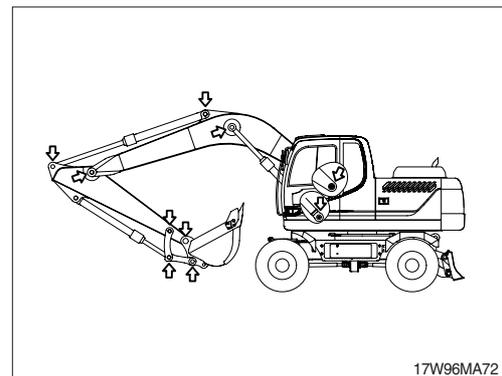
※ Shorten lubricating interval when working in the water or dusty place.



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(2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

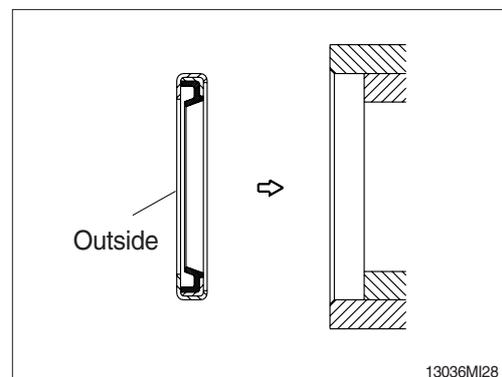
※ Mount the lip to be faced outside when replace the dust seal.



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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.

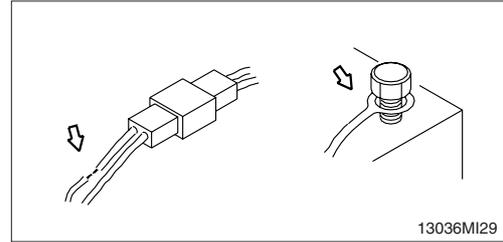


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7. ELECTRICAL SYSTEM

1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



2) BATTERY

(1) Clean

① Wash the terminal with hot water if it is contaminated, and apply grease to the terminals after washing.

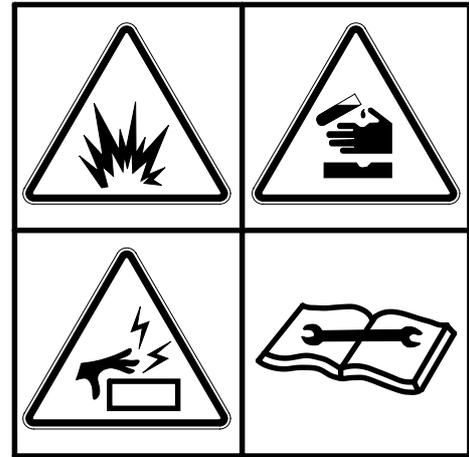
⚠ **Battery gas can explode. Keep sparks and flames away from batteries.**

⚠ **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.



(2) Recycle

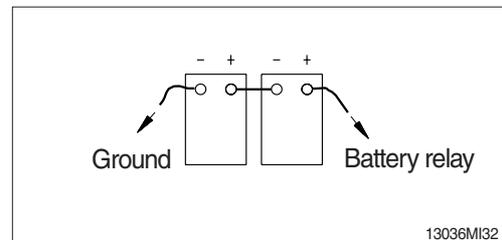
Never discard a battery.

Always return used batteries to one of the following locations.

- A battery supplier
- An authorized battery collection facility
- Recycling facility

(3) Method of removing the battery cable

Remove the cable from the ground connection first (⊖ terminal side) and reconnect it last when reassembling.



3) STARTING THE ENGINE WITH A BOOSTER CABLE

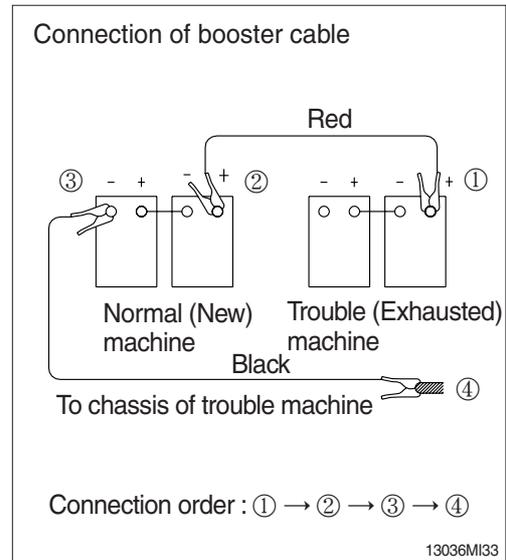
Keep following order when you are going to start engine using booster cable.

