

# CONTENTS

Foreword .....	0-1	6. Traveling of the machine .....	4-11			
Before servicing this machine .....	0-2	7. Efficient working method .....	4-14			
EC regulation approved .....	0-3	8. Operation in the special work sites .....	4-18			
Table to enter S/No and distribution .....	0-4	9. Normal operation of excavator .....	4-20			
Safety labels .....	0-5	10. Attachment lowering .....	4-21			
Machine data plate .....	0-16	11. Storage .....	4-22			
Guide(Direction, S/No, Symbol) .....	0-17	12. RCV lever operating pattern .....	4-24			
		13. Switching hydraulic attachment circuit .....	4-26			
<b>SAFETY HINTS</b>						
1. Before operating the machine .....	1-1	<b>TRANSPORTATION</b>				
2. During operating the machine .....	1-6	1. Preparation for transportation .....	5-1			
3. During maintenance .....	1-13	2. Dimension and weight .....	5-2			
4. Parking .....	1-16	3. Loading the machine .....	5-4			
		4. Fixing the machine .....	5-6			
<b>SPECIFICATIONS</b>				5. Loading and unloading by crane .....	5-7	
1. Major components .....	2-1	<b>MAINTENANCE</b>				
2. Specifications .....	2-2	1. Instruction .....	6-1			
3. Working range .....	2-4	2. Tightening torque .....	6-6			
4. Weight .....	2-6	3. Fuel, coolant and lubricants .....	6-9			
5. Lifting capacities .....	2-7	4. Maintenance check list .....	6-11			
6. Bucket selection guide .....	2-10	5. Maintenance chart .....	6-16			
7. Undercarriage .....	2-11	6. Service instruction .....	6-18			
8. Specification for major components .....	2-13	7. Electrical system .....	6-39			
9. Recommended oils .....	2-16	8. Air conditioner and heater .....	6-42			
<b>CONTROL DEVICES</b>				<b>TROUBLESHOOTING GUIDE</b>		
1. Cab devices .....	3-1	1. Engine .....	7-1			
2. Cluster .....	3-2	2. Electrical system .....	7-2			
3. Switches .....	3-13	3. Others .....	7-3			
4. Levers and pedals .....	3-17	<b>HYDRAULIC BREAKER AND QUICK CLAMP</b>				
5. Air conditioner and heater .....	3-19	1. Selecting hydraulic breaker .....	8-1			
6. Others .....	3-26	2. Circuit configuration .....	8-2			
<b>OPERATION</b>				3. Maintenance .....	8-3	
1. Suggestion for new machine .....	4-1	4. Precaution while operating the breaker .....	8-4			
2. Check before starting the engine .....	4-2	5. Quick clamp .....	8-6			
3. Starting and stop the engine .....	4-3	<b>INDEX</b> .....				9-1
4. Mode selection system .....	4-7					
5. Operation of the working device .....	4-10					

## 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.

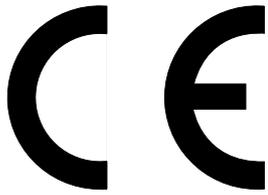
## EC REGULATION APPROVED

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

LWA : 99dB(EU only)

LPA : 70dB

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



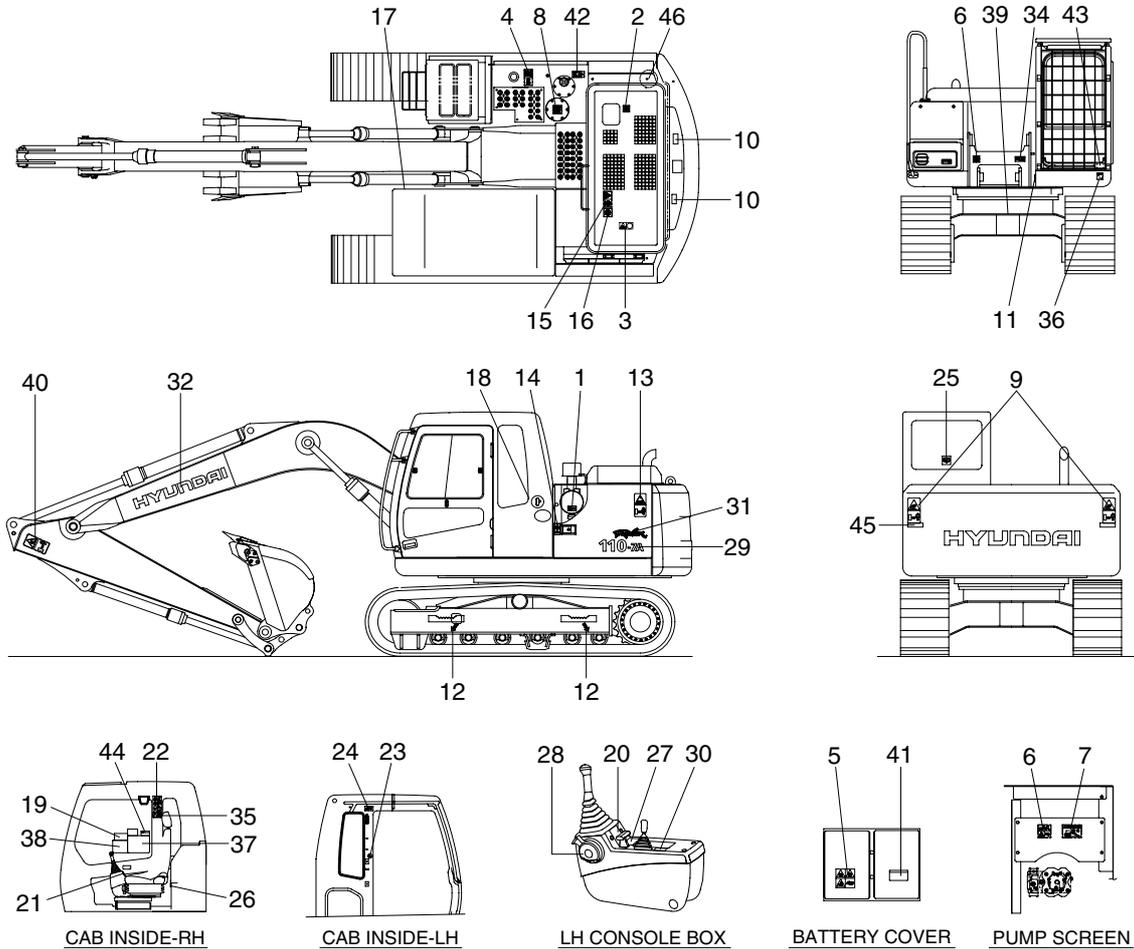
**TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR**

Machine Serial No.	
Engine Serial No.	
Manufacturing year	
Manufacturer Address	Hyundai Heavy Industries co., Ltd. 1000, Bangeojinsunhwan-doro, Dong-Ku, Ulsan 682-792, Korea
Distributor for U.S.A Address	Hyundai Heavy Industries U.S.A, Inc 6100 Atlantic Boulevard Norcross GA 30071 U.S.A
Distributor for Europe Address	Hyundai Heavy Industries 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        | 16 No step engine hood               | 31 Logo(ROBEX)           |
| 2 Turbocharger cover        | 17 Transporting                      | 32 Trade mark(Boom)      |
| 3 Radiator cap              | 18 Low emission engine               | 34 Reduction gear grease |
| 4 Fueling                   | 19 Control ideogram                  | 35 Locking-clamp         |
| 5 Battery accident          | 20 Control ideogram(LH)              | 36 Noise level LWA       |
| 6 High pressure hose        | 21 Control ideogram(RH)              | 37 Service instruction   |
| 7 Hydraulic oil level       | 22 Ref operator manual-Cab.RH pillar | 38 Lifting chart         |
| 8 Hydraulic oil lubrication | 23 Hammer                            | 39 Tie                   |
| 9 Keep clear-rear           | 24 Safety front window               | 40 Keep clear-Boom/arm   |
| 10 Lifting eye              | 25 Alternate exit                    | 41 ECU connector         |
| 11 Name plate               | 26 Air conditioner filter            | 42 Falling               |
| 12 Slinging ideogram        | 27 Console box tilting               | 43 FOPS FOG plate        |
| 13 Keep clear-side          | 28 Safety lever                      | 44 Turbocharger          |
| 14 Stay fix                 | 29 Model name                        | 45 Reflecting            |
| 15 Shearing-engine hood     | 30 Dozer ideogram                    | 46 Accumulator           |

1107A0SL01

## 2. DESCRIPTION

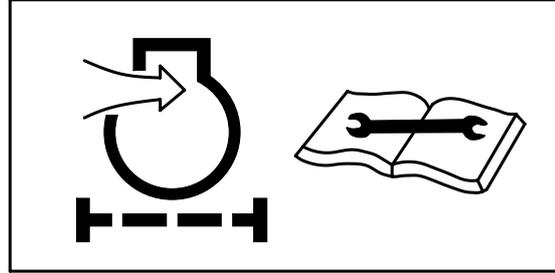
There are several specific warning labels on this machine please become familiarized with all warning labels.

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) TURBOCHARGER COVER(Item 2)

This warning label is positioned on the turbo charger cover.

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



21070FW02

### 3) RADIATOR CAP(Item 3)

This warning label is positioned on the radiator.

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

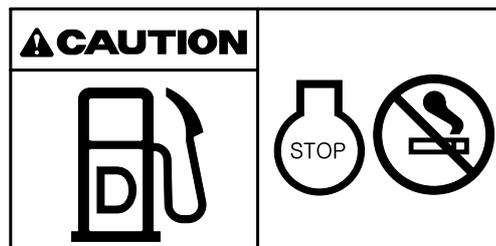


14070FW03

### 4) FUELING(Item 4)

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

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



21070FW04

### 5) BATTERY ACCIDENT (Item 5)

This warning label is positioned on the battery cover.

- ▲ **Electrolyte containing sulfuric acid cause severe burns. Avoid being in contact with skin, eyes or clothes. In the event of accident flush with sufficient water, call a physician immediately.**
- ※ **Maintain the electrolyte at the recommended level. Add distilled water to the battery only when starting up, never when shutting down.**  
With electrolyte at proper level, less space may cause the gases to be accumulated in the battery.
- ▲ **Extinguish all smoking materials and open flames before checking the battery.**
- ▲ **Do not use matches, lighters or torches as a light source near the battery for the probable presence of explosive gas.**
- ▲ **Do not allow unauthorized personnel to change the battery or to use booster cables.**
- ▲ **For safety from electric shock, do not battery terminal with a wet hand.**



36070FW05

### 6) HIGH PRESSURE HOSE (Item 6)

This warning label is positioned on the screen plate.

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

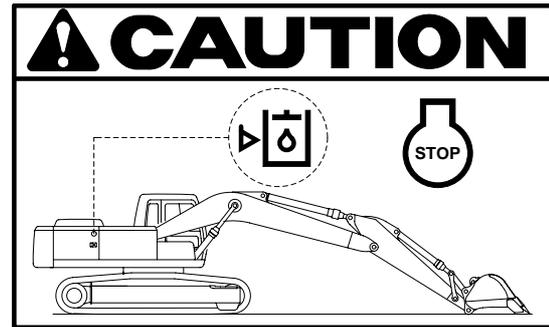


14070FW29

### 7) HYDRAULIC OIL LEVEL(Item 7)

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

- ▲ Place the bucket on the ground whenever servicing the hydraulic system.
- ※ Check oil level on the level gauge.
- ※ Refill the recommended hydraulic oil up to specified level if necessary.

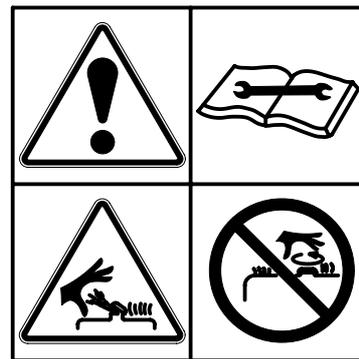


21070FW07

### 8) HYDRAULIC OIL LUBRICATION(Item 8)

This warning label is positioned on the right side of air breather.

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



14070FW08

### 9) KEEP CLEAR(Item 9)

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.

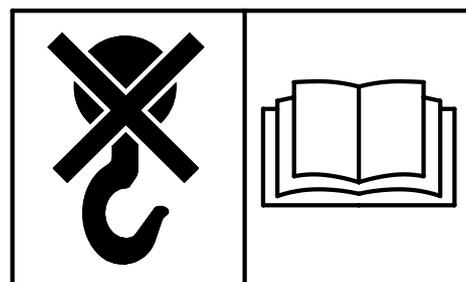


21070FW28

### 10) LIFTING EYE(Item 10)

This warning label is positioned on the counterweight.

- ▲ Do not lift the machine by using lifting eyes on the counterweight or the lifting eyes may be subject to overload causing its breaking and possible personal injury.
- ※ See page 5-8 for proper lifting method of the machine.

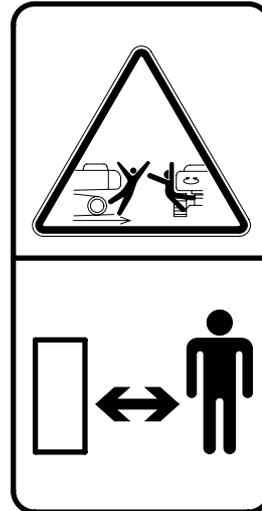


21070FW10

**11) SIDE KEEP CLEAR (Item 13)**

This warning label is positioned on the side of counterweight.

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



21070FW13

**12) STAY FIX (Item 14)**

This warning label is positioned on the side cover.

- ▲ Be sure to support the stay when the door needs to be opened.
- ▲ Be careful that the opened door may be closed by the external or natural force like strong wind.

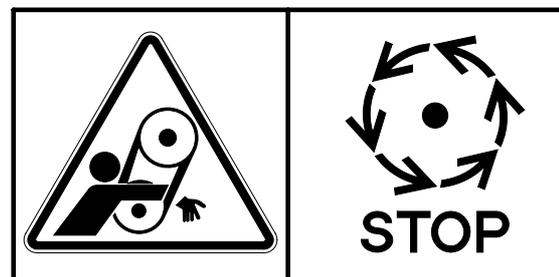


21070FW14

**13) SHEARING-ENGINE HOOD (Item 15)**

This warning label is positioned on the engine hood.

- ▲ Don't open the engine hood during the engine's running.
- ▲ Don't touch exhaust pipe or it may cause severe burn.

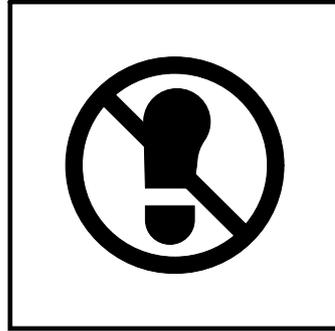


21070FW15

14) NO STEP-ENGINE HOOD(Item 16)

This warning label is positioned on the engine hood.

△ Don't step on the engine hood.



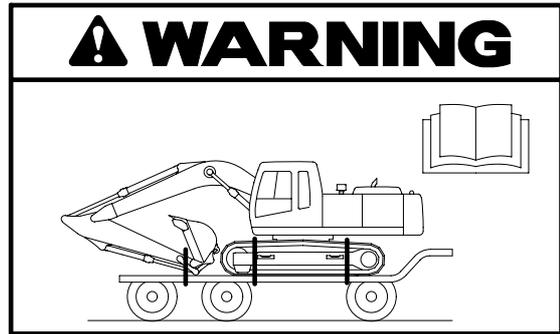
21070FW16

15) TRANSPORTING(Item 17)

This warning label is positioned right side of upper frame.

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

※ See page 5-6 for details.



14070FW17

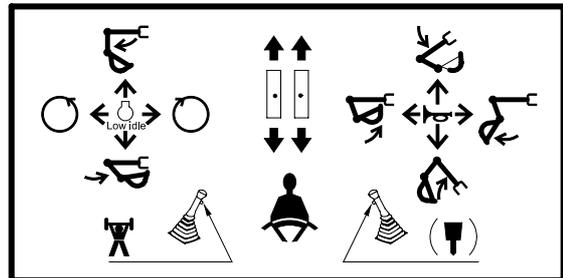
16) CONTROL IDEOGRAM(Item 19)

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

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

▲ Failure to do so could result in injury or death.

※ See page 4-10 for details.



36070FW19

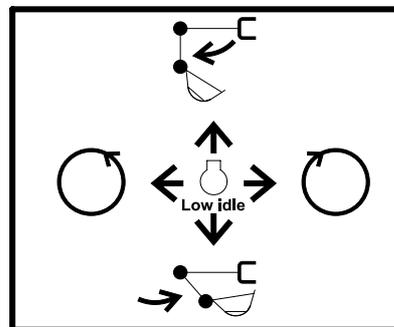
17) CONTROL IDEOGRAM-LH(Item 20)

This warning label is positioned on the LH console box.

▲ 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 4-10 for details.



36070FW20

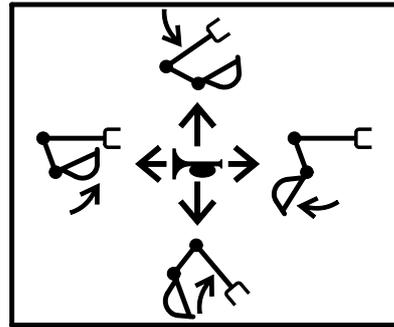
18) CONTROL IDEOGRAM-RH(Item 21)

This warning label is positioned on the RH console box.

▲ 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 4-10 for details.

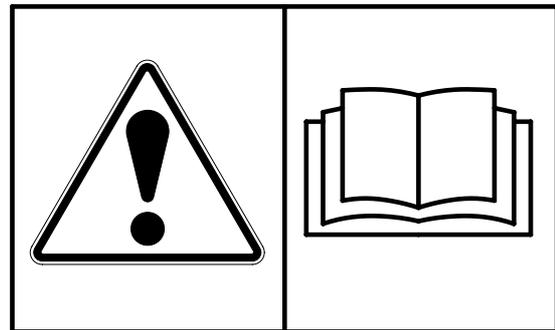


21070FW21

19) REF OPERATOR MANUAL(Item 22)

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

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



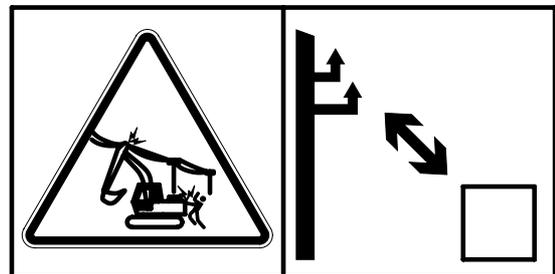
21070FW22

20) MAX HEIGHT(Item 22)

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

▲ 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.



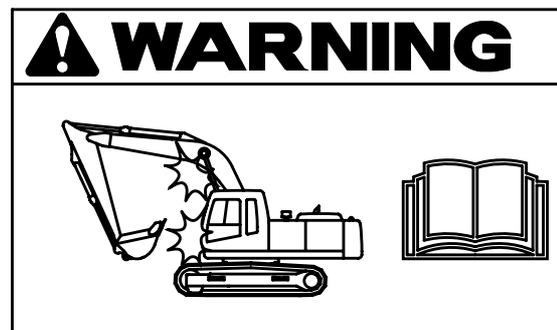
21070FW23

21) INTERFERENCE(Item 22)

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

▲ 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.

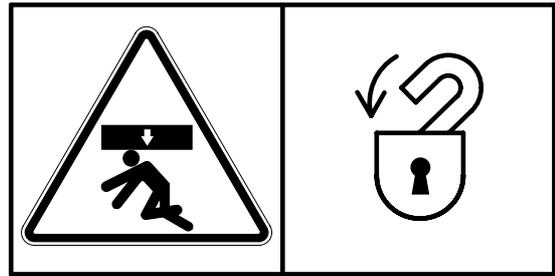


14070FW62

**22) SAFETY FRONT WINDOW**(Item 24)

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

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

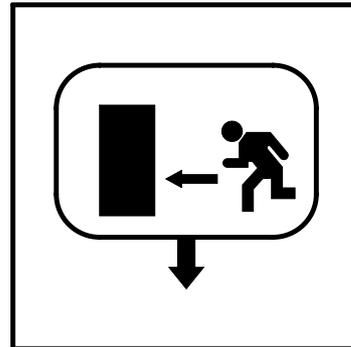


21070FW24

**23) ALTERNATE EXIT**(Item 25)

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.**

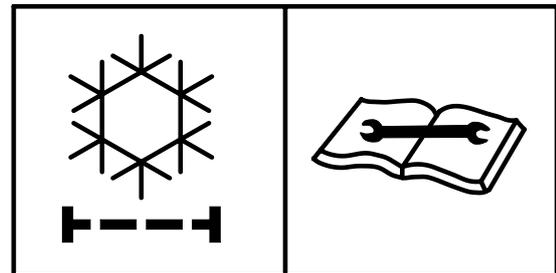


21070FW25

**24) AIR CONDITIONER FILTER**(Item 26)

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.**

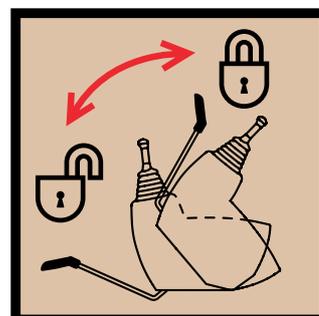


21070FW26

**25) CONSOLE BOX TILTING**(Item 27)

This warning label is positioned on the LH console box.

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

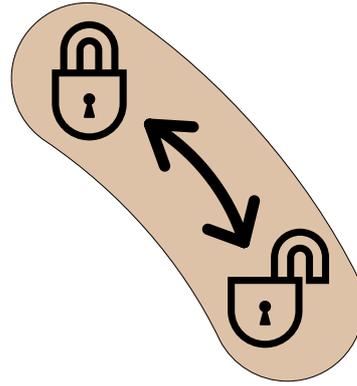


30007A1FW06

**26) SAFETY LEVER**(Item 28)

This warning label is positioned on the safety cover.

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

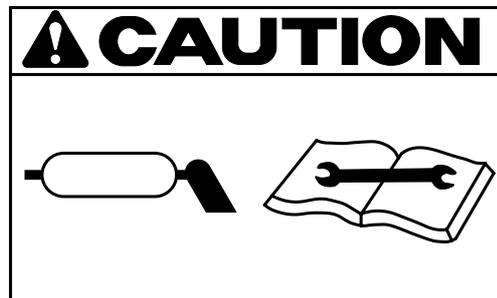


30007A1FW07A

**27) REDUCTION GEAR GREASE**(Item 34)

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.

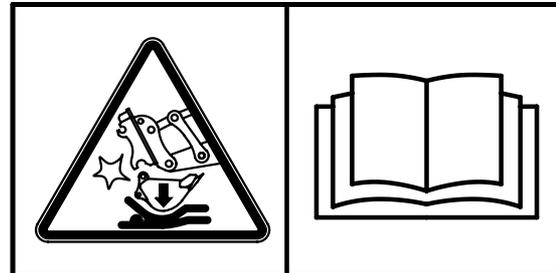


21070FW35

**28) CLAMP-LOCKING**(Item 35)

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.**

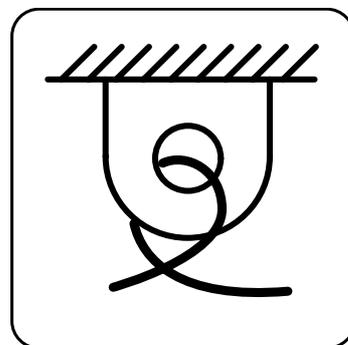


14070FW60

**29) TIE**(Item 39)

This warning label is positioned on the lower frame.

- ▲ **See page 4-13 for detail.**



4507A0FW02

### 30) KEEP CLEAR-BOOM/ARM(Item 40)

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.

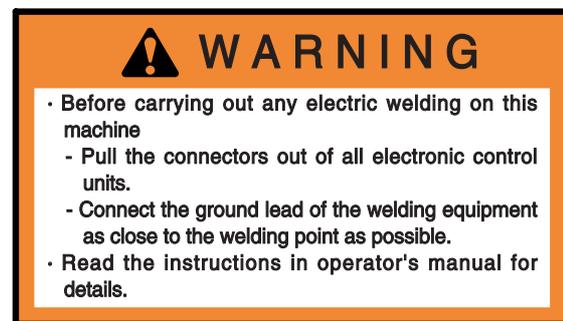


14070FW31

### 31) ECU CONNECTOR(Item 41)

This warning label is positioned on the battery cover.

- ▲ Before carrying out any electric welding on this machine.  
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 6-41 for detail.



7807AFW20

### 32) FALLING(Item 42)

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.

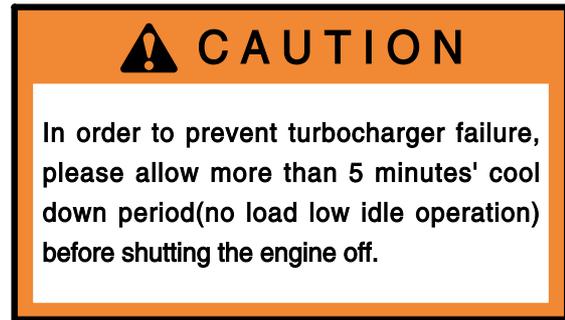


14070FW30

### 33) TURBOCHARGER(Item 44)

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

### 34) REFLECTING(Item 45)

This warning label is positioned counterweight.

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



2507AOFW03

### 35) ACCUMULATOR(Item 46)

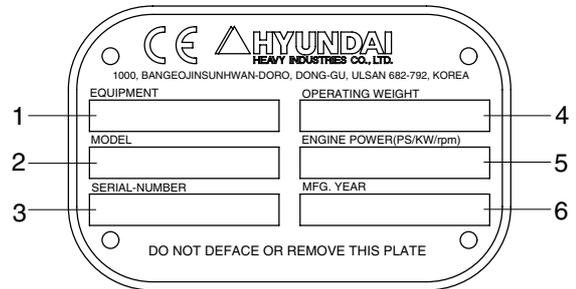
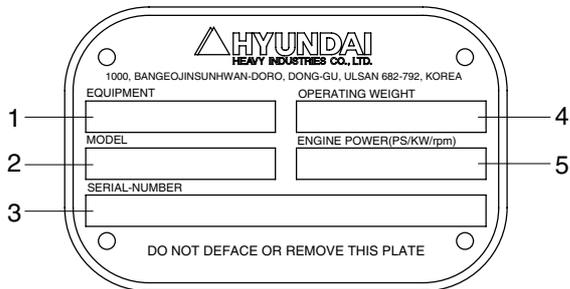
This warning label is positioned on the accumulator.

- ※ 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

# MACHINE DATA PLATE



FOR EU ONLY

21090FW10

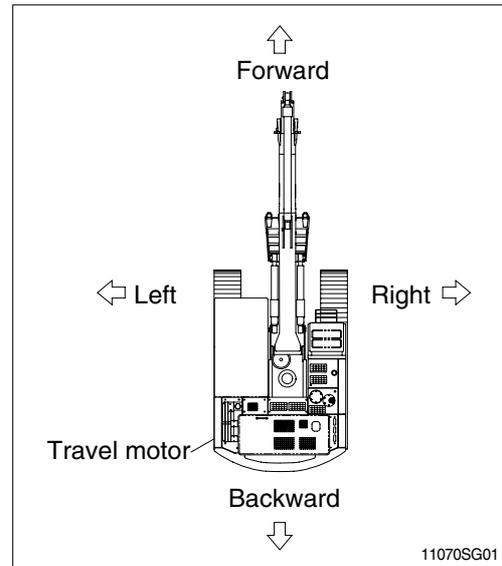
- |   |            |   |                  |   |                    |
|---|------------|---|------------------|---|--------------------|
| 1 | Equipment  | 3 | Serial number    | 5 | Engine power       |
| 2 | Model name | 4 | Operating weight | 6 | Manufacturing year |

※ 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 travel motor is in the rear and machine is on the traveling direction.

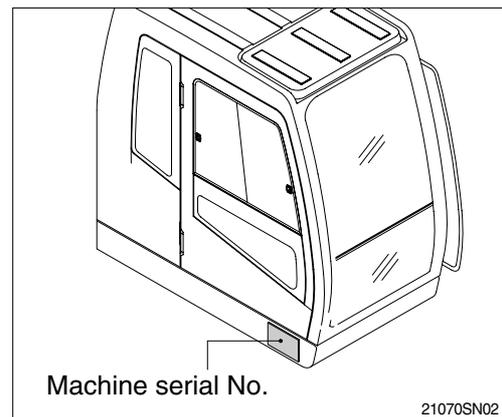


### 2. SERIAL NUMBER

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

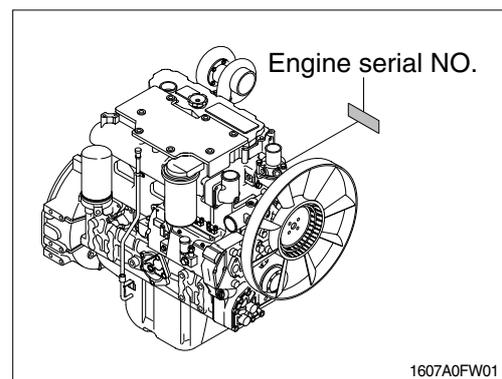
#### 1) MACHINE SERIAL NUMBER

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



#### 2) ENGINE SERIAL NUMBER

The numbers are located on the engine name plate.



### 3. SYMBOLS

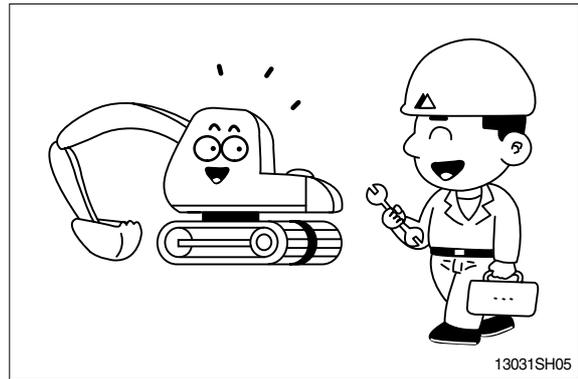
▲ Important safety hint.

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

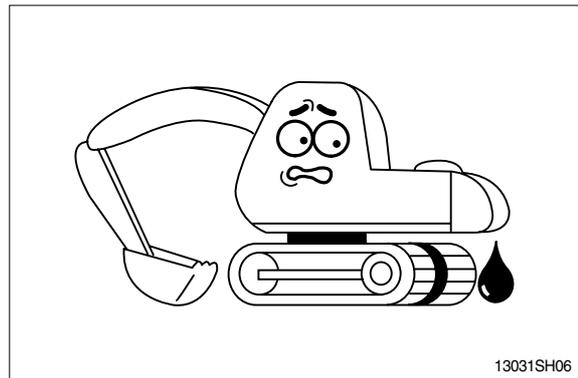
※ It indicates the useful information for operator.



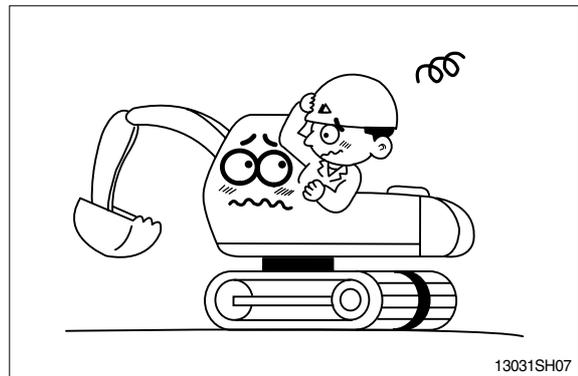
Check daily according to the operation manual.  
Repair the damaged parts and tighten the loosened bolts.



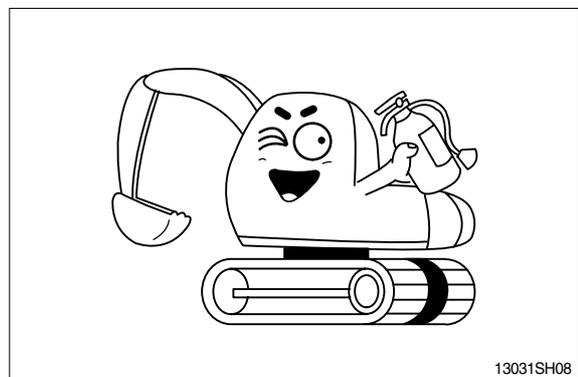
Check for leakage of engine oil, hydraulic oil,  
fuel and coolant.  
Keep machine clean, clean machine regularly.



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  
telephone.



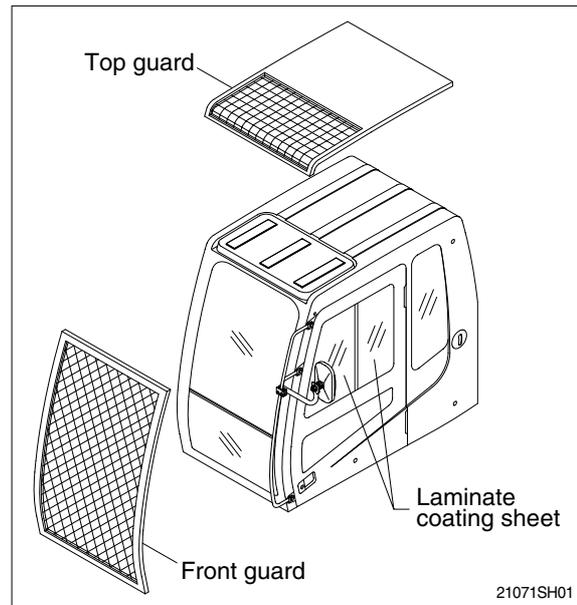
## PROTECTION AGAINST FALLING OR FLYING OBJECTS

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.

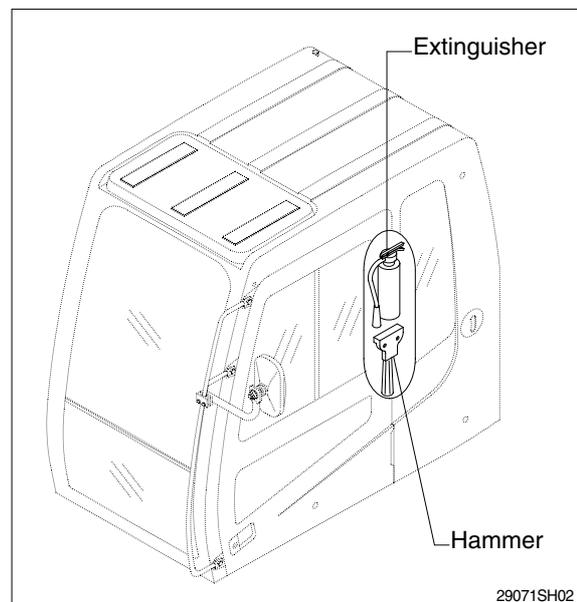
## PREPARE FOR EMERGENCY

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.

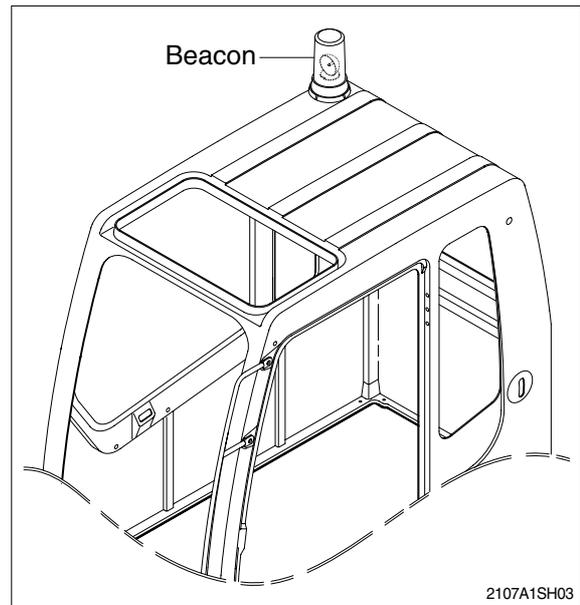
Be sure you know the phone numbers of persons you should contact in case of an emergency.



## 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.

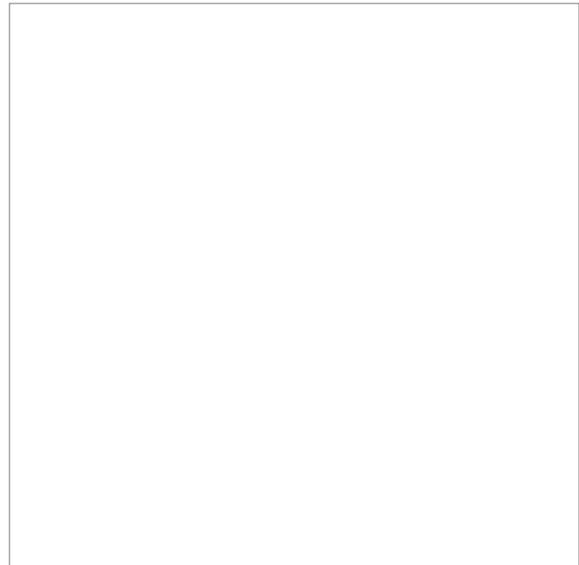


## PRECAUTIONS FOR ATTACHMENTS

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.

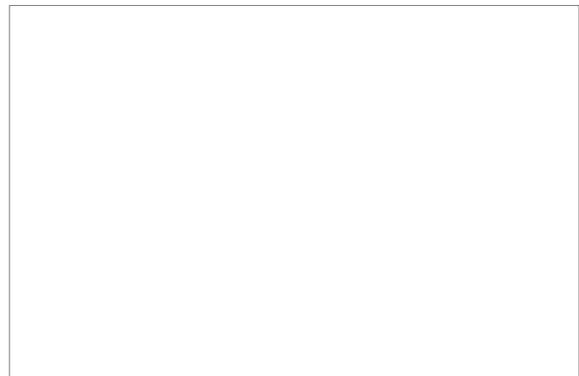


## SAFETY RULES

**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.



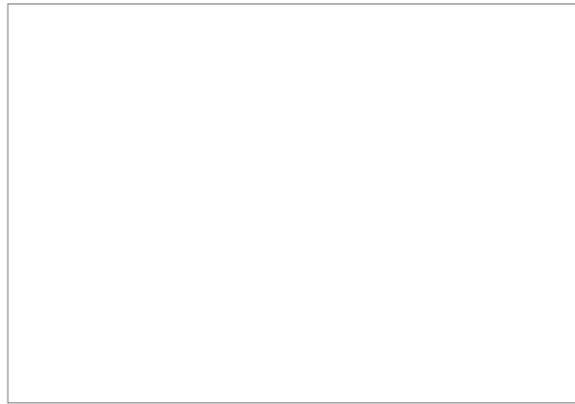
## SAFETY FEATURES

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.

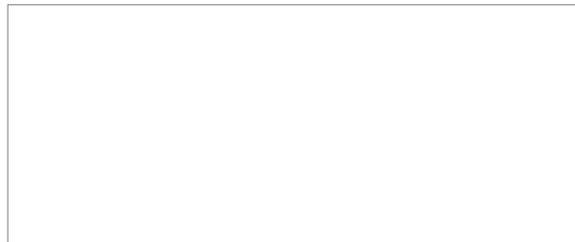


## MACHINE CONTROL PATTERN

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.

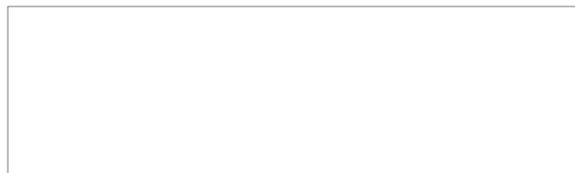
**WASH HANDS AFTER HANDLING**



13031SH55

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

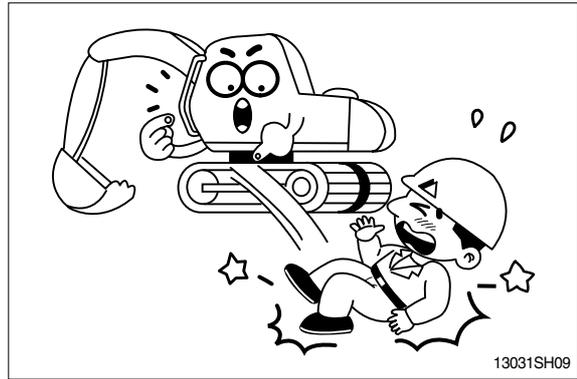
**▲** The wrong loading method can result in serious bodily injury or death.



## 2. DURING OPERATING THE MACHINE

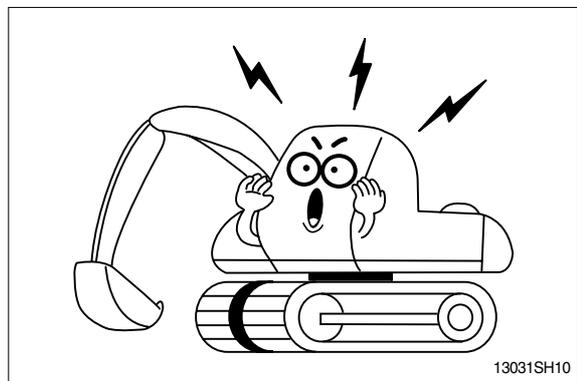
Use the handle and footstep when getting on or off the machine.

Do not jump on or off the machine.



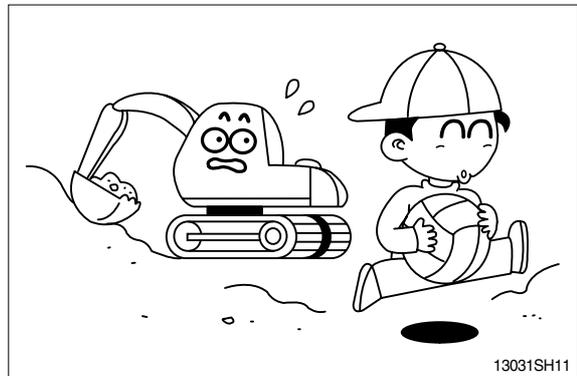
Sound the horn to warn nearby personnel before operating the machine.

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

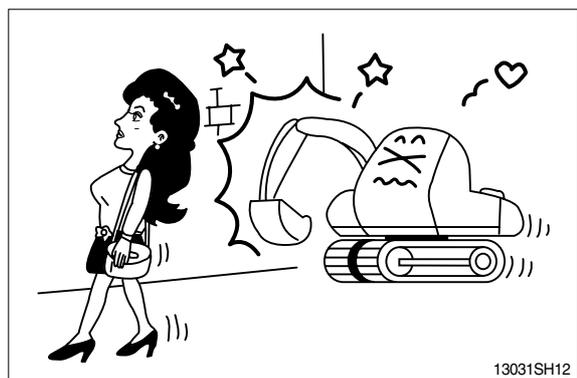


Operate carefully to make sure all personnel or obstacles are clear within the working range of the machine.

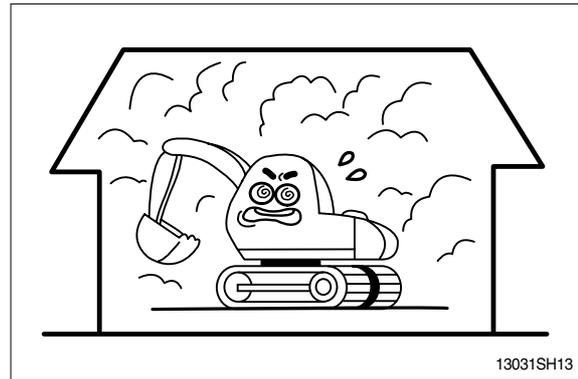
Place safety guards if necessary.



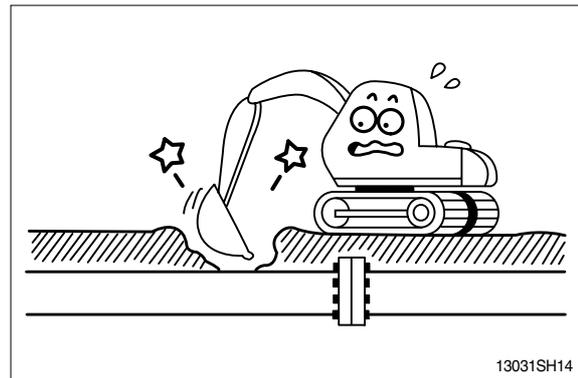
When using the work equipment, pay attention to job site.



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



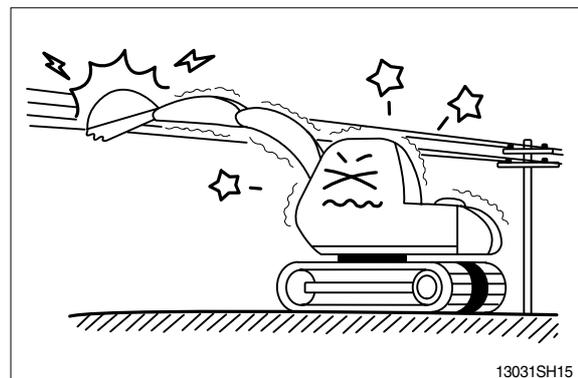
Check the locations of underground gas pipes or water line and secure the safety before operation.



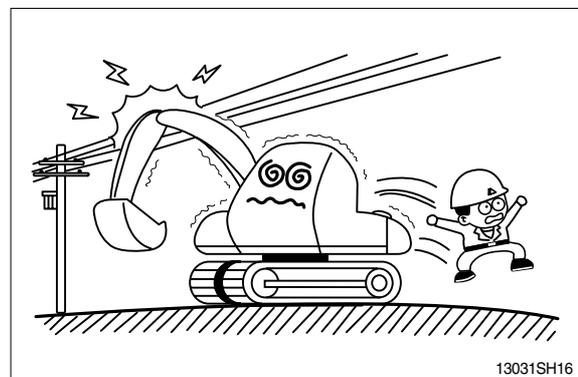
The operating near the electrical lines is very dangerous.

Operate within safe working range permitted as below.

Supply voltage	Min safe separation
6.6kV	3m(10ft)
33.0kV	4m(13ft)
66.0kV	5m(16ft)
154.0kV	8m(26ft)
275.0kV	10m(33ft)

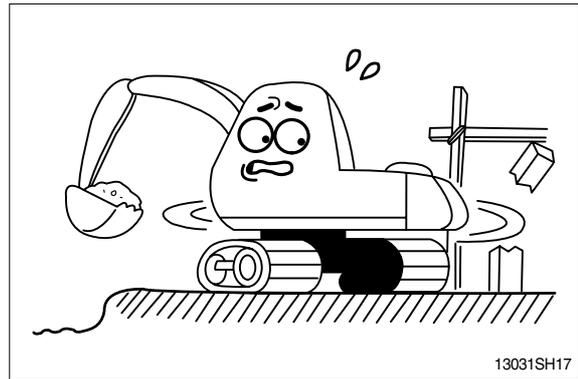


If the machine touches the electric power lines, keep sitting on the operator's seat and make sure the personnel on the ground not to touch the machine until turning off the electric current. Jump off the machine without contacting the machine when you need to get off.

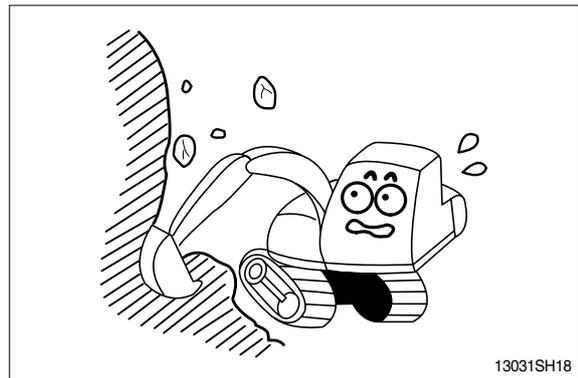


Watch out for obstacles.

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

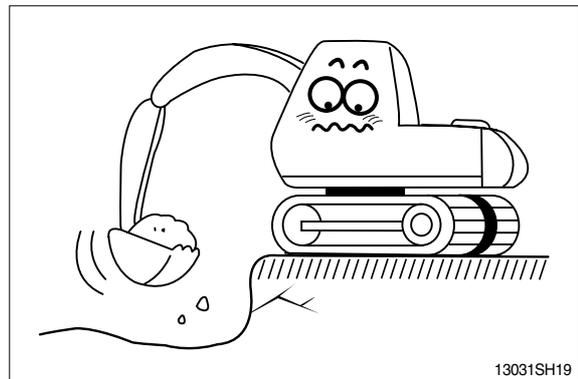


When using the machine as breaker or working in a place where stones may fall down, cab roof guard and head guard should be provided for proper protection.



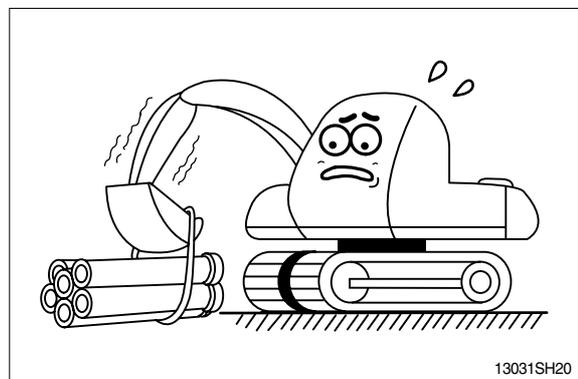
Avoid operating on a cliff or soft ground as there is danger of rolling over.

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.

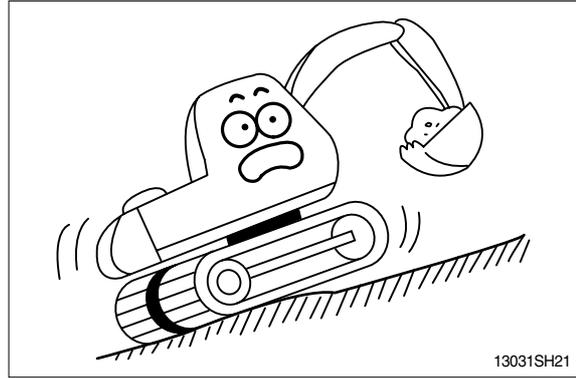


Operate for the lifting work considering the capacity of machine, weight and width of the load.

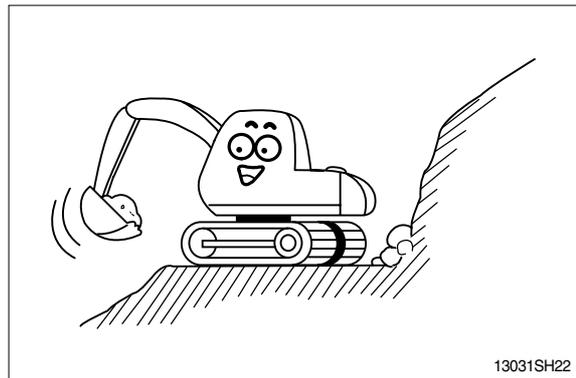
Be careful not to lift exceeding the machine capacity as it can be the cause of machine damage and safety accident.