(1) Connection of booster cable

※ **Use the same capacity of battery for starting.**

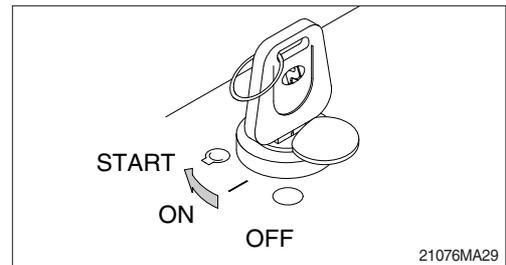
- ① Make sure that the starting switches of the normal machine and trouble machine are both at the OFF position.
- ② Connect the red terminal of booster cable to the battery (+) terminal between exhausted and new battery.
- ③ Connect the black terminal of the booster cable between new battery (-) terminal 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.

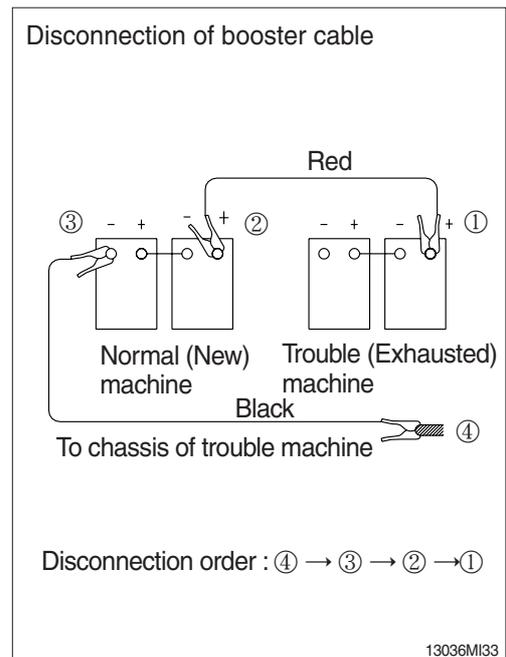


(3) Taking off the booster cable

- 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

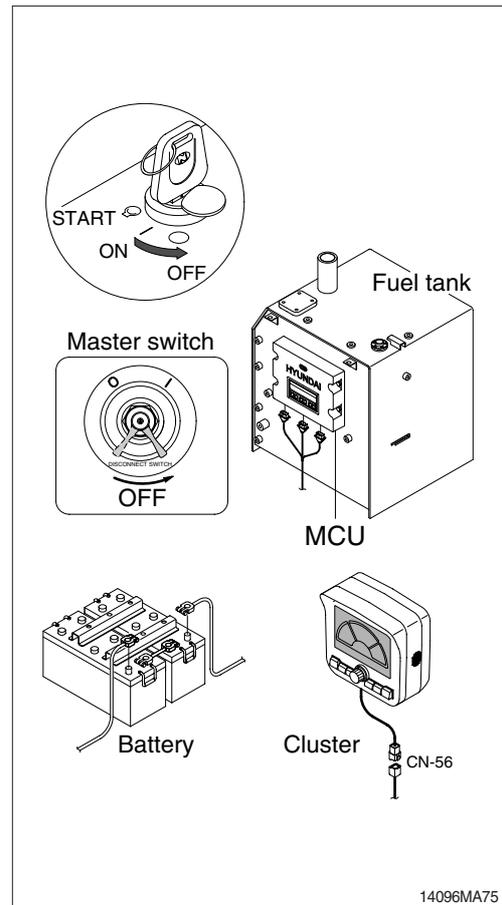
Before start to welding, follow the below procedure.

- 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, 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.

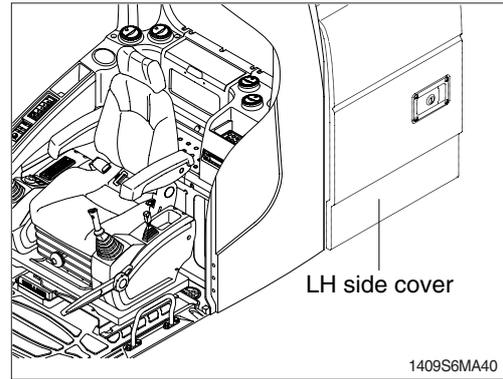


8. AIR CONDITIONER AND HEATER

1) CLEAN AND REPLACE OF FRESH AIR FILTER

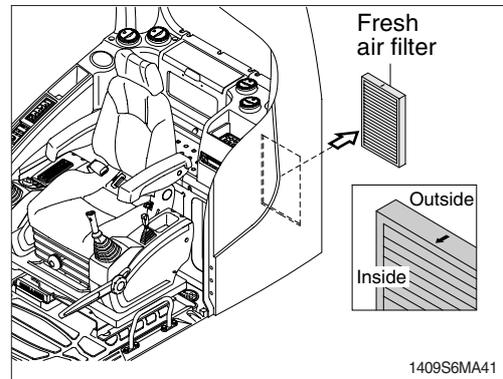
※ Always stop the engine before servicing.

(1) Open the LH side cover.



(2) Remove the fresh air filter.

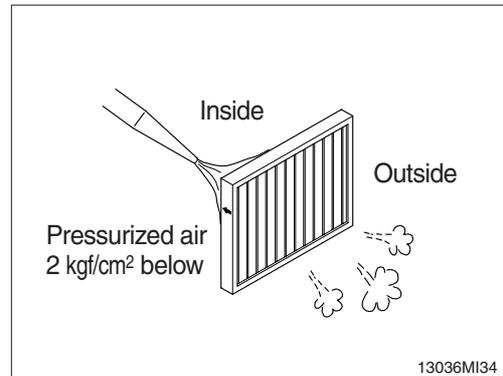
※ When installing a filter, be careful not to change the filter direction.



(3) Clean the filter using a pressurized air (below 2 kgf/cm², 28 psi).

△ When using pressurized air, be sure to wear safety glasses.

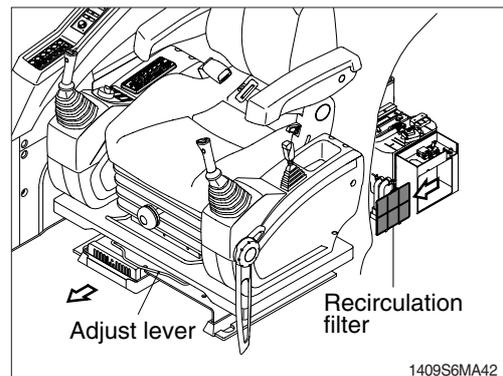
(4) Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.



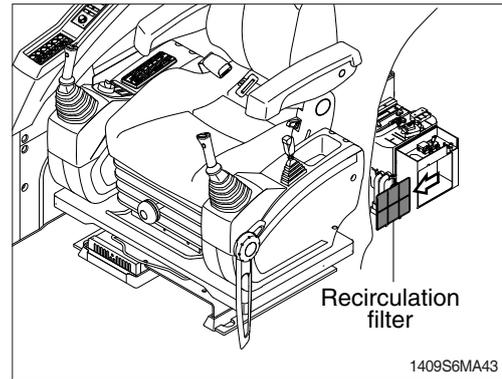
2) CLEAN AND REPLACE OF RECIRCULATION FILTER

※ Always stop the engine before servicing.

(1) Move seat and console box to arrow direction using the adjust lever.



(2) Remove recirculation filter.

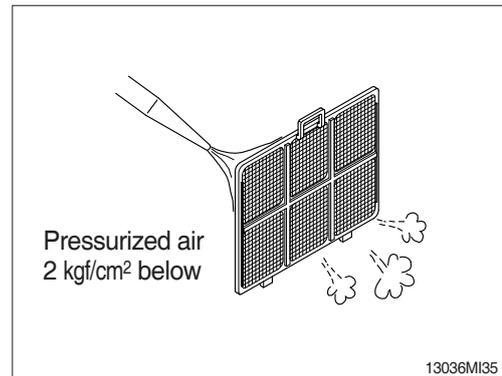


(3) Clean the recirculation filter using a pressurized air (below 2 kgf/cm², 28 psi) or washing with water.