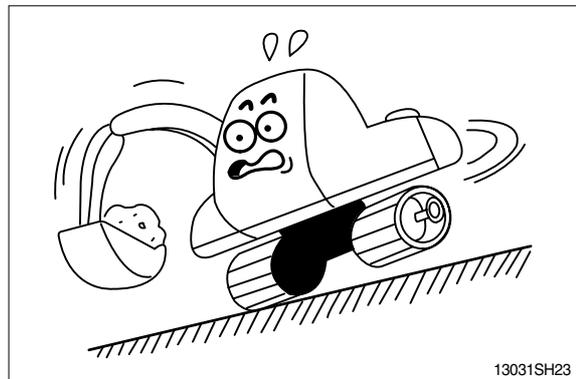
The operation on a slope is dangerous.  
Avoid operating the machine on a slope of over 10 degree.



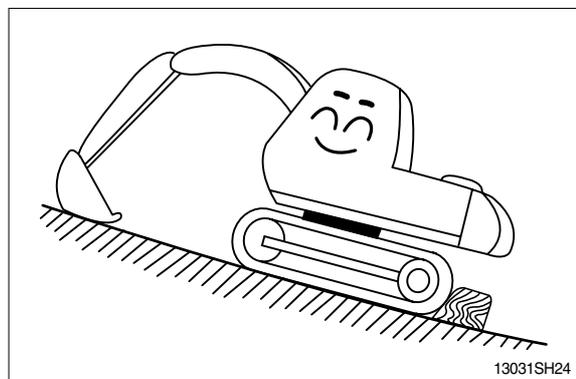
Operate the machine after making ground flat when operation is required on a slope.



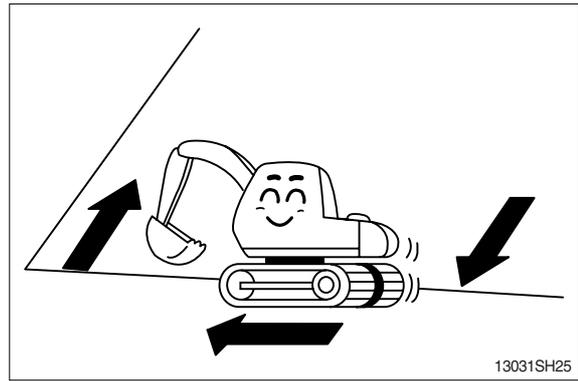
The swing on the slope can be danger of rolling over.  
Do not operate to swing the machine with the bucket loaded on a slope since the machine may lose its balance under such an instance.



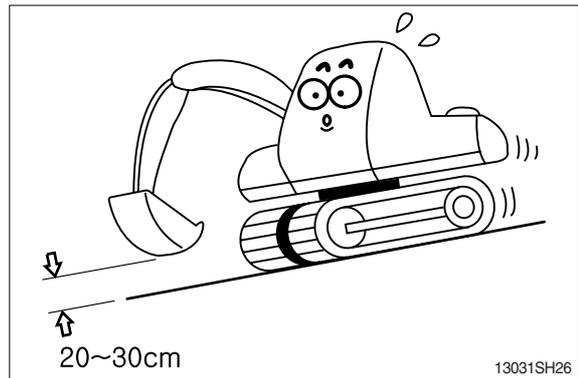
Avoid parking and stopping on a slope.  
Lower the bucket to the ground and block the track when parking.



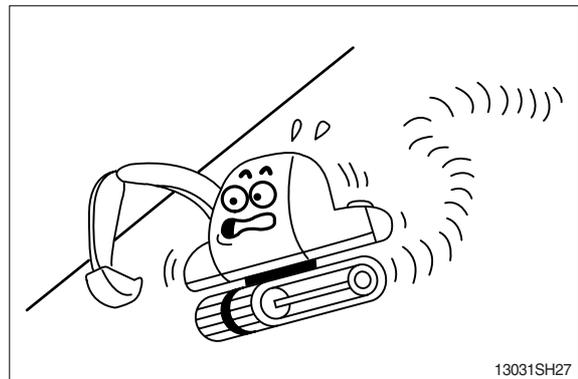
Avoid traveling in a cross direction on a slope as it can cause the danger of rolling over and sliding.



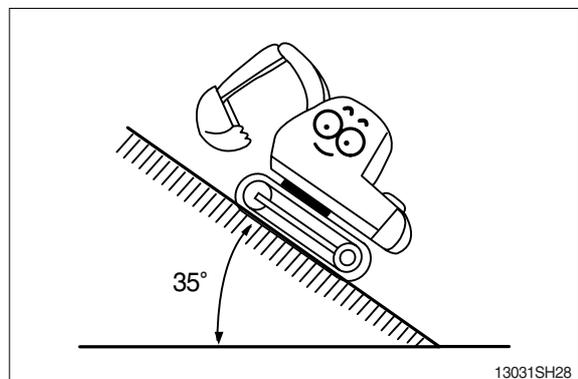
Traveling on a slope is dangerous. Be sure to operate slowly when traveling down a slope and maintain the bucket at a height of 20~30cm(1ft) above the ground so that it can be used as brake in an emergency.



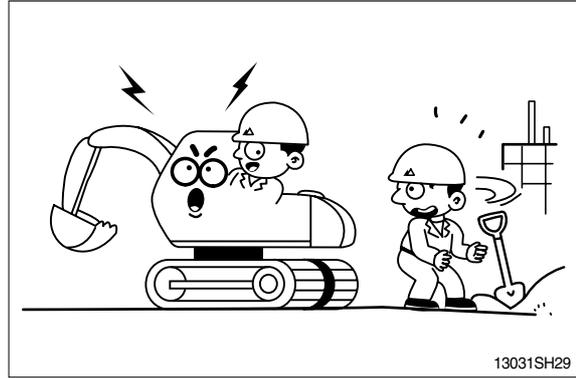
Steering of the machine while traveling on a slope is dangerous. When an inevitable turning of direction is required, turn on the flat and solid ground.



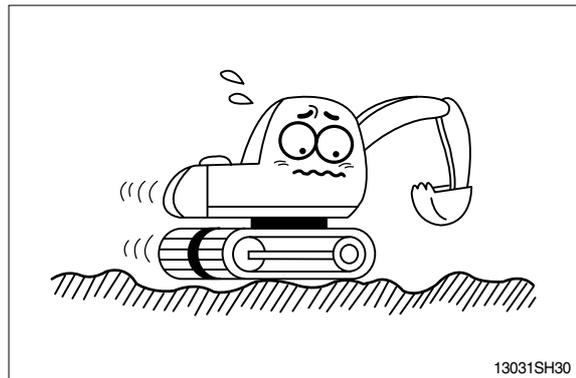
The engine angularity limits are 35 degree. Do not operate by more than the engine limits in any case.



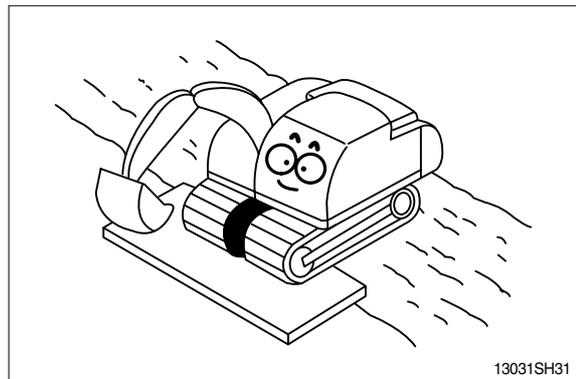
Before traveling the machine, sound the horn to warn nearby personnel.  
Operate forward and backward correctly with confirming the location of the travel motor.



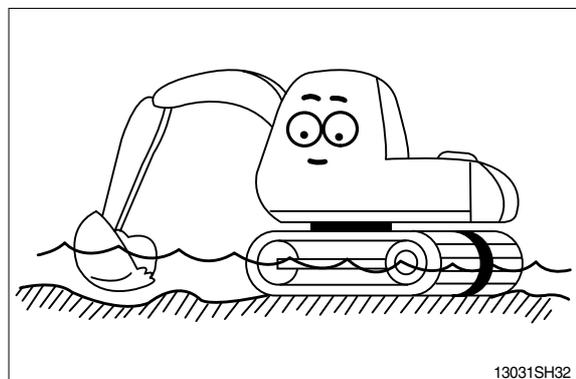
Slow down when traveling through obstacles or uneven ground.



When working on soft ground, place mats or wood boards on the ground to prevent the machine sinking.



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 carrier roller.



## MOUNTING AND DISMOUNTING

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

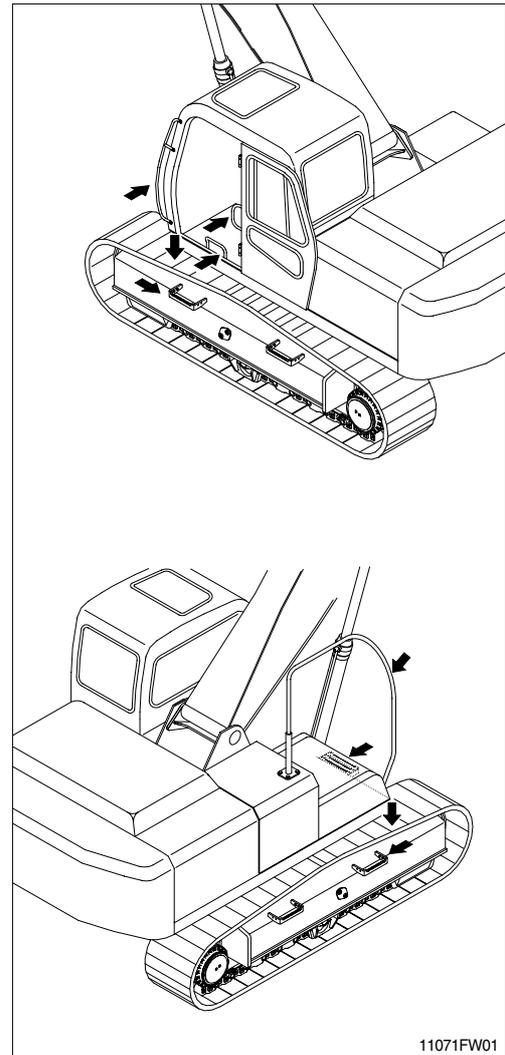
When mounting or dismounting, always face the machine and use the handrails, machine or track frame steps, and track shoes. Additional track frame step can be fitted for wider optional shoe. In this case please contact your Hyundai distributor.

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, steps or track shoes.

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

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

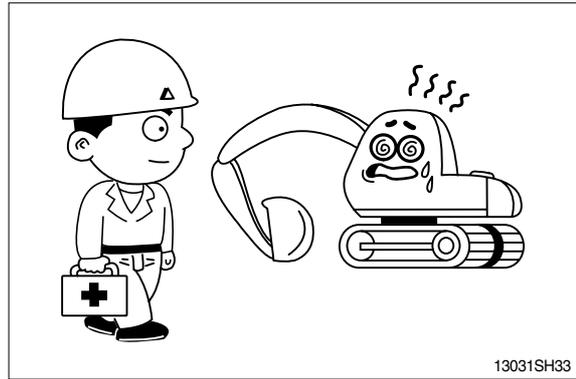


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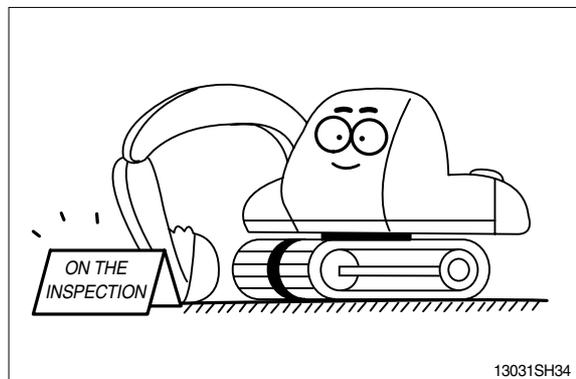
### 3. DURING MAINTENANCE

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.



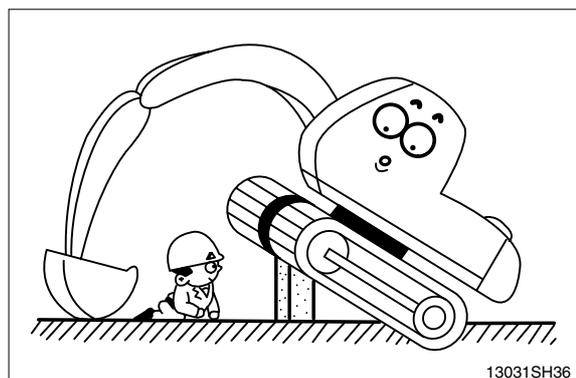
Park on a flat place and stop the engine for inspecting and repairing. Properly TAG machine is not operational. (Remove start key)  
Extreme care shall be taken during maintenance work. Parts may require additional safe guard.



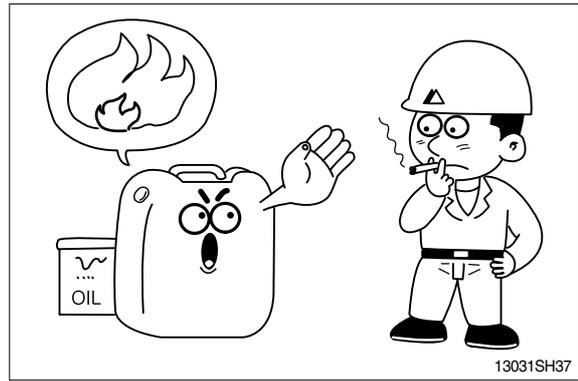
Do not remove the radiator cap from hot engine.  
Open the cap after the engine cools, below 50° C(112°F) to prevent personal injury from heated coolant spray or steam.



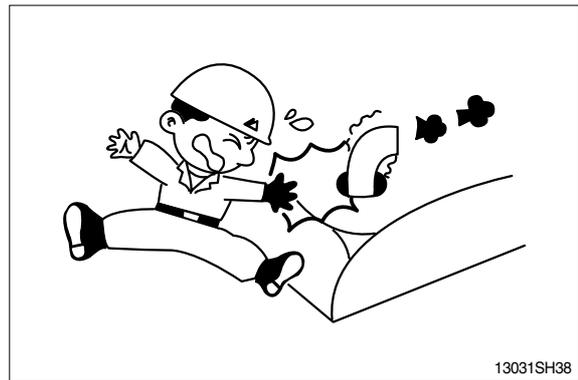
Do not work below the machine.  
Be sure to work with proper safety supports.  
Do not depend on the hydraulic cylinders to hold up the equipment and attachment.



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



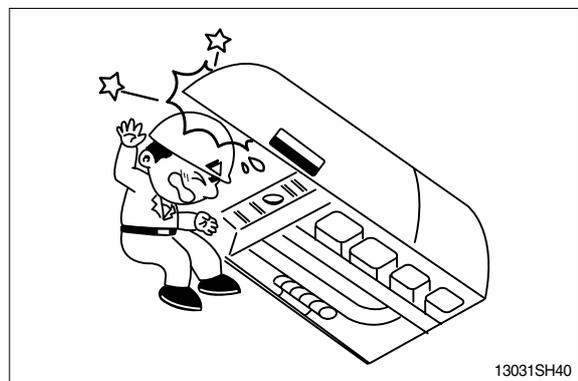
Do not touch exhaust pipe, or may cause severe burn.



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.

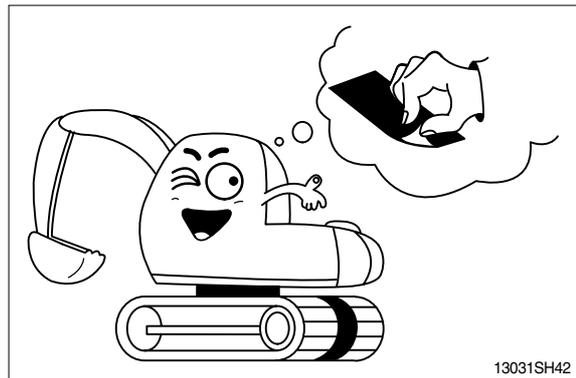
Be sure to support stay, when the side door needs to be opened.

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

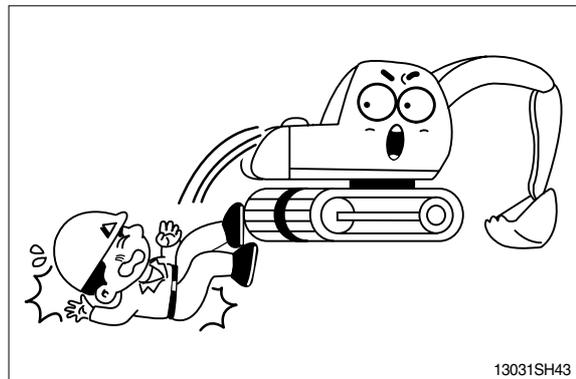


The antislip protection should be replaced if they have become worn or have been printed over.

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.

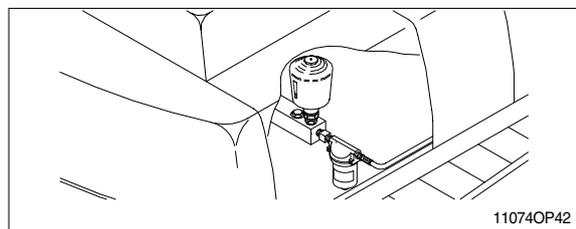


### HIGH PRESSURE GAS

Contain high pressure gas.

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

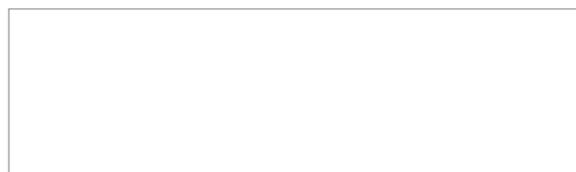
Relieve pressure before discharging.



### LIFT EYES CAN FAIL

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

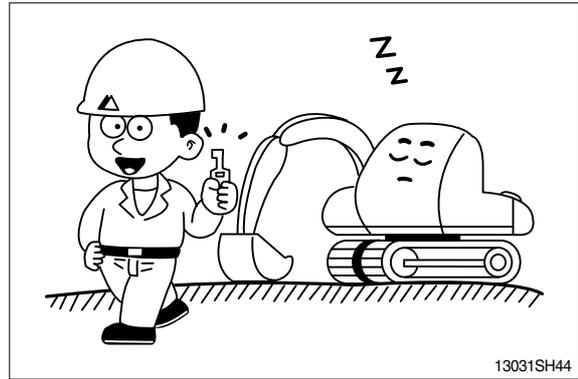
Drain tank of all fluids before lifting.



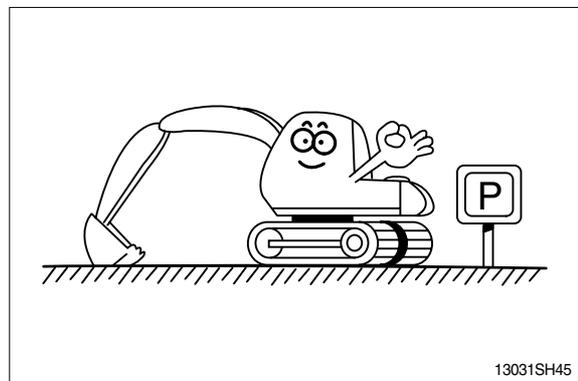
## 4. PARKING

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.

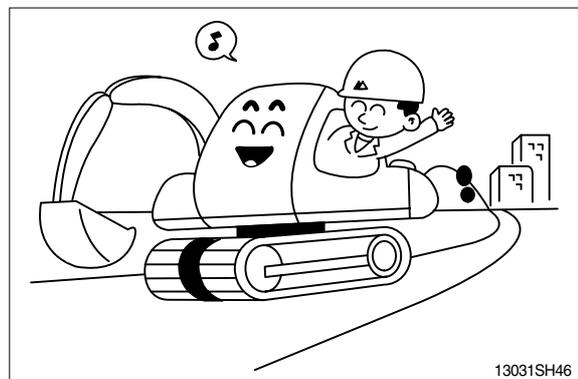


Park the machine in the flat and safe place.



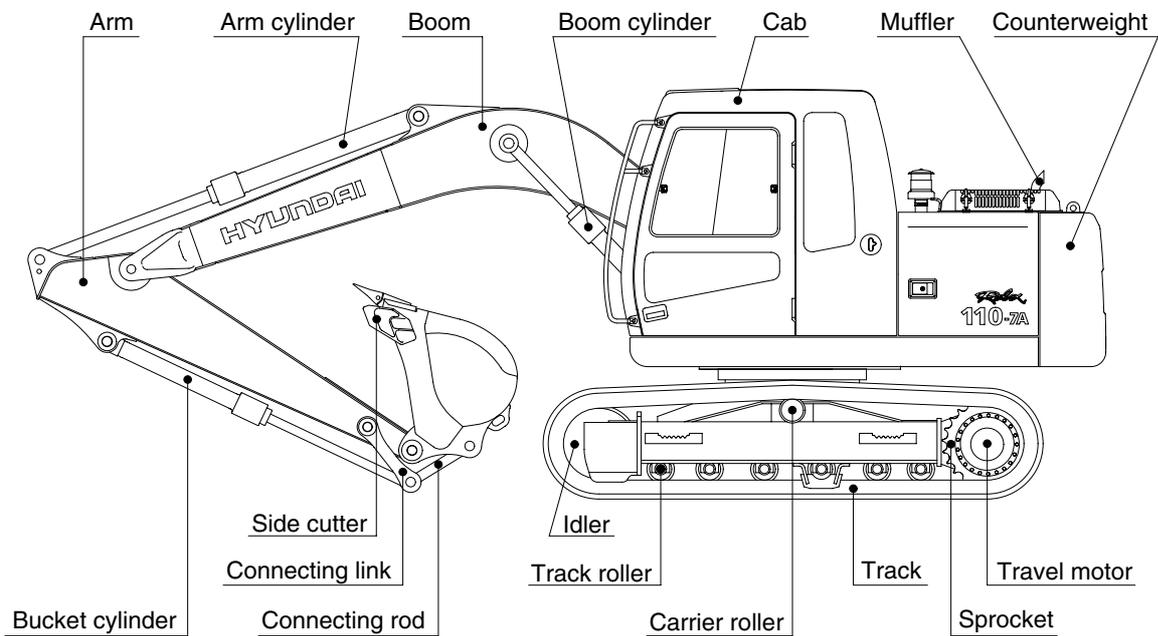
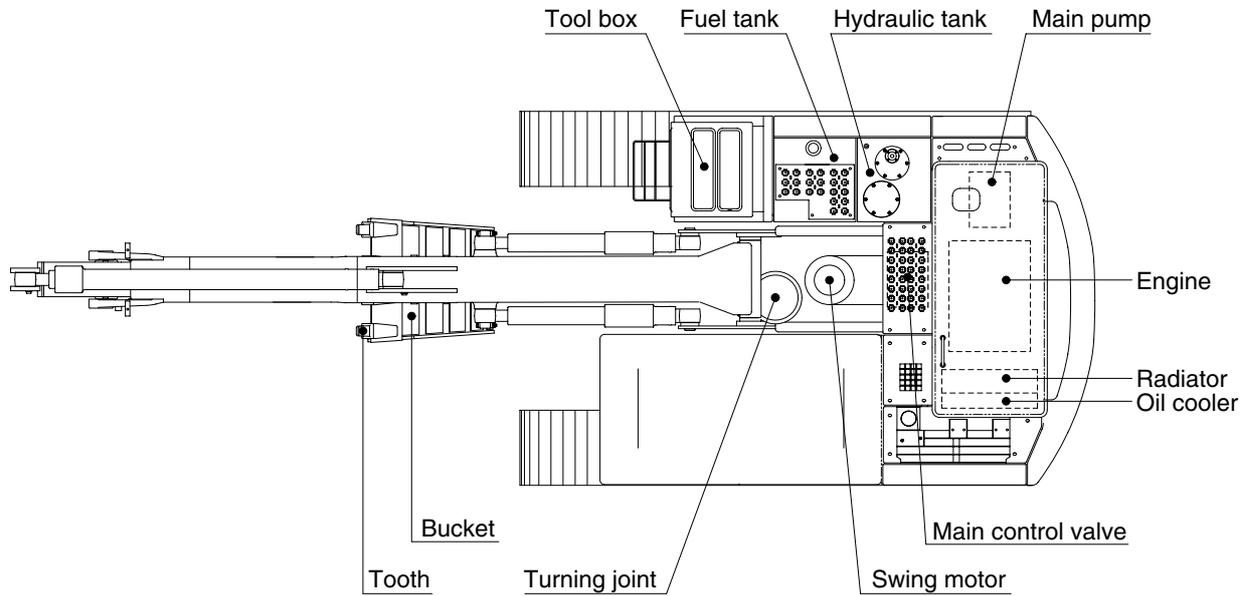
Hope you can work easily and safely observing safety rules.

For safe operation, observe all safety rules.



# SPECIFICATIONS

## 1. MAJOR COMPONENT

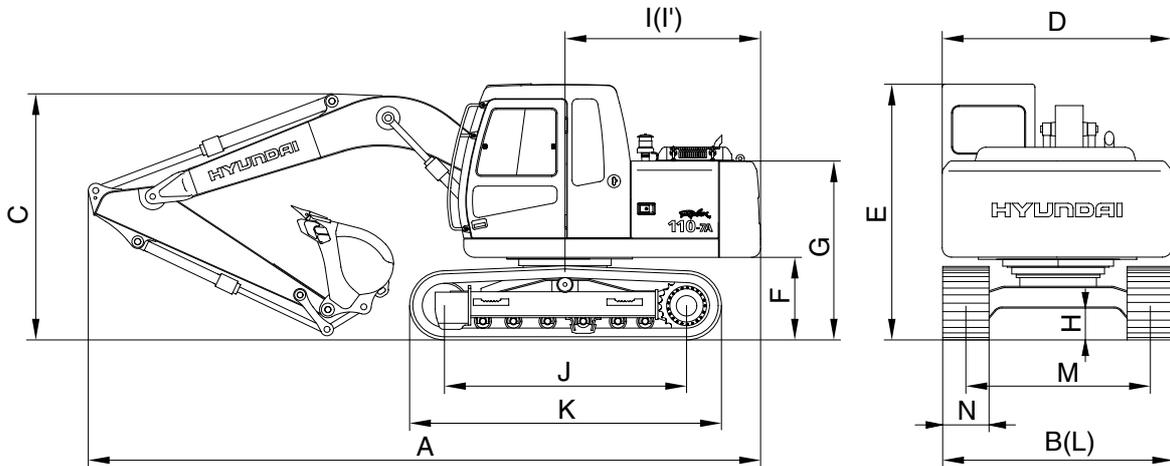


1107A2SP01

## 2. SPECIFICATIONS

### 1) R110-7A

(1) 4.3m(14' 1") MONO BOOM, 2.26m(7' 5") ARM

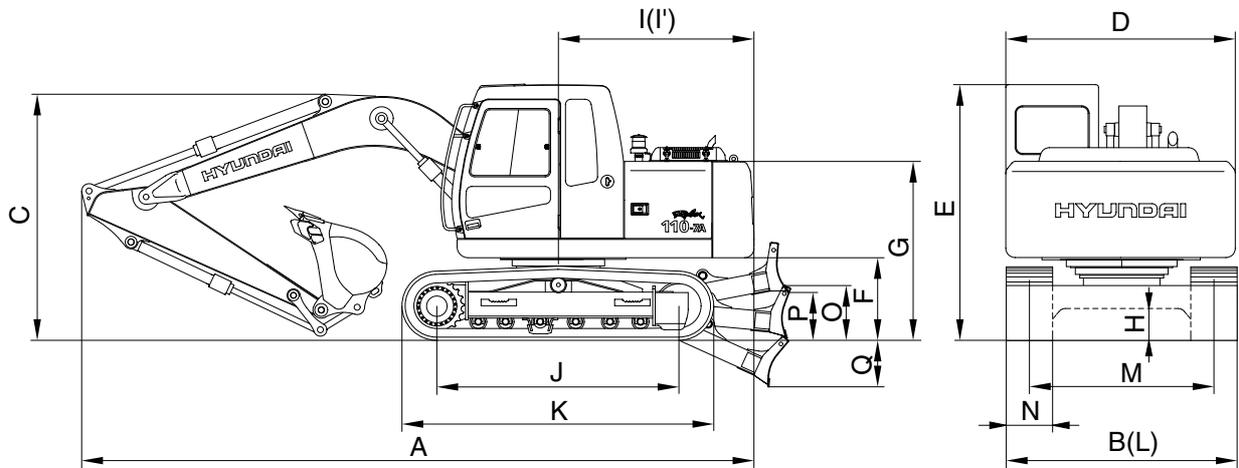


1107A2SP02

Description		Unit	Specification
Operating weight		kg(lb)	11200(24690)
Bucket capacity(SAE heaped), standard		m <sup>3</sup> (yd <sup>3</sup> )	0.45(0.59)
Overall length	A	mm(ft-in)	7270(23' 10")
Overall width, with 500mm shoe	B		2490( 8' 2")
Overall height	C		2720( 8' 11")
Superstructure width	D		2475( 8' 1")
Overall height of cab	E		2800( 9' 2")
Ground clearance of counterweight	F		900( 2' 11")
Engine cover height	G		1990( 6' 6")
Minimum ground clearance	H		440( 1' 5")
Rear-end distance	I		2110( 6' 11")
Rear-end swing radius	I'		2130( 7' 0")
Distance between tumblers	J		2610( 8' 7")
Undercarriage length	K		3340(10' 11")
Undercarriage width	L		2490( 8' 2")
Track gauge	M		1990( 6' 6")
Track shoe width, standard	N		500(20")
Travel speed(Low/high)		km/hr(mph)	3.4/5.2(2.1/3.2)
Swing speed		rpm	12.0
Gradeability		Degree(%)	35(70)
Ground pressure(500mm shoe)		kgf/cm <sup>2</sup> (psi)	0.39(5.55)

## 2) R110D-7A

### (1) 4.3m(14' 1") MONO BOOM, 2.26m(7' 5") ARM AND REAR DOZER BLADE



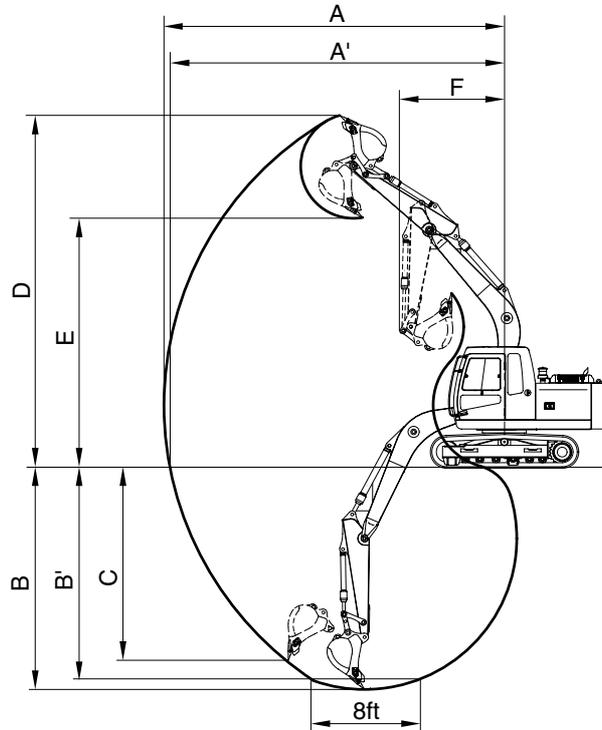
1107A2SP02A

Description		Unit	Specification	
Operating weight		kg(lb)	11900(26230)	
Bucket capacity(SAE heaped), standard		m <sup>3</sup> (yd <sup>3</sup> )	0.45(0.59)	
Overall length	A	mm(ft-in)	7650(25' 1")	
Overall width, with 500mm shoe	B		2500( 8' 2")	
Overall height	C		2720( 8' 11")	
Superstructure width	D		2475( 8' 1")	
Overall height of cab	E		2800( 9' 2")	
Ground clearance of counterweight	F		900( 2' 11")	
Engine cover height	G		1990( 6' 6")	
Minimum ground clearance	H		440( 1' 5")	
Rear-end distance	I		2110( 6' 11")	
Rear-end swing radius	I'		2130( 7' 0")	
Distance between tumbler	J		2610( 8' 7")	
Undercarriage length	K		3340(10' 11")	
Undercarriage width	L		2490( 8' 2")	
Track gauge	M		1990( 6' 6")	
Track shoe width, standard	N		500(20")	
Height of blade	O		550( 1' 10")	
Ground clearance of blade up	P		500( 1' 8")	
Depth of blade down	Q		520( 1' 8")	
Travel speed(Low/high)			km/hr(mph)	3.4/5.2(2.1/3.2)
Swing speed			rpm	12.0
Gradeability		Degree(%)	35(70)	
Ground pressure(500mm shoe)		kgf/cm <sup>2</sup> (psi)	0.42(5.97)	

### 3. WORKING RANGE

#### 1) R110-7A

#### (1) 4.3m(14' 1") MONO BOOM



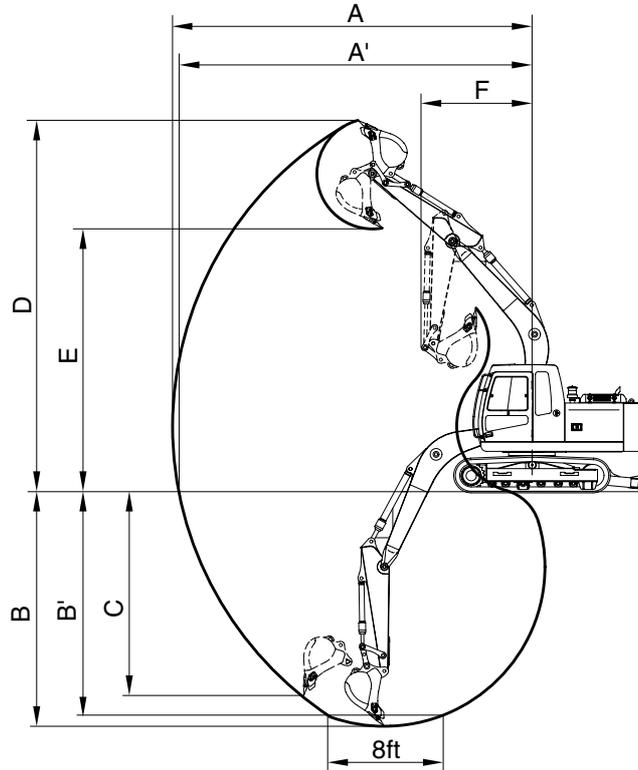
1107A2SP03

Description		1.96m(6' 5") Arm	※ 2.26m(7' 5") Arm	2.81m(9' 3") Arm
Max digging reach	A	7460mm (24' 6")	7740mm (25' 5")	8270mm (27' 2")
Max digging reach on ground	A'	7320mm (24' 0")	7610mm (25' 0")	8140mm (26' 8")
Max digging depth	B	4770mm (15' 8")	5090mm (16' 8")	5620mm (18' 5")
Max digging depth (8ft level)	B'	4510mm (14' 10")	4870mm (16' 0")	5410mm (17' 9")
Max vertical wall digging depth	C	4070mm (13' 4")	4430mm (14' 6")	4940mm (16' 2")
Max digging height	D	7900mm (25' 11")	8070mm (26' 6")	8460mm (27' 9")
Max dumping height	E	5540mm (18' 2")	5710mm (18' 9")	6100mm (20' 0")
Min swing radius	F	2340mm ( 7' 8")	2380mm ( 7' 10")	2510mm ( 8' 3")
Bucket digging force	SAE	78.5 [85.6] kN	78.5 [85.6] kN	78.5 [85.6] kN
		8000 [8730] kgf	8000 [8730] kgf	8000 [8730] kgf
		17640 [19240] lbf	17640 [19240] lbf	17640 [19240] lbf
	ISO	90.2 [98.4] kN	90.2 [98.4] kN	90.2 [98.4] kN
		9200 [10040] kgf	9200 [10040] kgf	9200 [10040] kgf
		20280 [22120] lbf	20280 [22120] lbf	20280 [22120] lbf
Arm digging force	SAE	60.2 [65.7] kN	55.7 [60.8] kN	48.1 [52.4] kN
		6140 [6700] kgf	5680 [6200] kgf	4900 [5350] kgf
		13540 [14770] lbf	12520 [13660] lbf	10800 [11780] lbf
	ISO	62.9 [68.6] kN	58.1 [63.3] kN	49.7 [54.2] kN
		6410 [6990] kgf	5920 [6460] kgf	5070 [5530] kgf
		14130 [15410] lbf	13050 [14240] lbf	11180 [12200] lbf

※ : STD [ ] : Power boost

2) R110D-7A

(1) 4.3m(14' 1") MONO BOOM



1107A2SP04

Description		1.96m(6' 5") Arm	※2.26m(7' 5") Arm	2.81m(9' 3") Arm
Max digging reach	A	7460mm (24' 6")	7740mm (25' 5")	8270mm (27' 2")
Max digging reach on ground	A'	7320mm (24' 0")	7610mm (25' 0")	8140mm (26' 8")
Max digging depth	B	4770mm (15' 8")	5090mm (16' 8")	5620mm (18' 5")
Max digging depth (8ft level)	B'	4510mm (14' 10")	4870mm (16' 0")	5410mm (17' 9")
Max vertical wall digging depth	C	4070mm (13' 4")	4430mm (14' 6")	4940mm (16' 2")
Max digging height	D	7900mm (25' 11")	8070mm (26' 6")	8460mm (27' 9")
Max dumping height	E	5540mm (18' 2")	5710mm (18' 9")	6100mm (20' 0")
Min swing radius	F	2340mm ( 7' 8")	2380mm ( 7' 10")	2510mm ( 8' 3")
Bucket digging force	SAE	78.5 [85.6] kN	78.5 [85.6] kN	78.5 [85.6] kN
		8000 [8730] kgf	8000 [8730] kgf	8000 [8730] kgf
		17640 [19240] lbf	17640 [9240] lbf	17640 [19240] lbf
	ISO	90.2 [98.4] kN	90.2 [98.4] kN	90.2 [98.4] kN
		9200 [10040] kgf	9200 [10040] kgf	9200 [10040] kgf
		20280 [22120] lbf	20280 [22120] lbf	20280 [22120] lbf
Arm digging force	SAE	60.2 [65.7] kN	55.7 [60.8] kN	48.1 [52.4] kN
		6140 [6700] kgf	5680 [6200] kgf	4900 [5350] kgf
		13540 [14770] lbf	12520 [13660] lbf	10800 [11780] lbf
	ISO	62.9 [68.6] kN	58.1 [63.3] kN	49.7 [54.2] kN
		6410 [6990] kgf	5920 [6460] kgf	5070 [5530] kgf
		14130 [15410] lbf	13050 [14240] lbf	11180 [12200] lbf

※ : STD [ ] : Power boost

## 4. WEIGHT

### 1) R110-7A

Item	kg	lb
Upperstructure assembly	3300	7280
Main frame weld assembly	1030	2270
Engine assembly	420	930
Main pump assembly	90	200
Main control valve assembly	130	290
Swing motor assembly	130	290
Hydraulic oil tank assembly	180	400
Fuel tank assembly	130	290
Counterweight	1450	3200
Cab assembly	310	680
Lower chassis assembly	3990	8800
Track frame weld assembly	1260	2780
Swing bearing	160	250
Travel motor assembly	330	730
Turning joint	60	130
Track recoil spring	210	460
Idler	390	860
Carrier roller	30	66
Track roller	300	660
Track-chain assembly(500mm standard triple grouser shoe)	1350	2980
Front attachment assembly(4.3m boom, 2.26m arm, 0.45m <sup>3</sup> SAE heaped bucket)	1640	3620
4.3m boom assembly	740	1630
2.26m arm assembly	340	750
0.45m <sup>3</sup> SAE heaped bucket	440	970
Boom cylinder assembly	230	510
Arm cylinder assembly	140	310
Bucket cylinder assembly	90	200
Bucket control link assembly	80	180

## 5. LIFTING CAPACITIES

### 1) ROBEX 110-7A

(1) 4.3m(14' 1") boom, 2.26m(7' 5") arm equipped with 0.45m<sup>3</sup>(SAE heaped) bucket and 500mm(20") triple grouser shoe and 1450kg counterweight.

Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach m(ft)
												
6.0m (20ft)	kg lb					*1750 <b>*3860</b>	*1750 <b>*3860</b>			*1750 <b>*3860</b>	*1560 <b>*3440</b>	5.99 <b>(19.7)</b>
4.5m (15ft)	kg lb					*1790 <b>*3950</b>	*1790 <b>*3950</b>	*1530 <b>*3370</b>	1490 <b>3280</b>	1520 <b>3350</b>	1130 <b>2490</b>	6.92 <b>(22.7)</b>
3.0m (10ft)	kg lb			*2820 <b>*6220</b>	*2820 <b>*6220</b>	*2270 <b>*5000</b>	*2270 <b>*5000</b>	1940 <b>4280</b>	1450 <b>3200</b>	1300 <b>2870</b>	940 <b>2070</b>	7.38 <b>(24.2)</b>
1.5m (5ft)	kg lb			*4700 <b>*10360</b>	4370 <b>9630</b>	*2970 <b>*6550</b>	2250 <b>4960</b>	1840 <b>4060</b>	1360 <b>3000</b>	1240 <b>2730</b>	880 <b>1940</b>	7.46 <b>(24.5)</b>
Ground Line	kg lb			5660 <b>12480</b>	3950 <b>8710</b>	2830 <b>6240</b>	2060 <b>4540</b>	1760 <b>3880</b>	1280 <b>2820</b>	1300 <b>2870</b>	930 <b>2050</b>	7.18 <b>(23.6)</b>
-1.5m (-5ft)	kg lb	*5580 <b>*12300</b>	*5580 <b>*12300</b>	5550 <b>12240</b>	3850 <b>8490</b>	2740 <b>6040</b>	1980 <b>4370</b>	1720 <b>3790</b>	1240 <b>2730</b>	1560 <b>3440</b>	1130 <b>2490</b>	6.49 <b>(21.3)</b>
-3.0m (-10ft)	kg lb	*8530 <b>*18810</b>	*8530 <b>*18810</b>	*5440 <b>*11990</b>	3930 <b>8660</b>	2770 <b>6110</b>	2010 <b>4430</b>			*2270 <b>*5000</b>	1730 <b>3810</b>	5.17 <b>(17.0)</b>

(2) 4.3m(14' 1") boom, 1.96m(6' 5") arm equipped with 0.45m<sup>3</sup>(SAE heaped) bucket and 500mm(20") triple grouser shoe and 1450kg counterweight.

Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach m(ft)
												
6.0m (20ft)	kg lb					*1770 <b>*3900</b>	*1770 <b>*3900</b>			*1820 <b>*4010</b>	1710 <b>3770</b>	5.62 <b>(18.4)</b>
4.5m (15ft)	kg lb					*1950 <b>*4300</b>	*1950 <b>*4300</b>			1610 <b>3550</b>	1180 <b>2600</b>	6.62 <b>(21.7)</b>
3.0m (10ft)	kg lb			*3160 <b>*6970</b>	*3160 <b>*6970</b>	*2410 <b>*5310</b>	2390 <b>5270</b>	1870 <b>4120</b>	1380 <b>3040</b>	1350 <b>2980</b>	970 <b>2140</b>	7.10 <b>(23.3)</b>
1.5m (5ft)	kg lb			*4940 <b>*10890</b>	4150 <b>9150</b>	2930 <b>6460</b>	2150 <b>4740</b>	1780 <b>3920</b>	1290 <b>2840</b>	1280 <b>2820</b>	910 <b>2010</b>	7.18 <b>(23.6)</b>
Ground Line	kg lb			5490 <b>12100</b>	3800 <b>8380</b>	2740 <b>6040</b>	1980 <b>4370</b>	1700 <b>3750</b>	1220 <b>2690</b>	1360 <b>3000</b>	960 <b>2120</b>	6.89 <b>(22.6)</b>
-1.5m (-5ft)	kg lb	*6090 <b>*13430</b>	*6090 <b>*13430</b>	5440 <b>11990</b>	3750 <b>8270</b>	2670 <b>5890</b>	1910 <b>4210</b>			1670 <b>3680</b>	1200 <b>2650</b>	6.15 <b>(20.2)</b>
-3.0m (-10ft)	kg lb	*9180 <b>*20240</b>	*9180 <b>*20240</b>	*5080 <b>*11200</b>	3880 <b>8550</b>	2750 <b>6060</b>	1980 <b>4370</b>					

- 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.

(3) 4.3m(14' 1") boom, 2.81m(9' 3") arm equipped with 0.45m<sup>3</sup>(SAE heaped) bucket and 500mm(20") triple grouser shoe and 1450kg counterweight.

Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach m(ft)
												
6.0m (20ft)	kg lb									*1570 <b>*3460</b>	1290 <b>2840</b>	6.66 <b>(21.9)</b>
4.5m (15ft)	kg lb							*1640 <b>*3620</b>	1570 <b>3460</b>	1330 <b>2930</b>	980 <b>2160</b>	7.50 <b>(24.6)</b>
3.0m (10ft)	kg lb					*1920 <b>*4230</b>	*1920 <b>*4230</b>	*1830 <b>*4030</b>	1500 <b>3310</b>	1160 <b>2560</b>	830 <b>1830</b>	7.92 <b>(26.0)</b>
1.5m (5ft)	kg lb			*4050 <b>*8930</b>	*4050 <b>*8930</b>	*2690 <b>*5930</b>	2340 <b>5160</b>	1890 <b>4170</b>	1410 <b>3110</b>	1100 <b>2430</b>	780 <b>1720</b>	7.99 <b>(26.2)</b>
Ground Line	kg lb	*3230 <b>*7120</b>	*3230 <b>*7120</b>	*5580 <b>*12300</b>	4110 <b>9060</b>	2900 <b>6390</b>	2130 <b>4700</b>	1790 <b>3950</b>	1310 <b>2890</b>	1150 <b>2540</b>	820 <b>1810</b>	7.74 <b>(25.4)</b>
-1.5m (-5ft)	kg lb	*4960 <b>*10930</b>	*4960 <b>*10930</b>	5620 <b>12390</b>	3920 <b>8640</b>	2770 <b>6110</b>	2010 <b>4430</b>	1730 <b>3810</b>	1250 <b>2760</b>	1330 <b>2930</b>	960 <b>2120</b>	7.11 <b>(23.3)</b>
-3.0m (-10ft)	kg lb	*7230 <b>*15940</b>	*7230 <b>*15940</b>	5630 <b>12410</b>	3930 <b>8660</b>	2760 <b>6080</b>	2000 <b>4410</b>			1830 <b>4030</b>	1350 <b>2980</b>	5.96 <b>(19.6)</b>
-4.5m (-15ft)	kg lb			*4480 <b>*9880</b>	4100 <b>9040</b>							

(4) 4.3m(14' 1") boom, 2.26m(7' 5") arm equipped with 0.45m<sup>3</sup>(SAE heaped) bucket and 500mm(20") triple grouser shoe, 1450kg counterweight and rear dozer blade down.

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

Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach m(ft)
												
6.0m (20ft)	kg lb					*1750 <b>*3860</b>	*1750 <b>*3860</b>			*1750 <b>*3860</b>	*1750 <b>*3860</b>	5.99 <b>(19.7)</b>
4.5m (15ft)	kg lb					*1790 <b>*3950</b>	*1790 <b>*3950</b>	*1530 <b>*3370</b>	*1530 <b>*3370</b>	1650 <b>3640</b>	1340 <b>2950</b>	6.92 <b>(22.7)</b>
3.0m (10ft)	kg lb			*2820 <b>*6220</b>	*2820 <b>*6220</b>	*2270 <b>*5000</b>	*2270 <b>*5000</b>	*2060 <b>*4540</b>	1710 <b>3770</b>	1420 <b>3130</b>	1140 <b>2510</b>	7.38 <b>(24.2)</b>
1.5m (5ft)	kg lb			*4700 <b>*10360</b>	*4700 <b>*10360</b>	*2970 <b>*6550</b>	2650 <b>5840</b>	2000 <b>4410</b>	1620 <b>3570</b>	1360 <b>3000</b>	1080 <b>2380</b>	7.46 <b>(24.5)</b>
Ground Line	kg lb			*5860 <b>*12920</b>	4750 <b>10470</b>	3060 <b>6750</b>	2460 <b>5420</b>	1910 <b>4210</b>	1540 <b>3400</b>	1430 <b>3150</b>	1140 <b>2510</b>	7.18 <b>(23.6)</b>
-1.5m (-5ft)	kg lb	*5580 <b>*12300</b>	*5580 <b>*12300</b>	5980 <b>13180</b>	4640 <b>10230</b>	2970 <b>6550</b>	2370 <b>5220</b>	1880 <b>4140</b>	1500 <b>3310</b>	1700 <b>3750</b>	1360 <b>3000</b>	6.49 <b>(21.3)</b>
-3.0m (-10ft)	kg lb	*8530 <b>*18810</b>	*8530 <b>*18810</b>	*5440 <b>*11990</b>	4720 <b>10410</b>	3000 <b>6610</b>	2400 <b>5290</b>			*2270 <b>*5000</b>	2050 <b>4520</b>	5.17 <b>(17.0)</b>

(5) 4.3m(14' 1") boom, 1.96m(6' 5") arm equipped with 0.45m<sup>3</sup>(SAE heaped) bucket and 500mm(20") triple grouser shoe, 1450kg counterweight and rear dozer blade down.