△ 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 (R134-a) AMOUNT : 800 g

7) COMPRESSOR LUBRICANT OIL (SYNTHETIC OIL) : 265mL

TROUBLESHOOTING GUIDE

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. | <ul style="list-style-type: none"> · Add the oil to the specified level. · Replace the oil filter cartridge. · Check oil leakage from the pipe or the joint. · Replace the monitor. | |
| Steam is emitted from the top part of the radiator (the pressure valve). Coolant level warning lamp lights ON. | <ul style="list-style-type: none"> · 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. | <ul style="list-style-type: none"> · 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. | |
| Exhaust gas is white or blue. | <ul style="list-style-type: none"> · Adjust to specified oil quantity. · Replace with specified fuel. | |
| Exhaust gas occasionally turns black. | <ul style="list-style-type: none"> · Clean or replace the air cleaner element. · Check the nozzle. · Check engine compression pressure. · Clean or replace the turbocharger. | |
| Combustion noise occasionally changes to breathing sound. | <ul style="list-style-type: none"> · Check the nozzle. | |
| Unusual combustion noise or mechanical noise. | <ul style="list-style-type: none"> · 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. | <ul style="list-style-type: none"> · Check for loose terminals and open-circuit wiring. · Adjust belt tension. | |
| Battery charging lamp does not go out even when engine runs at high speed. | <ul style="list-style-type: none"> · Check the alternator. · Check and repair wiring. | |
| Unusual noise is emitted from the alternator. | <ul style="list-style-type: none"> · Check the alternator. | |
| Starting motor does not turn when starting switch is turned START. | <ul style="list-style-type: none"> · Check and repair the wiring. · Charge the battery. · Check the starting motor. · Check the safety relay. | |
| The pinion of the starting motor keeps going in and out. | <ul style="list-style-type: none"> · Charge the battery. · Check the safety relay. | |
| Starting motor turns the engine sluggishly. | <ul style="list-style-type: none"> · Charge the battery. · Check the starting motor. | |
| The starting motor disengages before the engine starts up. | <ul style="list-style-type: none"> · Check and repair the wiring. · Charge the battery. | |
| The engine oil pressure lamp does not light up when engine is stationary (when the starting switch is in ON position.) | <ul style="list-style-type: none"> · Check the monitor. · Check the caution lamp switch. | |
| Battery charging lamp does not light up when the engine is stationary. (when the starting switch is in ON position.) | <ul style="list-style-type: none"> · Check the monitor. · Check and repair the wiring. | |

3. OTHERS

| Trouble | Service | Remark |
|---|--|--------|
| 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. | |

HYDRAULIC BREAKER AND QUICK CLAMP

1. SELECTING HYDRAULIC BREAKER

- 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 Hyundai for further explanation.

2. CIRCUIT CONFIGURATION

- 1) As for breaker oil pressure line, use extra spool of main control valve.
- 2) Set proper breaker pressure on load relief valve.
 - ※ The initial setting pressure of load relief valve for breaker is 200 bar.
- 3) The pressure of the ROBEX170W-9S system is 350 kgf/cm² (4980 psi).

4) Adjusting oil quantity

■ CLUSTER TYPE 1

- (1) Use the breaker mode from work tool of cluster.
Use select switch to control the oil flow quantity.
 - Setting oil quantity (130 lpm)

Flow set

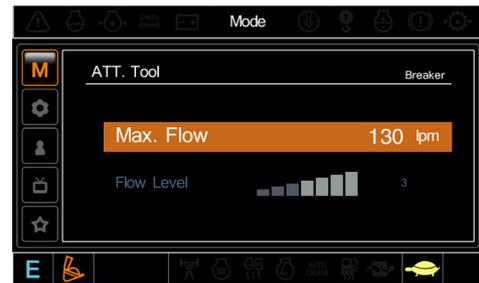
- Max flow : Set the maximum flow for the attachment.
- Flow level : Reduce the operating flow from maximum flow.
 - Breaker : Max 7 steps, reduced 10 lpm each step.

- (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.

■ CLUSTER TYPE 2

- (1) Use accel dial switch to control the oil flow quantity.
- 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/cm² (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 Hyundai genuine parts.
 - 11) Weld the bracket for pipe clamp to prevent damage caused by vibration.