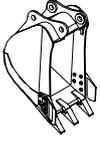
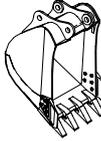
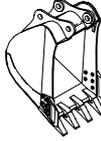
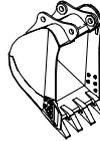
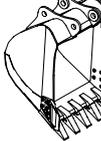
Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach
												m(ft)
6.0m (20ft)	kg lb					*1770 <b>*3900</b>	*1770 <b>*3900</b>			*1820 <b>*4010</b>	*1820 <b>*4010</b>	5.62 <b>(18.4)</b>
4.5m (15ft)	kg lb					*1950 <b>*4300</b>	*1950 <b>*4300</b>			1750 <b>3860</b>	1420 <b>3130</b>	6.62 <b>(21.7)</b>
3.0m (10ft)	kg lb			*3160 <b>*6970</b>	*3160 <b>*6970</b>	*2410 <b>*5310</b>	*2410 <b>*5310</b>	2020 <b>4450</b>	1640 <b>3620</b>	1480 <b>3260</b>	1180 <b>2600</b>	7.10 <b>(23.3)</b>
1.5m (5ft)	kg lb			*4940 <b>*10890</b>	*4940 <b>*10890</b>	*3060 <b>*6750</b>	2550 <b>5620</b>	1940 <b>4280</b>	1560 <b>3440</b>	1410 <b>3110</b>	1120 <b>2470</b>	7.18 <b>(23.6)</b>
Ground Line	kg lb			*5870 <b>*12940</b>	4580 <b>10100</b>	2970 <b>6550</b>	2370 <b>5220</b>	1860 <b>4100</b>	1480 <b>3260</b>	1490 <b>3280</b>	1180 <b>2600</b>	6.89 <b>(22.6)</b>
-1.5m (-5ft)	kg lb	*6090 <b>*13430</b>	*6090 <b>*13430</b>	*5860 <b>*12920</b>	4540 <b>10010</b>	2900 <b>6390</b>	2310 <b>5090</b>			1820 <b>4010</b>	1460 <b>3220</b>	6.15 <b>(20.2)</b>
-3.0m (-10ft)	kg lb	*9180 <b>*20240</b>	*9180 <b>*20240</b>	*5080 <b>*11200</b>	4670 <b>10300</b>	2980 <b>6570</b>	2380 <b>5250</b>					

(6) 4.3m(14' 1") boom, 2.81m(9' 3") arm equipped with 0.45m<sup>3</sup>(SAE heaped) bucket and 500mm(20") triple grouser shoe, 1450kg counterweight and rear dozer blade down.

Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach
												m(ft)
6.0m (20ft)	kg lb									*1570 <b>*3460</b>	*1520 <b>*3350</b>	6.66 <b>(21.9)</b>
4.5m (15ft)	kg lb							*1640 <b>*3620</b>	*1640 <b>*3620</b>	1450 <b>3200</b>	1170 <b>2580</b>	7.50 <b>(24.6)</b>
3.0m (10ft)	kg lb					*1920 <b>*4230</b>	*1920 <b>*4230</b>	*1830 <b>*4030</b>	1770 <b>3900</b>	1270 <b>2800</b>	1020 <b>2250</b>	7.92 <b>(26.0)</b>
1.5m (5ft)	kg lb			*4050 <b>*8930</b>	*4050 <b>*8930</b>	*2690 <b>*5930</b>	*2690 <b>*5930</b>	2050 <b>4520</b>	1670 <b>3680</b>	1210 <b>2670</b>	960 <b>2120</b>	7.99 <b>(26.2)</b>
Ground Line	kg lb	*3230 <b>*7120</b>	*3230 <b>*7120</b>	*5580 <b>*12300</b>	4910 <b>10820</b>	3130 <b>6900</b>	2530 <b>5580</b>	1950 <b>4300</b>	1570 <b>3460</b>	1290 <b>2780</b>	1000 <b>2200</b>	7.74 <b>(25.4)</b>
-1.5m (-5ft)	kg lb	*4960 <b>*10930</b>	*4960 <b>*10930</b>	6060 <b>13360</b>	4710 <b>10380</b>	3000 <b>6610</b>	2410 <b>5310</b>	1890 <b>4170</b>	1510 <b>3330</b>	1460 <b>3220</b>	1170 <b>2580</b>	7.11 <b>(23.3)</b>
-3.0m (-10ft)	kg lb	*7230 <b>*15940</b>	*7230 <b>*15940</b>	*5830 <b>*12850</b>	4720 <b>10410</b>	2980 <b>6570</b>	2390 <b>5270</b>			1990 <b>4390</b>	1610 <b>3550</b>	5.96 <b>(19.6)</b>
-4.5m (-15ft)	kg lb			*4480 <b>*9880</b>	*4480 <b>*9880</b>							

## 6. BUCKET SELECTION GUIDE

### 1) GENERAL BUCKET

				
0.30m <sup>3</sup> SAE heaped bucket	0.40m <sup>3</sup> SAE heaped bucket	※ 0.45m <sup>3</sup> SAE heaped bucket	0.50m <sup>3</sup> SAE heaped bucket	0.59m <sup>3</sup> SAE heaped bucket

Capacity		Width		Weight	Recommendation		
					4.3m (14' 1") Mono boom		
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.96m arm (6' 5")	2.26m arm (7' 5")	2.81m arm (9' 3")
0.30m <sup>3</sup> (0.39yd <sup>3</sup> )	0.27m <sup>3</sup> (0.35yd <sup>3</sup> )	610mm (24.0")	720mm (28.3")	360kg (790lb)			
0.40m <sup>3</sup> (0.52yd <sup>3</sup> )	0.36m <sup>3</sup> (0.47yd <sup>3</sup> )	760mm (29.9")	870mm (34.3")	410kg (900lb)			
※ 0.45m <sup>3</sup> (0.59yd <sup>3</sup> )	0.40m <sup>3</sup> (0.52yd <sup>3</sup> )	830mm (32.7")	940mm (37.0")	430kg (950lb)			
0.50m <sup>3</sup> (0.65yd <sup>3</sup> )	0.45m <sup>3</sup> (0.59yd <sup>3</sup> )	900mm (35.4")	1010mm (39.8")	450kg (990lb)			
0.59m <sup>3</sup> (0.77yd <sup>3</sup> )	0.52m <sup>3</sup> (0.68yd <sup>3</sup> )	1020mm (40.2")	1130mm (44.5")	490kg (1080lb)			

※ : Standard bucket

 Applicable for materials with density of 2000kg/m<sup>3</sup> (3370lb/yd<sup>3</sup>) or less

 Applicable for materials with density of 1600kg/m<sup>3</sup> (2700lb/yd<sup>3</sup>) or less

 Applicable for materials with density of 1100kg/m<sup>3</sup> (1850lb/yd<sup>3</sup>) or less

## 7. UNDERCARRIAGE

### 1) TRACKS

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

### 2) TYPES OF SHOES

Model	Shapes		Triple grouser		
					
R110-7A	Shoe width	mm(in)	500(20)	600(24)	700(28)
	Operating weight	kg(lb)	11200(24690)	11500(25350)	11800(26010)
	Ground pressure	kgf/cm <sup>2</sup> (psi)	0.39(5.55)	0.34(4.84)	0.30(4.27)
	Overall width	mm(ft-in)	2490(8' 2")	2590(8' 6")	2690(8'10")
R110D-7A	Overall width	mm(ft-in)	11900(26230)	12200(26900)	12500(27560)
	Overall width	mm(ft-in)	0.42(5.97)	0.36(5.12)	0.31(4.41)
	Overall width	mm(ft-in)	2500(8' 2")	2590(8' 6")	2690(8'10")

### 3) NUMBER OF ROLLERS AND SHOES ON EACH SIDE

Item	Quantity
Carrier rollers	1EA
Track rollers	6EA
Track shoes	41EA

### 4) SELECTION OF TRACK SHOE

Suitable track shoes should be selected according to operating conditions.

#### Method of selecting shoes

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

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

※ **Table 1**

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

※ **Table 2**

Category	Applications	Precautions
A	Rocky ground, river beds, normal soil	<ul style="list-style-type: none"> <li>• Travel at low speed on rough ground with large obstacles such as boulders or fallen trees</li> </ul>
B	Normal soil, soft ground	<ul style="list-style-type: none"> <li>• These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees</li> <li>• Travel at high speed only on flat ground</li> <li>• Travel slowly at low speed if it is impossible to avoid going over obstacles</li> </ul>
C	Extremely soft ground (Swampy ground)	<ul style="list-style-type: none"> <li>• Use the shoes only in the conditions that the machine sinks and it is impossible to use the shoes of category A or B</li> <li>• These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees</li> <li>• Travel at high speed only on flat ground</li> <li>• Travel slowly at low speed if it is impossible to avoid going over obstacles</li> </ul>

## 8. SPECIFICATIONS FOR MAJOR COMPONENTS

### 1) ENGINE

Item	Specification
Model	Mitsubishi D04FD-TAA
Type	4-cycle turbocharged charge air cooled diesel engine
Cooling method	Water cooling
Number of cylinders and arrangement	4 cylinders, in-line
Firing order	1-3-4-2
Combustion chamber type	Direct injection type
Cylinder bore × stroke	102 × 130mm(4.02" × 5.12")
Piston displacement	4249cc(259cu in)
Compression ratio	16.5:1
Rated gross horse power(SAE J1995)	97Hp at 1800rpm(72kW at 1800rpm)
Maximum torque at 1400rpm	42.8kgf · m(310lbf · ft)
Engine oil quantity	18.5 l (4.9U.S. gal)
Dry weight	420kg(926lb)
High idling speed	1900 ± 50rpm
Low idling speed	900 ± 100rpm
Rated fuel consumption	163.7g/Hp · hr at 1800rpm
Starting motor	Mitsubishi 24V-5.0kW
Alternator	Mitsubishi 24V-50A
Battery	2 × 12V × 80Ah

### 2) MAIN PUMP

Item	Specification
Type	Variable displacement tandem axis piston pumps
Capacity	2 × 59.5cc/rev
Maximum pressure	330kgf/cm <sup>2</sup> (4694psi) [360kgf/cm <sup>2</sup> (5120psi)]
Rated oil flow	2 × 107 l /min (2 × 28.3U.S.gpm)
Rated speed	1800rpm

[ ]: Poer boost

### 3) GEAR PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	15cc/rev
Maximum pressure	35kgf/cm <sup>2</sup> (500psi)
Rated oil flow	27.0 l /min(7.1U.S.gpm/5.9U.K.gpm)

### 4) MAIN CONTROL VALVE

Item	Specification
Type	11 spools mono-block
Operating method	Hydraulic pilot system
Main relief valve pressure	330kgf/cm <sup>2</sup> (4695psi)[360kgf/cm <sup>2</sup> (5120psi)]
Overload relief valve pressure	380kgf/cm <sup>2</sup> (5550psi)

[ ]: Power boost

### 5) SWING MOTOR

Item	Specification
Type	Axial piston motor
Capacity	64.3cc/rev
Relief pressure	240kgf/cm <sup>2</sup> (3414psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	25kgf · m <sup>2</sup> (181lbf · ft)
Brake release pressure	33~50kgf/cm <sup>2</sup> (469~711psi)
Reduction gear type	2 - stage planetary
Swing speed	13.0rpm

### 6) TRAVEL MOTOR

Item	Specification
Type	Variable displacement axial piston motor
Relief pressure	330kgf/cm <sup>2</sup> (4695psi)
Reduction gear type	2 stage planetary
Braking system	Automatic, spring applied hydraulic released
Brake release pressure	Less than 9kgf/cm <sup>2</sup> (128psi)
Braking torque	24.36kgf · m <sup>2</sup> (176lbf · ft)

## 7) REMOTE CONTROL VALVE

Item		Specification
Type		Pressure reducing type
Operating pressure	Minimum	6.5kgf/cm <sup>2</sup> (92psi)
	Maximum	26kgf/cm <sup>2</sup> (370psi)
Single operation stroke	Lever	61mm(2.4in)
	Pedal	123mm(4.84in)

## 8) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	∅ 95 × ∅ 70 × 1015mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	∅ 110 × ∅ 75 × 1070mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	∅ 95 × ∅ 65 × 855mm
	Cushion	Extend only
Dozer cylinder	Bore dia × Rod dia × Stroke	∅ 100 × ∅ 70 × 240mm
	Cushion	-

※ Discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

※ Discoloration does not cause any harmful effect on the cylinder performance.

## 9) SHOE

Item		Width	Ground pressure	Link quantity	Overall width
R110-7A	Standard	500mm(20")	0.39kgf/cm <sup>2</sup> (5.55psi)	41	2490mm( 8' 2")
	Option	600mm(24")	0.34kgf/cm <sup>2</sup> (4.84psi)	41	2590mm( 8' 6")
	Option	700mm(28")	0.30kgf/cm <sup>2</sup> (4.27psi)	41	2690mm( 8' 10")

## 10) BUCKET

Item		Capacity		Tooth quantity	Width	
		SAE heaped	CECE heaped		Without side cutter	With side cutter
R110-7A	STD	0.45m <sup>3</sup> (0.59yd <sup>3</sup> )	0.40m <sup>3</sup> (0.52yd <sup>3</sup> )	4	830mm(32.7")	940mm(37.0")
	OPT	0.30m <sup>3</sup> (0.39yd <sup>3</sup> )	0.27m <sup>3</sup> (0.35yd <sup>3</sup> )	3	610mm(24.0")	720mm(28.3")
		0.40m <sup>3</sup> (0.52yd <sup>3</sup> )	0.36m <sup>3</sup> (0.47yd <sup>3</sup> )	4	760mm(29.9")	870mm(34.3")
		0.50m <sup>3</sup> (0.65yd <sup>3</sup> )	0.45m <sup>3</sup> (0.59yd <sup>3</sup> )	4	900mm(35.4")	1010mm(39.8")
		0.59m <sup>3</sup> (0.77yd <sup>3</sup> )	0.52m <sup>3</sup> (0.68yd <sup>3</sup> )	5	1020mm(40.2")	1130mm(44.5")

## 9. 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)						
			-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)
Engine oil pan	Engine oil	18.5(4.9)	SAE 30						
			SAE 10W						
			SAE 10W-30						
			SAE 15W-40						
Swing drive	Gear oil	2.5(0.7)	SAE 85W-140						
Final drive		$\frac{2.5 \times 2}{0.7 \times 2}$							
Swing drive	Grease	0.32(0.1)	NLGI NO.1						
			NLGI NO.2						
Hydraulic tank	Hydraulic oil	Tank:100(26.4) System: 210(55.5)	ISO VG 32						
			ISO VG 46						
			ISO VG 68						
Fuel tank	Diesel fuel	256(67.6)	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 water 50 : 50	22(5.8)	Ethylene glycol base permanent type						

**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

# CONTROL DEVICES

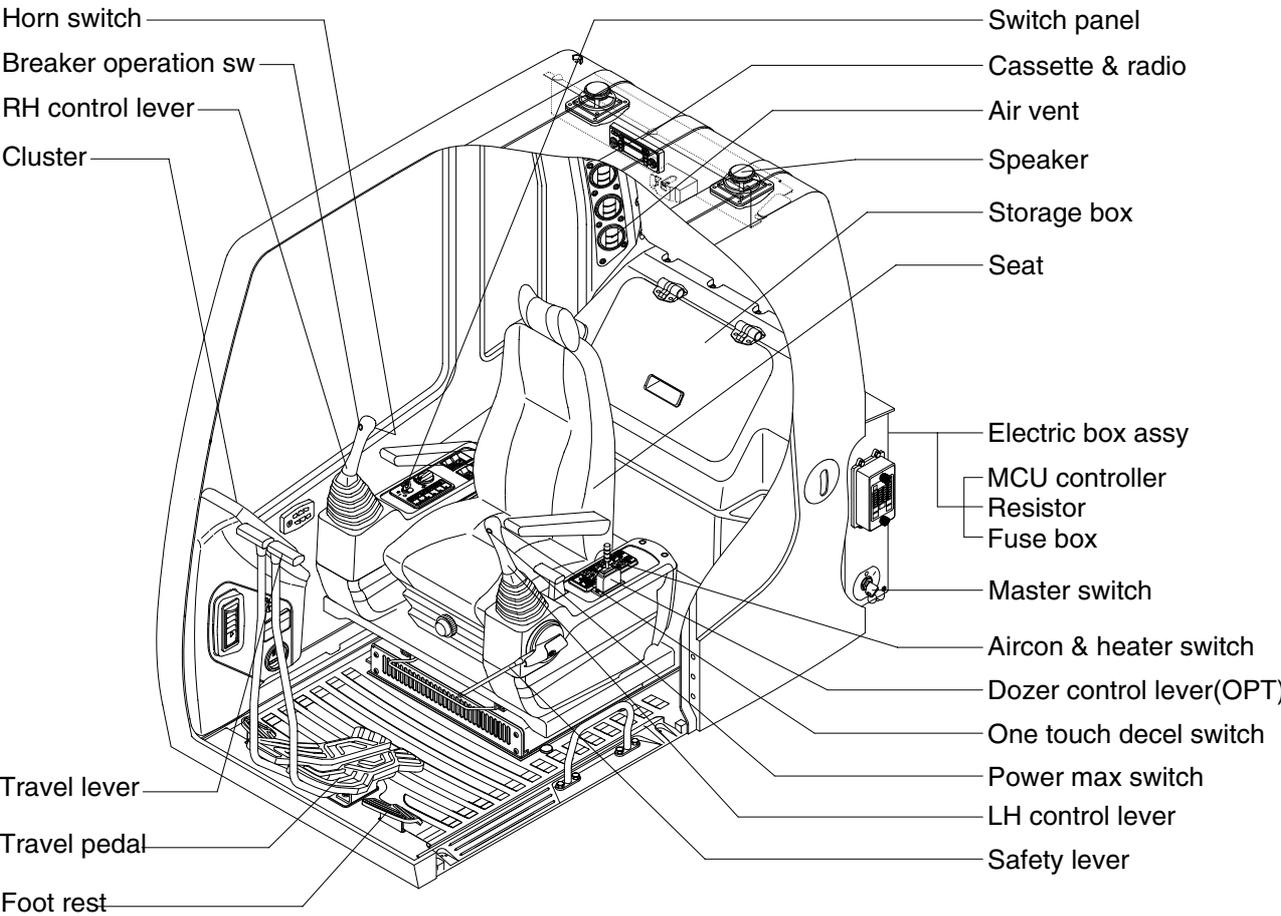
## 1. CAB DEVICES

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.



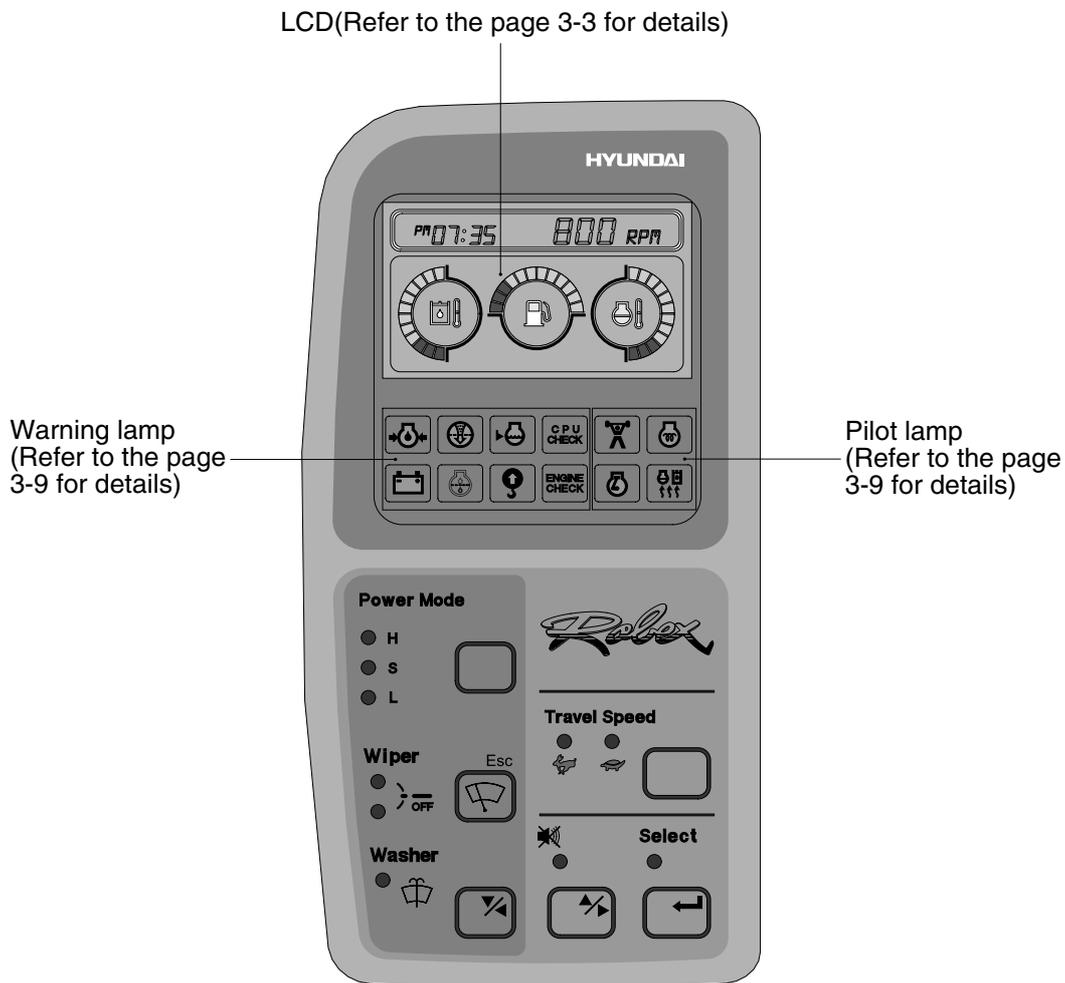
1107A3CD01

## 2. CLUSTER

### 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.

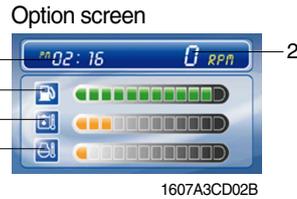
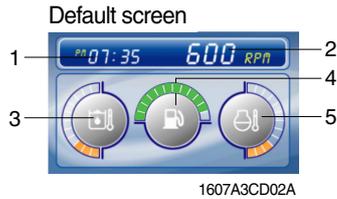
- LCD : Indicate operating status of the machine.
  - Warning lamp : Indicate abnormality of the machine(Red).
  - Pilot lamp : Indicate operating status of the machine(Amber).
- ※ The monitor installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to chapter 6, Maintenance.
- ※ When the monitor provides a warning immediately check the problem, and perform the required action.



1107A3CD02

- ※ 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.

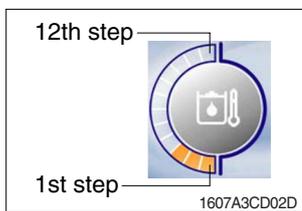
※ Refer to the page 3-7 to set time for details.

### (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.

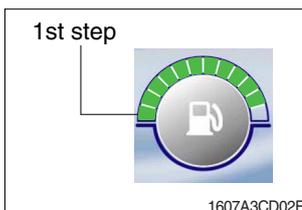
- 1st step : Below 30°C(86°F)
- 2nd~10th step : 30-105 °C(86-221°F)
- 11th~12th step : Above 105°C(221°F)

- 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

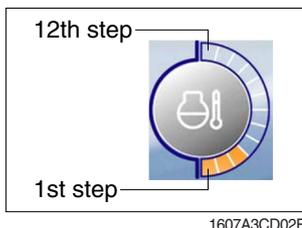


- ① This gauge indicates the amount of fuel in the fuel tank.

- 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 28 l (7.4U.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



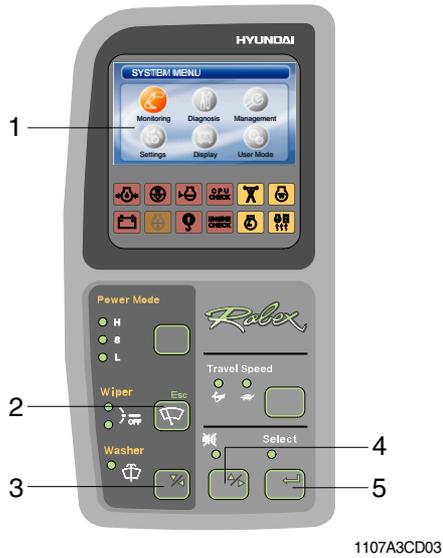
- Communication problem between MCU controller and cluster makes the lamp blinks and the buzzer sounds.
- Check if any fuse for MCU burnt off.  
If not check the communication line between them.

#### (2) Pop-up icon display

No	Switch	Selected mode	Display
1	Power mode switch	High power work mode	
		Standard power work mode	
		Light power work mode	

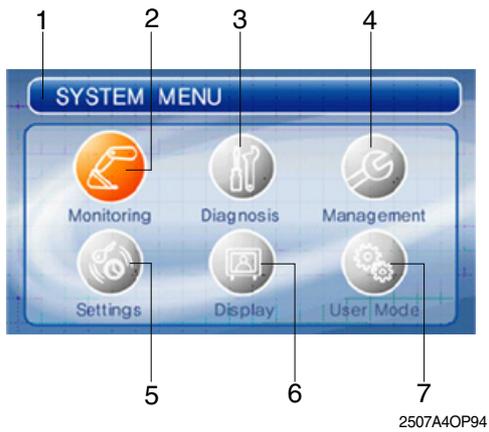
No	Switch	Selected mode	Display
2	Travel speed control switch	Low speed	
		High speed	

## 4) LCD



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

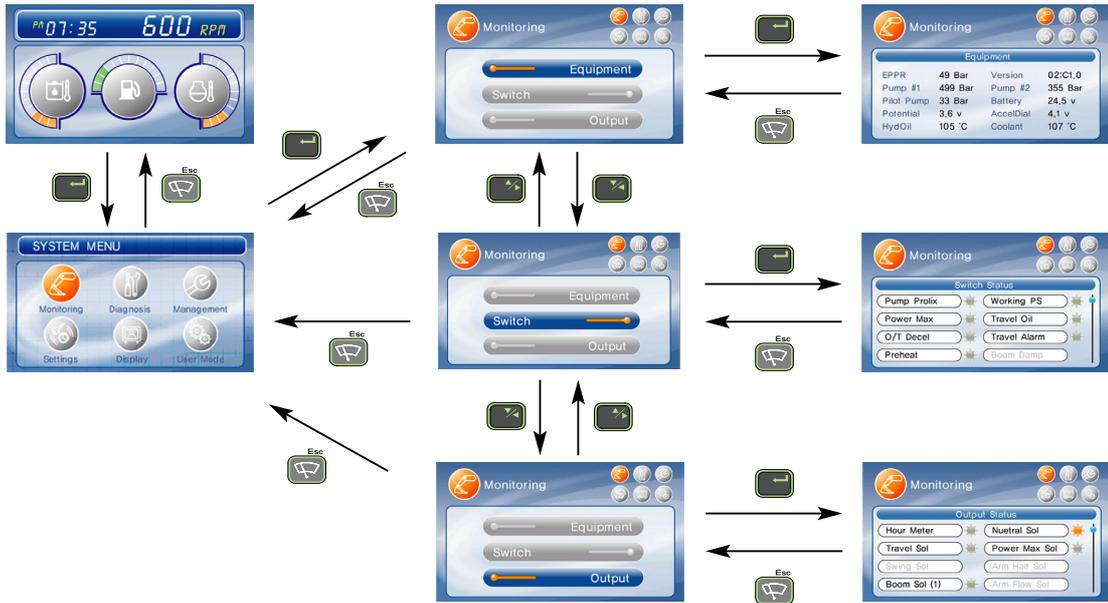
## (1) Main menu



- 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(null)

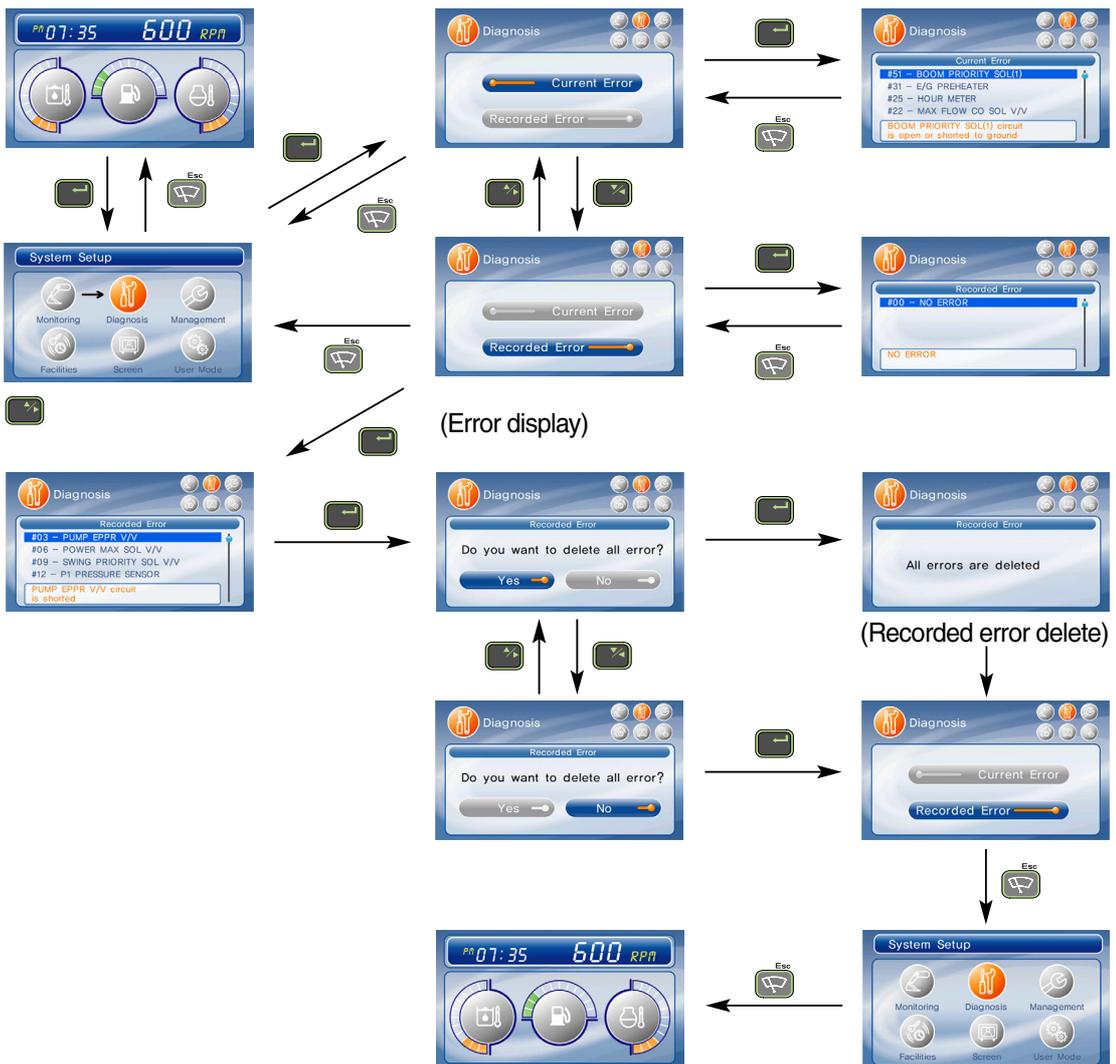
## (2) Display map

### ① Monitoring



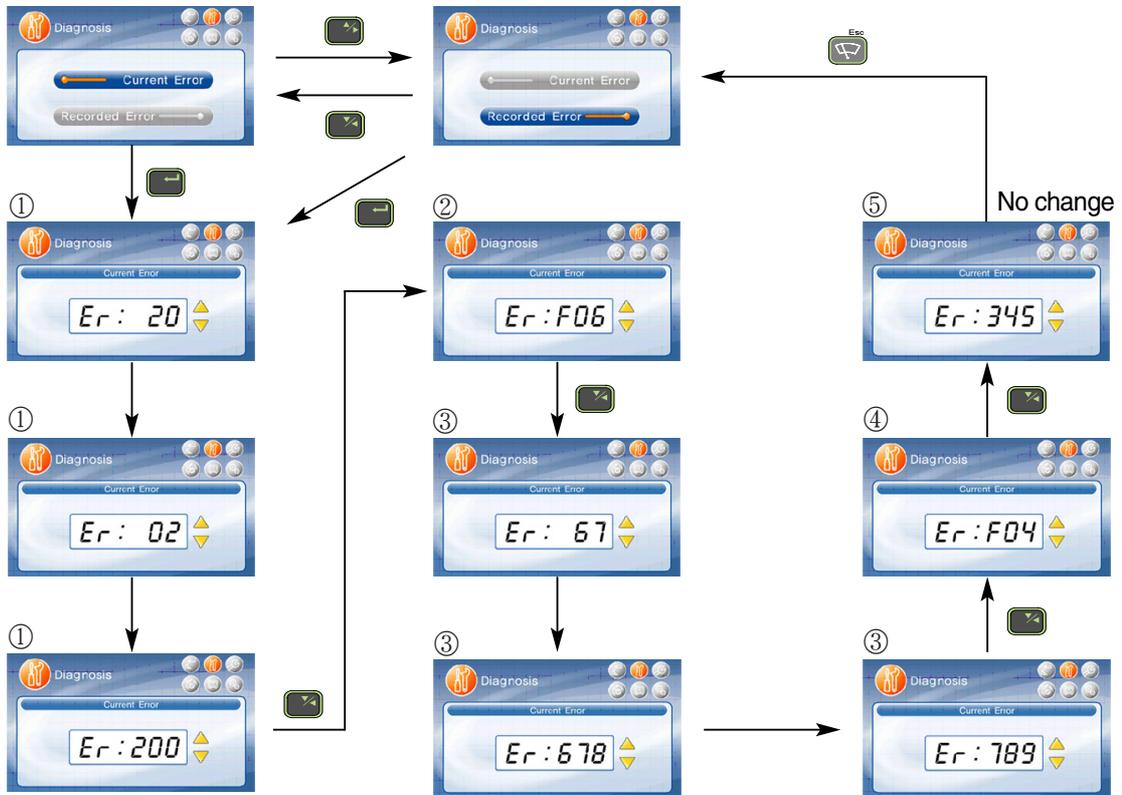
### ② Diagnosis

#### a. Protocol type 1

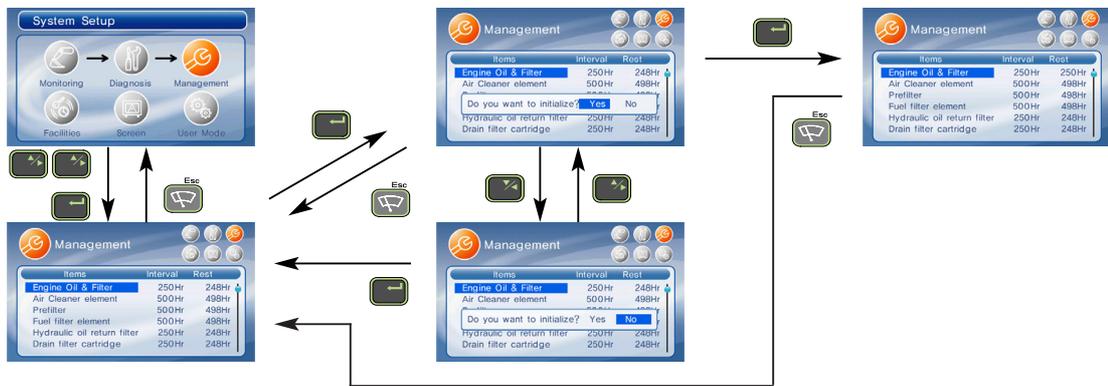


b. Protocol type 2

- If there are more than 2 error codes, each one can be displayed by pressing or switch respectively.
- 3 error codes (①SPN200200, ②FMI06, ③SPN6789, ④FMI04, ⑤345) display.



③ Maintenance



④ Setting

a. Time set



b. System lock - Reserved

c. Dual mode  
- Changing the MCU mode

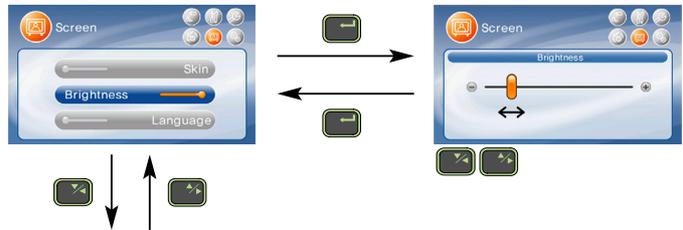


⑤ Display

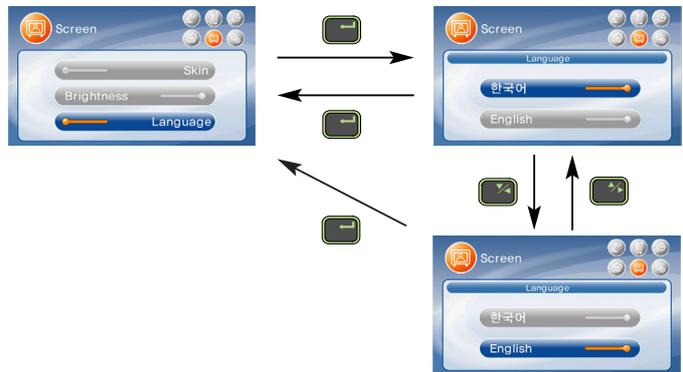
a. Operation skin



b. Brightness

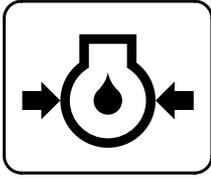


c. Language



## 5) Warning and pilot lamp

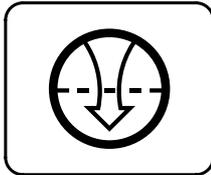
### (1) Engine oil pressure warning lamp



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.

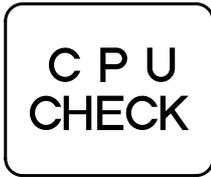
### (2) Air cleaner warning lamp



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.

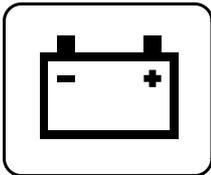
### (3) MCU controller check warning lamp



21073CD10

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

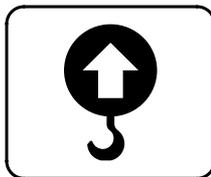
### (4) Battery charging warning lamp



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.

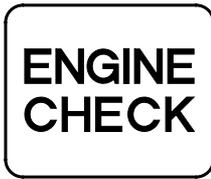
### (5) Overload warning lamp



21073CD15

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

(6) Engine check warning lamp



29073CD10

- ① This lamp blinks and the buzzer sounds when the communication between MCU controller and ECU on the engine is abnormal, or if any fault code received from ECU.
- ② Check the communication line between them.  
If the communication line is OK, then check the fault code on the cluster

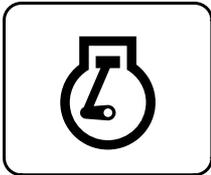
(7) Power max pilot lamp



21073CD11

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

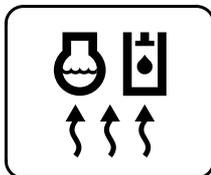
(8) Decel pilot lamp



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.

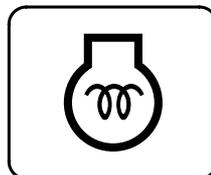
(9) Warming up pilot lamp



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.

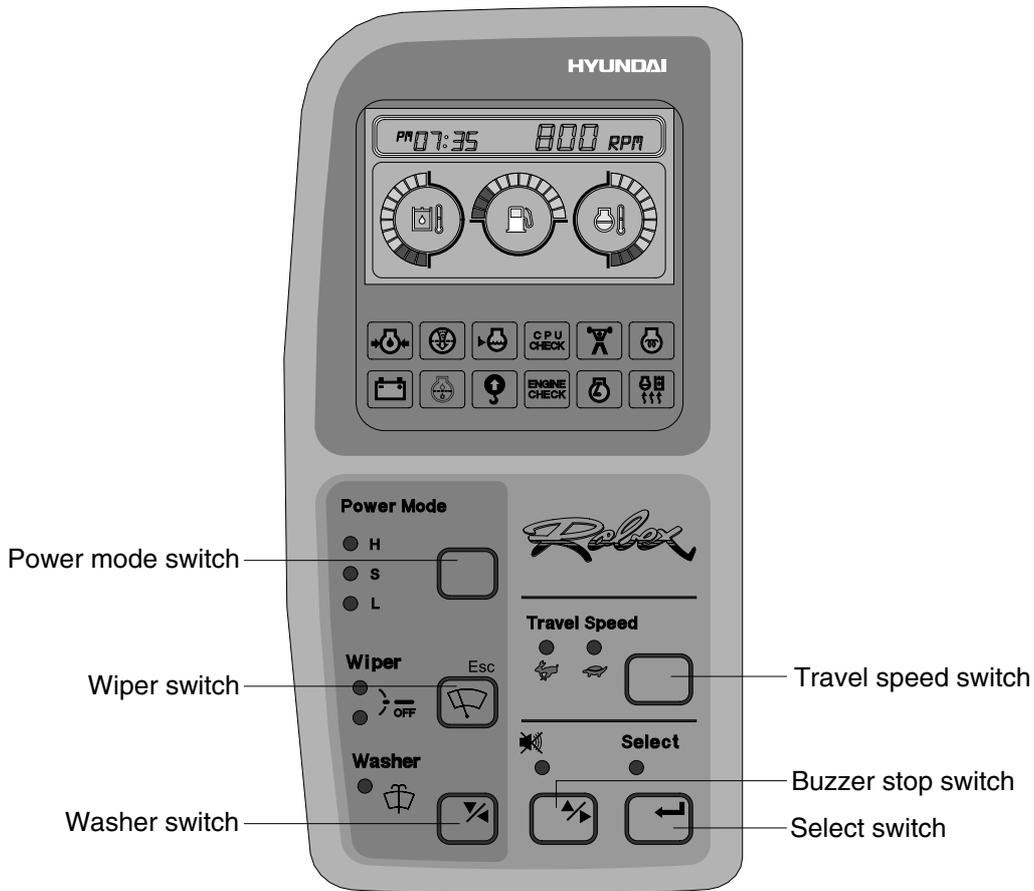
(10) Preheat pilot lamp



21073CD12

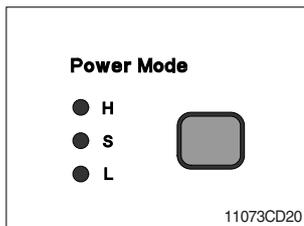
- ① Turning the start key switch ON position starts preheating in cold weather.
- ② Start the engine as this lamp is OFF.

## 6) SWITCH PANEL



1107A3CD19

### (1) Power mode switch

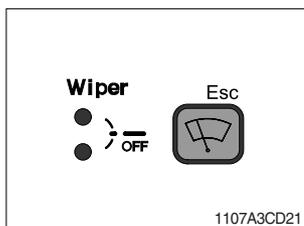


① This switch is to select the machine power mode, which shifts from high power work to standard power work and light power work in a row by pressing the switch.

- H : High power work mode
- S : Standard power work mode
- L : Light power work mode

※ Refer to the page 4-7 for details.

### (2) Wiper mode switch



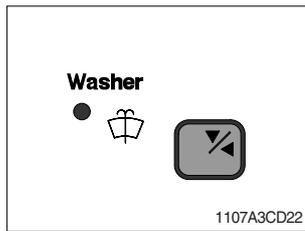
① This switch is used to operate wiper.

- Press the switch once to operate wiper.
- Press the switch once more to intermittently operate wiper low speed.
- Press the switch once more to turn off wiper.

※ Wiper motor doesn't operate with front sliding door open.

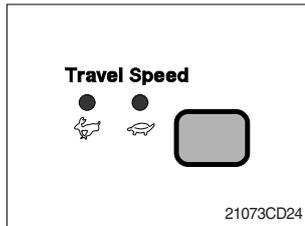
※ If wiper does not operate with the start switch in the ON position, turn the switch off immediately. Check the cause. If the switch remains ON, it can result in motor failure.

### (3) Washer switch



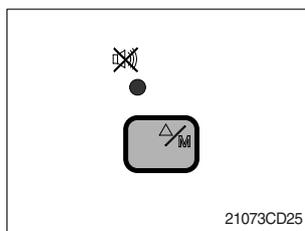
- ① The washer liquid is sprayed and the wiper is operated only while pressing this switch.
- ② The indicator lamp is turned ON when operating this switch.

### (4) Travel speed control switch



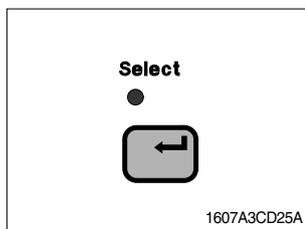
- ① This switch is to control the travel speed which is changed to high speed(Rabbit mark) by pressing the switch and low speed(Turtle mark) by pressing it again.

### (5) Buzzer stop switch



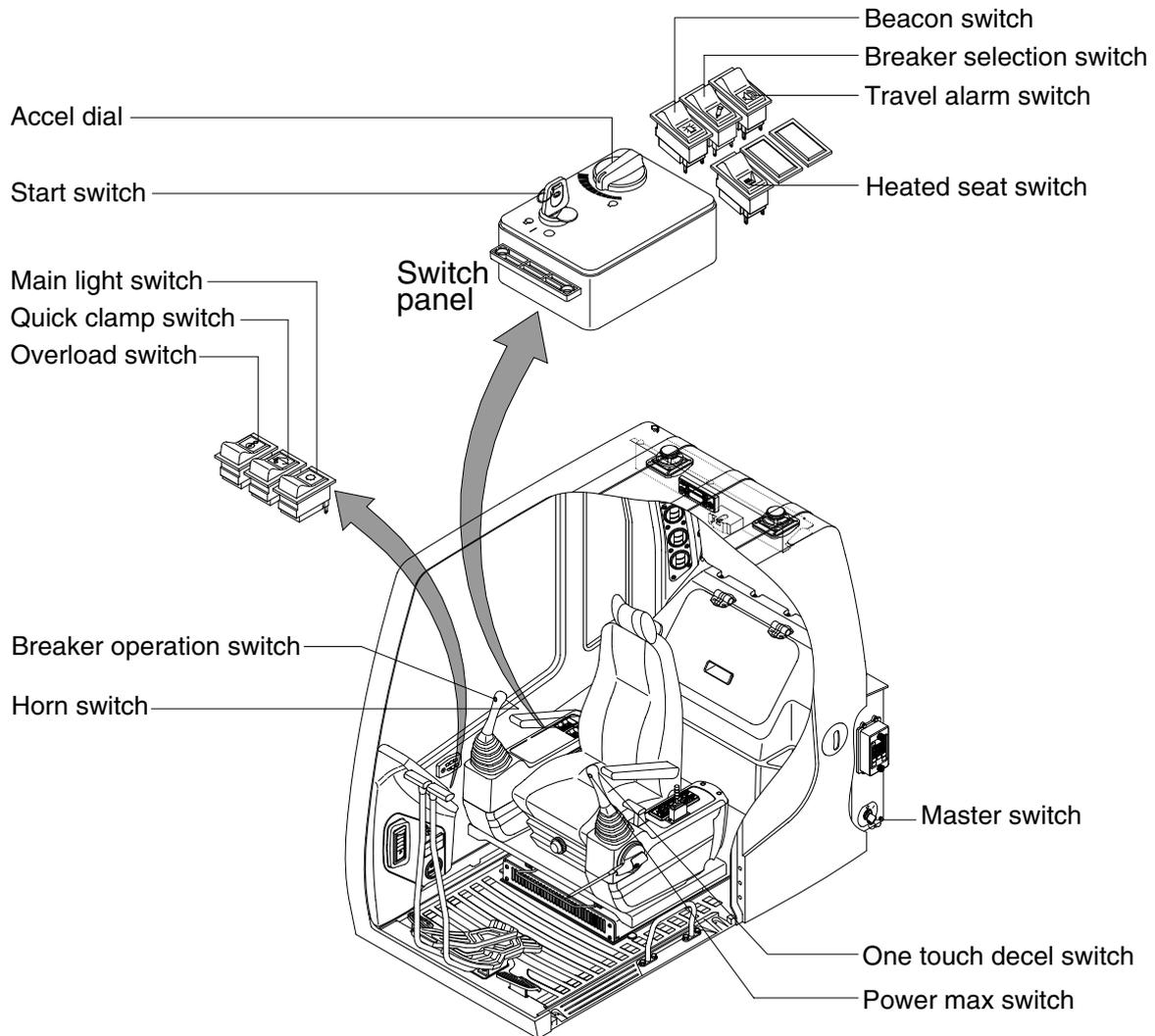
- ① When the starting switch is turned ON first, normally the alarm buzzer sounds for 2 seconds during lamp check operation.
- ② The red lamp lights ON and the buzzer sounds when the machine has a problem.  
In this case, press this switch and buzzer stops, but the red lamp lights until the problem is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

### (6) Select switch



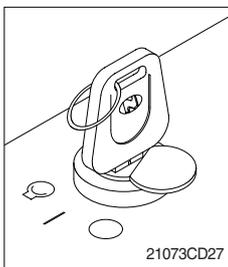
- ① This switch is used to enter main menu and sub menu for LCD.  
※ **Refer to the page 3-5 for details.**

### 3. SWITCHES



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#### 1) STARTING SWITCH



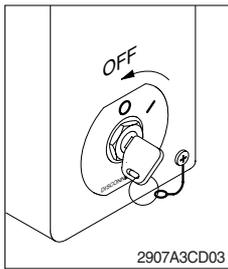
(1) There are three positions, OFF, ON and START.

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

Release key immediately after starting.

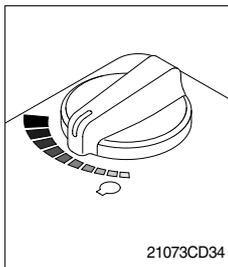
- ※ If you turn ON the starting switch in cold weather, the fuel warmer is automatically operated to heat the fuel by sensing the coolant temperature. Start the engine in 1~2 minutes after turning ON the starting switch. More time may take according to ambient temperature.
- ※ Key must be in the ON position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

## 2) MASTER SWITCH



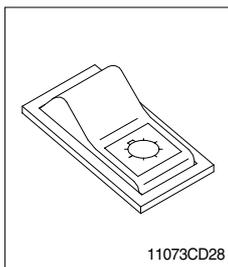
- (1) This switch is used to shut off the entire electrical system.
  - (2) I : The battery remains connected to the electrical system.  
O : The battery is disconnected to the electrical system.
- ※ **Never turn the master switch to O(OFF) with the engine running. It could result in engine and electrical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

## 3) ACCEL DIAL SWITCH



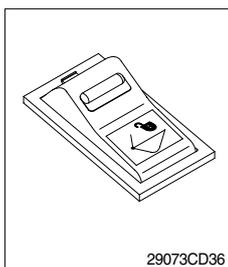
- (1) There are 10 dial setting.
- (2) Setting 1 is low idle and setting 10 is high idle.
  - By rotating the accel dial to right : Engine speed increases
  - By rotating the accel dial to left : Engine speed decreases

## 4) MAIN LIGHT SWITCH



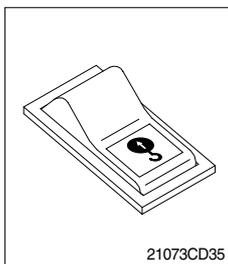
- (1) This switch is used to operate the head light and work light by two steps.
  - First step : Head light and cluster illumination lamp comes ON.  
Also, the below indicator lamp comes ON.
  - Second step : Work light comes ON.

## 5) QUICK CLAMP SWITCH(Optional)



- (1) This switch is used to engage or disengage the moving hook on quick clamp.
- ※ **Refer to the page 8-6 for details.**

## 6) OVERLOAD SWITCH(Optional)



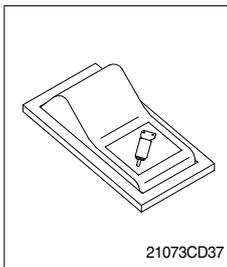
- (1) When this switch turned ON, buzzer makes sound and overload warning lamp comes ON in case that the machine is overloaded.
- (2) When turned OFF, buzzer stops and warning lamp goes out.

## 7) TRAVEL ALARM SWITCH



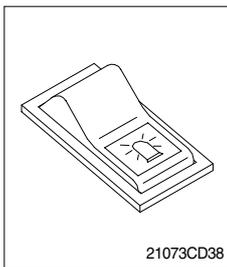
- (1) This switch is to activate travel alarm function when the machine travels forward and backward.
- (2) On pressing this switch, the alarm buzzer sounds only when the machine is traveling.

## 8) BREAKER SELECTION SWITCH(Optional)



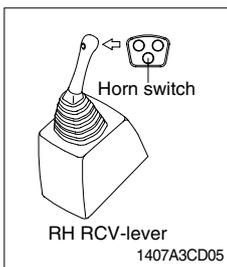
- (1) This switch is used to select breaker.  
※ **The breaker operates only when this switch is selected.**

## 9) BEACON SWITCH(Optional)



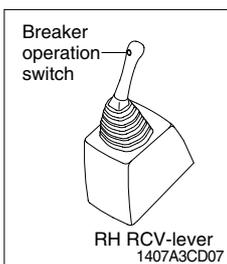
- (1) This switch turns ON the rotary light on the cab.
- (2) The below indicator lamp is turned ON when operating this switch.

## 10) HORN SWITCH



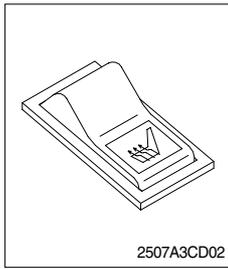
- (1) This switch is at the top of right side control lever.  
On pressing, the horn sounds.

## 11) BREAKER OPERATION SWITCH



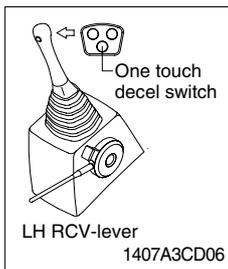
- (1) On pressing this switch, the breaker operates only when the breaker selection switch on the switch panel is selected.

## 12) HEATED SEAT SWITCH(Optional)



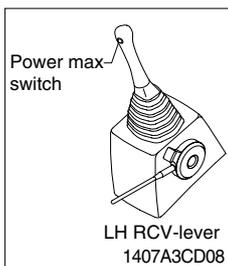
- (1) This switch is used to heat the seat.
- (2) On pressing the switch, the below indicator lamp is turned ON.
  - Heater operating temperature :  $28 \pm 3.5^{\circ}\text{C}$
  - Heater operating cancel temperature :  $37 \pm 3^{\circ}\text{C}$

## 13) ONE TOUCH DECEL SWITCH



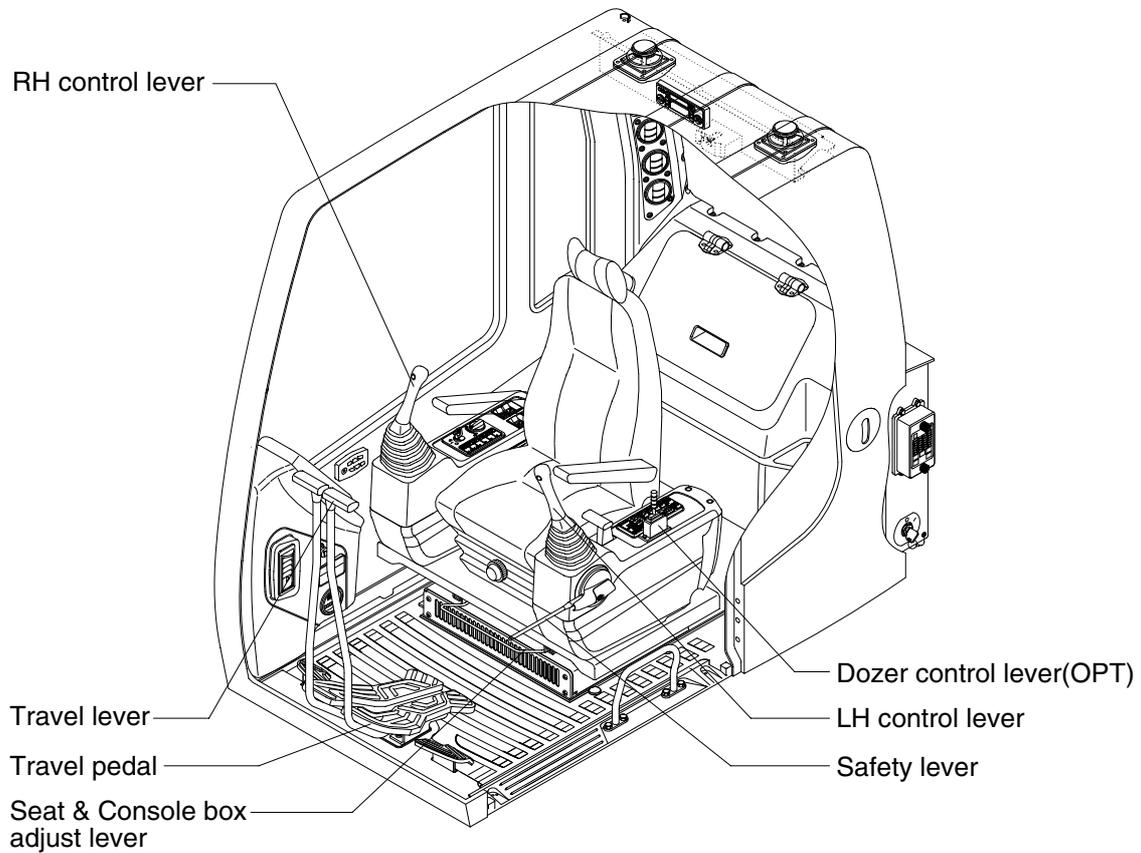
- (1) This switch is used to actuate the deceleration function quickly.
- (2) The engine speed is increased to previous setting value by pressing the switch again.

## 14) POWER MAX SWITCH



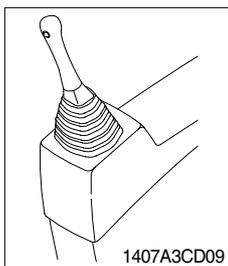
- (1) This switch activate power max function.  
When this switch is kept pressed, hydraulic power of work equipment will increased approx 110 percent during 8 seconds.
  - (2) After 8 seconds, function is cancelled automatically even switch is keep pressed.
- ※ **Don not use for craning purposes.**

## 4. LEVERS AND PEDALS



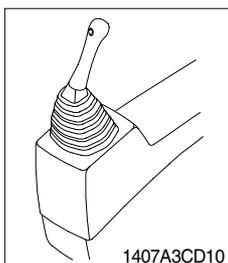
1107A3CD41

### 1) LH CONTROL LEVER



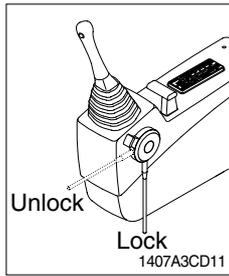
- (1) This joystick is used to control the swing and the arm.
- (2) Refer to **operation of working device** in chapter 4 for details.

### 2) RH CONTROL LEVER



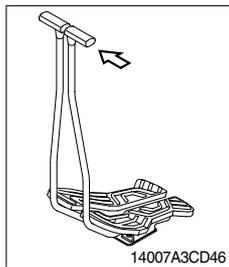
- (1) This joystick is used to control the boom and the bucket.
- (2) Refer to **operation of working device** in chapter 4 for details.

### 3) SAFETY LEVER



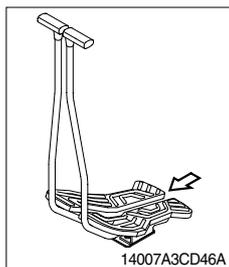
- (1) All control levers and pedals are disabled from operation by locating the lever to lock position as shown.
  - ※ **Be sure to lower the lever to LOCK position when leaving from operator's seat.**
- (2) By pull lever to UNLOCK position, machine is operational.
  - ※ **Do not use the safety lever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

### 4) TRAVEL LEVER



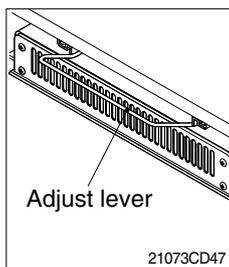
- (1) This lever is mounted on travel pedal and used for traveling by hand. The operation principle is same as the travel pedal.
- (2) Refer to **traveling of the machine** in chapter 4 for details.

### 5) TRAVEL PEDAL



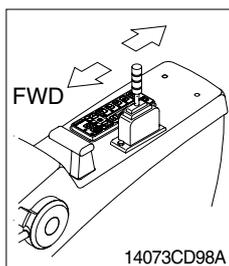
- (1) This pedal is used to move the machine forward or backward.
- (2) If left side pedal is pressed, left track will move.  
If right side pedal is pressed, right track will move.
- (3) Refer to **traveling of machine** in chapter 4 for details.

### 6) SEAT AND CONSOLE BOX ADJUST LEVER



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

### 7) DOZER CONTROL LEVER(Optional)



- (1) This lever is used to operate the dozer blade.
- (2) If the lever is pushed forward, the dozer blade will be going down.  
And the lever is pulled back, the dozer blade will be going up.

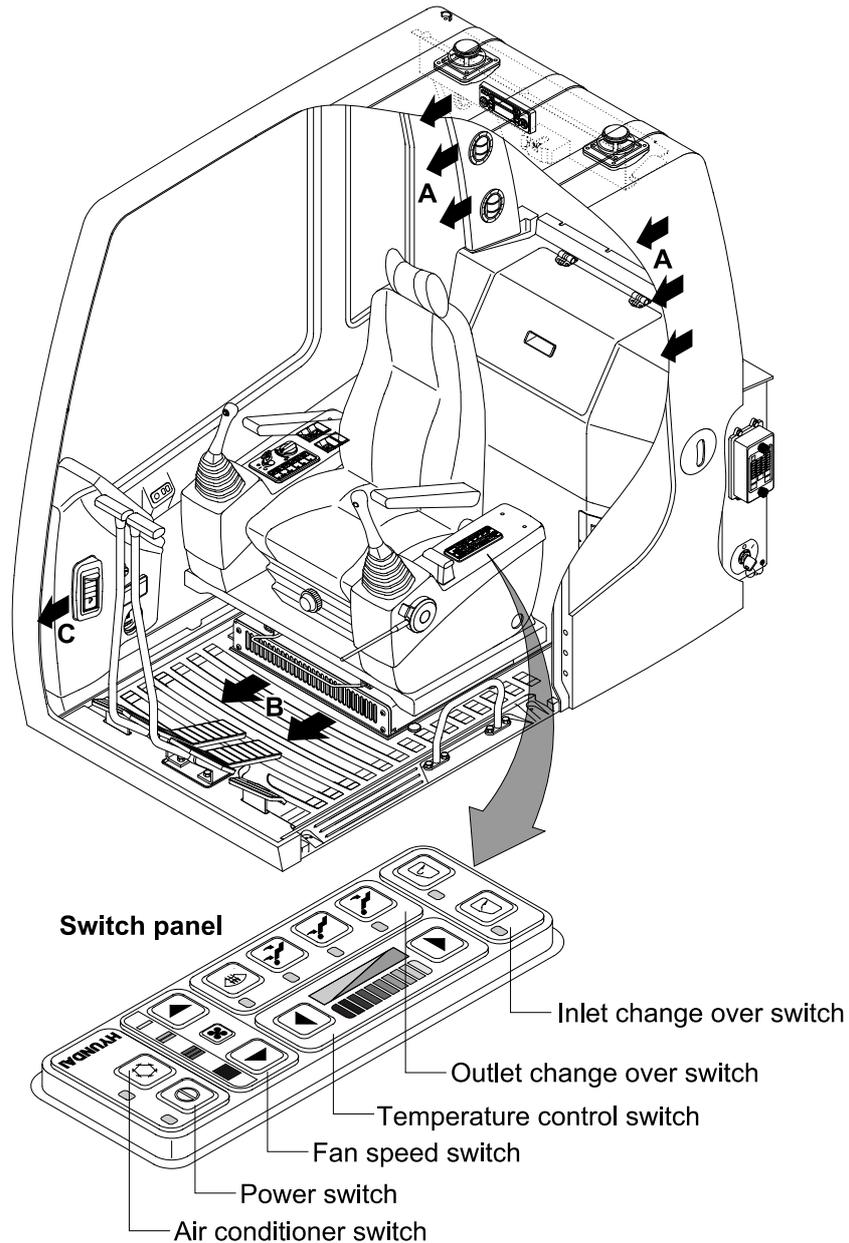
## 5. AIR CONDITIONER AND HEATER

### ■ MANUAL TYPE(STD)

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

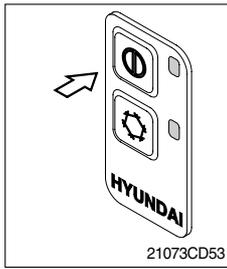
· Refer to the page 3-23 for auto air conditioner and heater(option)

### · Location of air flow ducts



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### 1) POWER SWITCH

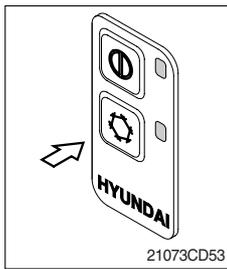


(1) This switch makes the system and the LED simultaneously ON or OFF.

#### (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)

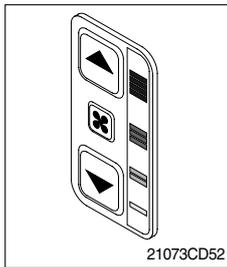


(1) Operating this switch turns the compressor and the LED simultaneously ON or OFF.

(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.**

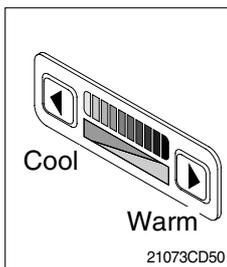
### 3) FAN SPEED SWITCH



(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



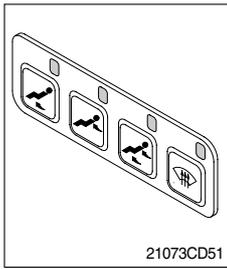
(1) There are 9 steps to control temperature from max cool to max warm controlled up and down by 1 step.

(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



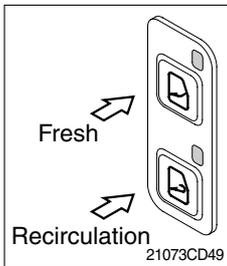
(1) There are four steps of air flow.

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 turns 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.**

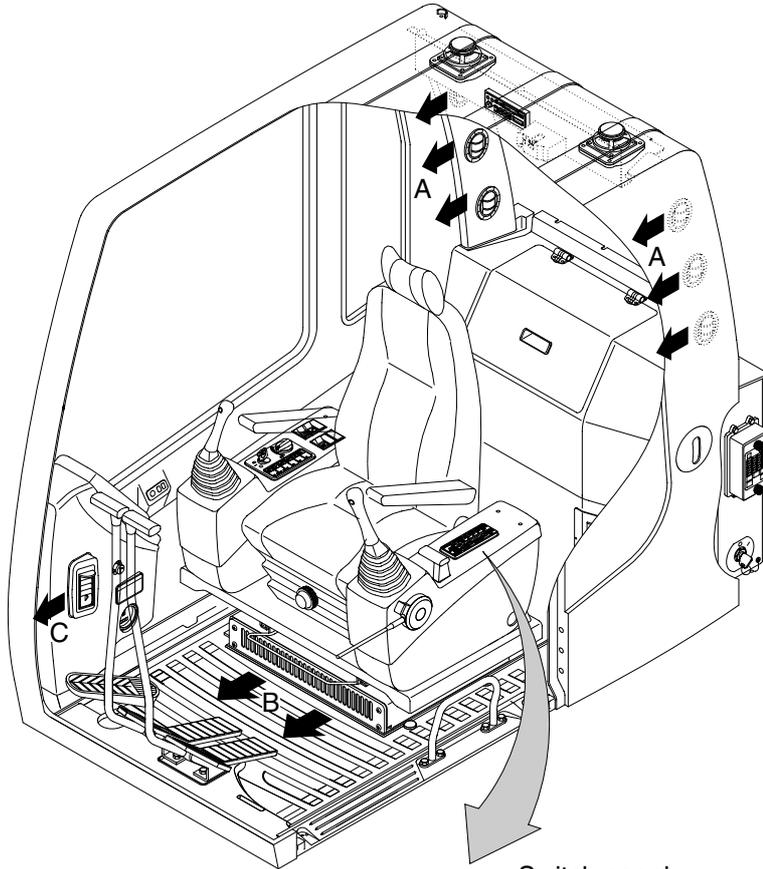
※ **Check out the recirculation filter periodically to keep a good efficiency.**

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

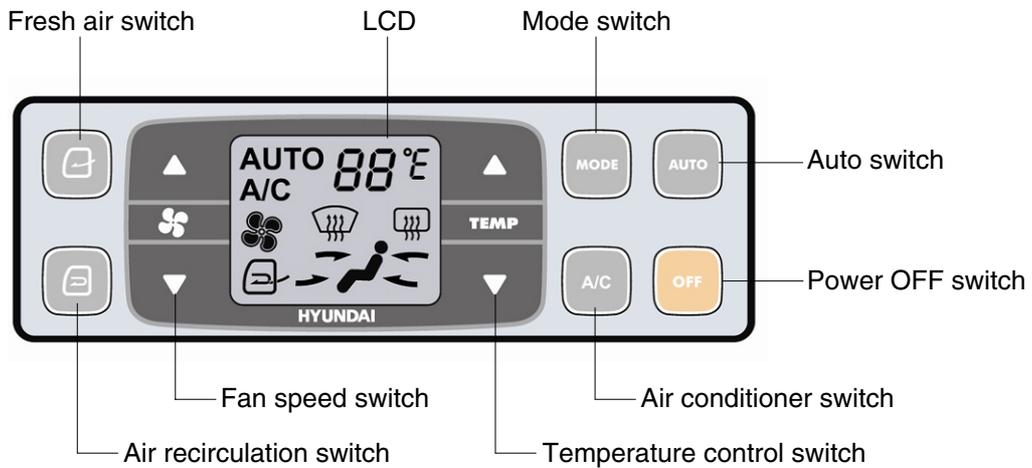
■ **AUTO AIR CONDITIONER AND HEATER(OPTION)**

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

- Location of air flow ducts

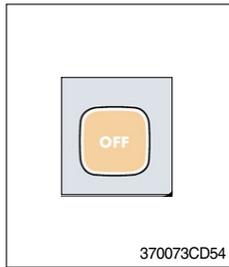


Switch panel



2107A3CD49

## 1) POWER OFF SWITCH

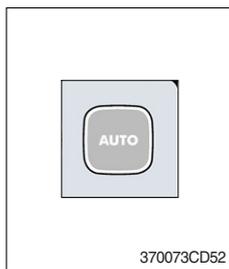


- (1) This switch makes the system and the LED OFF.  
Just before the power OFF, setted values are stored.

### (2) Default setting values

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

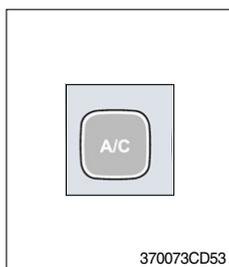
## 2) AUTO SWITCH



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

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

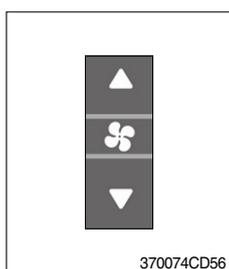
## 3) AIR CONDITIONER SWITCH(Compressor switch)



- (1) This switch turns the compressor and the LCD ON.  
(2) In accordance with the temperature sensed by duct(evaporator) sensor, compressor turns ON or OFF automatically.  
※ **Air conditioner operates to remove vapor and drains water through a drain hose. Water can be sprayed into the cab in case that the drain cock at the ending point of drain hose has a problem.**

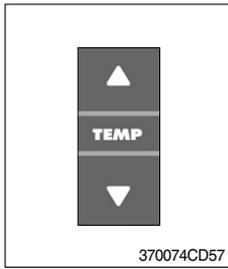
**In this case, exchange the drain cock.**

## 4) FAN SPEED SWITCH



- (1) Fan speed is controlled automatically by setted temperature.  
(2) This switch controls fan speed manually.  
· There are 8 up/down steps to control fan speed.  
· The maximum step or the minimum step beeps 5 times.  
(3) This switch makes the system ON.  
▲ : First step(AUTO)  
▼ : First step(Manually)

## 5) TEMPERATURE CONTROL SWITCH

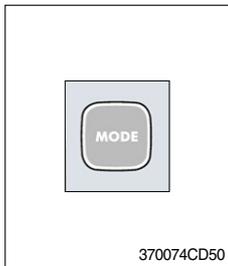


- (1) Setting temperature indication(17~32°C, Scale : 1°C)
- (2) Max cool and max warm beeps 5 times.
- (3) The max cool or the max warm position operates as following table.

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

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

## 6) MODE SWITCH

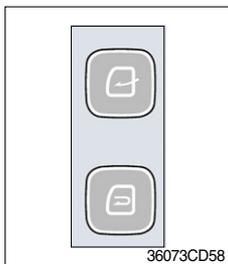


- (1) Operating this switch, it beeps and displays symbol of each mode in order.(Vent → B/L → Foot → Def → Vent)

Mode switch		Vent	B/L	Foot	Defroster
Outlet	A	●	●		
	B		●	●	●
	C				●

- (2) When defroster switch operating, FRESH AIR/AIR RECIRCULATION switch turns to FRESH AIR mode and air conditioner switch turns ON.
- (3) When this switch ON, the system operates with previous configuration.

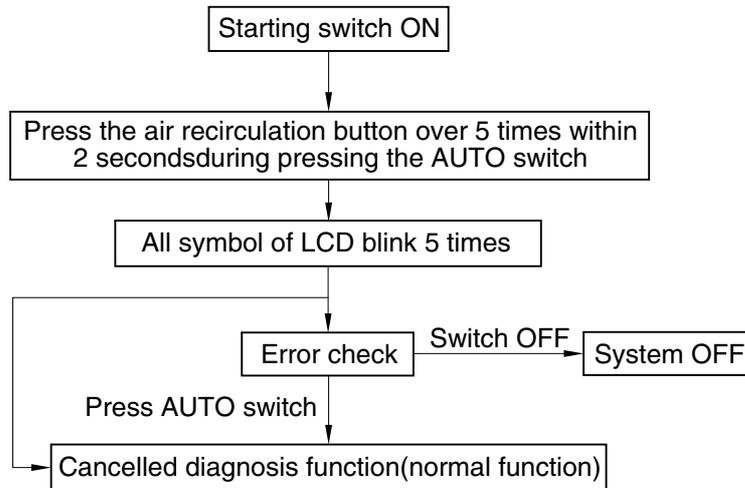
## 7) FRESH AIR/AIR RECIRCULATION SWITCH



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

## 8) SELF DIAGNOSIS FUNCTION

### (1) Procedure



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### (2) Error check

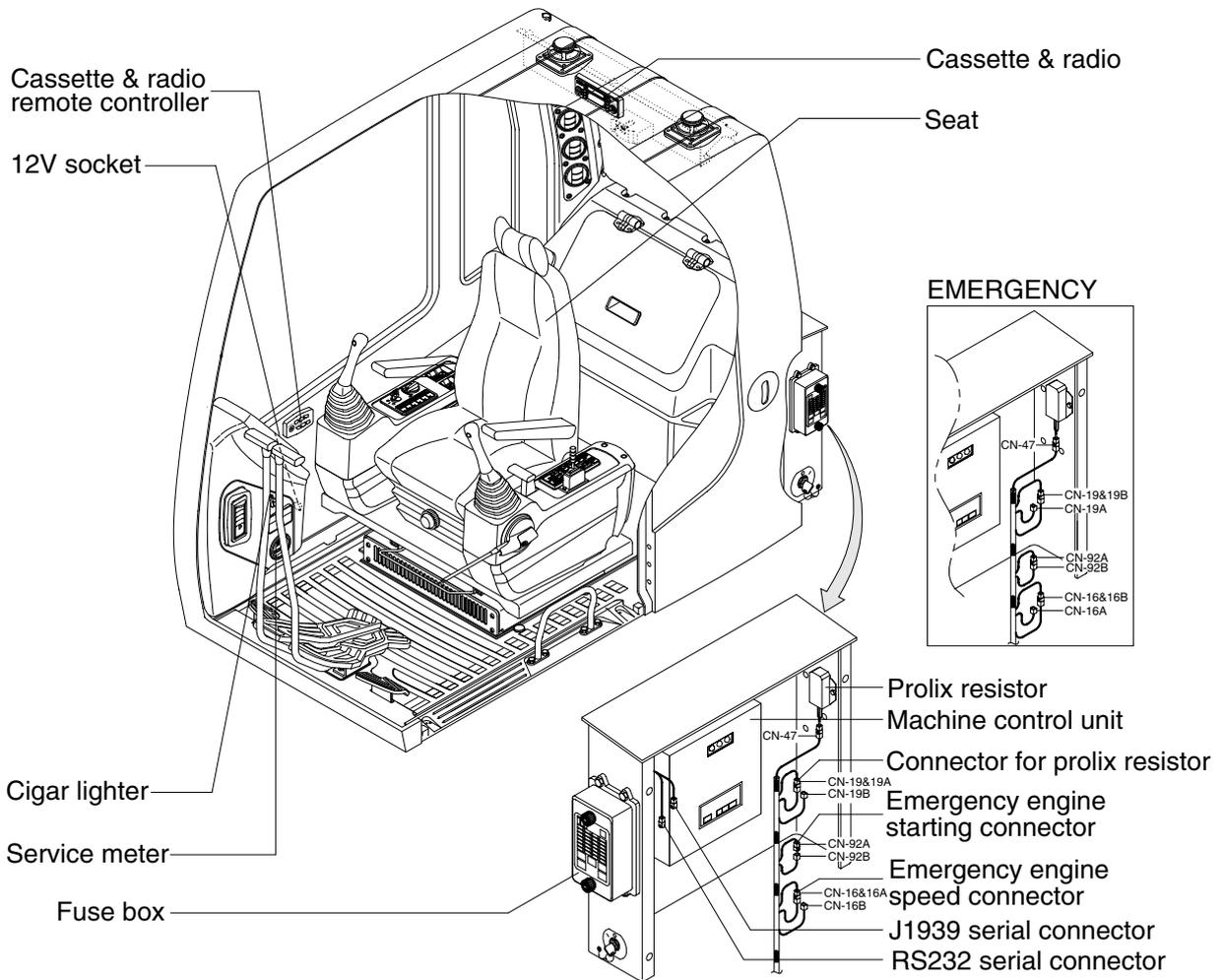
- The corresponding error code flickers on the setup temperature display panel, the other symbol will turn OFF.
- Error code flickers every 0.5 second.
- If error code is more than two, each code flickers 2 times in sequence.
- Error code

Error code	Description	Error code	Description
11	Ambient sensor	14	Duct(evaporator) sensor
12	Cabin inside sensor	15	Temp actuator
13	Coolant temp sensor	16	Mode actuator

### (3) Fail safe function

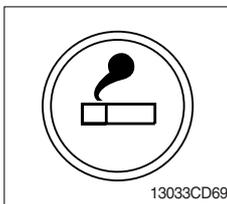
Error description	Fail safe function
Ambient sensor(11)	25°C alternate value control
Cabin inside sensor(12)	20°C alternate value control
Coolant temp sensor(13)	More than 10 minutes after engine start up, the alternate value is ON
Duct(evaporator) sensor(14)	1°C alternate value control
Temp actuator(15)	If opening amount is 0%, the alternate value is 0%
	If not, the alternate value is 100%
Mode actuator(16)	The alternate value is Vent

## 6. OTHERS



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### 1) CIGAR LIGHTER



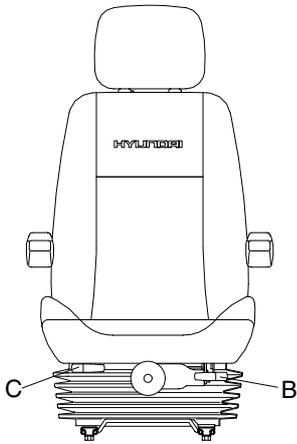
- (1) This can be used when the engine starting switch is ON.
- (2) The lighter can be used when it springs out in a short while after being pressed down.

※ **Service socket**

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

## 2) SEAT

The seat is adjustable to fit the contours of the operator's body. It will reduce operator fatigue due to long work hours and enhance work efficiency.



### (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 130mm(5.1") in 13 steps.

### (2) Upward/Downward adjustment(B)

- ① Pull lever B to adjust seat upward or downward.
- ② Forward or backward side adjustment only can be made, tilting to one side, by moving lever B respectively.

### (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)

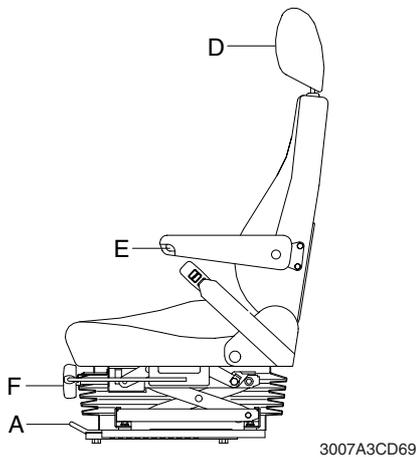
This is adjustable vertically to fit operator's requirements.

### (6) Cushion adjustment (F)

Adjust the handle to the operator's weight.

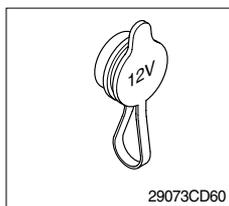
▲ Always check the condition of the seat belt and mounting hardware before operating the machine.

▲ Replace the seat belt at least once every three years, regardless of appearance.



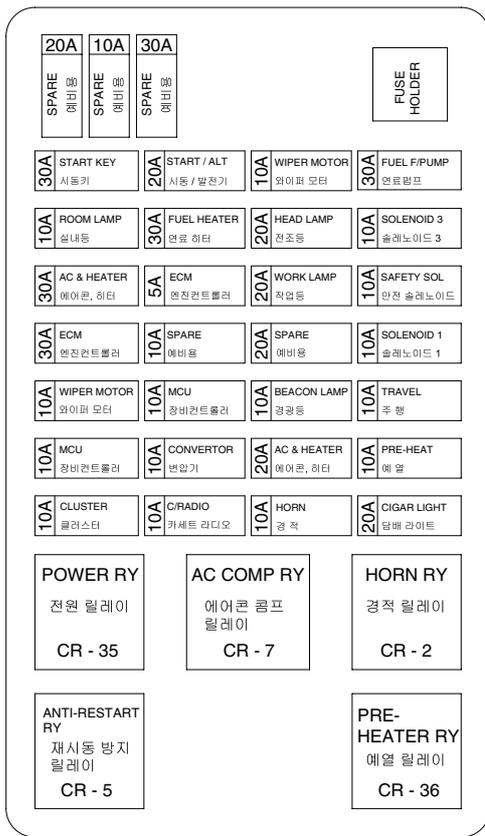
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## 3) 12V SOCKET(Option)



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

#### 4) FUSE BOX



1107A3CD55

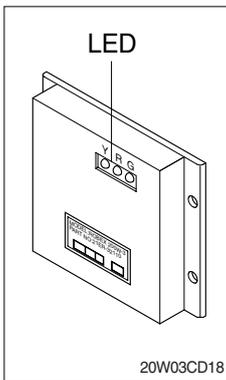
(1) The fuses protect the electrical parts and wiring from burning out.

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

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

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

#### 5) MCU CONTROLLER



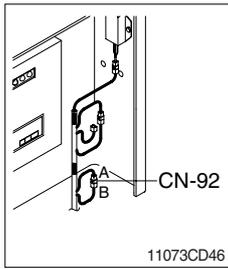
(1) To match the engine torque with the pump absorption torque, MCU controller varies EPPR valve output pressure, which control pump discharge amount whenever feedbacked engine speed drops under the reference rpm of each mode set.

(2) Three LED lamps on the MCU controller display as below.

LED lamp	Trouble	Service
G is turned ON	Normal	-
G and R are turned ON	Trouble on MCU or ROM	· Change the controller
G and Y are turned ON	Trouble on serial communication line	· Check if serial communication lines between controller and cluster are disconnected
Three LED are turned OFF	Trouble on MCU controller power	· Check if the input power wire (24V, GND) of controller is disconnected · Check the fuse

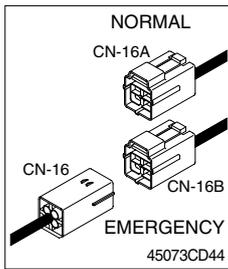
G : green, R : red, Y : yellow

## 6) EMERGENCY ENGINE STARTING CONNECTOR



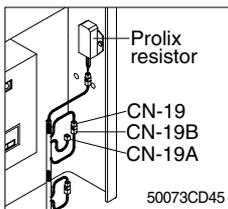
- (1) If the MCU controller is removed, the engine does not start.
  - (2) Before starting the engine, connect the connector CN-92 A with B.
- ※ **Do not connect these connectors when the MCU is not removed.**

## 7) EMERGENCY ENGINE SPEED CONTROL



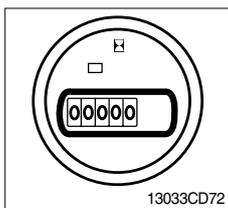
- (1) When the CAN communication between the ECM and the MCU controller is abnormal due to malfunction of the MCU controller, change CN-16 connection from CN-16A to CN-16B and then control the engine speed by rotating accel dial switch.

## 8) PROLIX RESISTOR(Option)



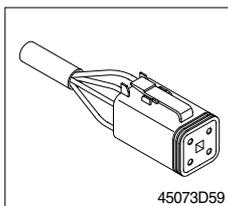
- (1) This resistor is used to continuous working in case of malfunction of the MCU controller.
    - **Normal** : CN-19 connect with connector CN-19A
    - **Emergency** : CN-19 connect with connector CN-19B
- ※ **Never connect connector CN-19 with connector CN-19B when MCU controller is in normal operation.**

## 9) SERVICE METER



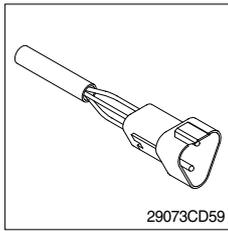
- (1) This meter shows the total operation hours of the machine.
- (2) Always ensure the operating condition of the meter during the machine operation. Inspect and service the machine based on hours as indicated in chapter 6, **maintenance**.

## 10) RS232 SERIAL CONNECTOR



- (1) MCU controller communicates the machine data with Lap top computer through RS232 connector.

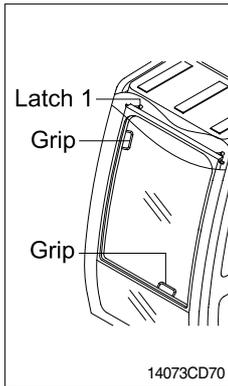
## 11) J1939 SERIAL CONNECTOR



(1) ECU communicates the engine data with cummins INLINE-II adapter through J1939 connector.

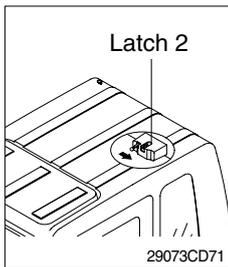
- ① ECU fault code check
- ② ECU program change
- ③ Engine data monitoring & test

## 12) UPPER WINDSHIELD



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

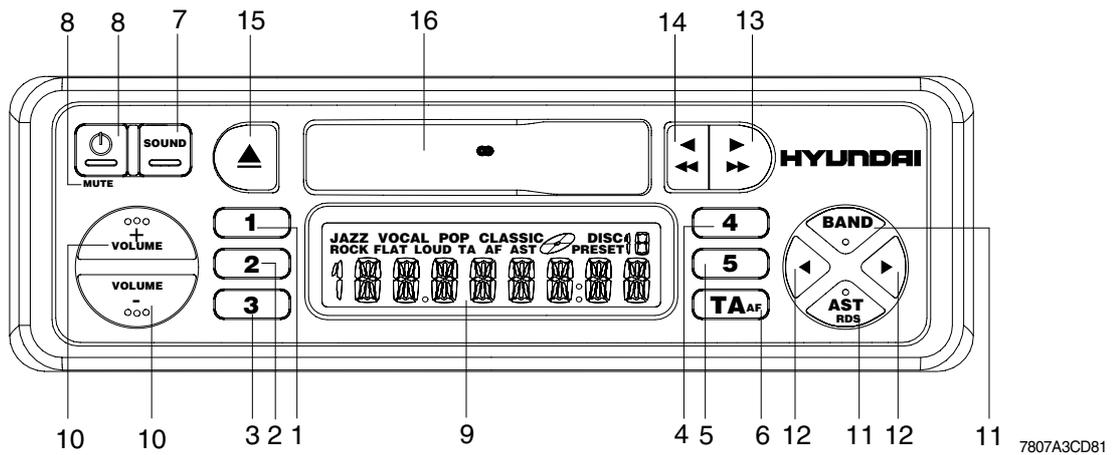
- ① Release both latches(1) in order to release the upper windshield.
- ② Hold both grips that are located at the bottom of the windshield frame and at the top of the windshield frame push the windshield upward.
- ③ Hold both grips that are provided on the windshield frame and back into the storage position until auto lock latch(2) is engaged, move the levers of both latches(1) into the locked position. Push the levers toward the rear of the cab in order to hold the windshield in storage position.



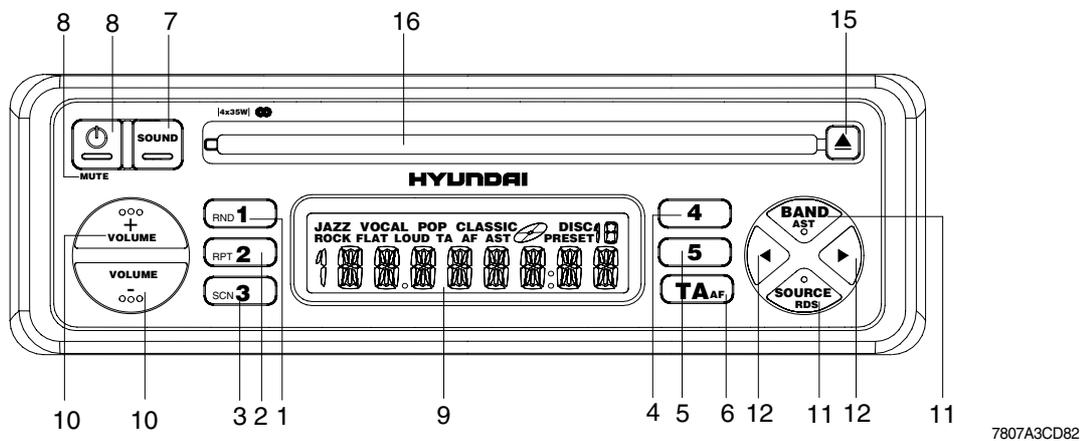
(2) Perform the following procedure in order to close the upper windshield.

- ① Move the lever of the auto lock latch(2) in the direction of the arrow in order to release the auto lock latch.
- ② Reverse step ① through step ③ in order to close the upper windshield.

### 13) RADIO AND CASSETTE(Standard)



### RADIO AND CD PLAYER(Optional)

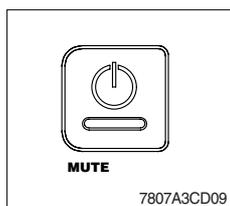


#### FRONT PANEL PRESENTATION

- |   |   |
|---|---|
| 1 <b>1</b> ..... Preset button 1                        | 11 <b>SOURCE</b> .. Short press : Change source(Radio/CD) |
| <b>RND</b> ..... CD random playback on/off              | <b>RDS</b> ..... Long press : RDS on/off                  |
| 2 <b>2</b> ..... Preset button 2                        | <b>BAND</b> ..... Short press : To select band            |
| <b>RPT</b> ..... CD repeat track on/off                 | <b>AST</b> ..... Long press : Autostore(CD)               |
| 3 <b>3</b> ..... Preset button 3                        | Short press : Autostore(Cassette)                         |
| <b>SCN</b> ..... CD's track scan                        | 12 <b>◀▶</b> ..... <b>Tuner mode</b>                      |
| 4 <b>4</b> ..... Preset button 4                        | Short press : Auto search up/down                         |
| 5 <b>5</b> ..... Preset button 5                        | Long press : Manual search up/down                        |
| 6 <b>TA AF</b> ..... Short press : TA on/off            | <b>Cassette mode</b> : No function                        |
| Long press : AF on/off                                  | <b>CD mode</b>  |
| 7 <b>SOUND</b> ..... Select sound/audio styles          | Short press : Next/previous track                         |
| 8 <b>⏻</b> ..... Short press : power on                 | Long press : Fast forward or fast rewind                  |
| Long press : power off                                  | 13 <b>▶▶</b> ..... Fast forward(cassette deck)            |
| <b>MUTE</b> ..... Short press : To mute or cancel mute. | 14 <b>◀◀</b> ..... Fast rewind(cassette deck)             |
| 9 ..... Display   | 15 <b>▲</b> ..... Disc eject(CD)                          |
| 10 ..... Volume knob : Press up/down to                 | Eject cassette  |
| adjust the volume ; adjust selected                     | 16 ..... CD opening / Cassette opening                    |
| audio mode  |   |

## ■ AUDIO

### (1) Power and mute button



#### ① POWER ON/OFF

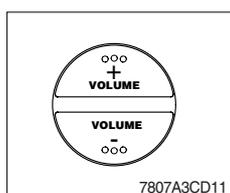
Press  to switch on the set. Press  for more than 2 seconds to switch off the set.

#### ② MUTE(Silence)

Short press  key to mute or cancel the mute(silence).

※ The silence period may be interrupted by ALARM announcement or traffic announcement messages(if TA is switched on).

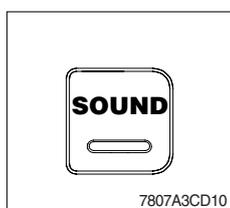
### (2) Volume button



#### ① Press the volume button up/down to adjust the volume.

Please make sure you can still hear the traffic(horns, sirens..).

### (3) Sound button



#### ① SOUND

Whether you listen to Jazz, Vocal, Pop, Classic or Rock music, the SOUND button is the perfect setting for your choice.

- Press SOUND then the sound button to select BASS-Treb for your own sound style, or adjust the settings with the volume up/down buttons to select one of the pre define sound styles:

- BASE -TRE : Your own settings of bass and treble.
- FLAT : Original
- JAZZ : Jazz music
- VOCAL : Speech
- POP : Pop music
- CLASSIC : Classical music
- ROCK : Rock music

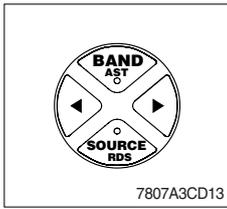
#### ② AUDIO SETTING

- Press SOUND to select desired audio mode.
- Adjust the settings with the volume up/down buttons :

- Sound style : BASS-TRE, FLAT, JAZZ, VOCAL, POP, CLASSIC, ROCK
- BASS : Low notes
- TREBLE : High notes
- BALANCE : Left-right
- FADER : Rear-front
- LOUD : OFF, LOW, MID, HIGH

- Press the volume button to adjust the selected audio mode. After 5 seconds the display goes back to the last mode of operation. Adjustment of Bass and Treble settings is only possible when BASS-TRE is selected as the sound style.

#### (4) Source button



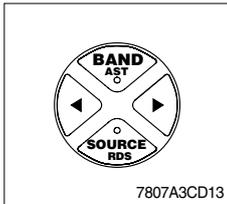
① Press SOURCE to select the desired source :

↻ - TUNER  
↻ - CD

※ Products with cassette mechanism will change source to cassette only when a tape is inserted.

### ■ RADIO

#### (1) Wave band / Automatic search button



##### ① WAVEBAND

· Press BAND to select the desired band:



##### ② AUTOMATIC SEARCH

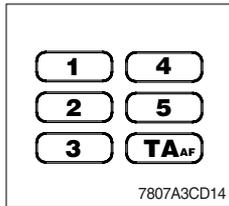
Use search tuning to automatically search for a station.

- Press ◀ to tune a station of a lower frequency or ▶ to a higher frequency.
- To search for another station, press the key again.

##### ③ MANUAL TUNING(If you know the frequency of the required station)

- **To switch to manual tuning :**  
Long press the search button ◀ or ▶ for more than 2 seconds will switch the tuning to manual tuning.
- Then press ◀ to tune to a station of a lower frequency or ▶ to a higher frequency.
- When keys are released, a time-out start to count. After 5 seconds time-out, display 'Auto' for one second and return to automatic search.

## (2) Preselected button



### Preselected stations

#### ① Manually storing stations in a preset

Five stations per band can be stored and recalled using the preset keys(1 to 5).

Tune in to the desired station.

- Press the desired preset key(1 to 5) for more than 2 seconds to
- store the current tuned station.

**When storing an FM station, the current program station name and the AF mode are stored on the preset(Some stations use alternating program service name).**

#### ② Recalling a preset

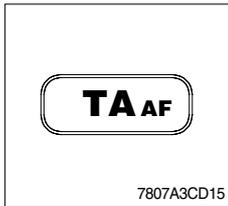
Press the desired preset key(1 to 5) to recall the stored station.

#### ③ Automatically storing stations(AUTO-STORE)

You can automatically store 5 strongest FM stations on the FM AST band or 5 strongest MW(AM) stations on the MW(AM) AST band. When you use Auto store, the new stations replace any stations previously stored in the FM AST band or the MW(AM) AST band.

- Press AST to activate autostore.
- The set gives a beep and then mutes.
- When it has finished, you hear a beep followed by the station stored on preset 1.
- Sometimes it may not be possible to find 5 stations.

## ■ RADIO DATA SYSTEM(RDS) ON FM



More and more stations broadcasts RDS informations in order to offer you many advantages including:

### (1) Program service name(PS)

Allows the radio to display the name of the station instead of its frequency.

### (2) Automatic returning(AF)

The set remains tuned to the current station by continually searching the best alternative frequency for best reception.

You can switch AF off.

#### - Activate/Deactivate AF

This set continuously search for other alternative frequencies for the tuned radio station and automatically selects the best frequency for reception. Long press  for more than 2 second to activate/deactivate AF.

### (3) Alarm messages(PHY ALARM)

This set automatically receives emergency messages made by the broadcaster.

- During the messages the display shows 'ALARM' and the station-name alternately.

### (4) Traffic announcements(TA)

You can activate the TA modes to give priority so as to hear traffic announcements related to these subjects(even if you play a cassettes/CD or mute the set).

#### - Activate/Deactivate TA

- Short press BAND to select an FM band.
- Press  to activate/deactivate TA.

#### - If you activate TA mode

- You will hear the traffic announcements when broadcast by station(even if you play a cassette/CD or mute the set).
- If the tuned station does not enable the reception of traffic announcements, the display shows 'NO TA'. The radio automatically searches and appropriate station.

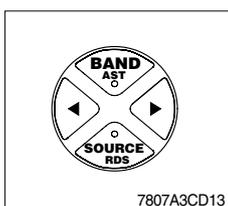
#### - Interrupting traffic announcement mode

If you do not wish to continue listening to a particular traffic announcement

- Short press  key to interrupt traffic announcement without switching off the mode
- The set will return to the previous operating mode.

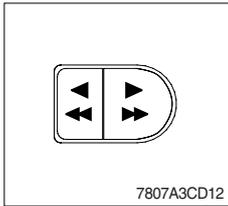
#### ※ You can switch off RDS features if not required.

- Long press RDS key to switch off RDS.
- All RDS related features e.g., TA, etc...will be deactivated when RDS is switch off.



■ CASSETTE PLAYER

(1) Winding/Rewinding button



- ※ Only use good quality cassettes.
- ※ To avoid possible tape damage always take out the cassette after use. Protect your cassettes. Put them back in their boxes immediately after use.
- ※ Never expose cassettes to heat or direct sunlight.

① **Play back**

Slide the cassette, with the open side to the right into the cassette opening. Playback starts.

The direction of playback is shown by indicator ► .

② **Stopping playback( ▲ )**

- To stop playback, Press the ▲ button fully home.
- The unit will switch over to radio reception.
- The cassette is partially ejected.

③ **Reverse(before the end of the tape)**

Press the ◀◀ and ▶▶ buttons at the same time halfway in.

④ **Fast rewind / Fast forward( ◀◀ or ▶▶ )**

The direction of fast winding depends on the direction of play indicated on the display.

Display during playback	Action	Key to press
►	Fast forward	▶▶
▶	Fast rewind	◀◀
◀	Fast forward	◀◀
◀	Fast rewind	▶▶

During fast forward or rewind the radio resumes. If you continue fast winding until the end of the tape, play back restarts automatically.

⑤ **To stop fast winding**

To stop fast winding before the end of the tape, press the key which is not pressed(◀◀ or ▶▶). Playback is then resumed.

⑥ **End of the tape**

At the end of the tape, playback continues in the revers direction.

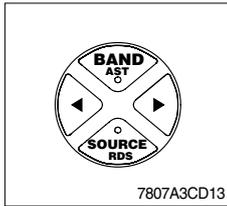
⑦ **Maintenance**

After extended use of the cassette player, dust, contamination or grime can accumulate on the playback head.

This results in diminishing high-note reproduction. This can be remedied using a cleaning cassette(one or twice a month) and playing it through like an ordinary cassette.

## ■ CD PLAYER

### (1) Winding / Rewinding button



#### ① CD playback

This CD player is suitable only for 12cm disc, do not use irregular shaped CD.

- Slide the disc into the slot with label facing upwards. Playback starts.
- If a disc is already inserted :  
Press SOURCE to select CD as the source.  
Playback starts.

#### ② Previous / Next track(◀ or ▶)

- Short press the ◀ or ▶ button to select the desired track.
- Playback resume with the chosen track.

#### ③ Fast rewind / Fast forward(◀◀ or ▶▶)

- Long press the ◀◀ or ▶▶ button for more than 2 seconds to quickly move rewind or forward through the disc.
- Normal play back resumes when you release the button.

#### ④ Random track playback

- Press RND to activate / deactivate random track playback.

#### ⑤ Repeat track

- Press RPT to activate / deactivate repeat current track.

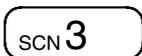
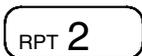
#### ⑥ Scan track

The scan function enables you to listen to the first few seconds of each track.