Oil quantity setting (cluster type 1)



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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 | |

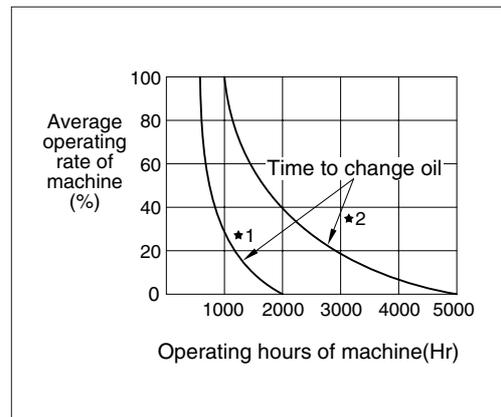
*¹: Conventional hydraulic oil

*²: Hyundai 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

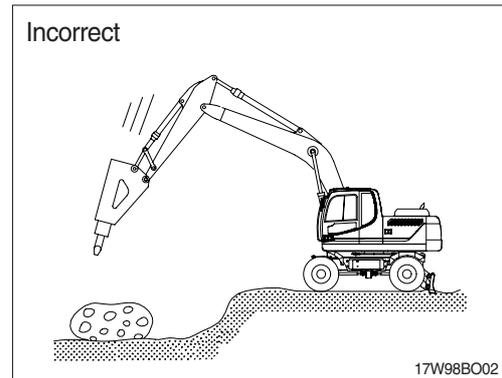
*²: Hyundai genuine long life hydraulic oil

4. PRECAUTIONS WHILE OPERATING THE BREAKER

1) DO NOT BREAK ROCK WHILE LOWERING

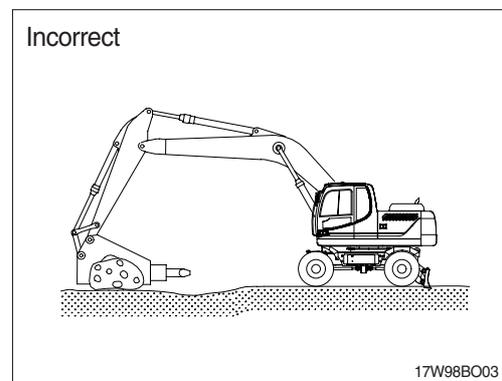
As the breaker is heavy in comparison with bucket, it must be operated slowly.

If breaker is rapidly pushed down, working device may be damaged.



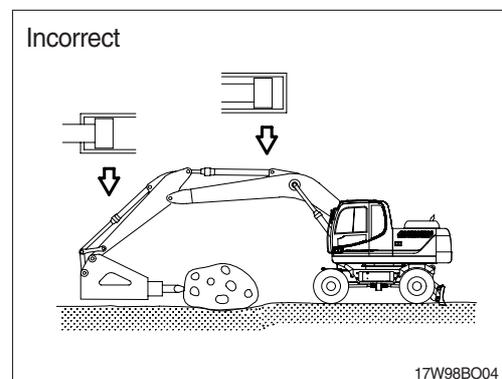
2) DO NOT USE BREAKER TO CARRY BROKEN STONE OR ROCK BY SWING OPERATING

This may damage the operation device and swing system.



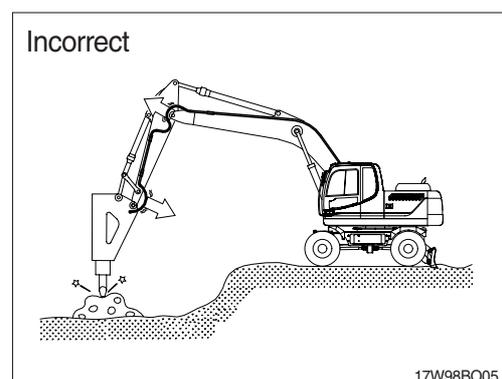
3) OPERATE BREAKER WITH A GAP IN EXCESS OF 100 mm (4 inches) FROM THE END OF THE STROKE TIP

If breaker is operated with the end tip, the cylinder may be damaged.



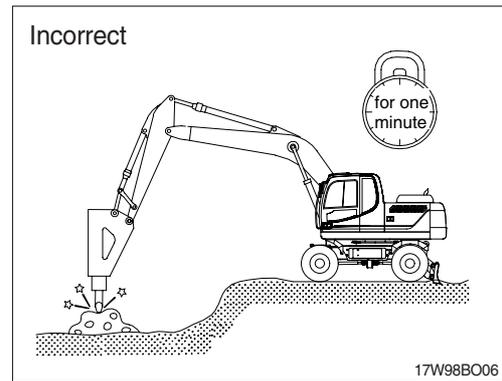
4) IF THE HYDRAULIC HOSES VIBRATE EXCESSIVELY

If the machine used in this condition continuously this will effect badly on the machine such as loosening bolt, oil leakage, damage of pump pipe and etc.