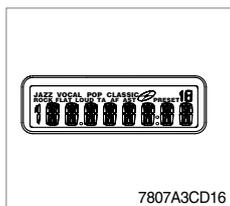
- Press SCN to activate / deactivate scan track.

#### ⑦ Disc eject

- Press ▲ to eject the disc.



## ■ RADIO SETTING



### (1) AMERICA

Press  , No. 1 and No. 4 buttons at the same time. Set up completes displaying " AMERICA".

### (2) SOUTH AMERICA

Press  , No. 2 and No. 5 buttons at the same time. Set up completes displaying " SOUTH".

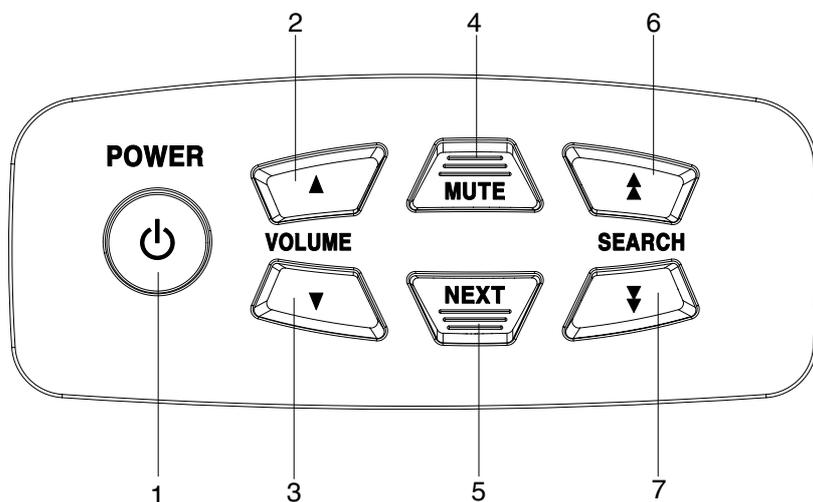
### (3) ASIA

Press  , No. 1 and No. 5 buttons at the same time. Set up completes displaying " ASIA".

### (4) EUROPE

Press power, No. 2 and No. 4 buttons at the same time. Set up completes displaying " EUROPE".

## 14) REMOTE CONTROLLER



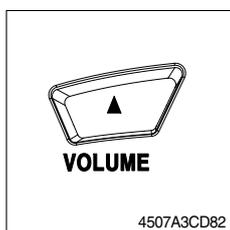
4507A3CD90

### (1) Power ON/OFF button



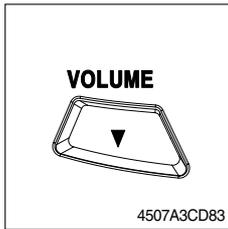
① Press  to switch ON the set. Press  for more than 2seconds to switch OFF the set.

### (2) Volume button(up)



- Short press : Volume up one step
- Long press : Volume up continuous

**(3) Volume button(down)**



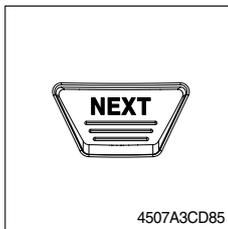
- Short press : Volume down one step
- Long press : Volume down continuous.

**(4) Source & mute button**



- Short press : Change source(Radio/CD)
- Long press : To mute or cancel mute.

**(5) Next button**



- ① Tuner mode
  - Short press : Preset up
  - Long press : Band up
- ② Cassette mode
  - Short press : Reverse(before the end of the tape)
  - Long press : No function
- ③ CD mode
  - Short press : Track 1
  - Long press : Scan track

**(6) Search button(up)**



- ① Tuner mode
  - Short press : Search up one step
  - Long press : Search up continuous
- ② Cassette & CD mode
  - Short press : Next track
  - Long press : Fast forward

**(7) Search button(down)**



- ① Tuner mode
  - Short press : Search down one step
  - Long press : Search down continuous
- ② Cassette & CD mode
  - Short press : Previous track
  - Long press : Fast rewind

## RADIO AND USB / MP3 PLAYER (machine serial no. : - #117)



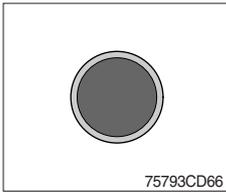
75793CD62

### ■ 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<br/>DISP ..... ID3 v2 display</p> <p>6  ..... Preset memory button 2<br/>SCN ..... File scan</p> <p>7  ..... Preset memory button 3<br/>RPT ..... Repeat play selector</p> <p>8  ..... Preset memory button 4<br/>RDM ..... Random play selector</p> <p>9  ..... Preset memory button 5<br/>D- ..... Directory down</p> | <p>10  ..... Preset memory button 6<br/>D+ ..... Directory up</p> <p>11  ..... Aux function</p> <p>12  ..... Preset scan (PS)<br/>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

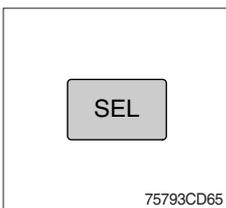
Press power button to turn the unit ON or OFF shortly.

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.

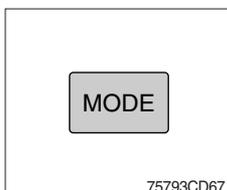
#### ⑥ Loud control

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.

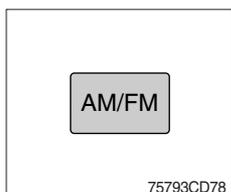
#### (4) Audio mute button



- 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

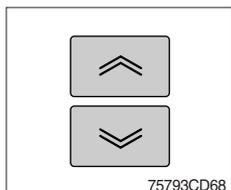


- ① Each time this button is pressed, the radio band is changed. Each time this button is pressed, LCD displays each band as follows :

FM1 → FM2 → FM3 → AM → LW

※ LW band is only available for Europe.

### (2) Up / down tuning

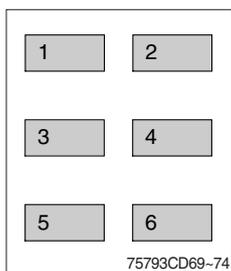


- ① To automatically select a radio station, momentarily press the up tune seek button  or down tune seek button  for less than 3 seconds to search for the closest radio station.

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

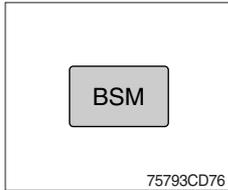


- ① Pressing these buttons shortly will recall your favorite pre-set radio stations.

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.

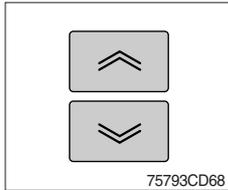
##### · Use of USB/AUX cable (option)



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.

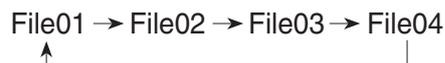
Press and hold for more than 3 seconds while playing MP3 file.

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

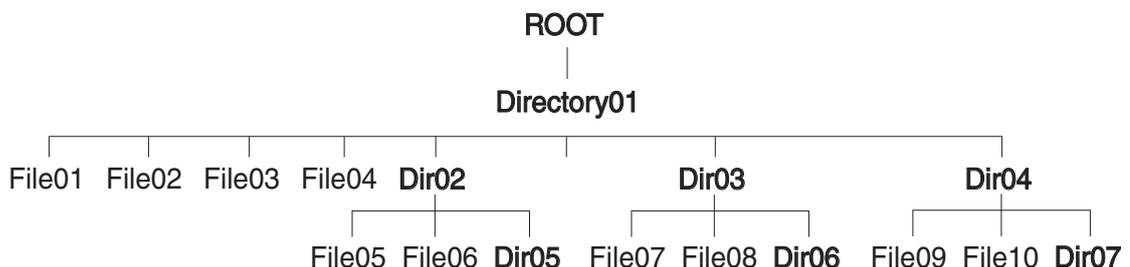
For example, the directory search generally changes in two methods depending on the order of writing as follows.

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

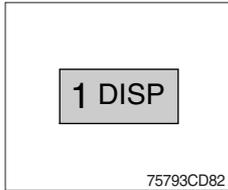
If you want to search the file in the located directory, turn right / left the power button consecutively. Press the button when you find the wanted file. The unit will then play the selected file. For instance, the file search changes in Dir01 as follows.



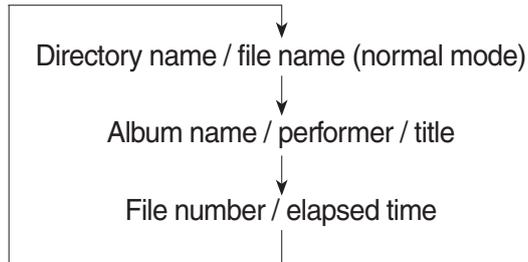
※ MP3 direction / file configuration



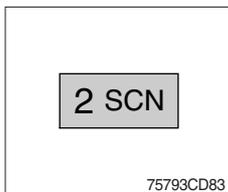
#### (4) ID3 v2 display



- 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.

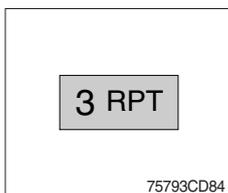


#### (5) File scan (SCN)



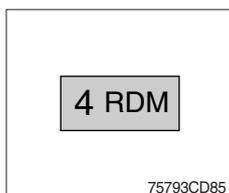
- ① During USB play, press SCN button to play the first 10 seconds of each file on the whole file on the USB (SCN mark will appear on the LCD display). When a desired file is reached, press the SCN button again to cancel the function. The unit will then play the selected file.
- ※ In case of playing 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)

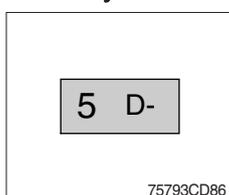


- ① During USB play, press RDM button to play the files on the USB in a random shuffled order (RDM will appear on the LCD display). The file select function will also select file in the random order instead of the normal process.

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

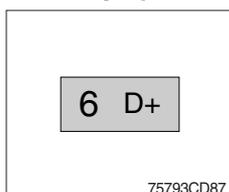
- ※ In case of MP3 file, when the random button is pressed and held longer than 2 seconds, the RDM mark will blink on the LCD display and play all files in directory randomly until the directory random mode is cancelled by pressing the random button again or by activating the scan or repeat functions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

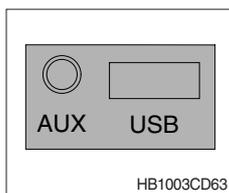
- ※ If the MP3 file does not have a directory, the unit play MP3 at 10-file intervals.

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

## ■ AUX PLAYER

### (1) Aux function

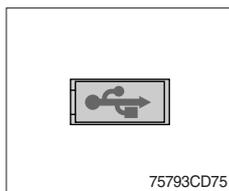
#### · Use of USB socket



- 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.

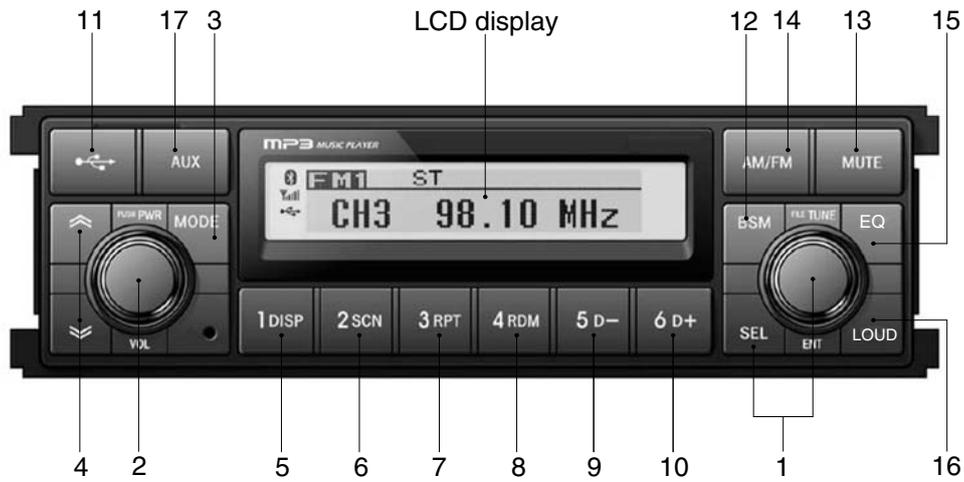
#### · Use of USB/AUX cable (option)



- 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.

**RADIO AND USB PLAYER (machine serial No. : #0118-)**



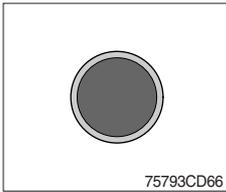
R25Z9A3CD38

**■ FRONT PANEL PRESENTATION**

- |  |   |
|--|---|
| <p>1  ..... Audio selection button</p> <p> ..... Audio selection knob</p> <p>2  ..... Power and volume button</p> <p>3  ..... Mode button<br/>(select RADIO / USB / AUX)</p> <p>4  ..... UP / DOWN tuning button</p> <p>5  ..... Preset memory button 1<br/>DISP ..... ID3 v2 display</p> <p>6  ..... Preset memory button 2<br/>SCN ..... File scan</p> <p>7  ..... Preset memory button 3<br/>RPT ..... Repeat play selector</p> <p>8  ..... Preset memory button 4<br/>RDM ..... Random play selector</p> <p>9  ..... Preset memory button 5<br/>D- ..... Directory down</p> | <p>10  ..... Preset memory button 6<br/>D+ ..... Directory up</p> <p>11  ..... Aux function</p> <p>12  ..... Preset scan (PS)<br/>Best station memory (BSM)</p> <p>13  ..... Audio mute button</p> <p>14  ..... AM / FM button (radio)</p> <p>15  ..... Equalizer</p> <p>16  ..... Loud</p> <p>17  ..... Aux connector</p> |
|--|---|

## ■ GENERAL

### (1) Power and volume button



#### ① Power ON/OFF button

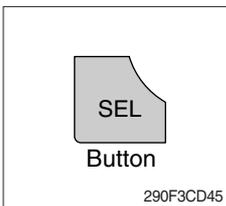
Press power button to turn the unit ON or OFF shortly.

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.

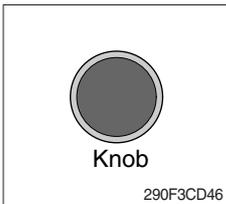
### (2) Sound function selection button/knob (audio selection)



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

BASS → TREBLE → BAL → LOUD → EQ → BASS

※ 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 SEL button until BASS indication appears on the LCD display. Within 5 seconds of choosing the bass mode, turn selection knob 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 SEL button until TREBLE indication appears on the LCD display. Within 5 seconds of choosing the treble mode, turn selection knob 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 SEL button until the BAL indication appears on the LCD display.

Within 5 seconds of choosing the balance mode, turn selection knob 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 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.

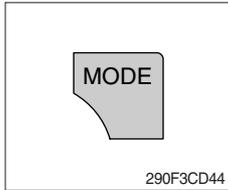
To select the loudness feature, press SEL button until LOUD ON or LOUD OFF is displayed, then turn selection knob left or right to activate or deactivate loudness.

#### ⑥ Equalizer (EQ)

You can select an equalizer curve designed for 4 music types (POP, ROCK, CLASSIC, JAZZ).

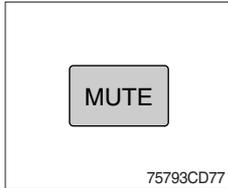
To select the desired curve, first select the EQ mode by pressing SEL button until the "EQ OFF" indication appears on the display panel. Within 5 seconds of choosing the EQ mode, turn selection knob to select an equalizer curve as desired.

### (3) Mode button



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

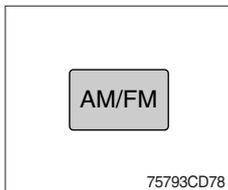
### (4) Audio mute button



- 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

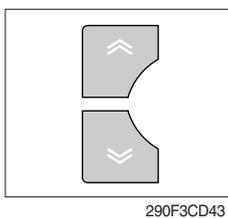


- ① Each time this button is pressed, the radio band is changed. Each time this button is pressed, LCD displays each band as follows :

FM1 → FM2 → FM3 → AM → LW → FM1

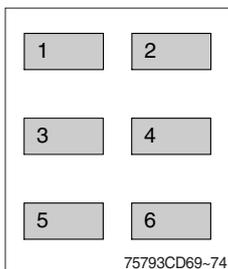
※ LW band is only available for Europe.

### (2) Up / down tuning



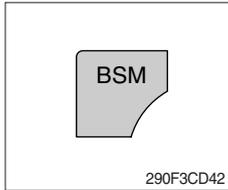
- ① To automatically select a radio station, momentarily press the up tune seek button  or down tune seek button  for less than 3 seconds to search for the closest radio station. To manually select a radio station, press the up tuning & down tuning button for longer than 3 seconds. The radio frequency 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 :
  - Turn the radio ON and select the desired band.
  - Select the first station to be pre-set using the manual up/down or automatic seek tuning control button.
  - 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



R25Z9A3CD39

##### (1) USB function

① Connect a USB device if you want to listen to MP3 file in a USB device.

② It will automatically play MP3 file in the USB device and the LCD display will show "READING USB".

※ If there are no files on USB device, playback will revert back to the previous mode after displaying "NO FILE".

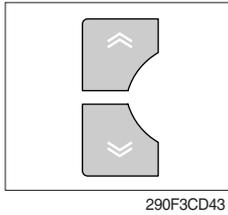
##### (2) AUX function

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

② Change AUX mode by pressing MODE button.

If audio file of Audio device is playing, you can listen to music through speaker.

### (3) File selection & cue / review button



#### ① File selection function

This button is used to select file up / down.

Each time the forward file select  $\blacktriangle\blacktriangle$  is pressed, file number is increased.

Each time the backward file select  $\blacktriangledown\blacktriangledown$  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  $\blacktriangle\blacktriangle$  to advance rapidly in the forward direction or the review button  $\blacktriangledown\blacktriangledown$  to advance rapidly in the backward direction.

### (4) MP3 directory / file searching

① The D-, D+ 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 selection knob 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 → ROOT

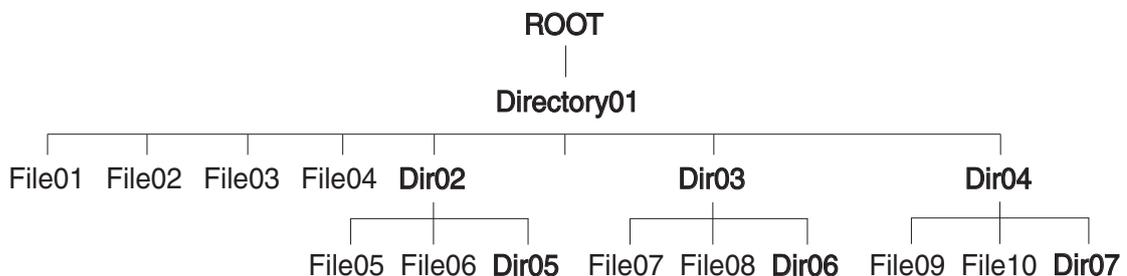
· Method 2 : ROOT → Dir01 → Dir02 → Dir05 → Dir03 → Dir06 → Dir04 → Dir07 → ROOT

If you want to search the file in the located directory, turn right / left the selection knob consecutively. Press the button when you find the wanted file. The unit will then play the selected file.

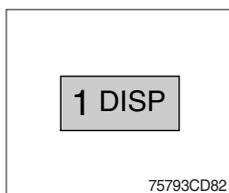
For instance, the file search changes in Dir01 as follows.

File01 → File02 → File03 → File04 → File01

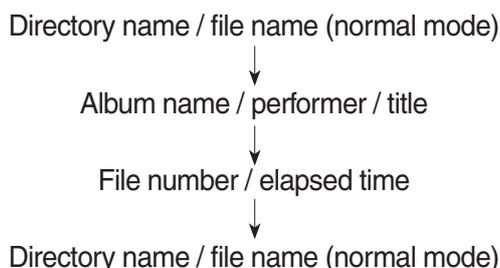
※ MP3 directory / file configuration



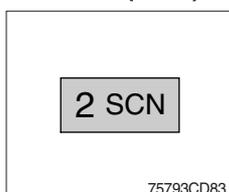
### (5) ID3 v2 display



- 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.

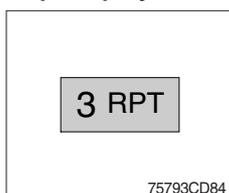


### (6) File scan (SCN)



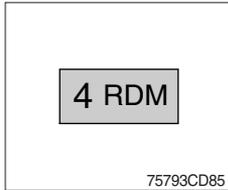
- ① During USB play, press SCN button to play the first 10 seconds of each file on the whole file on the USB (SCN mark will appear on the LCD display).  
When a desired file is reached, press the SCN button again to cancel the function.  
The unit will then play the selected file.
- ※ In case of playing 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.

### (7) 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).

### (8) Random play selector (RDM)

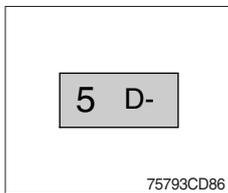


- ① During USB play, press RDM button to play the files on the USB in a random shuffled order (RDM will appear on the LCD display). The file select function will also select file in the random order instead of the normal process.

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

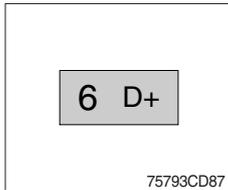
- ※ In case of MP3 file, when the random button is pressed and held longer than 2 seconds, the RDM mark will blink on the LCD display and play all files in directory randomly until the directory random mode is cancelled by pressing the random button again or by activating the scan or repeat functions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

### (9) Directory down



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

### (10) 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.

## 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.**

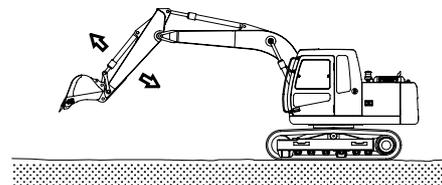
### 3) Be careful during the initial 100 hours operation

- (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 50 hours of operation

Checking items	Service
Engine oil	Replace
Engine oil filter element	
Hydraulic oil return filter element	
Hydraulic oil tank drain filter cartridge	
Line filter element	
Fuel filter	
Prefilter	

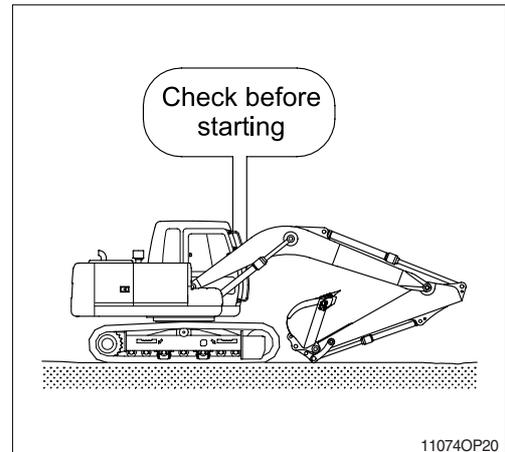
Avoid excessive operation for initial 100 hours



1107A4OP01

## 2. CHECK BEFORE STARTING THE ENGINE

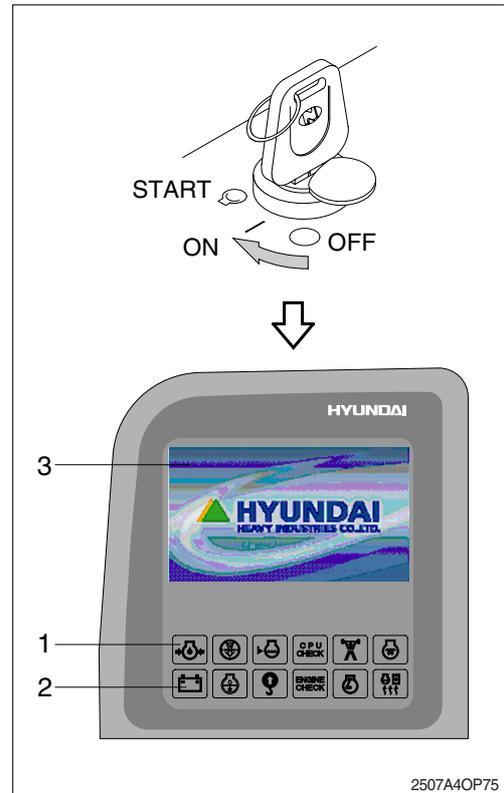
- 1) Look around the machine and under the machine to check for loosen nut or bolts, collection of dirt, or leakage of oil, fuel or coolant and check the condition of the work equipment and hydraulic system. Check also loosen wiring, and collection of dust at places which reach high temperature.  
※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



### 3. STARTING AND STOP THE ENGINE

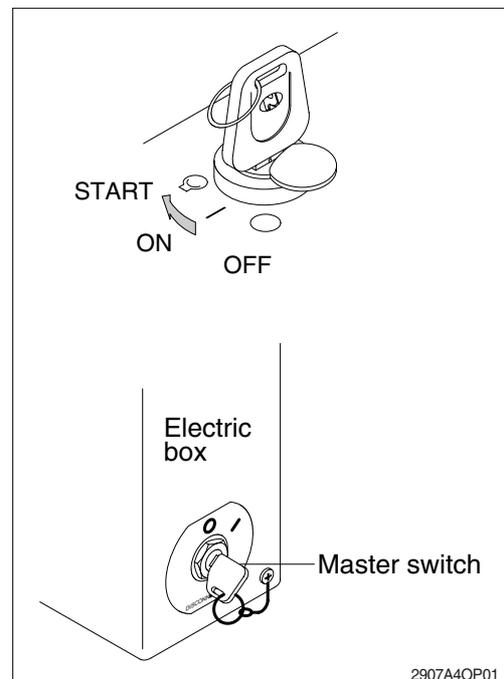
#### 1) CHECK INDICATOR LIGHTS

- (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

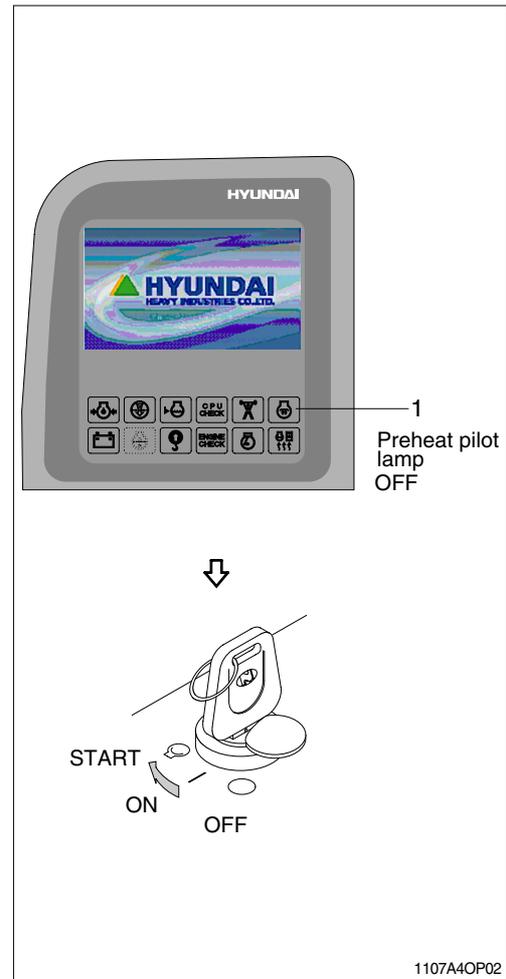
- ※ Sound the horn to warn the surroundings after checking if personnel or obstacles are in the area.
- (1) Turn the starting switch to START position to start the engine.
    - ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
  - (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 2-16.
- ※ 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.

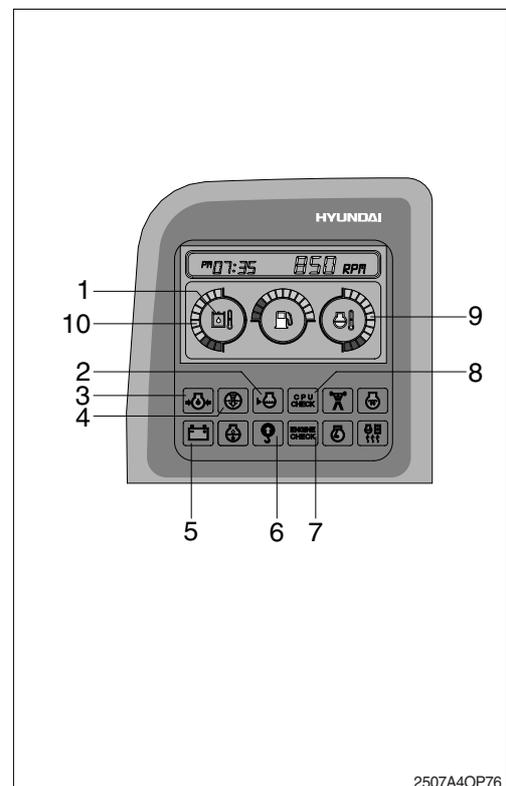
- (1) Check if all the levers are in the neutral position.
- (2) Turn the starting switch to ON position, and wait 1~2 minutes. More time may take according to ambient temperature.
- (3) Start the engine by turning the starting switch to the START position after the preheat pilot lamp OFF.
- ※ If the engine does not start, allow the starter to cool for about 2 minutes before attempting to start the engine again.
- (4) Release the starting switch immediately after starting engine.
- (5) The operation for the warming up machine is automatic.



### 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 OFF(1-8)?
- (4) Is the indicator of water temperature gauge(9) and hydraulic temperature gauge(10) in the 2nd~10th step zone?
- (5) Is the engine sound and the color of exhaust gas normal?
- (6) Are the sound and vibration normal?
- ※ Do not increase engine speed quickly after starting, it can damage engine or turbocharger.
- ※ If there are problems in the control panel, stop the engine immediately and correct problem as required.



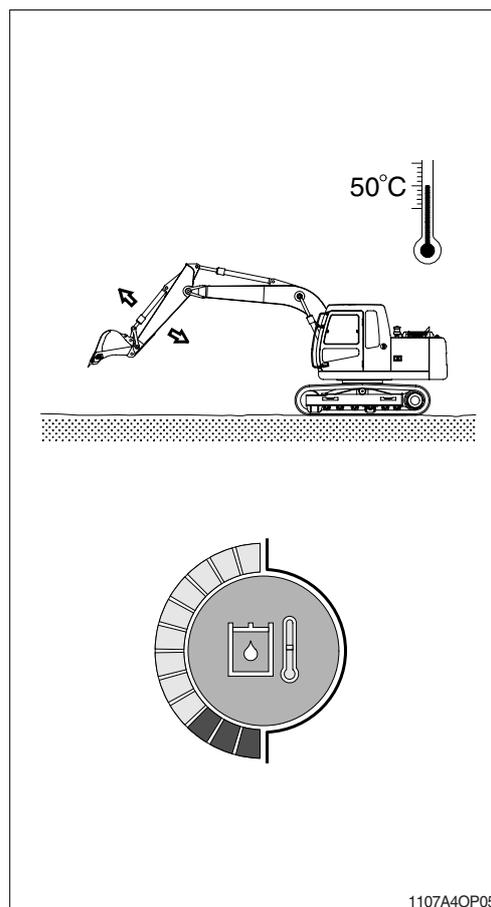
## 5) WARMING-UP OPERATION

※ 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.  
※ **Increase the warming-up operation during winter.**

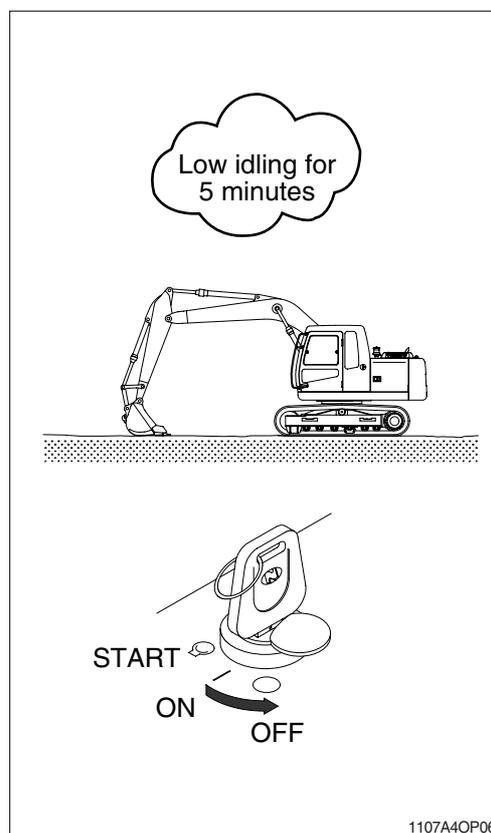


## 6) TO STOP THE ENGINE

※ 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 particularly if the engine has overheated, do not abruptly stop it but run it at medium speed to allow it to cool gradually, then stop it.

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



## 4. MODE SELECTION SYSTEM

### 1) STRUCTURE OF CAPO SYSTEM

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

#### (1) Power mode

3 power modes can be selected for the optimal power of the machine operation.

##### ① H mode

This mode is used for heavy-duty work.

##### ② S mode

When key switch is turned ON, this mode is selected automatically. This mode is used for standard work.

##### ③ L mode

This mode is used for light-duty work.

#### (2) Wiper switch

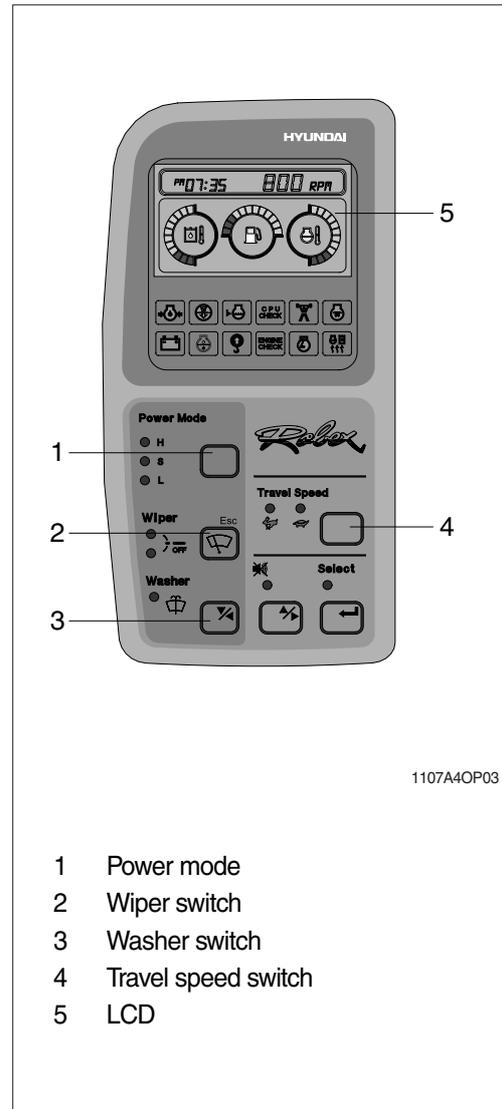
- Press the switch once to operate wiper.
- Press the switch once more to intermittently operate wiper low speed.
- Press the switch a third time to turn off wiper.

#### (3) Washer switch

The washer liquid is sprayed and the wiper is operated only while pressing the switch.

#### (4) Travel speed switch

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



- 1 Power mode
- 2 Wiper switch
- 3 Washer switch
- 4 Travel speed switch
- 5 LCD

## (5) Monitoring system

Information of machine performance as monitored by the MCU controller can be displayed on the **LCD**. Refer to the page 3-5.

## (6) Self diagnostic system

### ① MCU controller

The MCU controller 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).

### ② Engine controller(ECU)

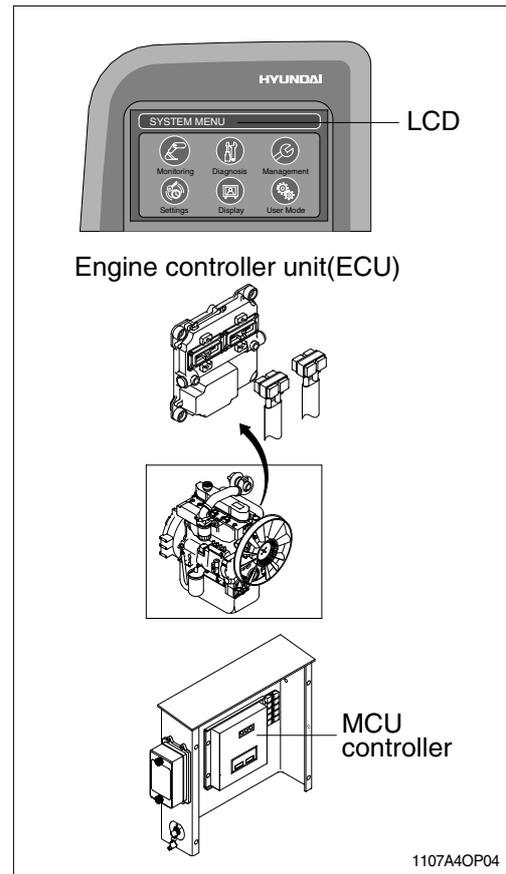
If the engine or relevant system has problem ECU diagnoses and displays on the **LCD** as fault codes(3 digit or more).

※ **Consult hyundai or hyundai dealer for details.**

※ **Refer to the page 3-5 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 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

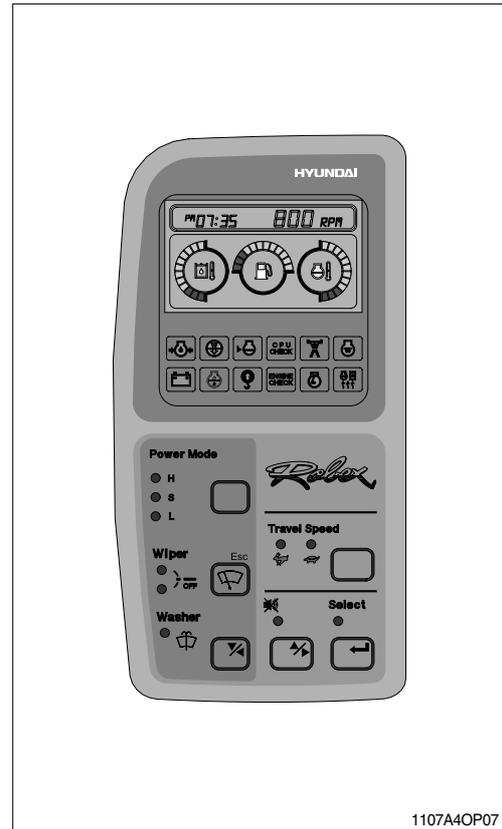
- ① When the engine is started, three lamps are ON as below.

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

- In this condition, tachometer indicates low idle,  $900 \pm 100$ rpm.
- If coolant temperature is below  $30^{\circ}\text{C}$ , after 10 seconds the engine speed increases to  $1200 \pm 100$ 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 3-5 for details.



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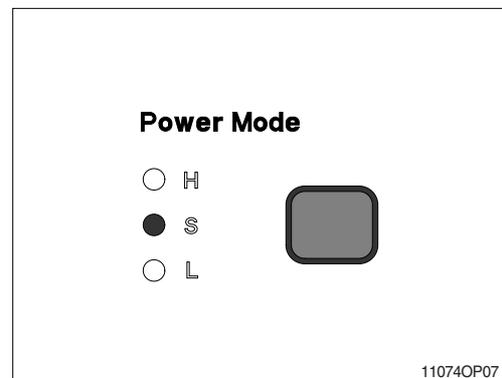
## 3) SELECTION OF POWER MODE

### (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
$1800 \pm 50$	Same power as <b>non</b> mode type machine.

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



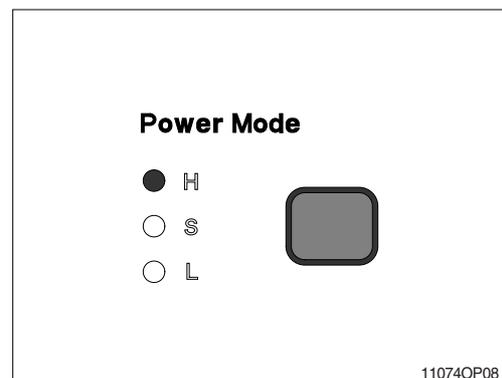
11074OP07

### (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
$1900 \pm 50$	Approximately 110% of power and speed available than <b>non</b> mode type machine or <b>S</b> mode.

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



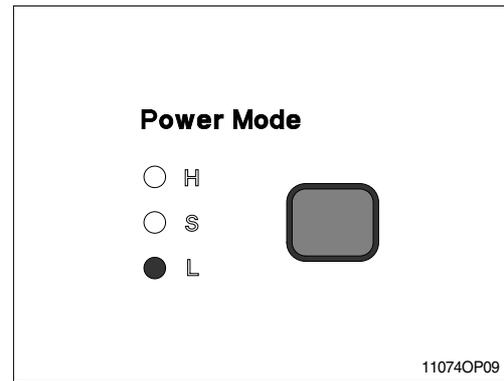
11074OP08

### (3) L mode

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

Engine rpm	Effect
1700 ± 50	Approximately 85% of power and speed available than <b>non</b> mode type machine or <b>S</b> mode.

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

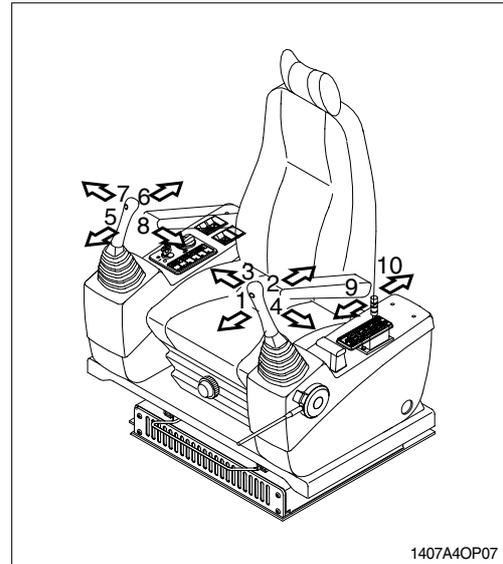


## 5. OPERATION OF WORKING DEVICE

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

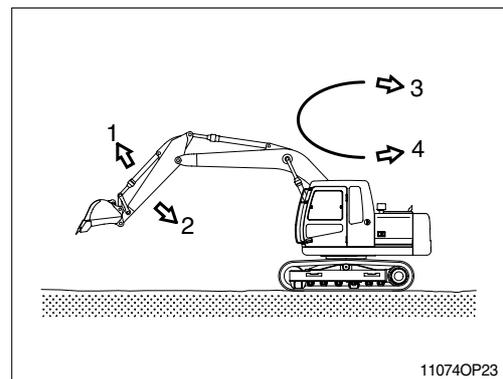
- 1) Left control lever controls arm and swing.
- 2) Right control lever controls boom and bucket.
- 3) When you release the control lever, control lever returns to neutral position automatically.

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



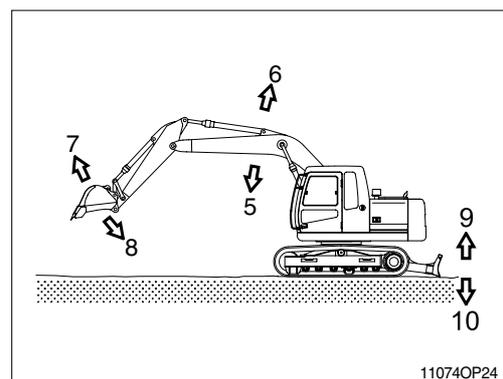
※ **Left control lever**

- 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 control lever**

- 9 Dozer blade up
- 10 Dozer blade down

## 6. TRAVELING OF THE MACHINE

### 1) BASIC OPERATION

#### (1) Traveling position

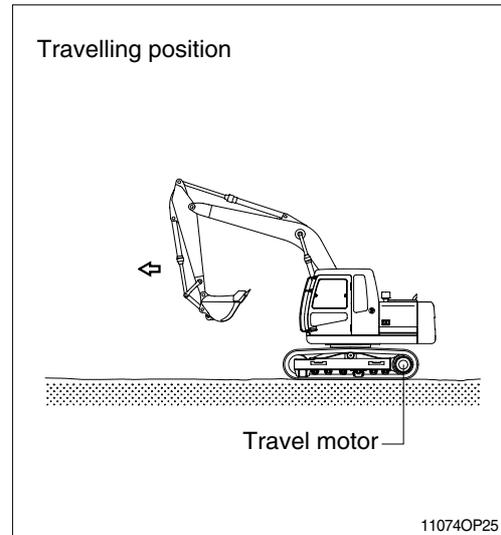
It is the position which the traveling motor is in the rear and the working device is forward.

- ▲ **Be careful as the traveling direction will be reversed when the whole machine is swung 180 degree.**

#### (2) Traveling operation

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

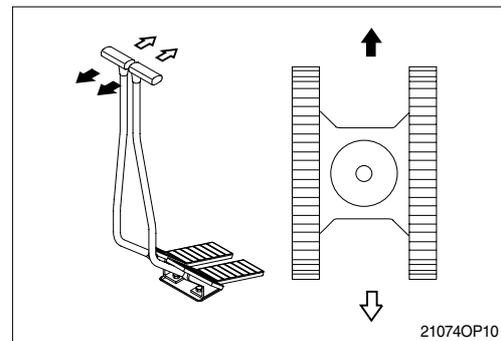
- ※ **Do not travel continuously for a long time.**
- ※ **Reduce the engine speed and travel at a low speed when traveling on uneven ground.**



#### (3) Forward and backward traveling

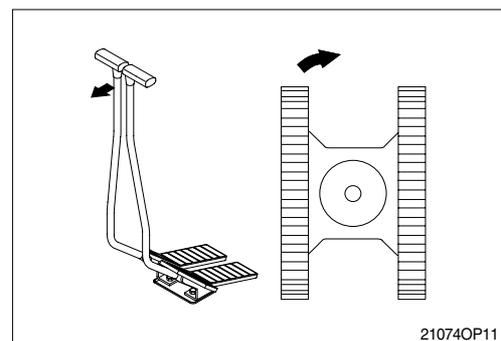
When the left and right travel lever or pedal are pushed at the same time, the machine will travel forward or backward.

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



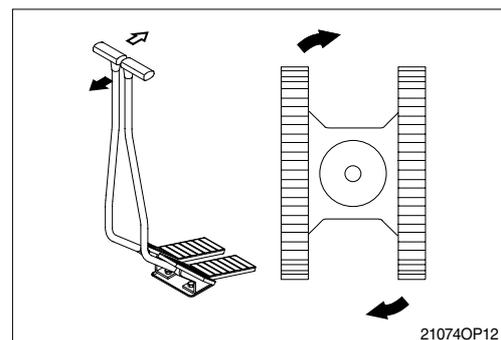
#### (4) Pivot turning

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



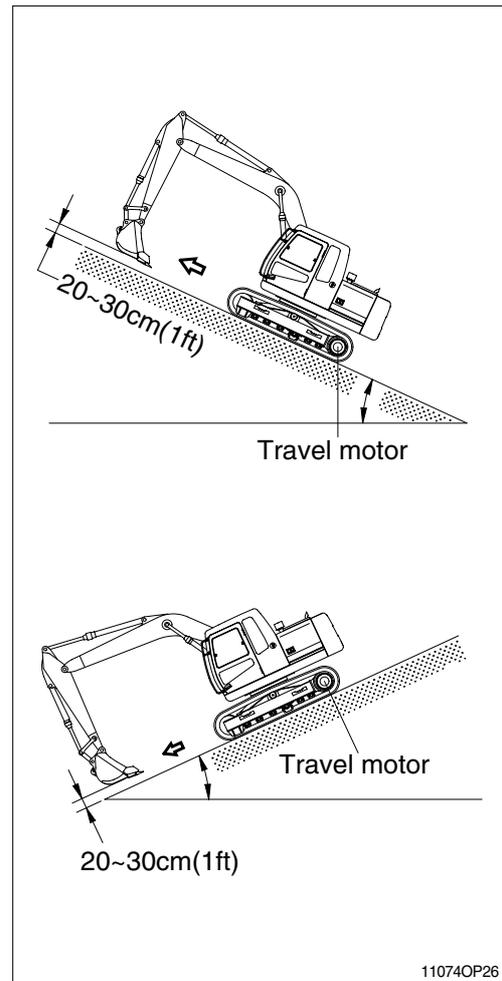
#### (5) Counter rotation

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



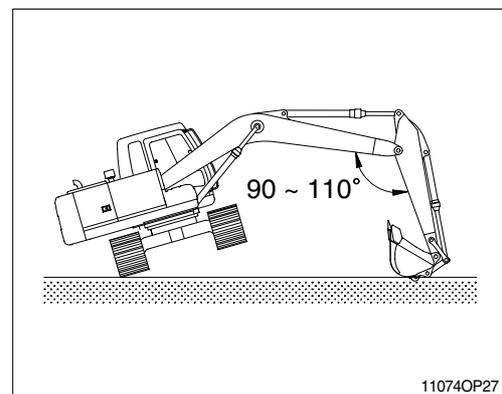
## 2) TRAVELING ON A SLOPE

- (1) Make sure that the travel lever is properly maneuvered by confirming the travel motor is in the right location.
  - (2) Lower the bucket 20 to 30cm(1ft) to the ground so that it can be used as a brake in an emergency.
  - (3) If the machine starts to slide or loses stability, lower the bucket immediately and brake the machine.
  - (4) When parking on a slope, use the bucket as a brake and place blocks behind the tracks to prevent sliding.
- ※ **Machine cannot travel effectively on a slope when the oil temperature is low. Do the warming-up operation when it is going to travel on a slope.**
- ▲ **Be careful when working on slopes. It may cause the machine to lose its balance and turn over.**
- ▲ **Be sure to keep the travel speed switch on the LOW(Turtle mark) while traveling on a slope.**



## 3) TRAVELING ON SOFT GROUND

- ※ **If possible, avoid to operate on soft ground.**
- (1) Move forward as far as machine can move.
  - (2) Take care not to go beyond the depth where towing is impossible on soft ground.
  - (3) When driving becomes impossible, lower bucket and use boom and arm to pull the machine. Operate boom, arm, and travel lever at the same time to avoid the machine sinking.



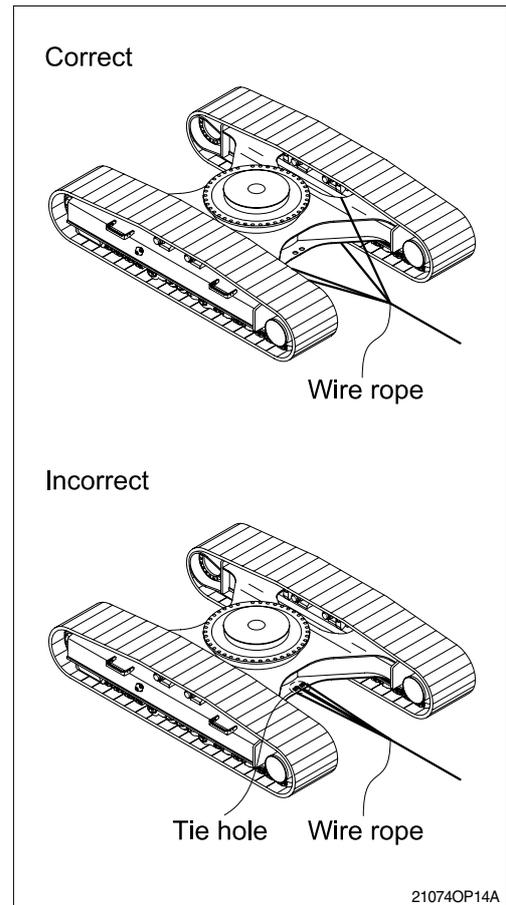
#### 4) TOWING THE MACHINE

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

- (1) Tow the machine by other machine after hook the wire rope to the frame as shown in picture at right.
- (2) Hook the wire rope to the frame and put a support under each part of wire rope to prevent damage.

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

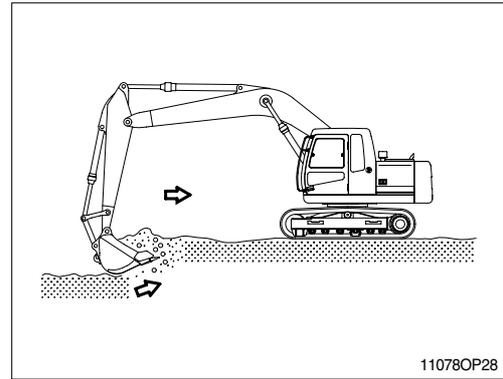
▲ **Make sure no personnel are standing close to the tow rope.**



## 7. EFFICIENT WORKING METHOD

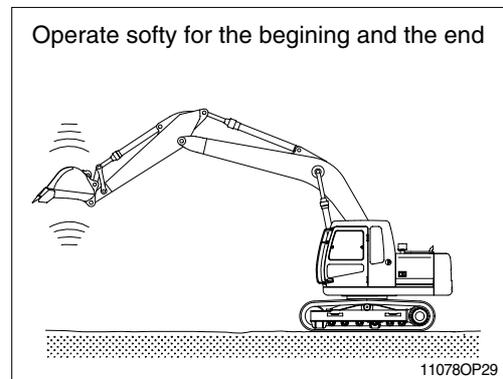
- 1) Do the digging work by arm.

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

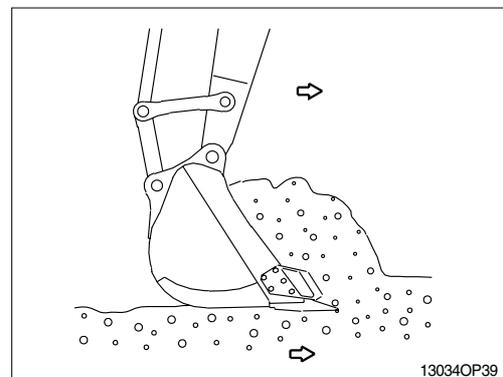


- 2) When lowering and raising the boom operate softly for the beginning and the end.

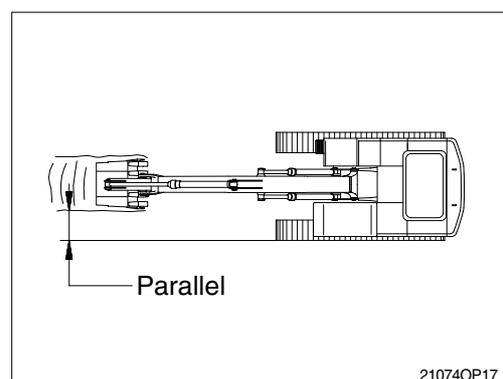
In particularly, sudden stops while lowering the boom may cause damage to the machine.



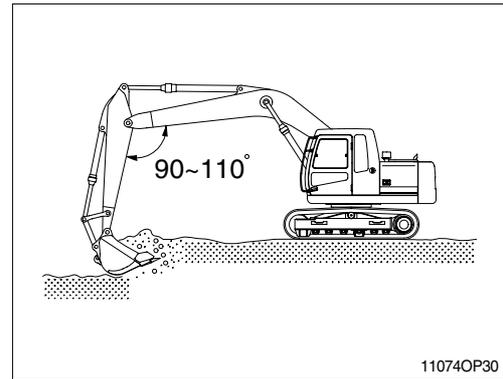
- 3) The digging resistance and wearing of tooth can be reduced by putting the end of bucket tooth to the digging direction.



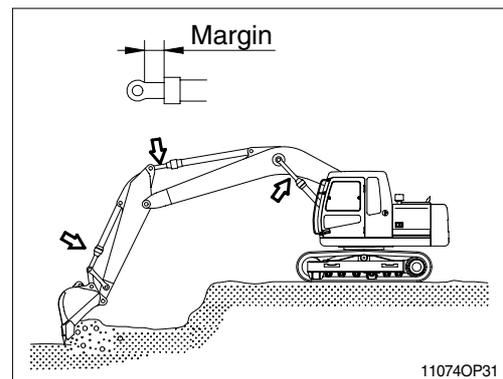
- 4) Set the tracks parallel to the line of the ditch to be excavated when digging ditch. Do not swing while digging.



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

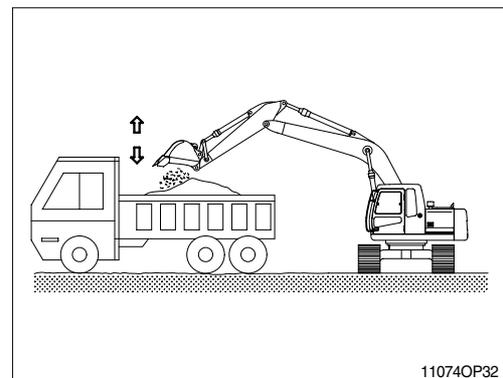


- 6) Operate leaving a small safety margin of cylinder stroke to prevent damage of cylinder when working with the machine.

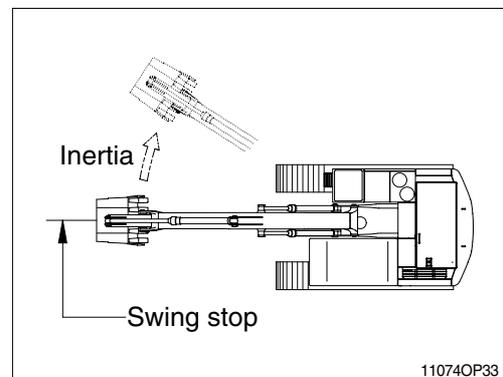


- 7) Keep the bucket to the dumping position and the arm horizontal when dumping the soil from the bucket.  
Operate bucket lever 2 or 3 times when hard to dump.

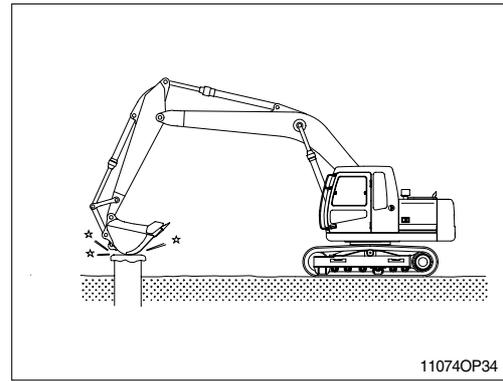
※ Do not use the impact of bucket tooth when dumping.



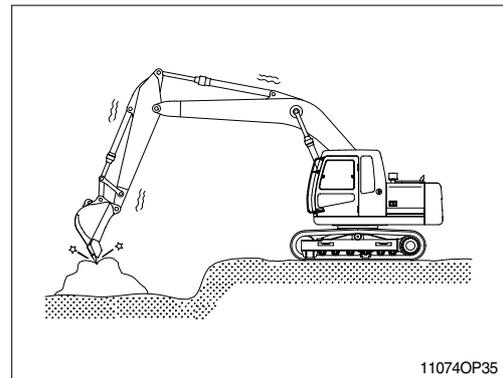
- 8) Operate stop of swing considering the swing slip distance is created by inertia after neutralizing the swing lever.



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



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



**11) NEVER CARRY OUT EXCESSIVE OPERATIONS**

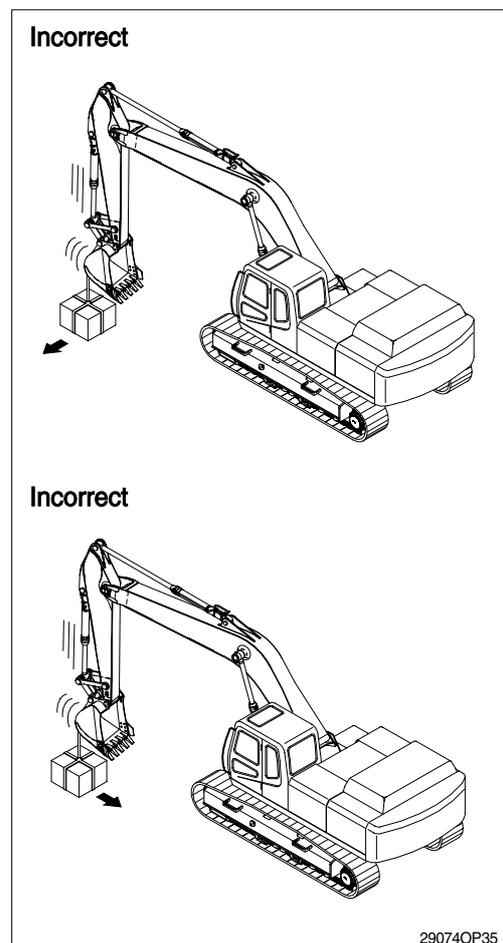
Operation exceeding machine performance may result in accident or failure.

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.



## 12) BUCKET WITH HOOK

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

The following operations are prohibited.

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

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

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

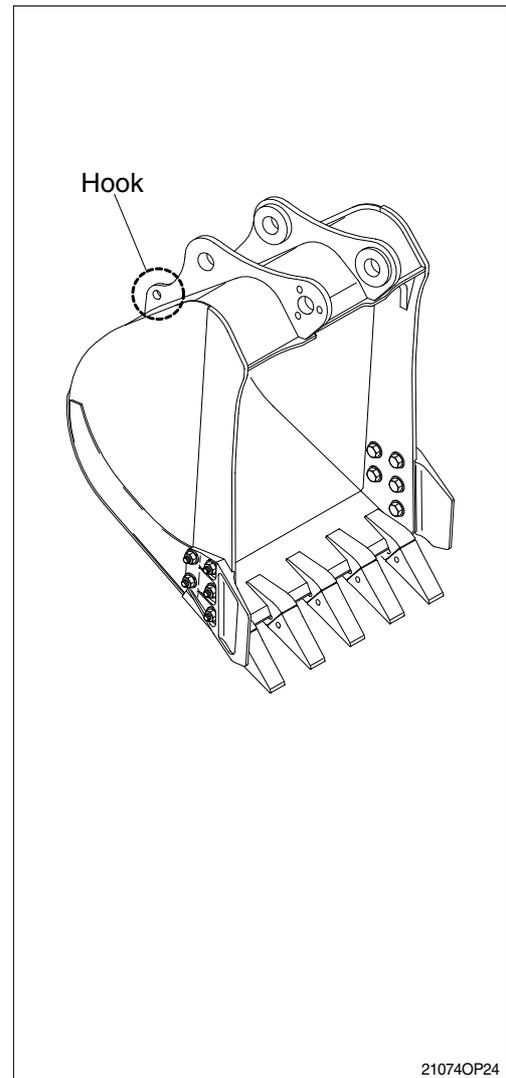
Due to the possible danger of the load falling or of collision with the load, no persons shall be allowed in the working area.

Before performing lifting operation, designate an operation supervisor.

Always execute operation according to his instructions.

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

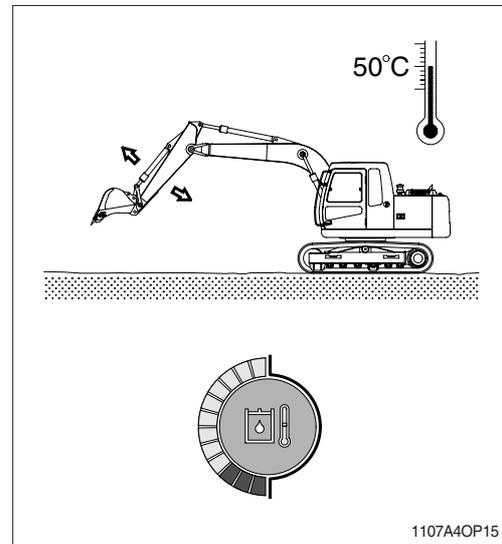
Never leave the operator's seat while lifting a load.



## 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.

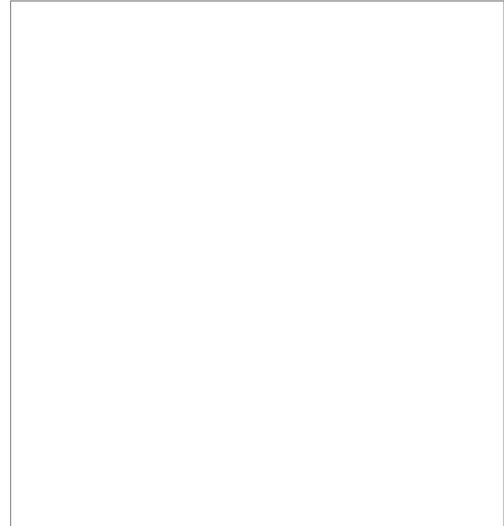


### 2) OPERATION IN SANDY OR DUSTY WORK SITES

- (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 6 times of cleaning.**
- (2) Inspect radiator 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 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.

### 3) SEA SHORE OPERATION

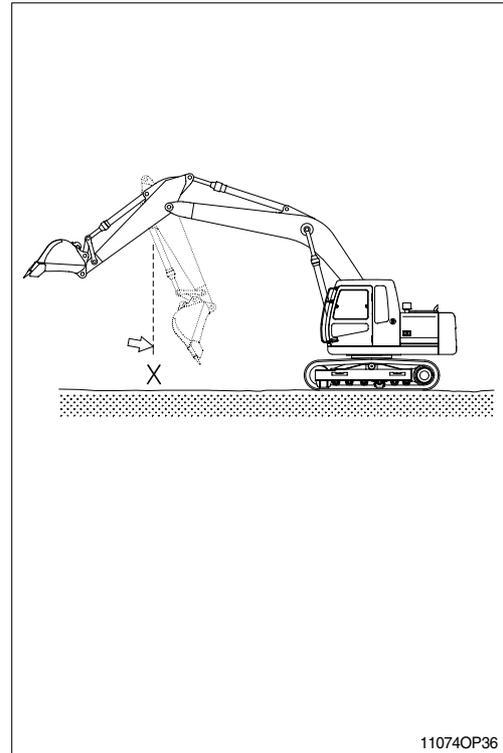
- (1) Prevent ingress of salt by securely tightening plugs, cocks and bolts of each part.
- (2) Wash machine after operation to remove salt residue.  
Pay special attention to electrical parts and hydraulic cylinders to prevent corrosion.
- (3) Inspection and lubrication must be carried out more frequently.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



## 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 is happen only starting switch ON position and safety lever UNLOCK position. After the engine is stopped, set the safety lever to the LOCK position.

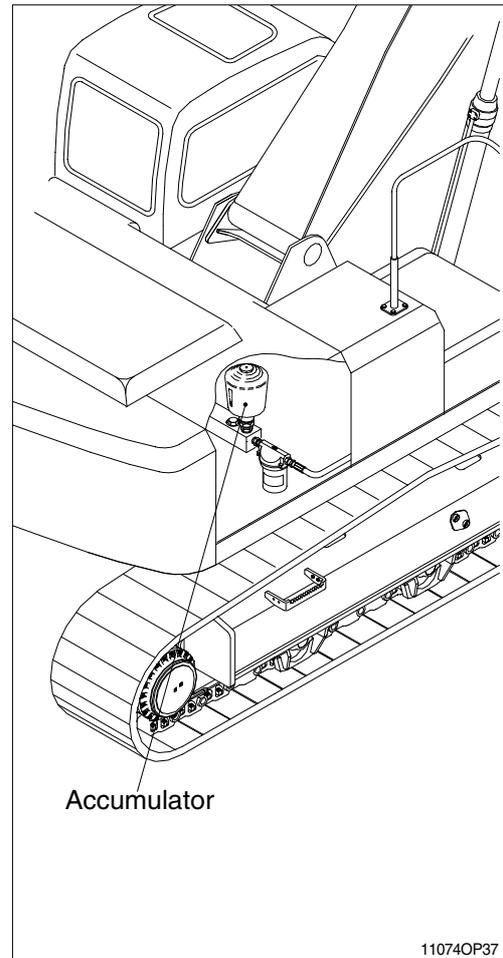
**▲ Be sure no one is under or near the attachment before lowering the boom.**

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

**▲ Never make any hole in the accumulator expose it to flame or fire.**

**▲ Do not weld anything to the accumulator.**

※ When carrying out disassembly or maintenance of the accumulator, or when disposing of the accumulator, it is necessary to release the gas from the accumulator. A special air bleed valve is necessary for this operation, so please contact your Hyundai distributor.



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## 11. STORAGE

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

### 1) CLEANING THE MACHINE

Clean the machine. Check and adjust tracks.  
Grease each lubrication part.

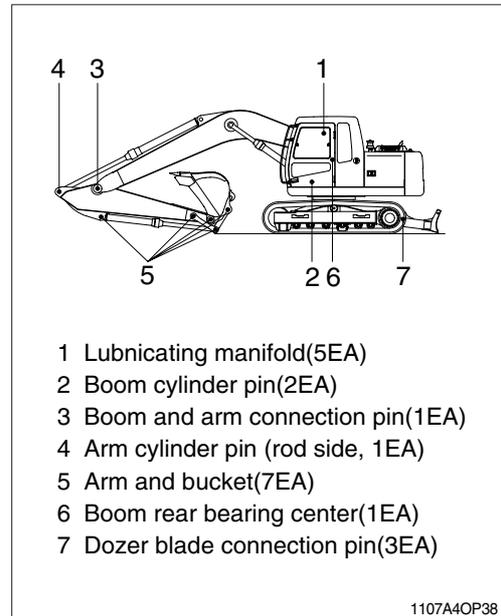
### 2) LUBRICATION POSITION OF EACH PART

Change all oil.

※ Be particularly careful when you reuse the machine.

As oil can be diluted during storage.

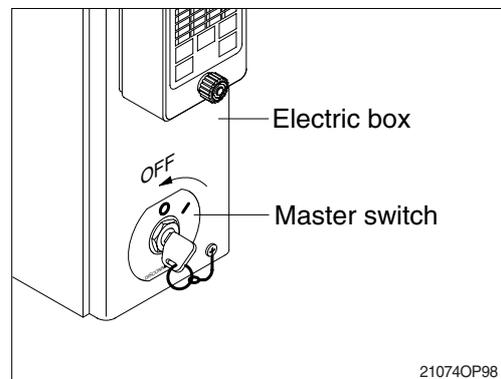
Apply an anticorrosive lubricant on the exposed part of piston rod of cylinder and in places where the machine rusts easily.



### 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.

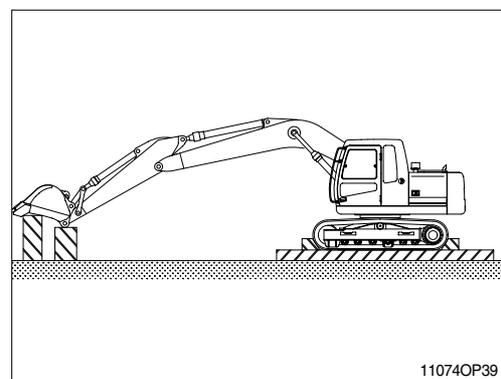


### 5) PREVENTION OF DUST AND MOISTURE

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

※ Cover exposed part of piston rod of cylinder.

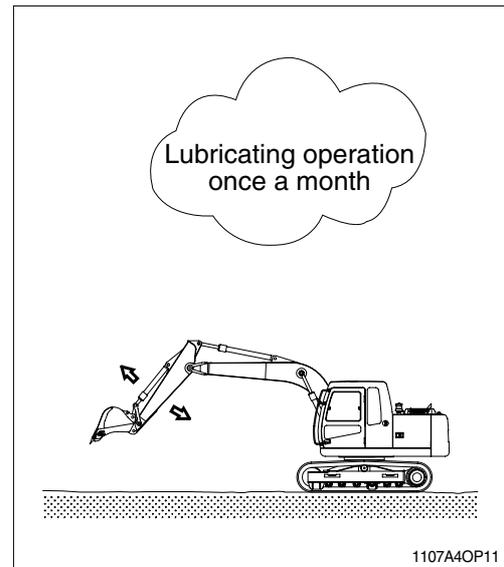
※ Lower the bucket to the ground and set a support under track.



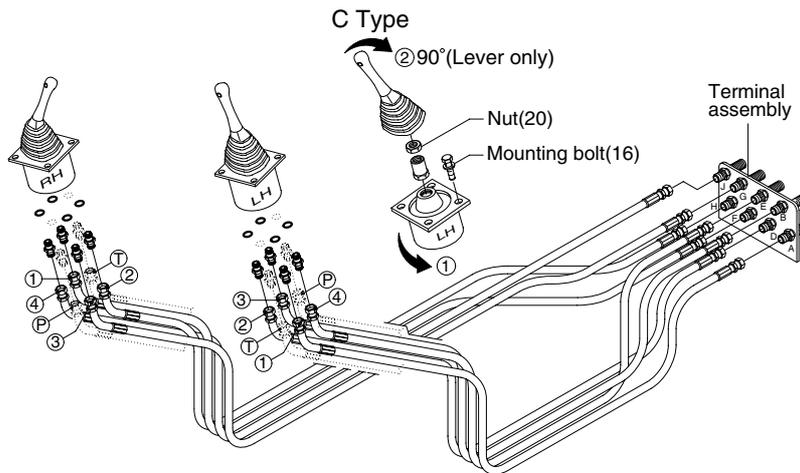
## 6) DURING STORAGE

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.



## 12. RCV LEVER OPERATING PATTERN(STD)

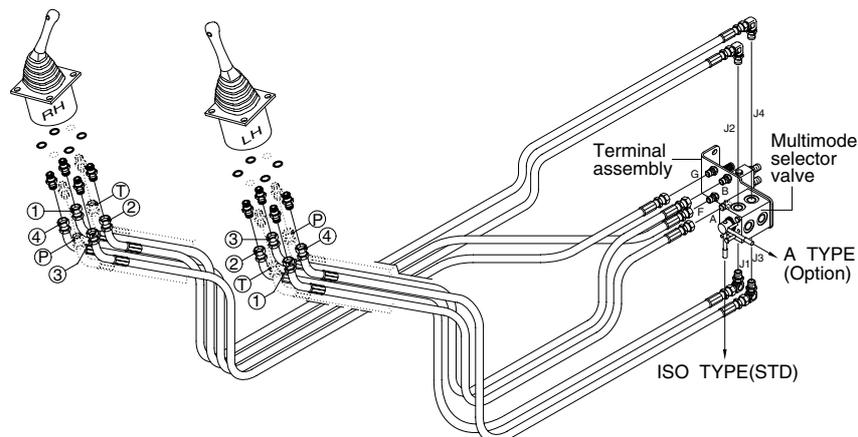


※ Whenever a change is made to the machine control pattern also exchange the pattern label in the cab to match the new pattern.

2107A4OP95

Pattern	Operation		Control function	Hose connection(Port)			
	Left	Right		RCV lever	Change of MCV port		
					From	To	
ISO Type			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	F	-
				⑧ Bucket in	③	G	-
Hyundai							
A Type			Left	① Boom lower	See next page		
				② Boom raise			
				③ Swing right			
				④ Swing left			
			Right	⑤ Arm out			
				⑥ Arm in			
				⑦ Bucket out			
				⑧ Bucket in			
B Type			Left	① Boom lower	②	D	J
				② Boom raise	④	E	H
				③ Bucket in	③	A	G
				④ Bucket out	①	B	F
			Right	⑤ Arm out	④	J	D
				⑥ Arm in	②	H	E
				⑦ Swing right	①	F	A
				⑧ Swing left	③	G	B
C Type			Left	① Loosen the RCV lever mounting bolt(16) and rotates lever assy 90° counterclockwise; then install. ② To put lever in correct position, disassemble nut(20) and rotates only lever 90° clockwise.			
			Right	Same as ISO type			

## RCV LEVER OPERATING PATTERN(option, A type)

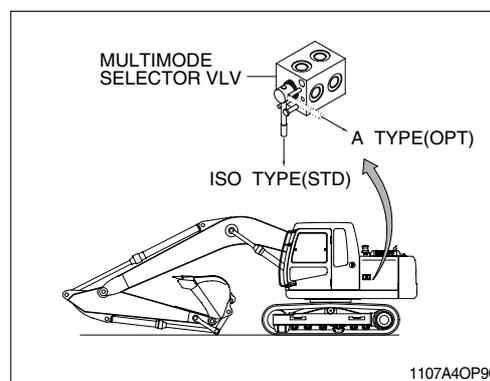


1607A4OP94A

Pattern	Operation		Control function	Hose connection(Port)		
	Left	Right		RCV lever	MCV port	
A Type			Left	① Boom lower	②	J1
				② Boom raise	④	J3
				③ Swing right	③	B
				④ Swing left	①	A
	Right		Right	⑤ Arm out	④	J2
				⑥ Arm in	②	J4
				⑦ Bucket out	①	F
				⑧ Bucket in	③	G

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

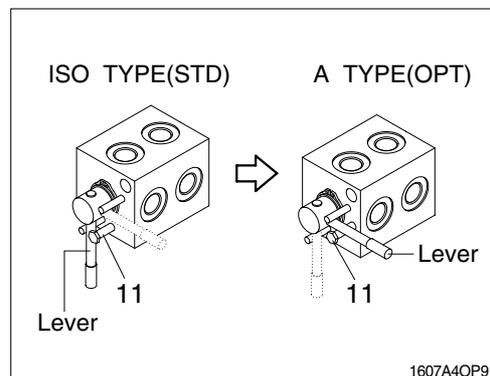
**▲ Before starting the machine, check the lever position of multimode selector valve and actual operating of attachment.**



1107A4OP90

2) **Change of operating pattern(ISO → A type)**

- (1) Loosen bolt(11).
- (2) Move lever from the "ISO" type to "A" type position.
- (3) After setting the lever, tighten bolt to secure lever.



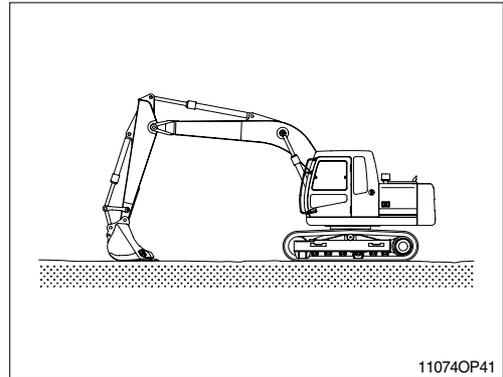
1607A4OP91

### 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.

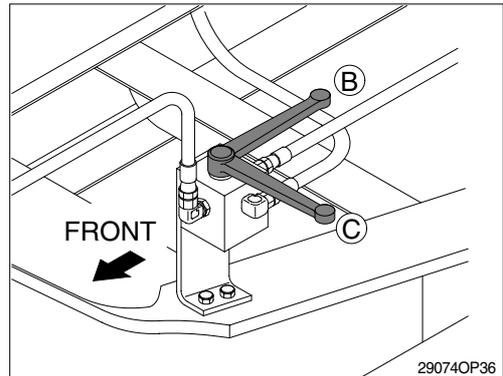


- 3) Before you change the flow mode of hydraulic attachment circuit, place the machine in the servicing position as shown. Stop the engine.



- 4) Use the manual lever to turn the 3 way valve. Make sure that you fully turn the valve until the valve stops.

- (1) **One way flow**(Hydraulic breaker)  
Position the manual lever parallel to the piping (B).
- (2) **Two way flow**(Clamshell or shear)  
Position the manual lever perpendicular to the piping (C).

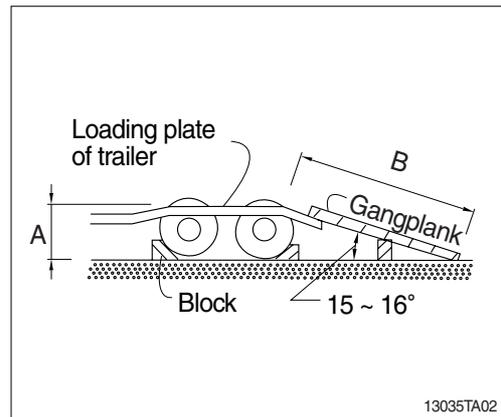
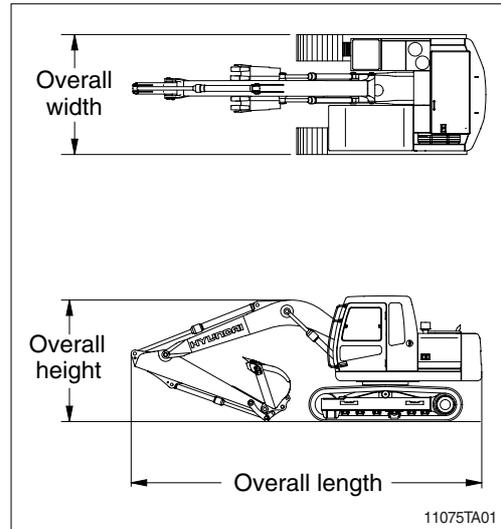


# TRANSPORTATION

## 1. PREPARATION FOR TRANSPORTATION

- 1) When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc.
- 2) Select proper trailer after confirming the weight and dimension from the chapter 2, specification.
- 3) Check the whole route such as the road width, the height of bridge and limit of weight and etc., which will be passed.
- 4) Get the permission from the related authority if necessary.
- 5) Prepare suitable capacity of trailer to support the machine.
  
- 6) Prepare gangplank for safe loading referring to the below table and illustration.

A	B
1.0	3.65 ~ 3.85
1.1	4.00 ~ 4.25
1.2	4.35 ~ 4.60
1.3	4.75 ~ 5.00
1.4	5.10 ~ 5.40
1.5	5.50 ~ 5.75



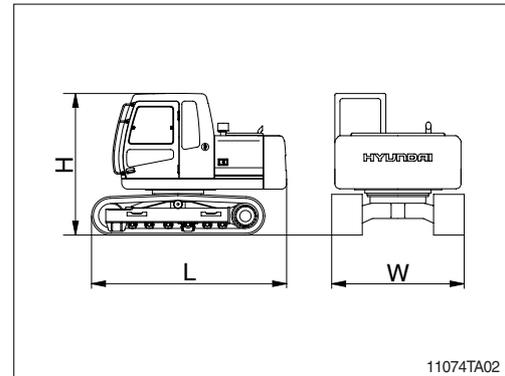
## 2. DIMENSION AND WEIGHT

### 1) ROBEX 110-7A

#### (1) Base machine

Mark	Description	Unit	Specification
L	Length	mm(ft-in)	3800(12' 6")
H	Height	mm(ft-in)	2800( 9' 2")
Wd	Width	mm(ft-in)	2490( 8' 2")
Wt	Weight	kg(lb)	9280(20460)

※ With 500mm(20") triple grouser shoes and 1450kg(3200lb) counterweight.

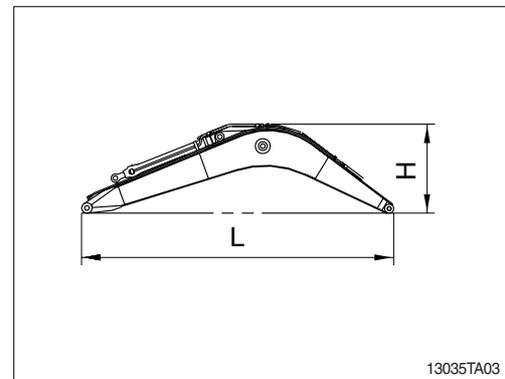


11074TA02

#### (2) Boom assembly

Mark	Description	Unit	Specification
L	Length	mm(ft-in)	1340( 4' 5")
H	Height	mm(ft-in)	4450(14' 7")
W	Width	mm(ft-in)	520( 1' 8")
Wt	Weight	kg(lb)	950(2090)

※ 4.3m(14' 1") boom with arm cylinder(Included piping and pins).

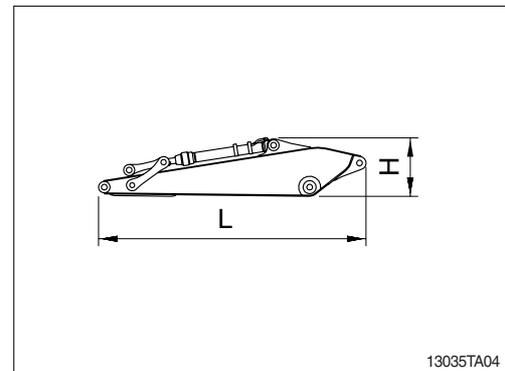


13035TA03

#### (3) Arm assembly

OMark	Description	Unit	Specification
L	Length	mm(ft-in)	2970( 9' 9")
H	Height	mm(ft-in)	680( 2' 3")
W	Width	mm(ft-in)	380( 1' 3")
Wt	Weight	kg(lb)	530(1170)

※ 2.26m(7' 5") arm with bucket cylinder(Included linkage and pins).

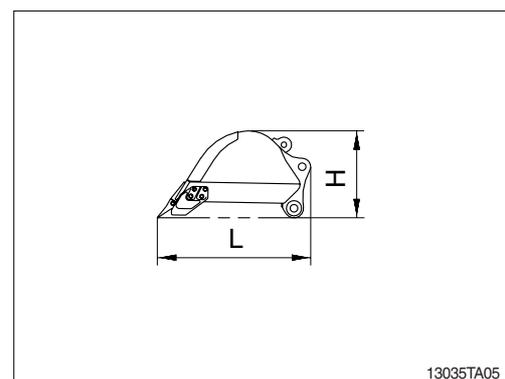


13035TA04

#### (4) Bucket assembly

Mark	Description	Unit	Specification
L	Length	mm(ft-in)	1350( 4' 5")
H	Height	mm(ft-in)	920( 3' 0")
W	Width	mm(ft-in)	940( 3' 1")
Wt	Weight	kg(lb)	440(970)

※ 0.45m<sup>3</sup>(0.52yd<sup>3</sup>) SAE heaped bucket(Included tooth and side cutters).

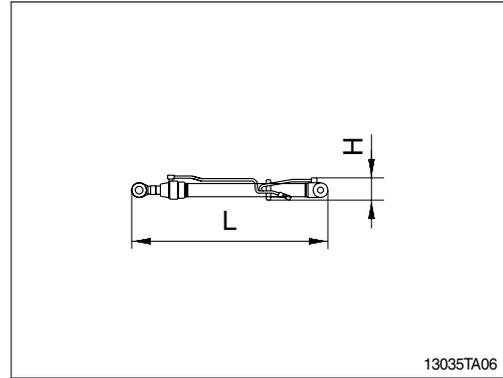


13035TA05

**(5) Boom cylinder**

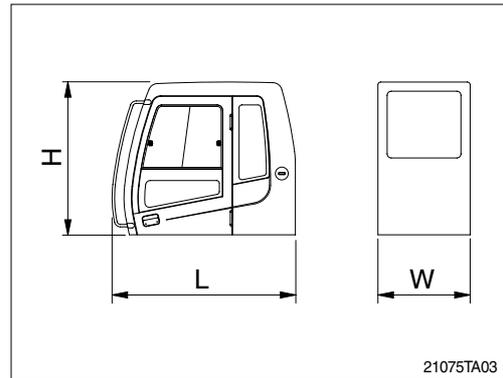
Mark	Description	Unit	Specification
L	Length	mm(ft-in)	1650( 5' 5")
H	Height	mm(ft-in)	216( 0' 9")
W	Width	mm(ft-in)	310( 1' 0")
Wt	Weight(2EA)	kg(lb)	230(510)

※ Included piping.



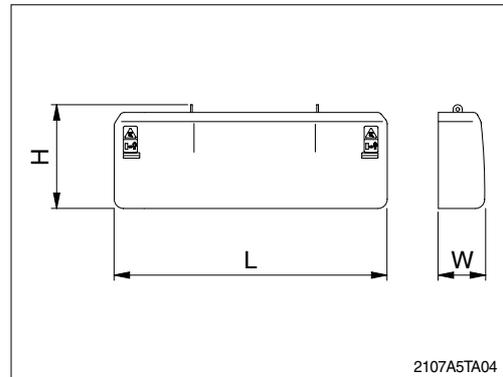
**(6) Cab assembly**

Mark	Description	Unit	Specification
L	Length	mm(ft-in)	1962( 6' 5")
H	Height	mm(ft-in)	1676( 5' 6")
W	Width	mm(ft-in)	1288( 4' 3")
Wt	Weight	kg(lb)	310(680)



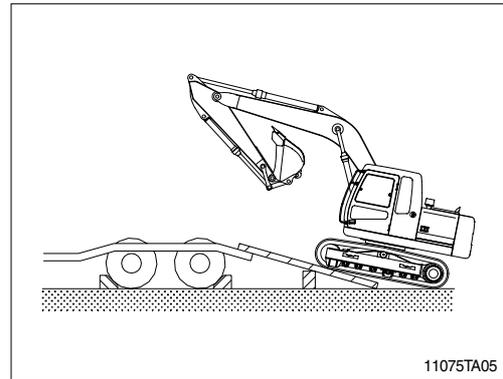
**(7) Counterweight**

Mark	Description	Unit	Specification
L	Length	mm(ft-in)	2460( 8' 1")
H	Height	mm(ft-in)	1050( 3' 5")
W	Width	mm(ft-in)	445(1' 6")
Wt	Weight	kg(lb)	1450(3200)

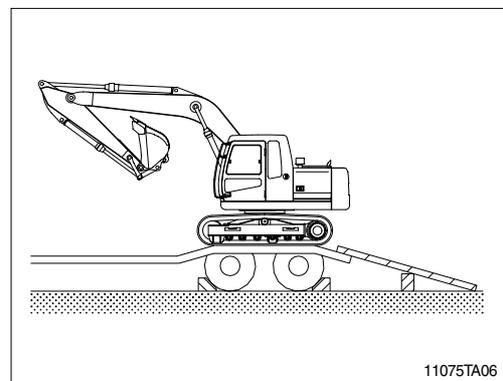


### 3. LOADING THE MACHINE

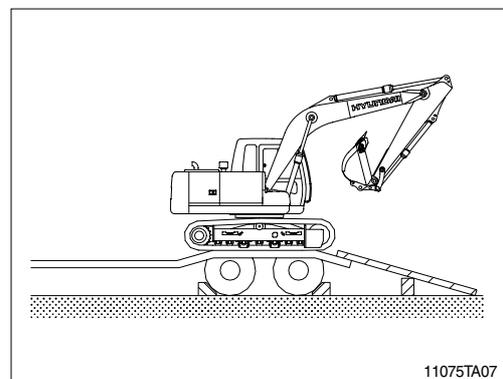
- 1) Load and unload the machine on a flat ground.
- 2) Use the gangplank with sufficient length, width, thickness and gradient.
- 3) Place the swing lock lever to the LOCK position before fixing the machine at the bed of trailer and confirm if the machine parallels the bed of trailer. Keep the travel motor in the rear when loading and in the front when unloading.



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



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



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

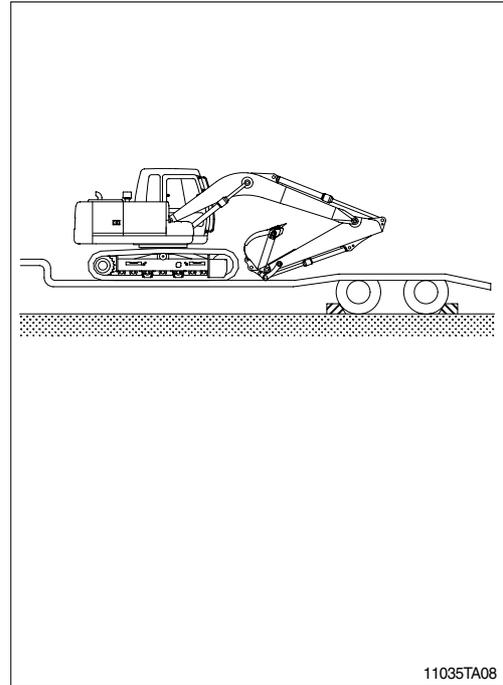
※ Place rectangular timber under the bucket cylinder to prevent the damage of it during transportation.

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

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

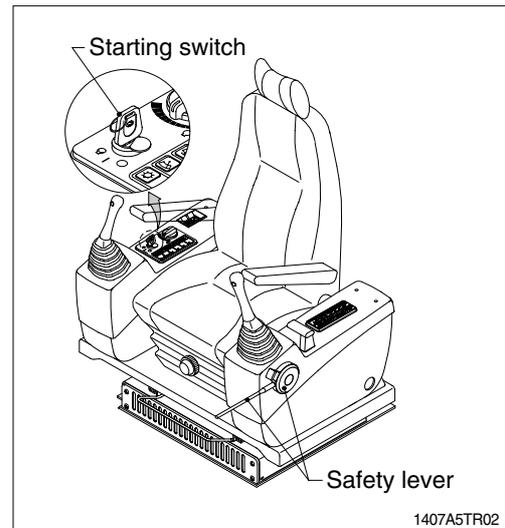
▲ Do not operate any other device when loading.

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

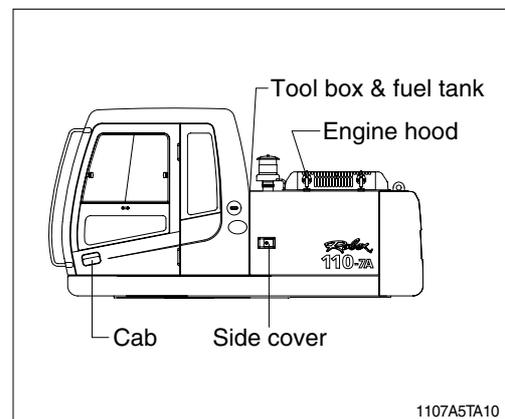


## 4. FIXING THE MACHINE

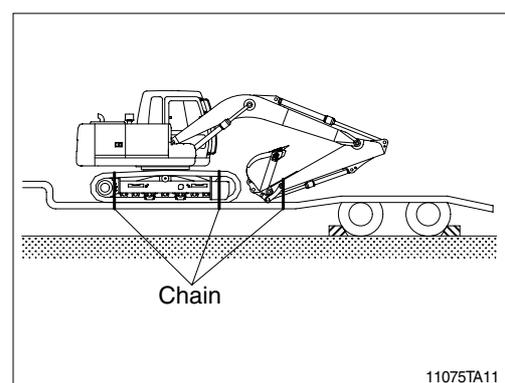
- 1) Place the swing lock lever on the LOCK position.
- 2) Lower down the working device on the loading plate of trailer.
- 3) Keep the safety lever on the LOCK position.
- 4) Turn OFF all the switches and remove the key.



- 5) Secure all locks.



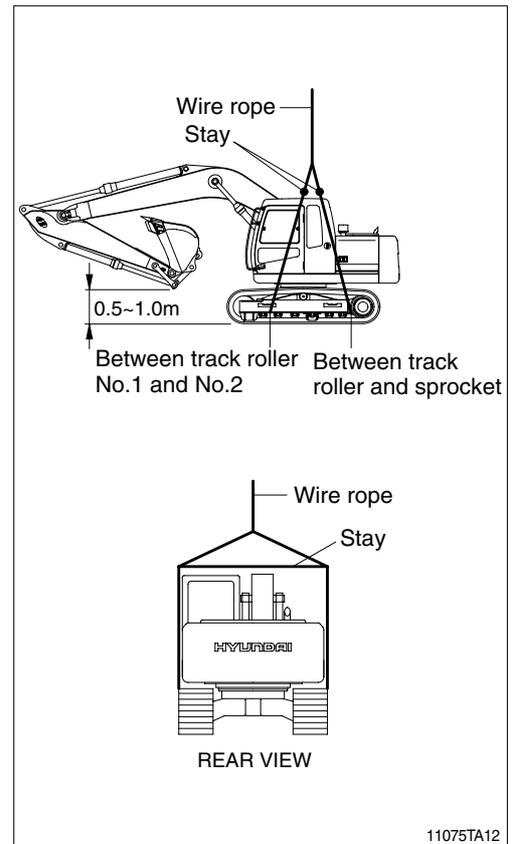
- 6) Place timber underneath of the track and fix firmly with wire rope to prevent the machine from moving forward, backward, right or left.



## 5. LOADING AND UNLOADING BY CRANE

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

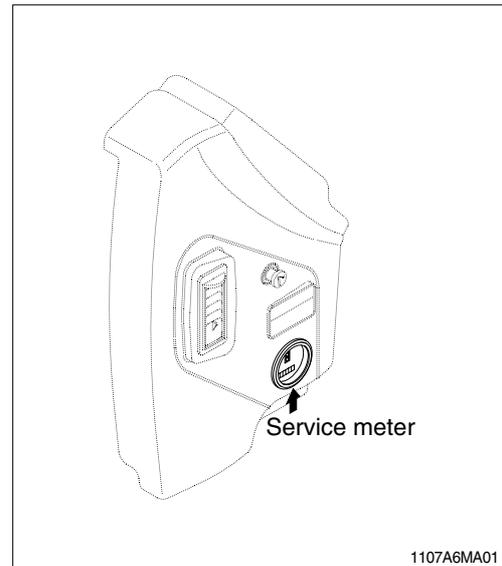
- ⚠ **Make sure wire rope is proper size.**
- ⚠ **Place the swing lock lever and safety lever to LOCK position to prevent the machine moving when hoisting the machine.**
- ⚠ **The wrong hoisting method or installation of wire rope can cause damage to the machine.**
- ⚠ **Do not load abruptly.**
- ⚠ **Keep area clear of personnel.**



## 1. INSTRUCTION

### 1) INTERVAL OF MAINTENANCE

- (1) You may inspect and service the machine by the period as described at page 6-11 based on hour meter at control panel.
- (2) Shorten the interval of inspect and service depending on site condition.(Such as dusty area, quarry, sea shore and etc.)
- (3) Practice the entire related details at the same time when the service interval is doubled.  
For example, in case of 100hours, carry out all the maintenance 「Each 100hours, each 50 hours and daily service」 at the same time.



### 2) PRECAUTION

- (1) Start to maintenance after you have the full knowledge of machine.
- (2) The monitor installed on this machine does not entirely guarantee the condition of the machine.  
Daily inspection should be performed according to clause 4, maintenance check list.
- (3) Engine and hydraulic components have been preset in the factory.  
Do not allow unauthorized personnel to reset them.
- (4) 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.

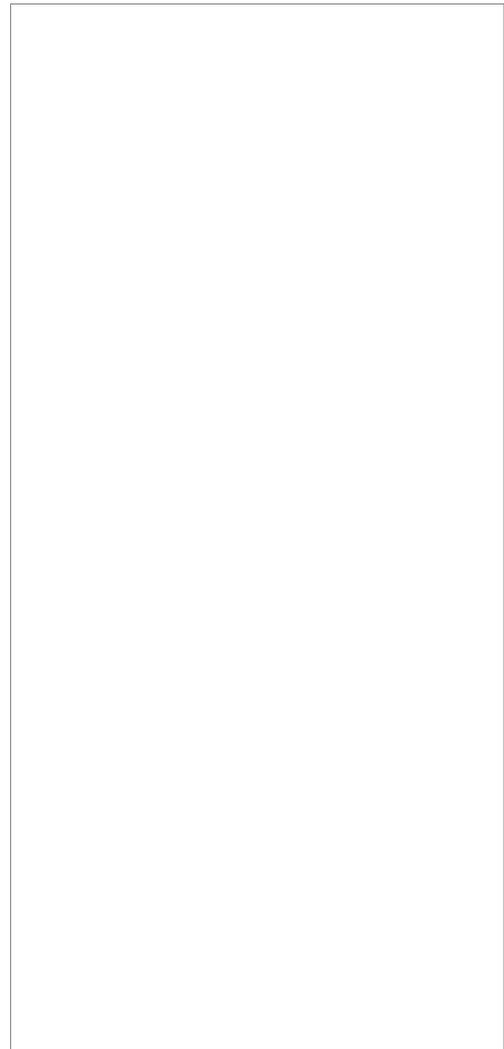
### 3) PROPER MAINTENANCE

#### (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.**

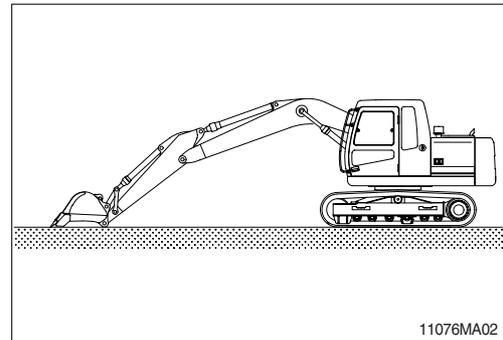


#### 4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

※ 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.

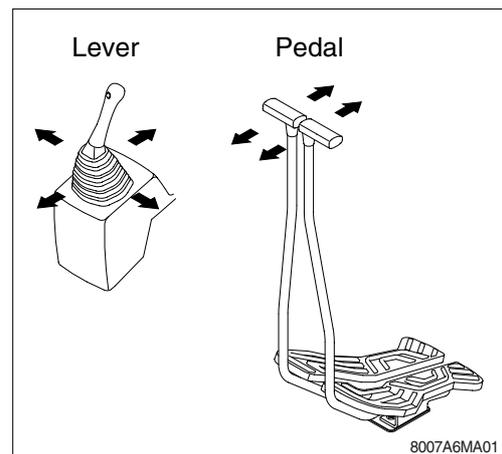
Be sure to relieve the pressure in the system before repairing hydraulic system.

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

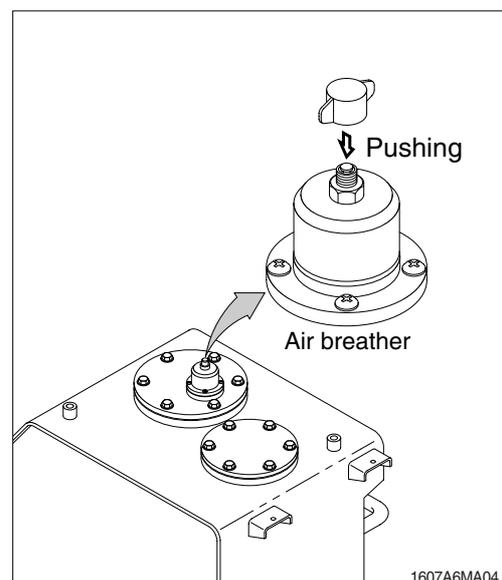


- (2) Set the safety lever completely in the release position, operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ 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			

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

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

## 2. TIGHTENING TORQUE

Use following table for unspecified torque.