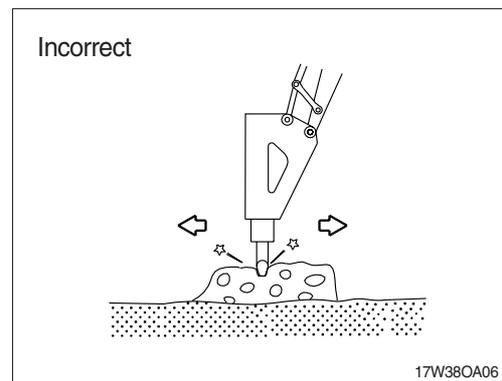
5) DO NOT CONTINUE TO WORKING OVER ONE MINUTE AT SAME POSITION OF BOOM AND ARM

This will increase the temperature of the oil, and cause problem in the accumulator and seals.



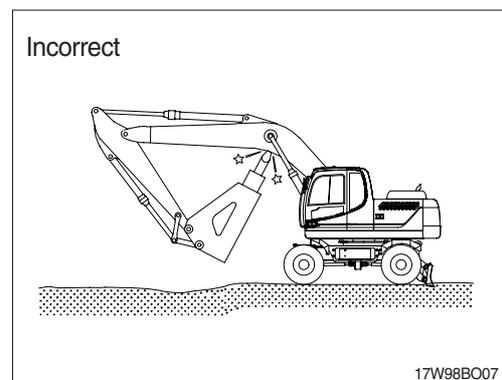
6) DO NOT MOVE MACHINE OR BREAKER WHILE STRIKING

Do not move hammer while striking. This will cause damage to the working device and the swing system.

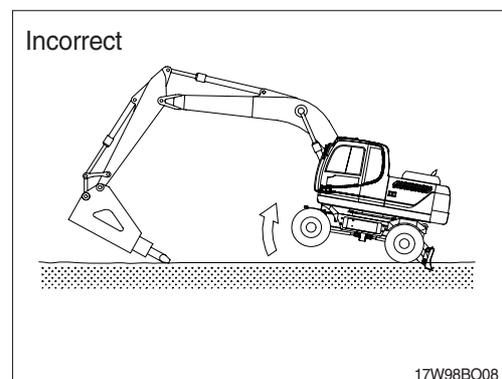


7) TAKE CARE OF CHISEL AND BOOM INTERFACE

Make sure of the arm and bucket control lever operation.



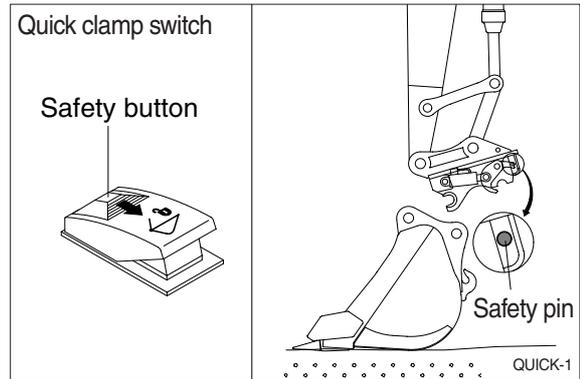
8) Do not extend the bucket cylinder fully and thrusting to raise the machine off the ground.