### 1) BOLT AND NUT

#### (1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · 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 × 2.0	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	
	kgf · m	lbf · ft	kgf · m	lbf · 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(Engine-Bracket)	M12 × 1.75	10.0±1.0	72.3±7.2
2		Engine mounting bolt(Bracket-Frame, FR)	M16 × 2.0	30±3.5	253±25.3
3		Engine mounting bolt(Bracket-Frame, RR)	M20 × 2.5	55±3.5	398±25.3
4		Radiator mounting bolt, nut	M12 × 1.75	12.2±1.3	88.2±9.4
5		Coupling mounting socket bolt	M16 × 2.0	22.0±1.1	159±8.0
		Coupling mounting clamp bolt	M16 × 2.0	11±1.0	79.6±7.2
6		Main pump housing mounting bolt	M10 × 1.5	6.1±0.3	44.1±2.2
7	Hydraulic system	Main pump mounting bolt	M16 × 2.0	22.1±2.4	159±17.3
8		Main control valve mounting bolt	M12 × 1.75	12.2±1.3	88.2±9.4
9		Fuel tank mounting bolt	M20 × 2.5	45±5.1	325±36.9
10		Hydraulic oil tank mounting bolt	M20 × 2.5	45±5.1	325±36.9
11		Turning joint mounting bolt, nut	M12 × 1.75	12.3±1.3	88.2±9.4
12	Power train system	Swing motor mounting bolt	M16 × 2.0	29.6±3.2	214±23.1
13		Swing bearing upper mounting bolt	M18 × 2.0	41.3±4.5	299±32.5
14		Swing bearing lower mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
15		Travel motor mounting bolt	M16 × 2.0	23±2.5	166±18.1
16		Sprocket mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
17		Carrier roller mounting bolt, nut	M16 × 2.0	29.7±4.5	215±32.5
18	Under carriage	Track roller mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
19		Track tension cylinder mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
20		Track shoe mounting bolt, nut	M16 × 1.5	31.3±4.7	226±34.0
21		Track guard mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
22	Others	Counter weight mounting bolt	M24 × 3.0	100±15	723±109
23		Cab mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
24		Operator's seat mounting bolt	M 8 × 1.25	4.05±0.8	29.3±5.8

### 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)
Hydraulic oil	ISO VG 46(SAE 10W)
Swing and travel reduction gear	SAE 85W-140(API GL-5)
Grease	Lithium base grease NLGI No. 2
Fuel	ASTM D975-No. 2
Coolant	Mixture of 50% ethylene glycol base antifreeze and 50% water.

**SAE** : Society of Automotive Engineers

**API** : American Petroleum Institute

**ISO** : International Organization for Standardization

**NLGI** : National Lubricating Grease Institute

**ASTM** : American Society of Testing and Material

**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)						
			-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)
Engine oil pan	Engine oil	18.5(4.9)	SAE 30						
			SAE 10W						
			SAE 10W-30						
			SAE 15W-40						
Swing drive	Gear oil	2.5(0.7)	SAE 85W-140						
Final drive		2.5 × 2 (0.7 × 2)							
Swing drive	Grease	0.32(0.1)	NLGI NO.1						
			NLGI NO.2						
Hydraulic tank	Hydraulic oil	Tank:100(26.4) System: 210(55.5)	ISO VG 32						
			ISO VG 46						
			ISO VG 68						
Fuel tank	Diesel fuel	256(67.6)	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 water 50 : 50	22(5.8)	Ethylene glycol base permanent type						

## 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	6-39
Prefilter	Check, Clean	6-26
Fan belt tension	Check, Adjust	6-24

### 2) EVERY 50 HOURS SERVICE

Check items	Service	Page
Fuel tank (Water sediment)	Drain	6-25
Track tension	Check, Adjust	6-34
Swing bearing grease	Lubricate	6-32
Swing reduction gear oil	Check, Add	6-32
Lubricate pin and bushing	Lubricate	6-38
<ul style="list-style-type: none"> <li>· Boom cylinder tube end</li> <li>· Boom foot</li> <li>· Boom cylinder rod end</li> <li>· Arm cylinder tube end</li> <li>· Arm cylinder rod end</li> <li>· Boom + Arm connecting</li> <li>· Bucket cylinder tube end</li> <li>· Bucket cylinder rod end</li> <li>· Arm + Bucket connecting</li> <li>· Arm + Link, Bucket control</li> <li>· Bucket control rod</li> </ul>		

### 3) INITIAL 50 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	Replace	6-27
Bolts & Nuts	Check, Tight	6-8
<ul style="list-style-type: none"> <li>· Sprocket mounting bolts</li> <li>· Travel motor mounting bolts</li> <li>· Swing motor mounting bolts</li> <li>· Swing bearing mounting bolts</li> <li>· Engine mounting bolts</li> <li>· Counterweight mounting bolts</li> <li>· Turning joint locating bolts</li> <li>· Track shoe mounting bolts and nuts</li> <li>· Hydraulic pump mounting bolts</li> </ul>		

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

### 4) EVERY 100 HOURS SERVICE

Check items	Service	Page
★ Return filter	Replace	6-30
★ Pilot line filter	Replace	6-31
★ Element in hydraulic tank breather	Replace	6-31
★ Drain filter cartridge	Replace	6-31

**★ Replace 4 filters for continuous hydraulic breaker operation only.**

### 5) INITIAL 250 HOURS SERVICE

Check items	Service	Page
Pilot line filter	Replace	6-31
Hydraulic return filter	Replace	6-30
Drain filter cartridge	Replace	6-31
Swing reduction gear oil	Change	6-32

## 6) EVERY 250 HOURS SERVICE

Check items	Service	Page
Battery electrolyte	Check, Add	6-39
Aircon & heater flesh filter	Check	6-43
Air breather element	Replace	6-31
Bolts & Nuts	Check, Tight	6-8
<ul style="list-style-type: none"> <li>· Sprocket mounting bolts</li> <li>· Travel motor mounting bolts</li> <li>· Swing motor mounting bolts</li> <li>· Swing bearing mounting bolts</li> <li>· Engine mounting bolts</li> <li>· Counterweight mounting bolts</li> <li>· Turning joint locating bolts</li> <li>· Track shoe mounting bolts and nuts</li> <li>· Hydraulic pump mounting bolts</li> </ul>		

## 7) INITIAL 500 HOURS SERVICE

Check items	Service	Page
Travel reduction gear oil	Change	6-33

## 8) EVERY 500 HOURS SERVICE

Check items	Service	Page
★Engine oil	Change	6-18, 19
★Engine oil filter	Replace	6-18, 19
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
Prefilter	Change	6-26

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

☆ 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.

### 9) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Travel motor reduction gear oil	Change	6-33
Swing reduction gear oil	Change	6-32
Grease in swing gear and pinion	Change	6-32
Hydraulic oil return filter	Replace	6-30
Drain filter cartridge	Replace	6-31
Pilot line filter	Replace	6-31

### 10) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Hydraulic tank		
★ · Oil	Change	6-30
· Suction strainer	Check, Clean	6-30
Coolant	Change	6-20, 21, 22, 23

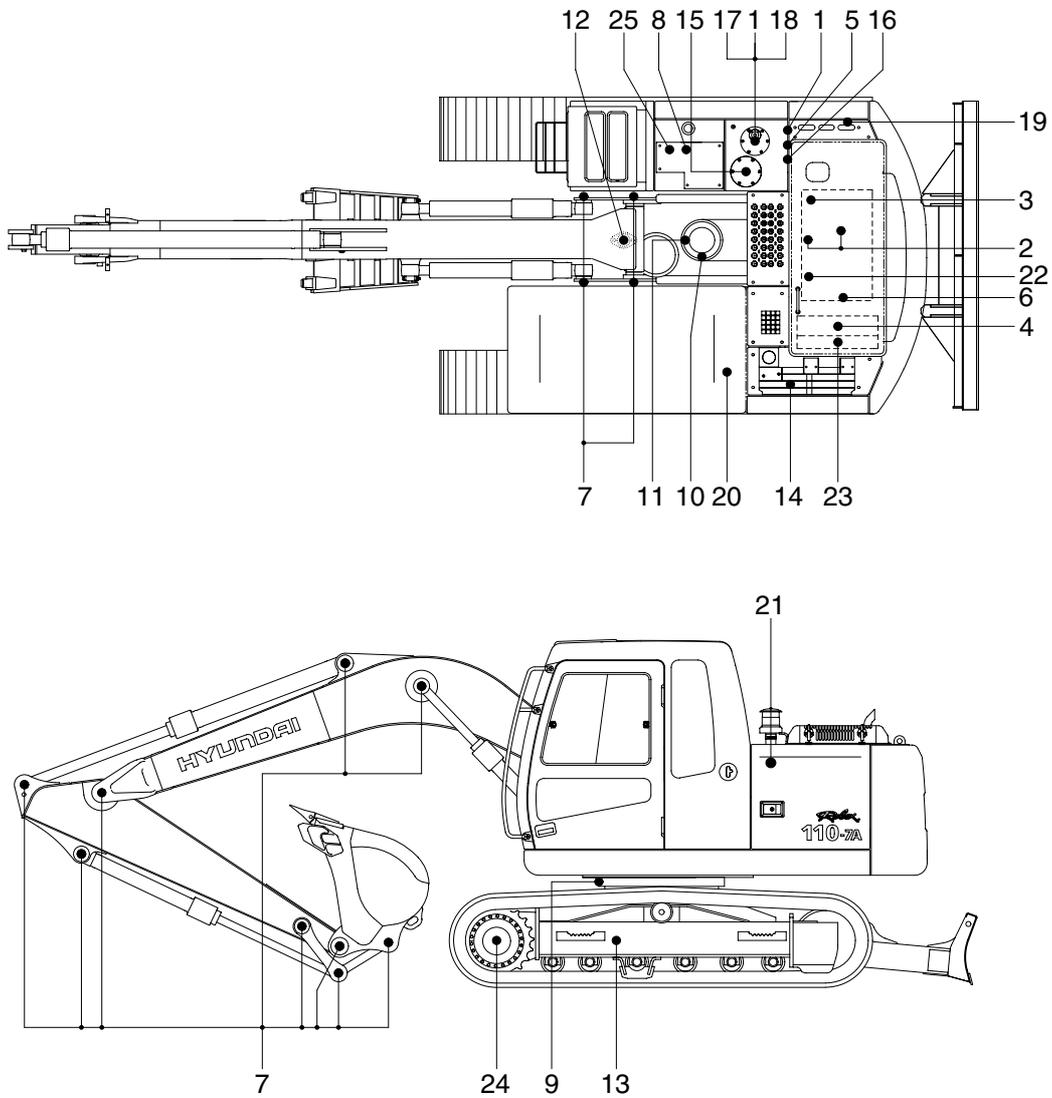
★Change oil every 600 hours of continuous hydraulic breaker operation.

## 11) WHEN REQUIRED

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

Check items	Service	Page
<b>Fuel system</b>		
· Fuel tank	Drain or Clean	6-25
· Prefilter	Clean or Replace	6-26
· Fuel filter element	Replace	6-27
<b>Engine lubrication system</b>		
· Engine oil	Change	6-18, 19
· Engine oil filter	Replace	6-18, 19
<b>Engine cooling system</b>		
· Coolant	Add or Change	6-20, 21, 22, 23
· Radiator	Clean or Flush	6-20, 21, 22, 23
· Charge air cooler	Check	6-23
<b>Engine air system</b>		
· Air cleaner element	Replace	6-25
<b>Hydraulic system</b>		
· Hydraulic oil	Add or Change	6-29
· Return filter	Replace	6-30
· Drain line filter	Replace	6-31
· Pilot line filter	Replace	6-31
· Element of breather	Replace	6-31
· Suction strainer	Clean	6-30
<b>Undercarriage</b>		
· Track tension	Check, Adjust	6-34
<b>Bucket</b>		
· Tooth	Replace	6-36
· Side cutter	Replace	6-36
· Linkage	Adjust	6-35
· Bucket assy	Replace	6-35
<b>Air conditioner and heater</b>		
· Fresh filter	Clean, Replace	6-42
· Recirculation filter	Clean	6-43

## 5. MAINTENANCE CHART



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### Caution

1. Service intervals are based on the hour meter reading.
2. The number of each item shows the lubrication point on the machine.
3. Stop engine while filling oil, and use no open flames.
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	100(26.4)	1
	2	Engine oil level	Check, Add	EO	18.5(4.9)	1
	4	Radiator coolant	Check, Add	C	22(5.8)	1
	5	Prefilter(water, element)	Check, Clean	-	-	1
	6	Fan belt tension & damage	Check, Adjust	-	-	1
	25	Fuel tank oil	Check, Refill	DF	256(67.6)	1
50 Hours or weekly	7	Attachment pins & chamber	Check, Add	PGL	-	17
	8	Fuel tank (water, sediment)	Check, Clean	-	-	1
	9	Swing bearing grease	Check, Add	PGL	-	3
	10	Swing reduction gear case	Check, Add	GO	2.5(0.66)	1
	13	Track tension	Check, Adjust	PGL	-	2
250 Hours	14	Battery(electrolyte)	Check, Add	-	-	2
	17	Air breather element	Replace	-	-	1
	20	Aircon & heater flesh filler	Check, Clean	-	-	1
500 Hours	2	Engine oil	Change	EO	18.5(4.9)	1
	3	Engine oil filter	Replace	-	-	1
	5	Prefilter	Replace	-	-	1
	21	Air cleaner element(primary)	Clean	-	-	1
	22	Fuel filter element	Replace	-	-	1
	23	Radiator, Oil cooler, Charge air cooler	Clean	-	-	3
1000 Hours	10	Swing reduction gear case	Change	GO	2.5(0.66)	1
	12	Swing gear and pinion grease	Change	PGL	4.0kg(8.7lb)	1
	15	Hydraulic oil return filter	Replace	-	-	1
	16	Drain filter cartridge	Replace	-	-	1
	19	Pilot line filter element	Replace	-	-	1
	24	Travel reduction gear case	Change	GO	2.5(0.66)	2
2000 Hours	1	Hydraulic oil	Change	HO	100(26.4)	1
	4	Radiator coolant	Change	C	22(5.8)	1
	18	Hydraulic oil suction strainer	Check, Clean	-	-	1
As required	20	Aircon & heater recirculation filter	Clean, Replace	-	-	1
	20	Aircon & heater fresh filter	Replace	-	-	1
	21	Air cleaner element(safety)	Replace	-	-	1
	21	Air cleaner element(primary)	Replace	-	-	1

※ **Oil symbol**

Please refer to the recommended lubricants for specification.

DF : Diesel fuel    PGL : Grease    C : Coolant

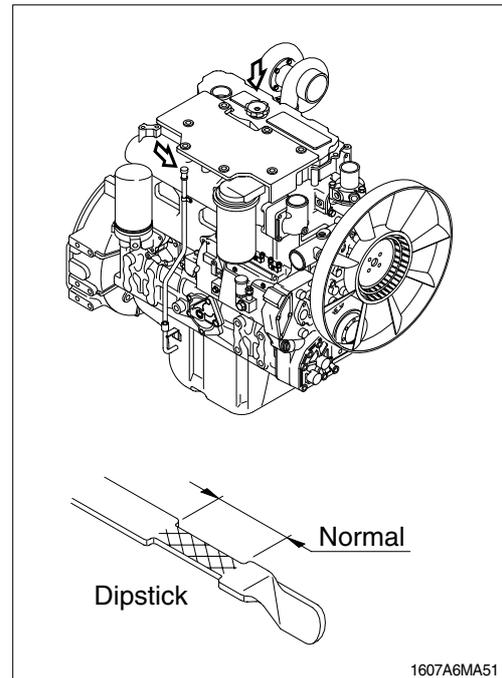
HO : Hydraulic oil    GO : Gear oil    EO : Engine oil

## 6. SERVICE INSTRUCTION

### 1) CHECK ENGINE OIL LEVEL

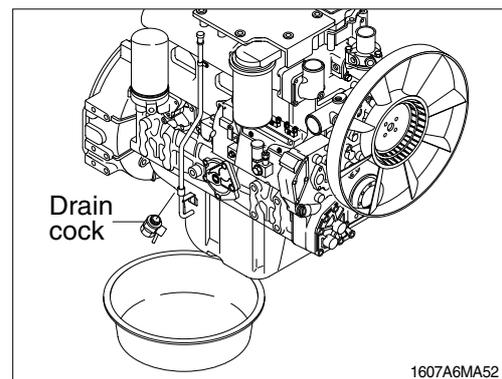
Check the oil level with the machine on a flat ground before starting engine.

- (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.

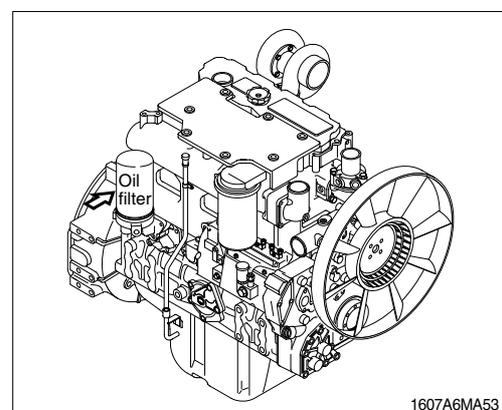


### 2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

- (1) Warm up the engine.
- (2) Open the drain cock and allow the oil to drain.
  - ※ A drain pan with a capacity of 20 liters(5 U.S. gallons) will be adequate.



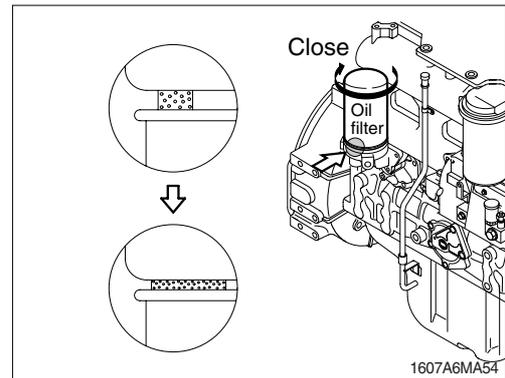
- (3) Clean around the filter head, remove the filter with a filter wrench and clean the gasket surface.



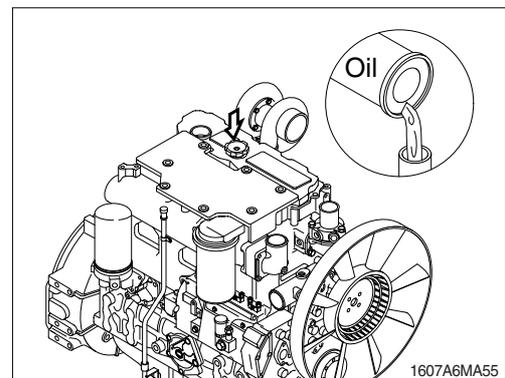
- (4) Apply a light film of lubricating oil to the gasket sealing surface before installing the filters.



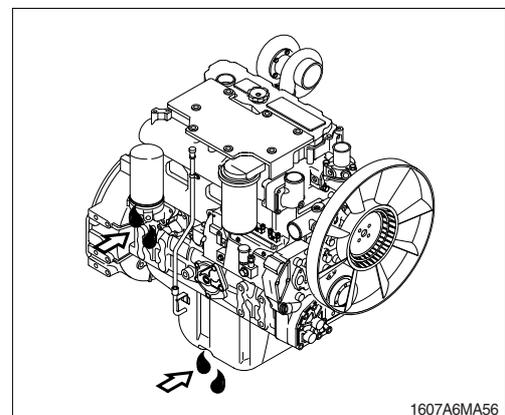
- (5) Install the filter to the filter head.
- ※ **Mechanical over-tightening may distort the threads or damage the filter element seal.**
  - Install the filter as specified by the filter manufacturer.



- (6) Fill the engine with clean oil to the proper level.
- Quantity : 18.5 l (4.9U.S.gallons)



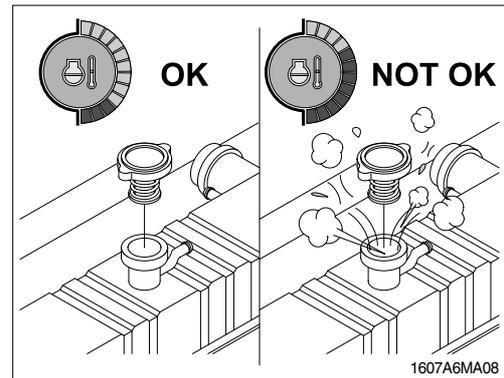
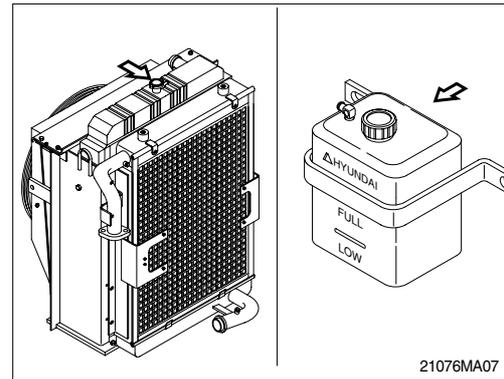
- (7) Operate the engine at low idle and inspect for leaks at the filters and the drain plug.
- Shut the engine off and check the oil level with the dipstick. Allow 15minutes for oil to drain down before checking.



### 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.**

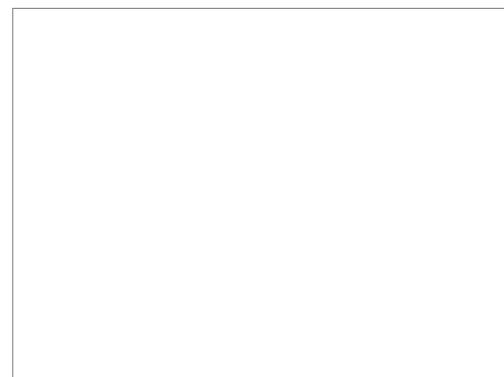
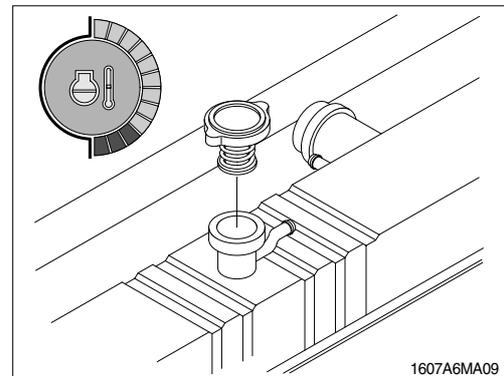
**Avoid excessive contact-wash thoroughly after contact.**

**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.**

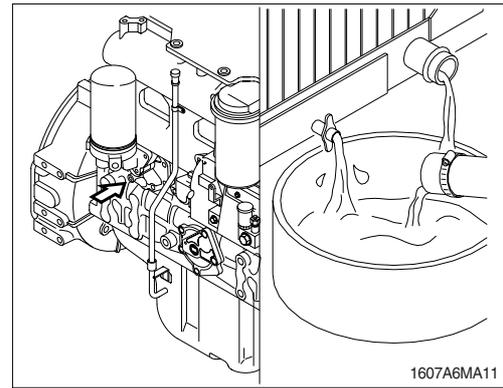
**If in doubt, contact your local authorities for guidance as to proper handling of used antifreeze.**



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

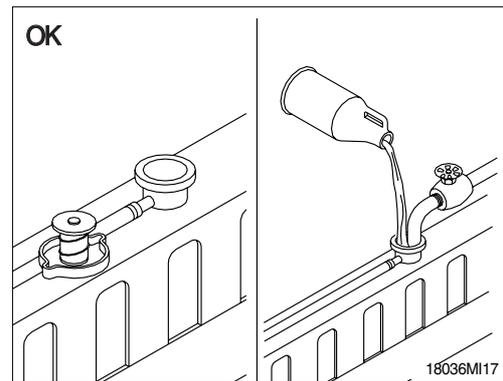


## (2) Flushing of cooling system

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

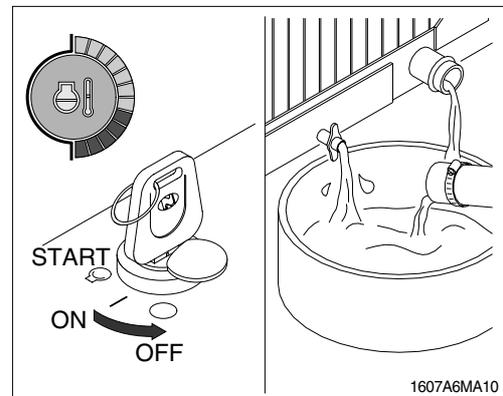
※ Use 0.5kg(1.0pound) of sodium carbonate for every 23 liters(6.0U.S. gallons) of water.

※ 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) .

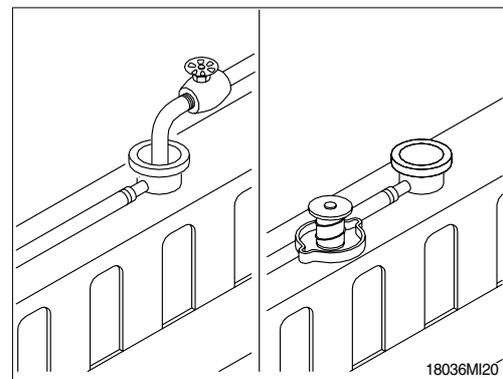
Shut the engine off, and drain the cooling system.



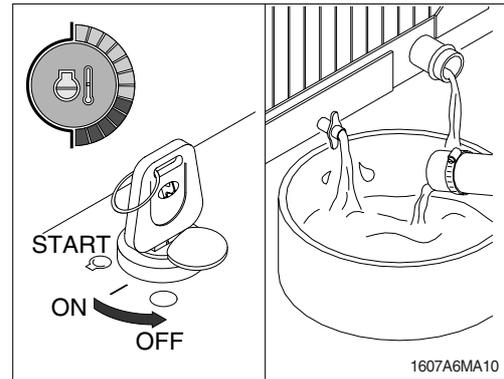
③ Fill the cooling system with clean water.

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

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

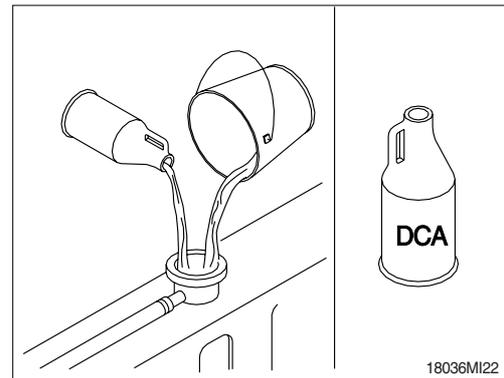


- ④ Operate the engine for 5 minutes with the coolant temperature above 80°C(176°F) .  
Shut the engine off, and drain the cooling system.
- ※ If the water being drained is still dirty, the system must be flushed again until the water is clean.

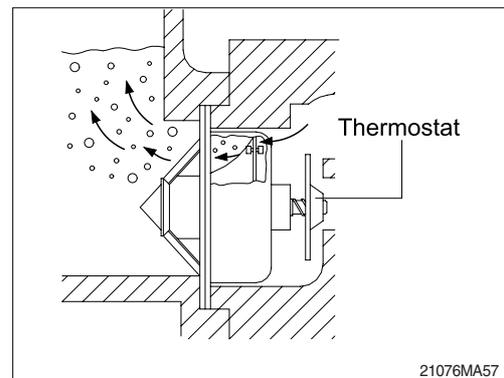


### (3) Cooling system filling

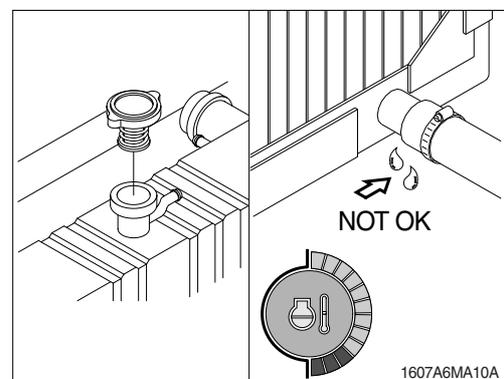
- ① Use a mixture of 50 percent water and 50 percent ethylene glycol antifreeze to fill the cooling system.  
Coolant capacity(engine only) : 6 l (1.6U.S. gallons)



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



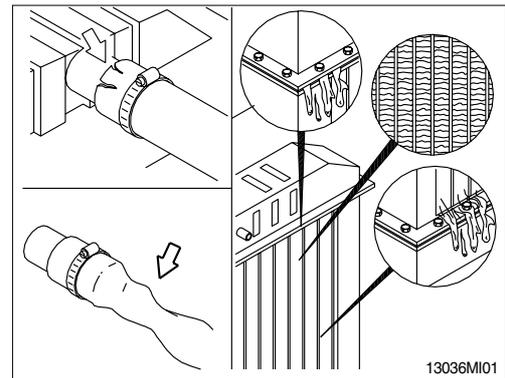
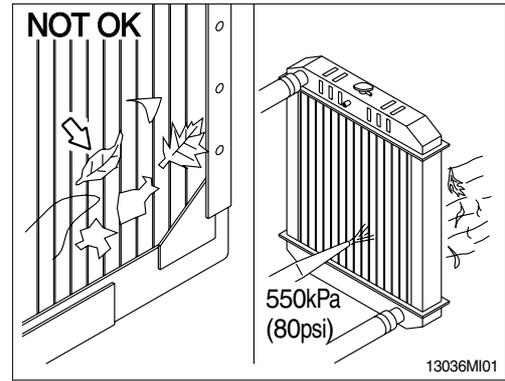
- ③ Install the pressure cap. Operate the engine until it reaches a temperature 80°C(176°F), and check for coolant leaks.  
Check the coolant level again to make sure the system is full of coolant.



## 5) CLEAN RADIATOR AND OIL COOLER

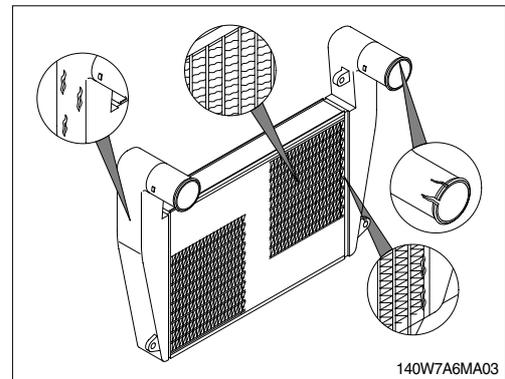
Check, and if necessary, clean and dry outside of radiator and oil cooler. After working in a dusty place, clean radiator more frequently.

- (1) Visually inspect the radiator for clogged radiator fins.
- (2) Use 550kPa(80psi) 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 and gasket leaks.



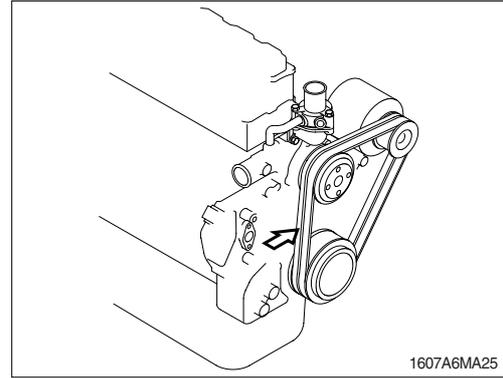
## 6) CHECK CHARGE AIR COOLER

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.

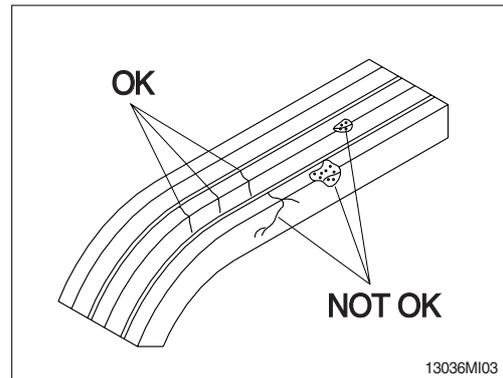


## 7) FAN BELT TENSION

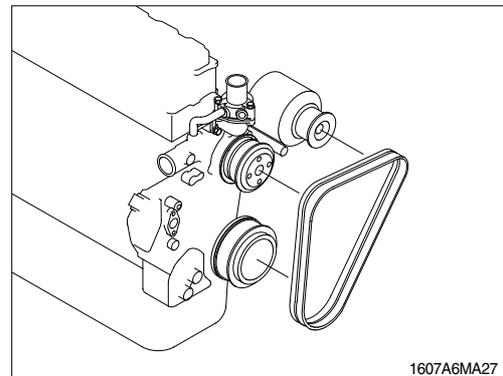
- (1) Measure the belt deflection at the longest span of the belt.
  - Maximum deflection :  $7 \pm 1\text{mm}$  ( $0.28 \pm 0.04\text{in}$ )



- (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.**

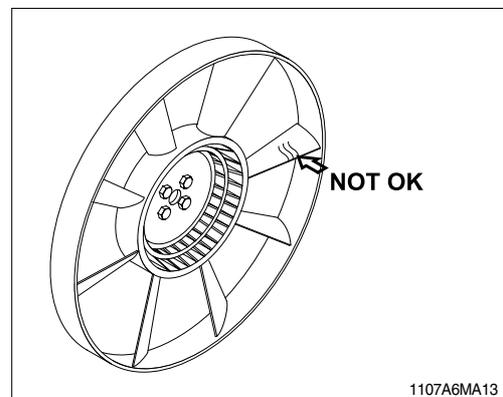
※ Rotate the crankshaft by using the engine barring gear.

※ A visual inspection of the cooling fan is required daily.

Check for cracks, loose rivets, and bent or loose blades.

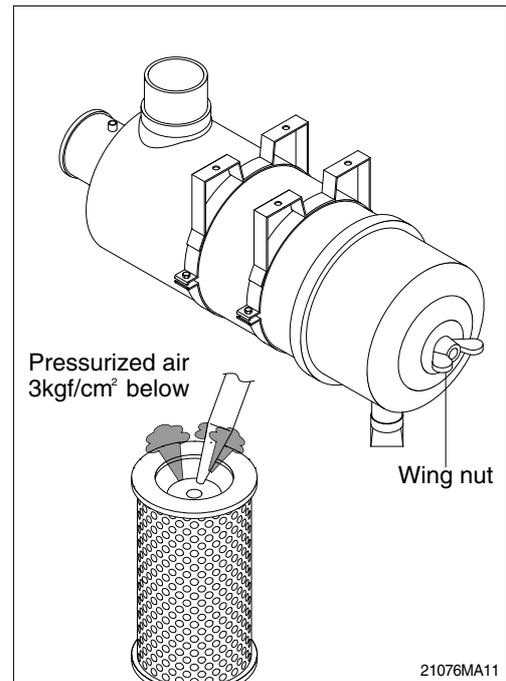
Check the fan to make sure it is securely mounted. Tighten the capscrews if necessary.

Replace any fan that is damaged.

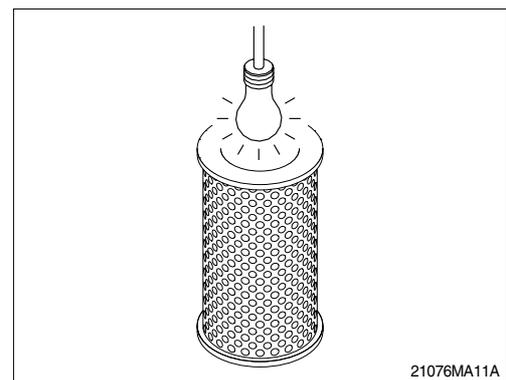


## 9) CLEANING OF AIR CLEANER

- (1) Loosen the wing nut and remove the element.
- (2) Clean the inside of the body.
- (3) Clean the element either with pressurized air or washing.
  - ① **Using pressurized air**  
Remove the dust inside of the element by the pressurized air (below  $3\text{kgf/cm}^2$ , 40psi) forward and backward equally.
  - ② **Washing**  
Wash the element with a neutral detergent which does not cause bubbles.  
Dry off after washing with water.

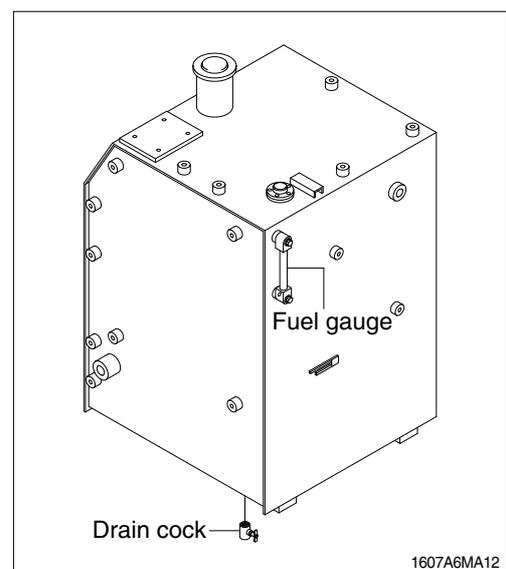


- (4) Inspect for cracks or damage of element by putting a light bulb inside of the element.
- (5) Insert element and tighten wing nut.
  - ※ **Replace the element with new one after use 500hours(6 times washing), or if damage is found.**
  - ※ **Clean the air cleaner element when the air cleaner warning lamp on the cluster lights ON.**



## 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.**

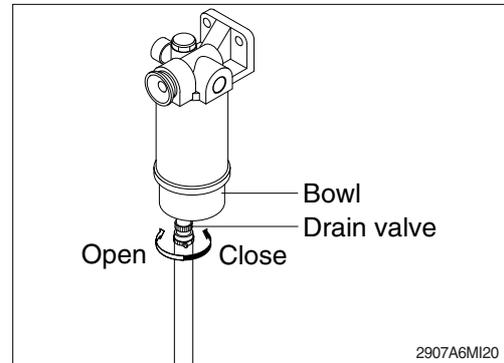


## 11) PREFILTER

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

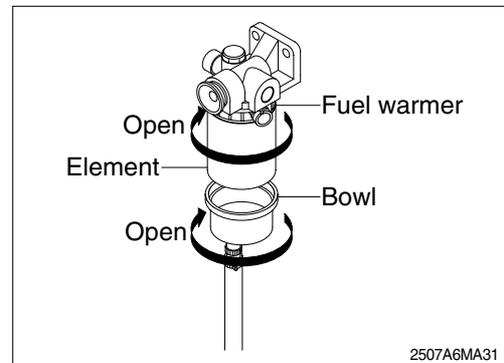
### (1) Drain water

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

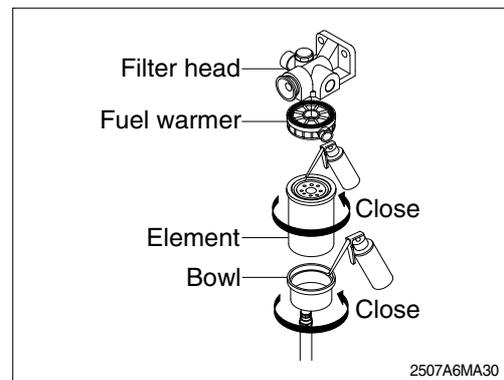


### (2) Replace element

- ① Drain the unit of fuel. Follow "Drain water" instructions above.
- ② Remove element, fuel warmer and bowl from filter head.
- ※ The bowl is reusable, do not damage or discard.
- ③ Separate element from bowl. Clean bowl and seal gland.

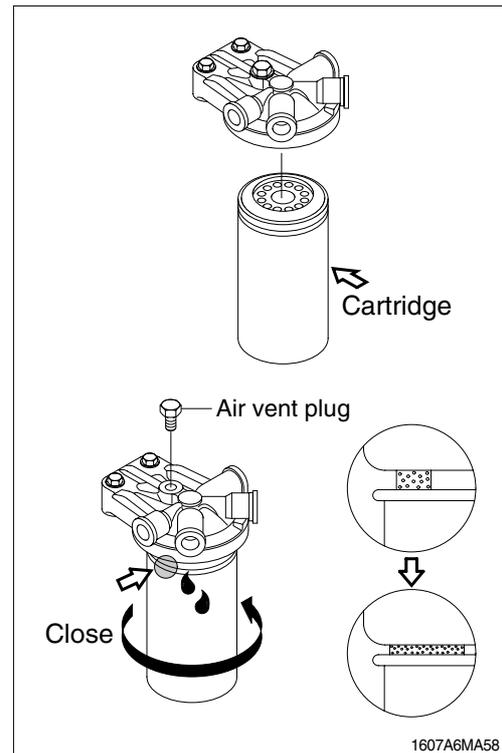


- ④ Lubricate new bowl seal with clean fuel or motor oil and place in bowl gland.
- ⑤ Attach bowl to new element firmly by hand.
- ⑥ Lubricate new element seal and place in element top gland.
- ⑦ Attach the element, fuel warmer and bowl to the head.



## 12) REPLACEMENT OF FUEL FILTER

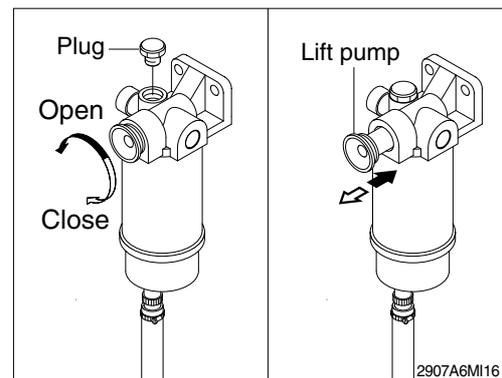
- (1) Clean around the filter head, remove the filter with a filter wrench and clean the gasket surface.
  - (2) Apply a clean fuel oil to the gasket.
  - (3) Apply engine oil on the gasket of filter when mounting, and tighten 3/4 to 1 turn more after the gasket touches the filter head.
  - (4) Relieve the air by plug after mounting.
- ※ **When installing the fuel filter, do not use a filter wrench. Tighten the fuel filter by hand.**
  - ※ **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

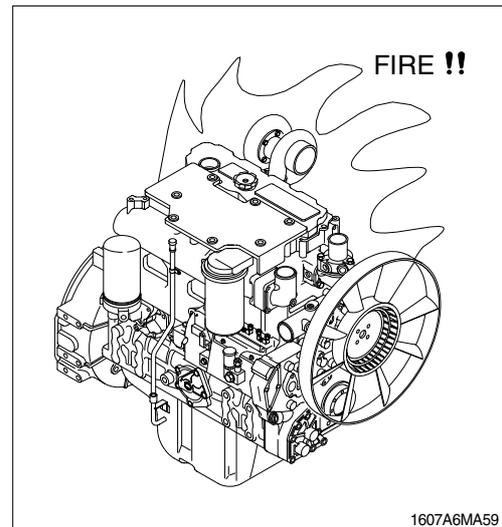
- (1) Loosen fuel supply line plug at the outlet of prefilter.
- (2) Do hand-priming the lift pump repeatedly until air bubbles comes out from fuel supply line completely.
- (3) Tighten fuel supply line to its origin position.

- ▲ **The fuel pump, high-pressure fuel lines, and fuel rail contain very high-pressure fuel. Do not loosen any fittings while the engine is running. Personal injury and property damage can result. Wait at least 10 minutes after shutting down the engine before loosening any fittings in the high-pressure fuel system to allow pressure to decrease to a lower level.**



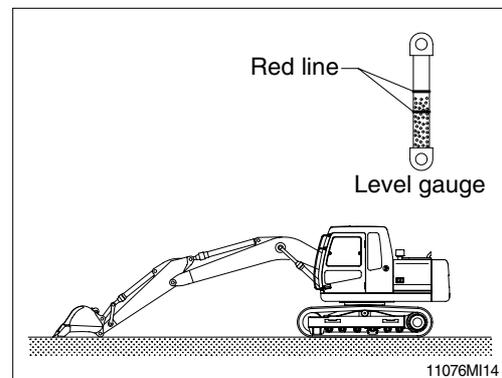
#### 14) LEAKAGE OF FUEL

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



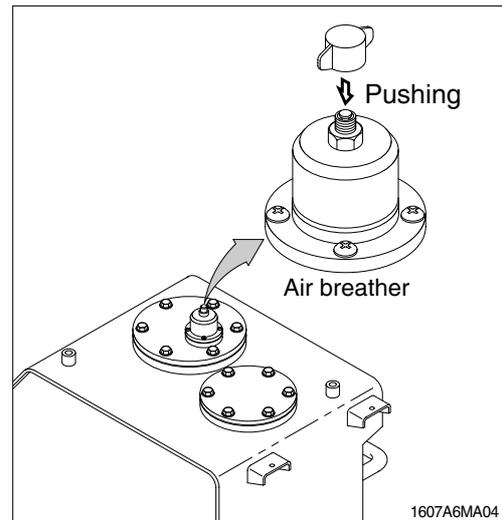
#### 15) HYDRAULIC OIL CHECK

- (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.



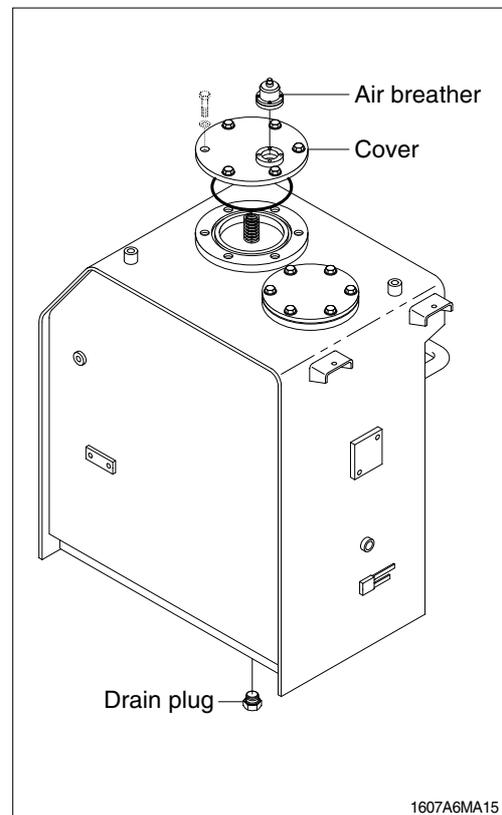
## 16) FILLING HYDRAULIC OIL

- (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 :  $1.44 \pm 0.3 \text{kgf} \cdot \text{m}$   
( $10.4 \pm 2.1 \text{lb} \cdot \text{ft}$ )
- (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

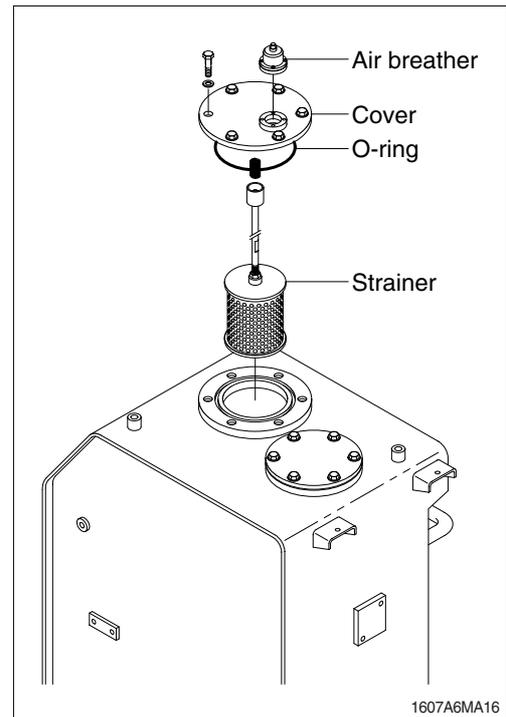
- (1) Lower the bucket on the ground pulling the arm and bucket cylinder to the maximum.
- (2) Loosen the cap and relieve the pressure in the tank by pushing the top of the air breather.
- (3) Remove the cover.
  - Tightening torque :  $6.9 \pm 1.4 \text{kgf} \cdot \text{m}$   
( $50 \pm 10 \text{lb} \cdot \text{ft}$ )
- (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.

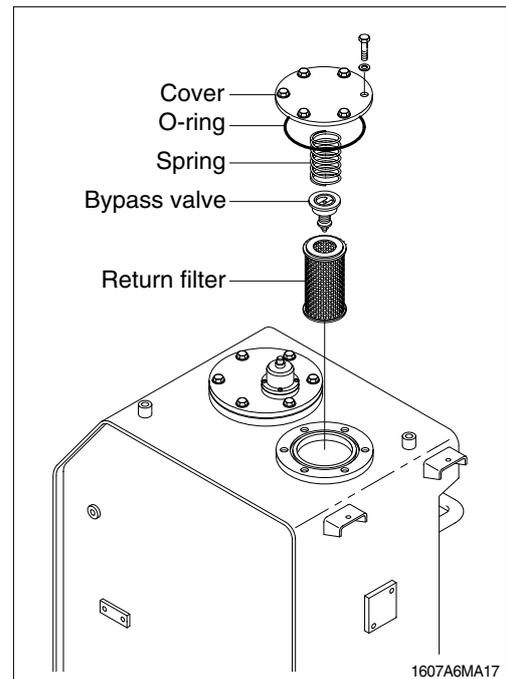
- (1) Remove the cover on the top of the oil tank.
    - Tightening torque :  $6.9 \pm 1.4 \text{kgf} \cdot \text{m}$   
( $50 \pm 10 \text{lbf} \cdot \text{ft}$ )
  - (2) Pull out the strainer in the tank.
  - (3) Wash the foreign material on the suction strainer with gasoline or cleaning oil.
  - (4)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

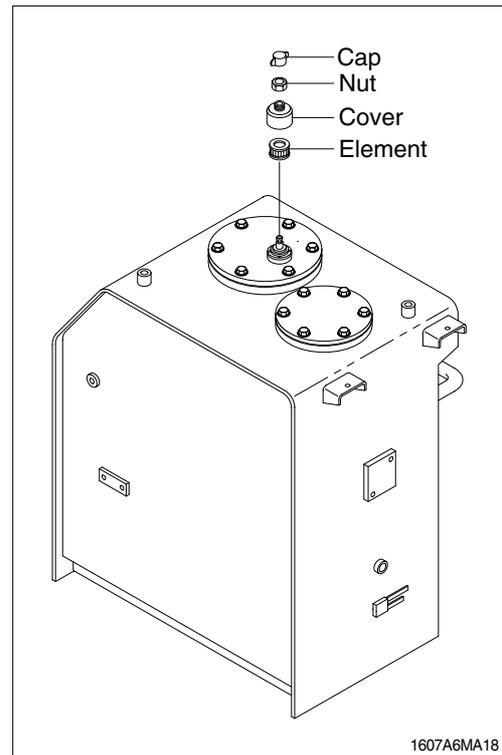
Replace as follows paying attention to the cause to be kept during the replacement.