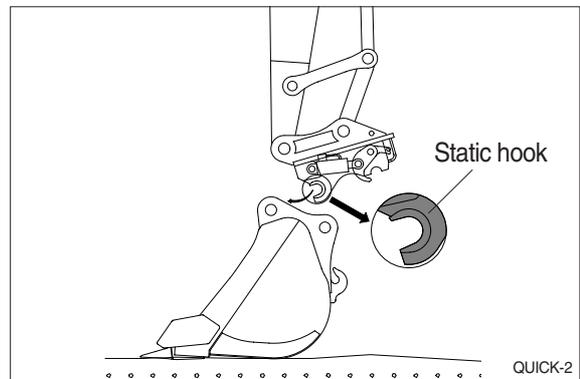
5. QUICK CLAMP

1) FIXING BUCKET WITH QUICK CLAMP

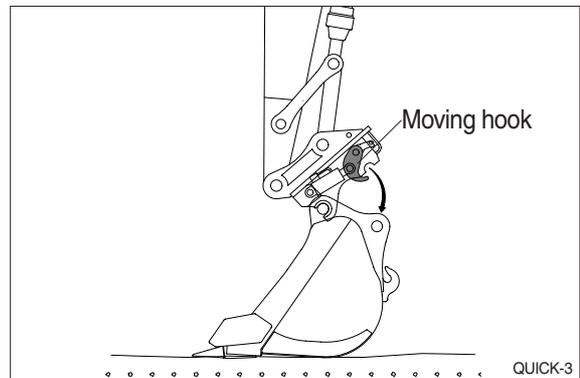
- (1) Before fixing bucket, remove safety pin of the moving hook.
- (2) Pulling safety button, press the quick clamp switch to unlock position. Then, the moving hook is placed on release position.



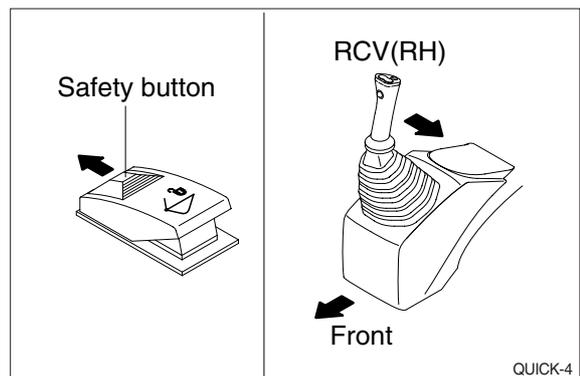
- (3) Aligning the arm and bucket, insert static hook of quick clamp to the bucket pin.



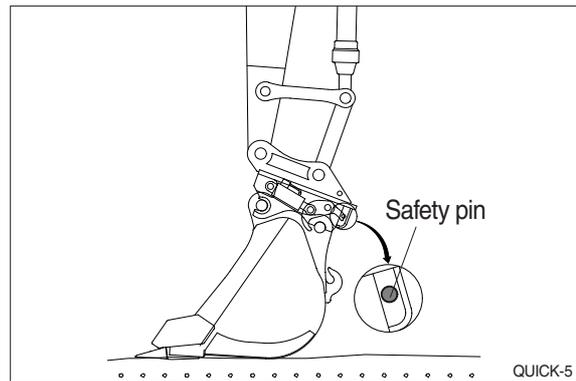
- (4) Operate RCV lever to bucket-in position. Then, the moving hook is coupled with the bucket link pin. Make sure that the moving hook is completely contacted with bucket link pin.



- (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

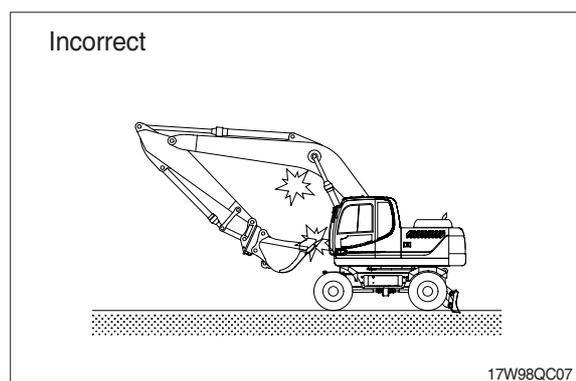
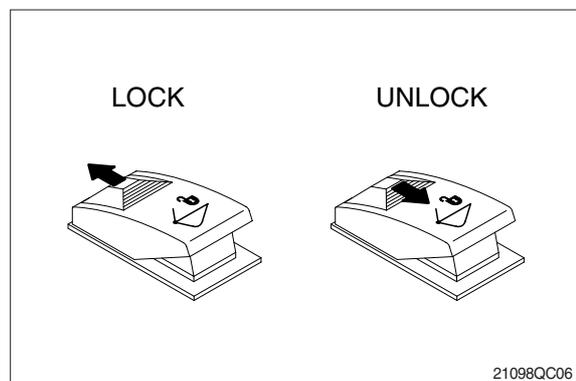
- ⚠ When operating the machine with quick clamp, confirm that the quick clamp switch is lock position and safety pin of moving hook is inserted.

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.

HYUNDAI will not be responsible for any injury or damage in case that safety pin is not installed properly.



| | |
|---|------------|
| A | |
| Accel dial switch | 3-35 |
| Accel pedal | 3-47 |
| Air engine start | 4-5, 4-9 |
| Air breather element | 6-30 |
| Air cleaner filter | 6-25 |
| Air conditioner & heater | 3-48 |
| Air conditioner filter | 6-45 |
| Alternate exit | 0-12 |
| Attachment lowering | 4-35 |
| Axle gear oil | 6-35 |
| B | |
| Battery | 6-42 |
| Before starting engine | 4-2 |
| Boom lowering | 4-35 |
| Breaker pedal | 3-47 |
| Bucket clearance adjustment | 6-40 |
| Bucket replacement | 6-38 |
| Bucket selection guide | 2-9 |
| Bucket tooth replacement | 6-39 |
| C | |
| Cab air filter | 6-45 |
| Cab device | 3-1 |
| Changing machine control pattern | 4-38 |
| Charge air cooler | 6-23 |
| Cigar lighter | 3-55 |
| Cluster | 3-2, 3-23 |
| Coolant | 6-20 |
| Cooling fan | 6-23 |
| D | |
| Drain filter | 6-29 |
| Dimension and weight | 5-3 |
| E | |
| Emergency engine starting connector | 3-67 |
| Engine oil filter | 6-18 |
| Engine oil level | 6-18 |
| Engine starting & stop | 4-3, 4-7 |
| Engine starting by booster | 6-43 |
| Engine stop | 4-6 |
| F | |
| Fan belt | 6-24 |
| Fixing the machine | 5-7 |
| FNR lever | 3-39 |
| Fuel filter | 6-26 |
| Fuel leakage | 6-29 |
| Fuel system bleeding | 6-27 |
| Fuel tank | 6-25 |
| Fuse & relay box | 3-66 |
| G | |
| Gauge | 3-3, 3-24 |
| H | |
| Hydraulic breaker | 8-1 |
| Hydraulic oil changing | 6-28 |
| Hydraulic oil filling | 6-28 |
| Hydraulic oil level | 6-29 |
| L | |
| LCD | 3-4, 3-26 |
| LCD display map | 3-5, 3-27 |
| LCD main operation display | 3-3, 3-24 |
| Levers & pedals | 3-45 |
| Lifting capacities | 2-7 |
| Loading the machine | 5-5 |
| Lubricant specification | 2-13 |
| M | |
| Maintenance check list | 6-11 |
| Major component | 2-1 |
| Master switch | 3-35 |
| MCU (Machine Control Unit) | 3-66 |
| Mode selection system | 4-10, 4-15 |
| Monitor panel | 3-2, 3-23 |
| Mounting and dismounting | 1-12 |
| Multifunction switch | 3-39 |
| N | |
| New machine operation | 4-1 |
| O | |
| Oil cooler | 6-23 |
| Operating pattern | 4-30 |
| P | |
| Pedals | 3-45 |
| Periodical replacement parts | 6-5 |
| Pilot lamps | 3-7, 3-30 |
| Pilot line filter | 6-30 |
| Pin & bushing lubrication | 6-41 |
| Prefilter | 6-26 |

Q

Quick clamp 8-6

R

Radiator flushing 6-20

Radio & USB player 3-56

RCV lever lubricate 6-32

Recommended oils 2-13, 6-10

Relieving pressure 6-3

Return filter 6-30

RCV lever operating pattern 4-38

RS 232 service socket 3-67

S

Safety hints 1-1

Safety labels 0-5

Safety parts 6-5

Seat 3-64, 65

Seat belt 3-64, 65

Start switch 1 (dozer/outrigger) 3-36

Start switch 2 (parking/working/traveling) 3-41

Service meter 3-67

Service socket 3-67

Socket 12V 3-55

Specification for major component 2-10

Specification 2-2

Start switch 3-34

Storage 4-36

Suction strainer 6-29

Swing bearing grease 6-31

Swing gear 6-31

Swing lock lever 3-47, 6-32

Swing reduction gear oil 3-33

Switch panel 3-9

Switches 3-34

T

Tires air pressure 6-34

Torques-major component 6-6

Torques-fastener 6-6

Towing machine 4-25

Transportation 5-2

Transmission gear oil 6-37

Traveling machine 4-21

Travel pilot lamo 3-43

Troubleshooting guide 7-1

W

Warming up operation 4-5, 4-9

Warning lamps 3-4, 3-25

Weight 2-6

Windshield 3-68

Working device operation 4-20

Working method 4-27

Working range 2-4