- (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

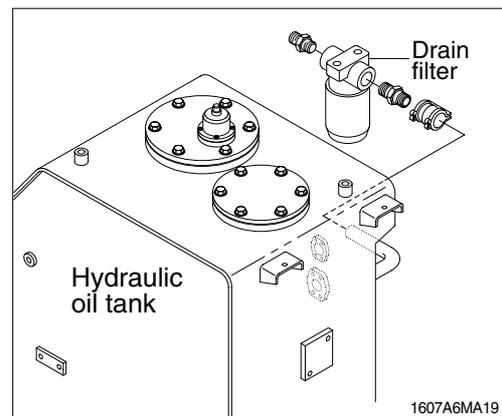
- (1) Loosen the cap and relieve the pressure in the tank by pushing the top of the air breather.
- (2) Loosen the lock nut and remove the cover.
- (3) Pull out the filter element.
- (4) Replace the filter element new one.
- (5) Apply oil on the O-ring and reassemble by reverse order of disassembly.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



## 21) REPLACE OF DRAIN FILTER CARTRIDGE

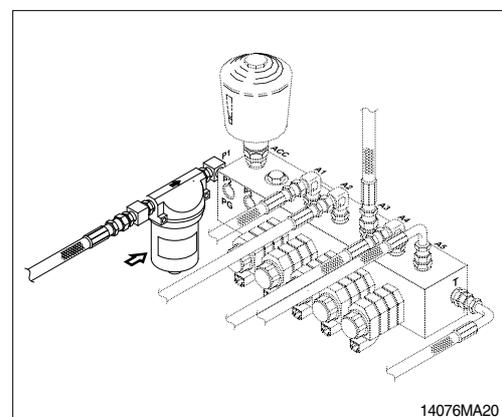
Clean the dust around filter and replace with new one after removing the cartridge.

- ※ 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.



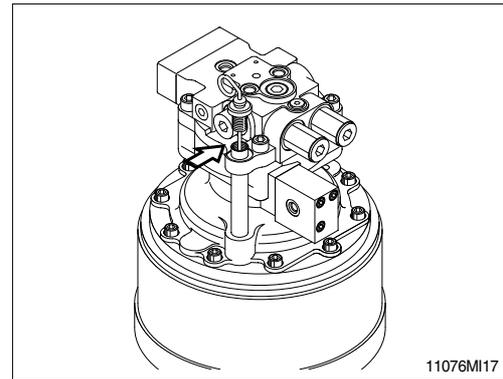
## 22) REPLACE OF PILOT LINE FILTER

- (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.



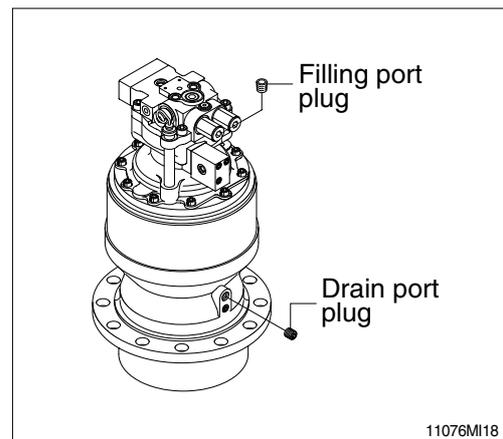
### 23) CHECK THE SWING REDUCTION GEAR OIL

- (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.



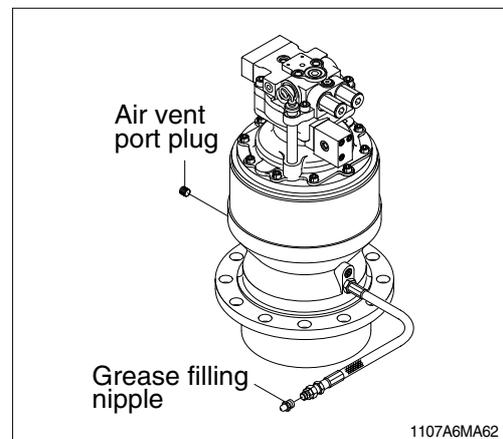
### 24) CHANGE SWING REDUCTION GEAR OIL

- (1) Raise the temperature of oil by swinging the machine before replace the oil and park the machine on the flat ground.
- (2) Loosen the plug of the drain port.
- (3) Drain into a proper container.
- (4) Wash the drain plug and reinstall it with sealing tape.  
Fill proper amount of recommended oil.
  - Amount of oil : 2.5 l (0.66U.S.gal)



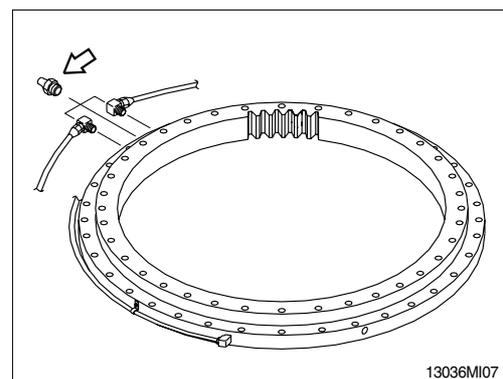
### 25) LUBRICATE BEARING OF OUTPUT SHAFT IN REDUCTION GEAR

- (1) Remove air vent plug.
- (2) Remove grease fill plug and install grease fitting hose and nipple at that place.
- (3) Lubricate NLGI No.2 with grease gun until comes out new grease from air vent port.
  - Capacity : 0.32kg(0.7lb)



### 26) LUBRICATE SWING BEARING

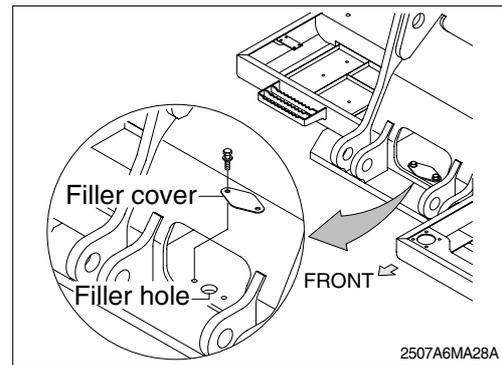
- (1) Grease at 3 fitting.
  - ※ Lubricate every 50 hours.



## 27) SWING GEAR AND PINION

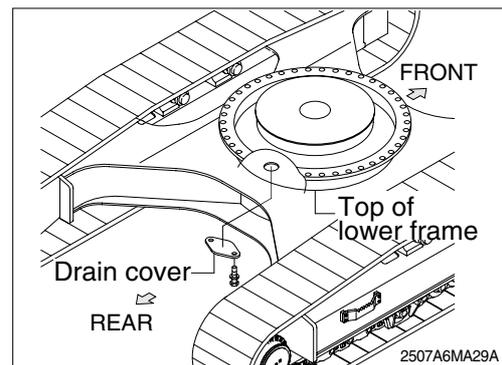
### (1) Drain old grease

- 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.



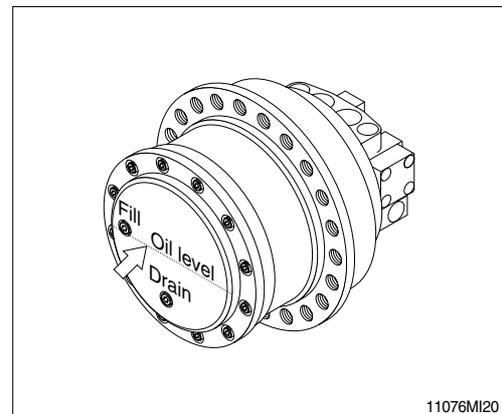
### (2) Refill new grease

- ① Install drain cover.
  - ② Fill with new grease.
  - ③ Install filler cover.
- Capacity : 4.0kg(8.7lb)



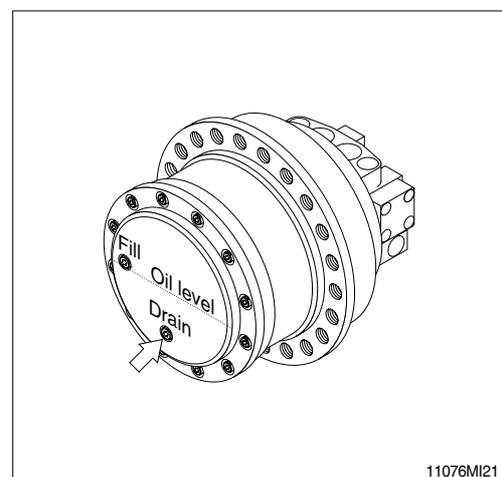
## 28) CHECK THE TRAVEL REDUCTION GEAR OIL

- (1) Operate the machine to the position of drain plug down to the flat ground.
- (2) Loosen the level plug and check the oil level.  
If the level is at the hole of the plug, it is normal.  
Fill the oil if it is not sufficient.  
Amount of oil : 2.5 l (0.7 U.S.gal)



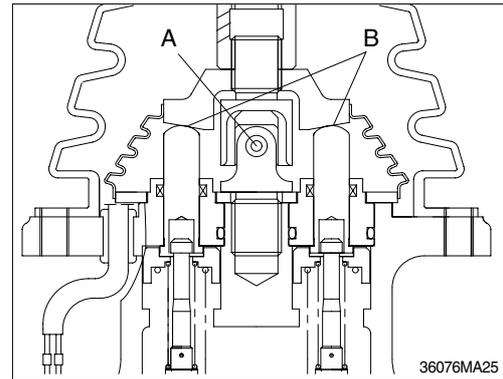
## 29) CHANGE OF THE TRAVEL REDUCTION GEAR OIL

- (1) Raise the temperature of the oil by traveling machine first.
- (2) Stop when the position of the drain plug is down.
- (3) Loosen the level plug and then the drain plug.
- (4) Drain the oil to adequate container.
- (5) Tighten the drain plug and fill specified amount of oil at filling port.
- (6) Tighten the level plug and travel slowly to check if there is any leakage of oil.



### 30) LUBRICATE RCV LEVER

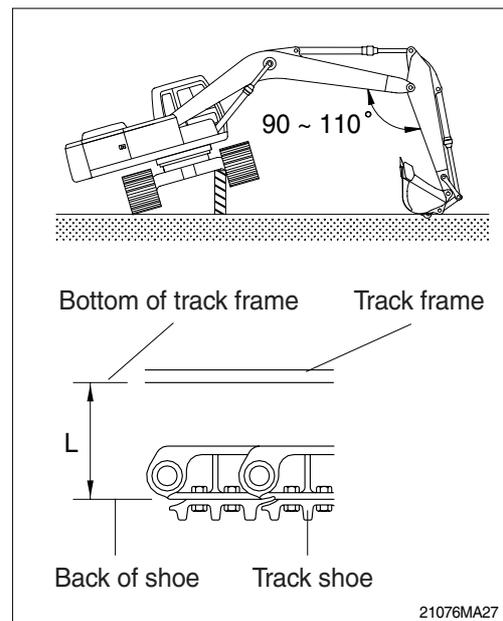
Remove the bellows and with a grease gun grease the joint part(A) and sliding parts(B).



### 31) ADJUSTMENT OF TRACK TENSION

- ※ It is important to adjust the tension of track properly to extend the lifetime of track and traveling device.
- ※ The wear of pins and bushings on the undercarriage will vary with the working conditions and soil properties.  
It is thus necessary to continually inspect the track tension so as to maintain the standard tension on it.

- (1) Raise the chassis with the boom and arm.
- (2) Measure the distance between bottom of track frame on track center and track of shoe.
  - ※ **Remove mud with rotating the track before measuring.**



- (3) If the tension is tight, drain the grease in the grease nipple and if the tension is loose, charge the grease.

- ▲ **Personal injury or death can result from grease under pressure.**
- ▲ **When loosening the grease nipple, do not loosen more than one turn as there is a danger of a spring coming out of the nipple because of the high pressure inside.**
- ※ **When the grease is drained, move the track to the forward and backward slightly.**  
If the track tension is loose even after the grease is charged to the maximum, change the pins and bushings as there are worn seriously.

Length(L)	
240~270mm	9.4~10.6"

### 32) 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.

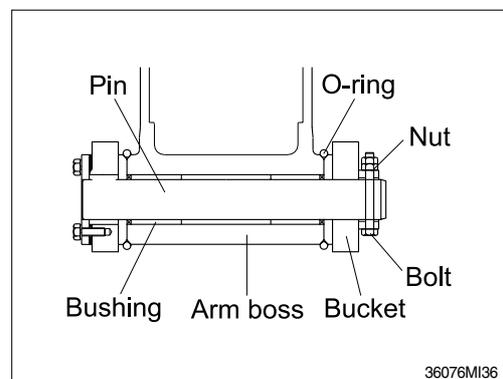
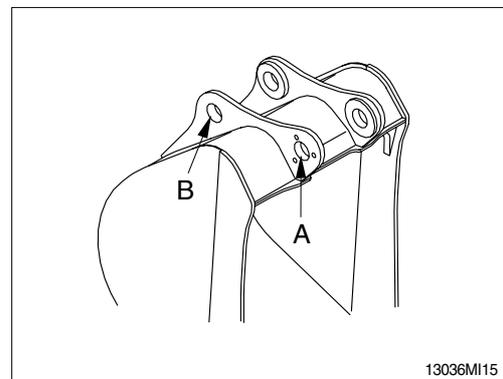
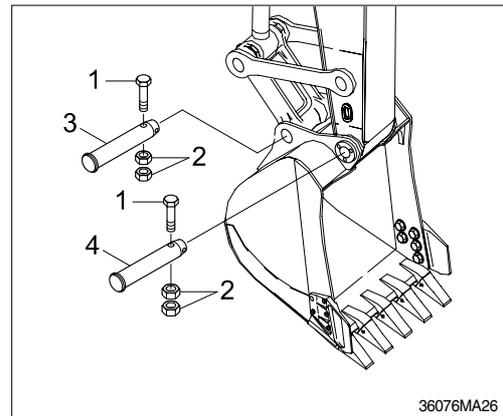
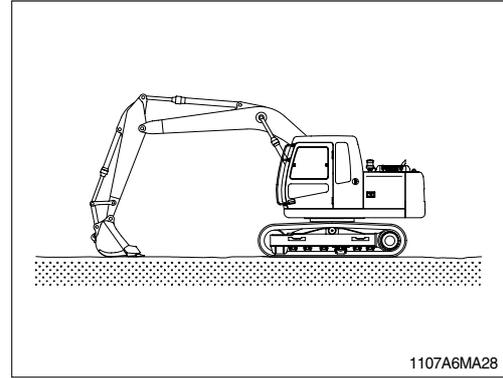
※ After remove the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

(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.

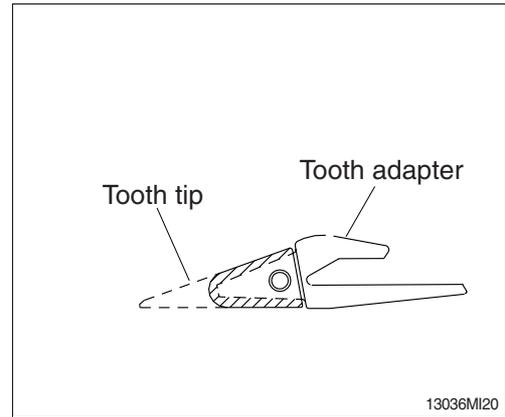
(5) Install the stopper bolt(1) and nuts(2) for each pin, then grease the pin.



### 33) 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.

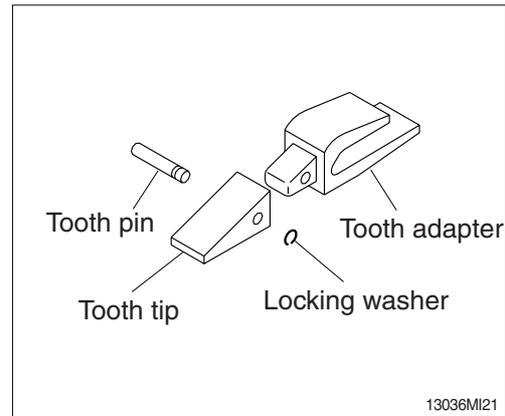


#### (2) Instructions for replacement

- 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.



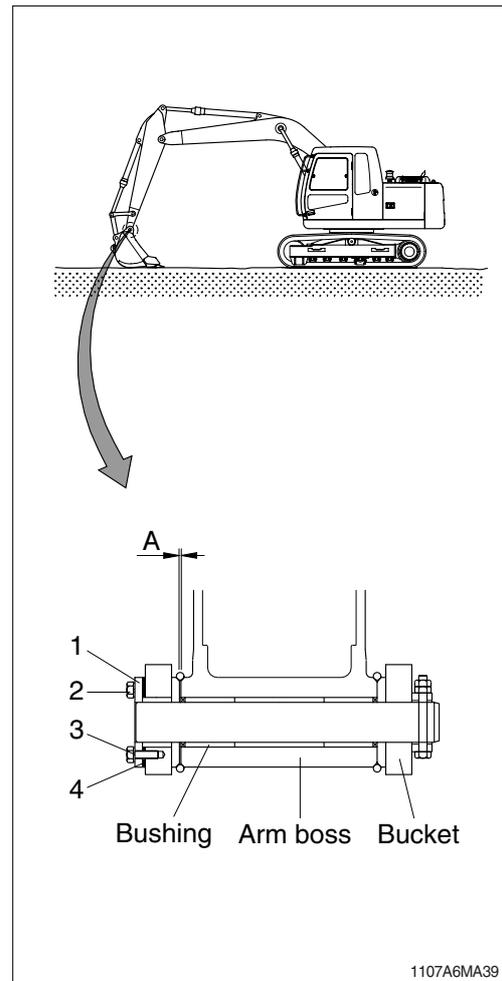
### 34) ADJUSTMENT OF BUCKET CLEARANCE

- (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 :  $29.6 \pm 3.2 \text{kgf} \cdot \text{m}$   
( $214.0 \pm 23.1 \text{lb} \cdot \text{ft}$ )
  - Normal clearance :  $0 \sim 0.5 \text{mm}$   
( $0 \sim 0.02 \text{in}$ )

※ If the bucket is not adjusted correctly, noise and vibration created during operation, and damaged O-ring, pin and bushing quickly.



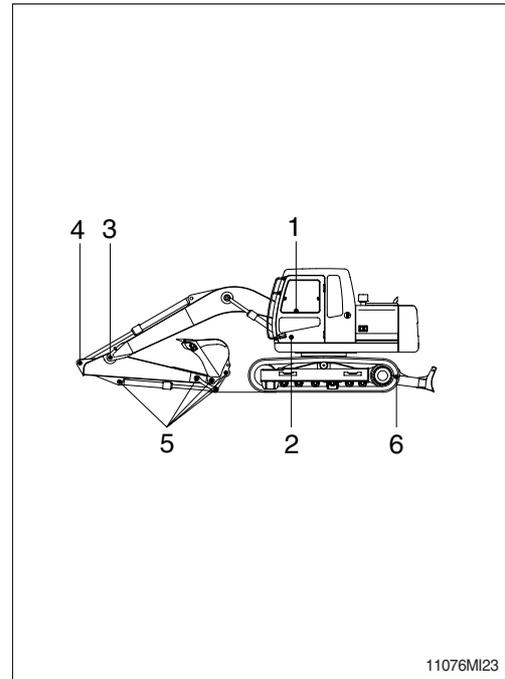
### 35) LUBRICATE PIN AND BUSHING

#### (1) Lubricate to each pin of working device

Lubricate the grease to the grease nipple according to the lubricating interval.

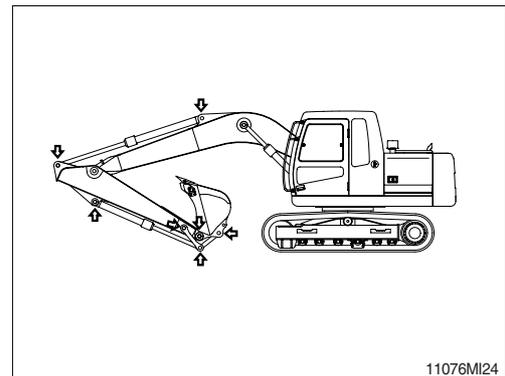
No.	Description	Qty
1	Lubrication manifold at boom	5
2	Boom cylinder pin	2
3	Boom and arm connection pin	1
4	Arm cylinder pin(Rod side)	1
5	Bucket cylinder pin(Head, rod)	2
	Bucket link(Control rod)	3
	Arm and bucket connection pin	1
	Arm and control link connection pin	1
6	Dozer blade cylinder pin	3

※ Shorten lubricating interval when working in the water or dusty place.

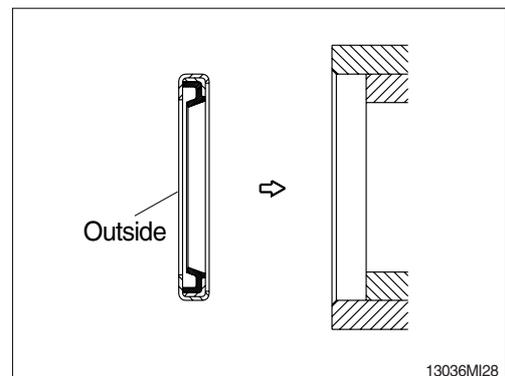


#### (2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

※ Mount the lip to be faced outside when replace the dust seal.



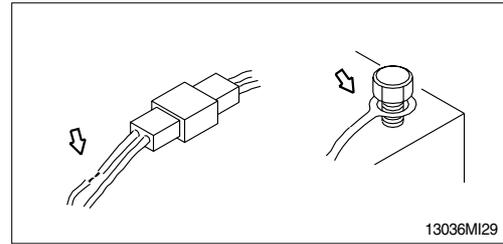
- ※ If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.
- ※ Assemble the seal same direction with picture and use with plastic hammer when replace.



## 7. ELECTRICAL SYSTEM

### 1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



### 2) BATTERY

#### (1) Check and repair

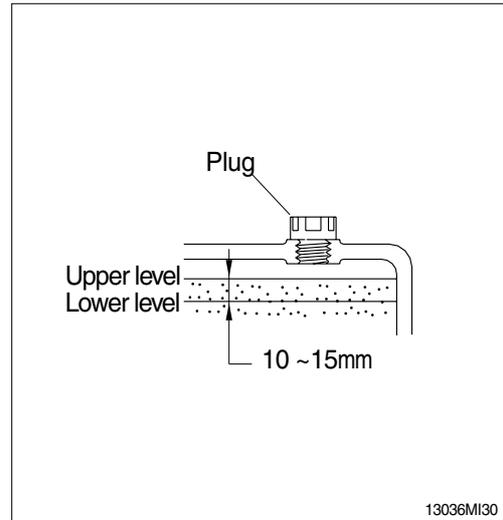
- ① Check the electrolyte level and fill with distilled water to the prescribed level as necessary.
- ② Wash the terminal with hot water if it is contaminated, and apply grease to the terminals after washing.

**▲ 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.**

※ Remove the fire and spark around battery.

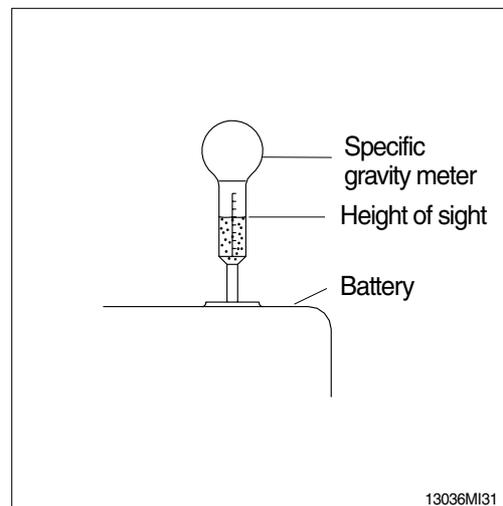


#### (2) Specific gravity of battery

Judge the charging rate of battery by the specific gravity. The specific gravity changes by the ambient temperature.

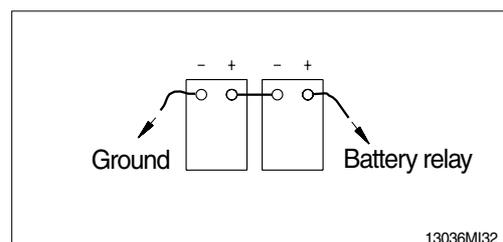
Check the charging rate by referring to the chart below.

Temperature	20°C (68°F)	10°C (50°F)	-10°C (14°F)
Charging rate			
100%	1.26	1.27	1.28
90%	1.24	1.25	1.26
80%	1.22	1.23	1.24
75%	1.21	1.22	1.23



#### (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

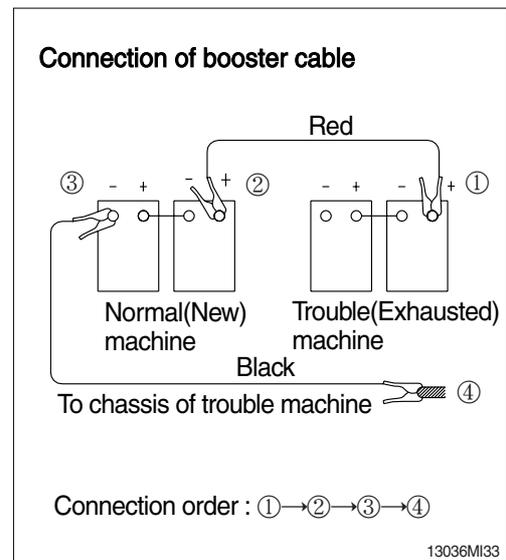
Keep following order when you are going to start engine using booster cable.

#### (1) Connection of booster cable

Use the same capacity of battery for starting.

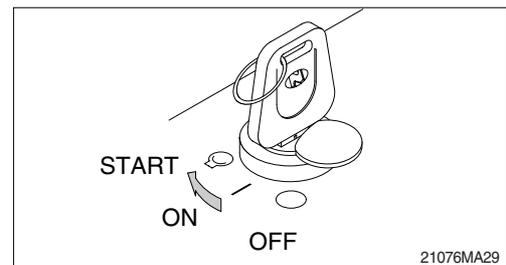
- ① Make sure that the starting switches of the normal machine and trouble machine are both at the OFF position.
- ② Connect the red terminal of booster cable to the battery (+) terminal between exhausted and new battery.
- ③ Connect the black terminal of the booster cable between new battery (-) terminal 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.

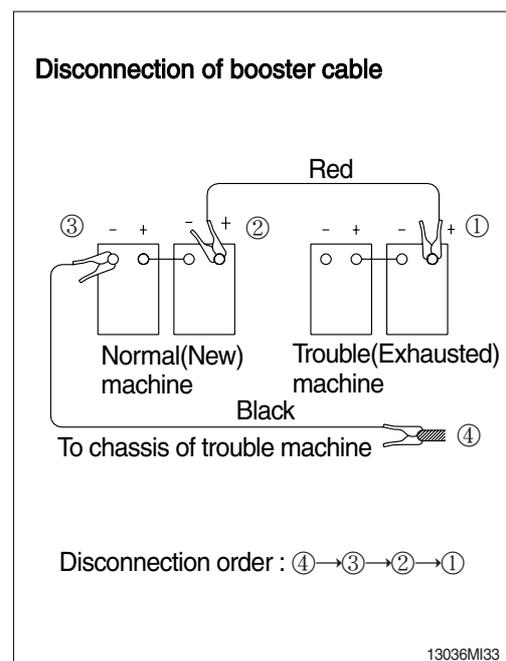


#### (3) Taking off the booster cable

- 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

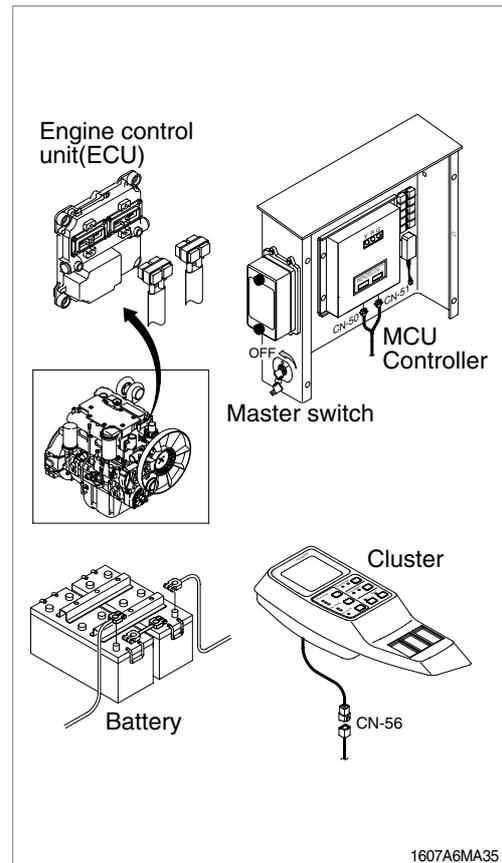
Before start to welding, follow the below procedure.

- 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 CAPO system.

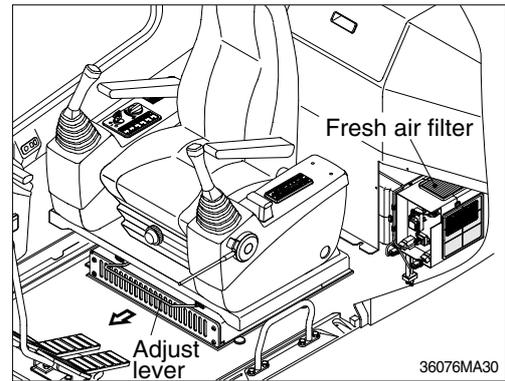


## 8. AIR CONDITIONER AND HEATER

### 1) CLEAN AND REPLACE OF OUTER FILTER

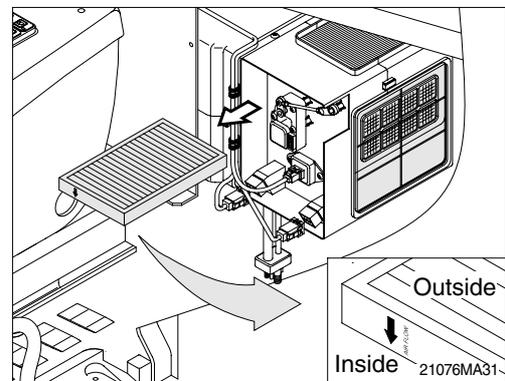
※ Always stop the engine before servicing.

- (1) Move seat and console box to arrow direction using the adjust lever.



- (2) Remove the outer filter.

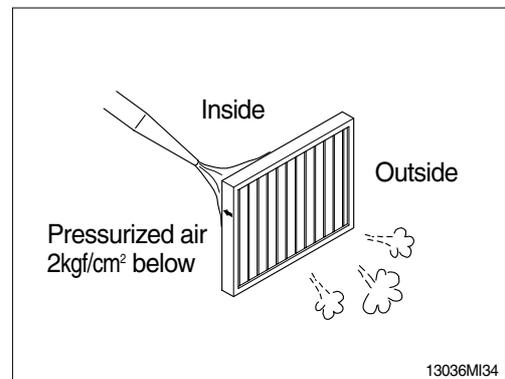
※ When installing a filter, be careful not to change the filter direction.



- (3) Clean the filter using a pressurized air (Below  $2\text{kgf/cm}^2$ , 28psi).

△ When using pressurized air, be sure to wear safety glasses.

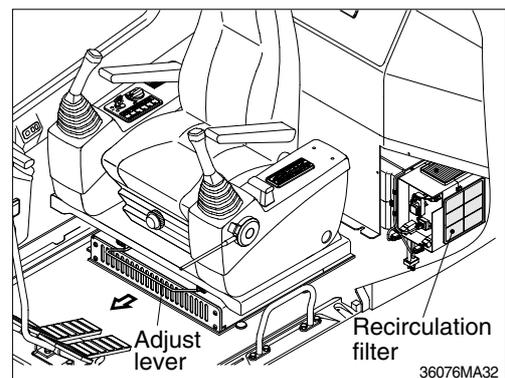
- (4) Inspect the filter after cleaning. If it is damaged or badly contaminated, use a new filter.



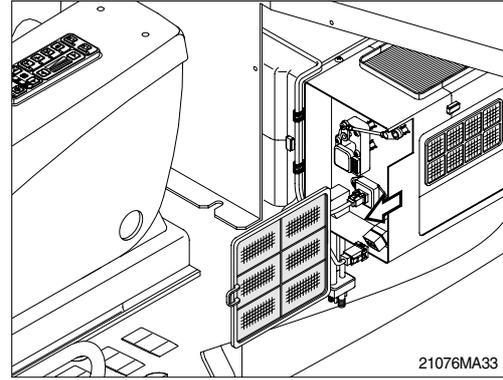
### 2) CLEAN AND REPLACE OF INNER FILTER

※ Always stop the engine before servicing.

- (1) Move seat and console box to arrow direction using the adjust lever.



(2) Remove recirculation filter.

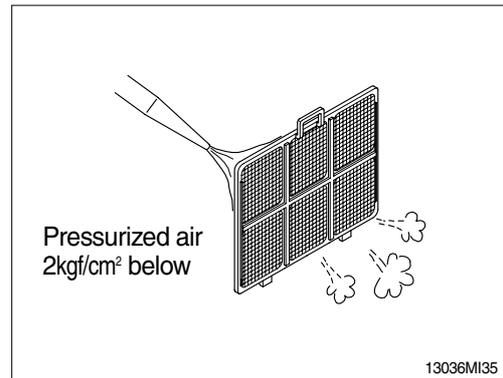


(3) Clean the recirculation filter using a pressurized air (Below 2kgf/cm<sup>2</sup>, 28psi) or washing with water.

△ **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.

# 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"> <li>· Add the oil to the specified level.</li> <li>· Replace the oil filter cartridge.</li> <li>· Check oil leakage from the pipe or the joint.</li> <li>· Replace the monitor.</li> </ul>	
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"> <li>· Supply the coolant and check leakage.</li> <li>· Adjust fan belt tension.</li> <li>· Wash out inside of cooling system.</li> <li>· Clean or repair the radiator fin.</li> <li>· Check the thermostat.</li> <li>· Tighten the radiator cap firmly or replace the packing of it.</li> <li>· Replace the monitor.</li> </ul>	
The engine does not start when the starting motor is turned over.	<ul style="list-style-type: none"> <li>· Add fuel.</li> <li>· Repair where air is leaking into fuel system.</li> <li>· Check the injection pump or the nozzle.</li> <li>· Check the valve clearance.</li> <li>· Check engine compression pressure.</li> <li>· In cold weather, check if fuel warmer system is working normal.</li> </ul>	Refer to the pages 3-13 and 4-4.
Exhaust gas is white or blue.	<ul style="list-style-type: none"> <li>· Adjust to specified oil quantity.</li> <li>· Replace with specified fuel.</li> </ul>	
Exhaust gas occasionally turns black.	<ul style="list-style-type: none"> <li>· Clean or replace the air cleaner element.</li> <li>· Check the nozzle.</li> <li>· Check engine compression pressure.</li> <li>· Clean or replace the turbocharger.</li> </ul>	
Combustion noise occasionally changes to breathing sound.	<ul style="list-style-type: none"> <li>· Check the nozzle.</li> </ul>	
Unusual combustion noise or mechanical noise.	<ul style="list-style-type: none"> <li>· Check with specified fuel.</li> <li>· Check over-heating</li> <li>· Replace the muffler.</li> <li>· Adjust valve clearance.</li> </ul>	

## 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"> <li>· Check for loose terminals and open-circuit wiring.</li> <li>· Adjust belt tension.</li> </ul>	
Battery charging lamp does not go out even when engine runs at high speed.	<ul style="list-style-type: none"> <li>· Check the alternator.</li> <li>· Check and repair wiring.</li> </ul>	
Unusual noise is emitted from the alternator.	<ul style="list-style-type: none"> <li>· Check the alternator.</li> </ul>	
Starting motor does not turn when starting switch is turned ON.	<ul style="list-style-type: none"> <li>· Check and repair the wiring.</li> <li>· Charge the battery.</li> <li>· Check the starting motor.</li> <li>· Check the safety relay.</li> </ul>	
The pinion of the starting motor keeps going in and out.	<ul style="list-style-type: none"> <li>· Charge the battery.</li> <li>· Check the safety relay.</li> </ul>	
Starting motor turns the engine sluggishly.	<ul style="list-style-type: none"> <li>· Charge the battery.</li> <li>· Check the starting motor.</li> </ul>	
The starting motor disengages before the engine starts up.	<ul style="list-style-type: none"> <li>· Check and repair the wiring.</li> <li>· Charge the battery.</li> </ul>	
The engine warming up lamp does not go ON.	<ul style="list-style-type: none"> <li>· Check and repair wiring.</li> <li>· Check the monitor.</li> </ul>	
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"> <li>· Check the monitor.</li> <li>· Check the caution lamp switch.</li> </ul>	
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"> <li>· Check the monitor.</li> <li>· Check and repair the wiring.</li> </ul>	

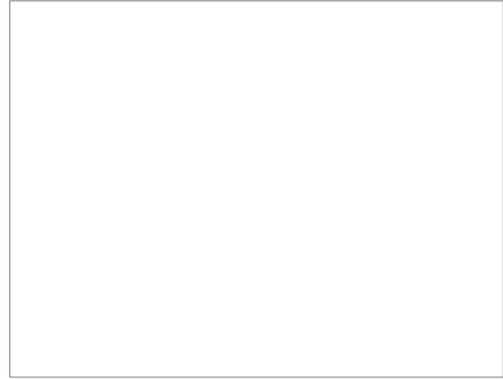
### 3. OTHERS

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

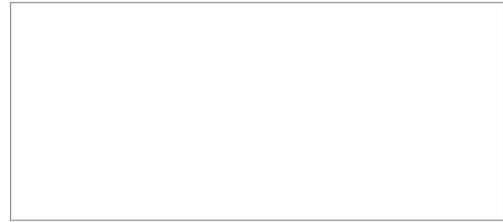
## 1. SELECTING HYDRAULIC BREAKER

- 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.
- 3) The pressure of the ROBEX110-7A system is 330kgf/cm<sup>2</sup>(4700psi).



### 4) Adjusting oil quantity

- (1) Use the breaker mode from work mode. Default oil flow quantity is 110lpm at 2000rpm. Use accel dial switch to control the oil flow quantity.
- (2) If the quantity of hydraulic oil is not controlled properly, it causes short life cycle of the breaker and the machine by increased breaking force and count.

Oil quantity according to engine rpm

Engine rpm	Oil flow /min	Oil flow U.S.gpm
1900	104	27.5
1800	99	26.2
1700	93	24.6
1600	88	23.3

※ Relief pressure : 200kgf/cm<sup>2</sup>

- 5) The accumulator should be used to the breaker charging and return line.
  - ※ **Keep the pressure pulsation of pump below 60kgf/cm<sup>2</sup>(853psi) by installing the accumulator.**
  - ※ **If the accumulator is not used, it will be damage as the input wave is delivered.**
- 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) Shipless 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.

### 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 4 kinds of filter elements in particular, in order to prolong machine life.
- (4) Replace when the breaker work is used for short time according to the standard of right graph.

#### 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

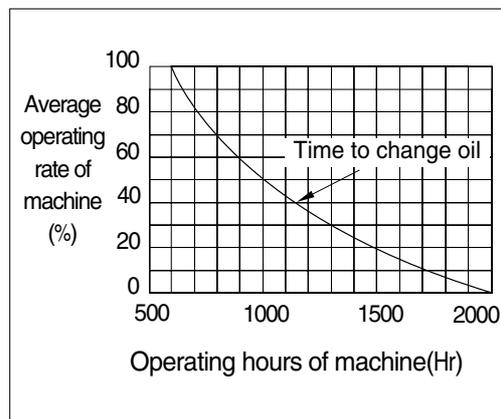
unit : hours

Attachment	Operating rate	Hydraulic oil	Filter element
Breaker	100%	600	500

● **Replace following filter same time**

- Hydraulic return filter : 1EA
- Pilot line filter : 1EA
- Element in hydraulic tank breather : 1EA
- Drain filter cartridge : 1EA

Hyd oil change guide for hydraulic breaker

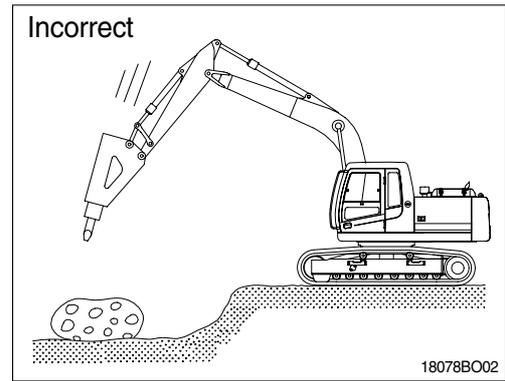


## 4. PRECAUTIONS WHILE OPERATING THE BREAKER

### 1) DO NOT BREAK ROCK WHILE LOWERING

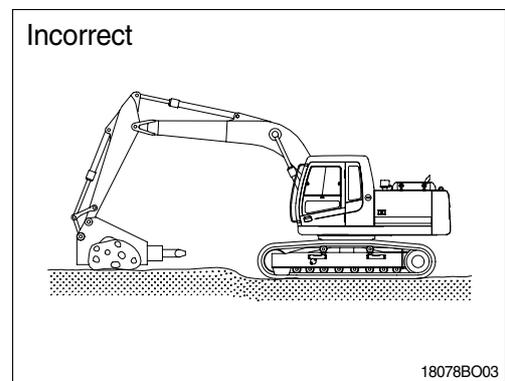
As the breaker is heavy in comparison with bucket, it must be operated slowly.

If breaker is rapidly pushed down, working device may be damaged.



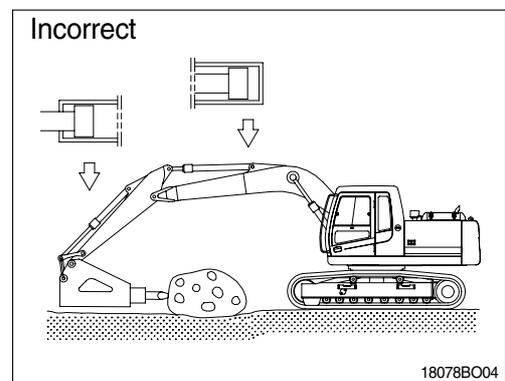
### 2) DO NOT USE BREAKER TO CARRY BROKEN STONE OR ROCK BY SWING OPERATING

This may damage the operation device and swing system.



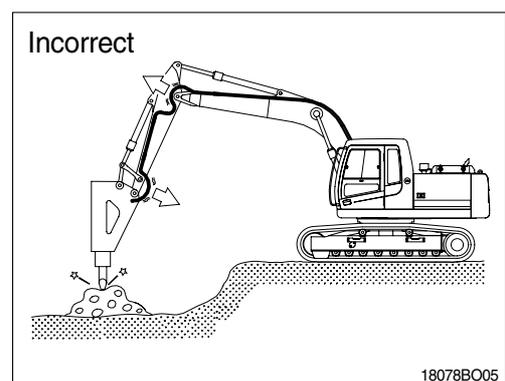
### 3) OPERATE BREAKER WITH A GAP IN EXCESS OF 100mm(4 inches) FROM THE END OF THE STROKE TIP

If breaker is operated with the end tip, the cylinder may be damaged.



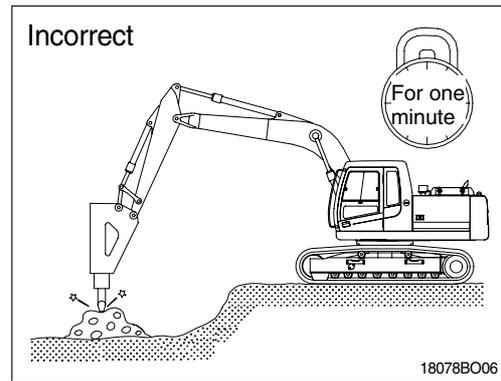
### 4) IF THE HYDRAULIC HOSES VIBRATE EXCESSIVELY

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.



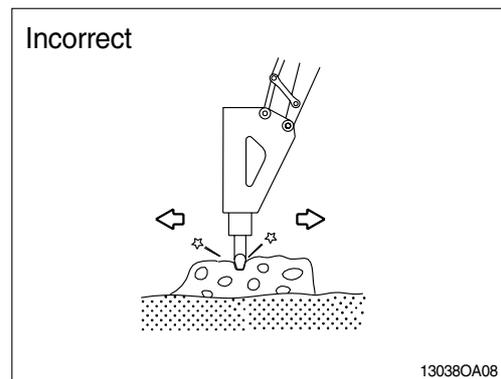
**5) DO NOT CONTINUE TO WORKING OVER ONE MINUTE AT SAME POSITION OF BOOM AND ARM**

This will increase the temperature of the oil, and cause problem in the accumulator and seals.



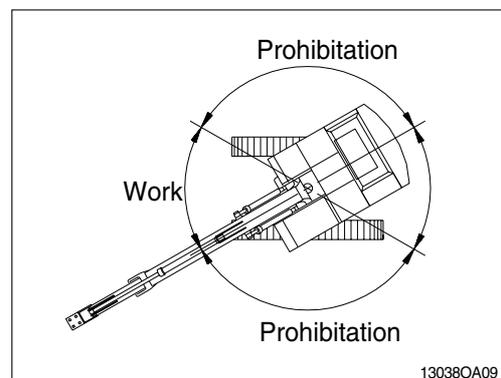
**6) DO NOT MOVE MACHINE OR BREAKER WHILE STRIKING**

Do not move hammer while striking.  
This will cause damage to the working device and the swing system.



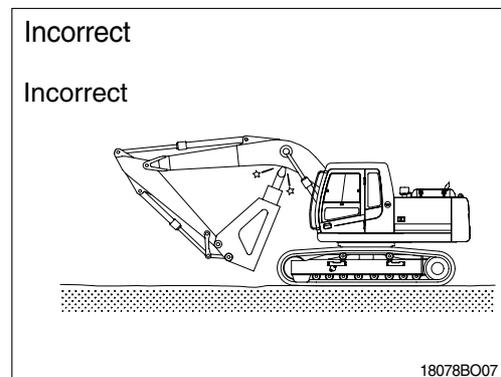
**7) DO NOT WORK WHILE SWING STATE**

Do not work while swing position of superstructure.  
It cause the band of track shoe, oil leakage of roller.



**8) TAKE CARE OF CHISEL AND BOOM INTERFACE**

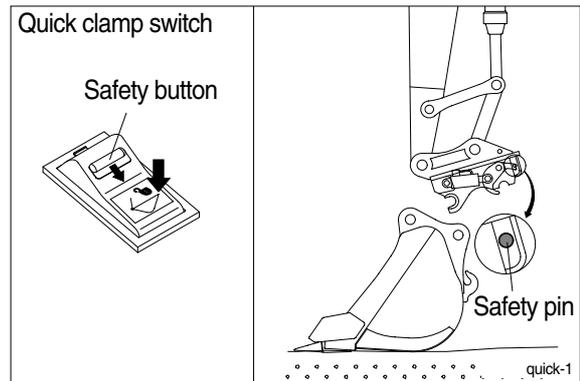
Make sure of the arm and bucket control lever operation.



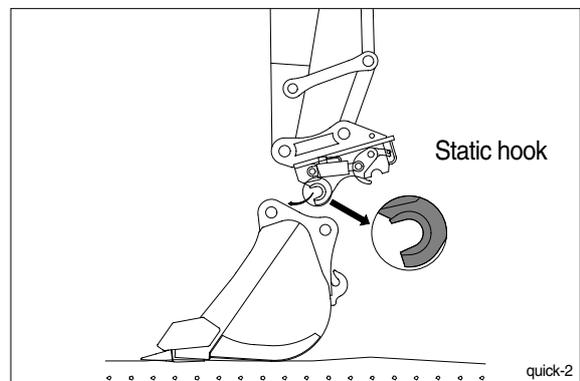
## 5. QUICK CLAMP

### 1) FIXING BUCKET WITH QUICK CLAMP

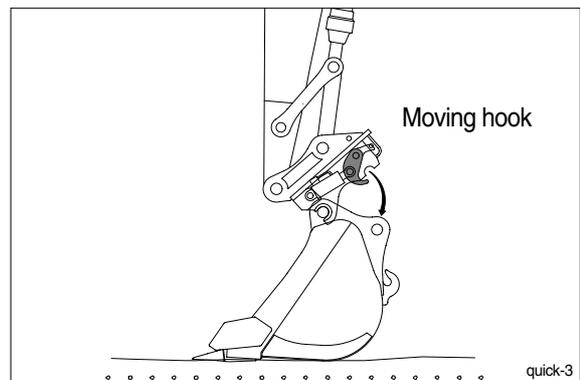
- (1) Before fixing bucket, remove safety pin of the moving hook.
- (2) Pulling safety button, press the quick clamp switch to unlock position. Then, the moving hook is placed on release position.



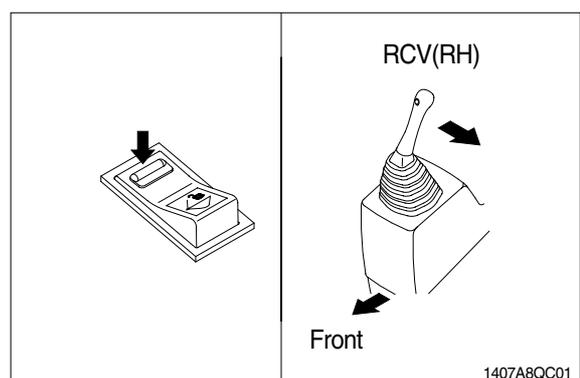
- (3) Aligning the arm and bucket, insert static hook of quick clamp to the bucket pin.



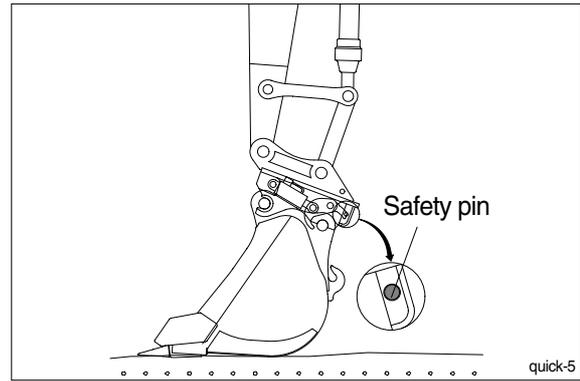
- (4) Operate RCV lever to bucket-in position. Then, the moving hook is coupled with the bucket link pin. Make sure that the moving hook is completely contacted with bucket link pin.



- (5) Press quick clamp switch 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) PRE-CAUTION OF USING QUICK CLAMP.

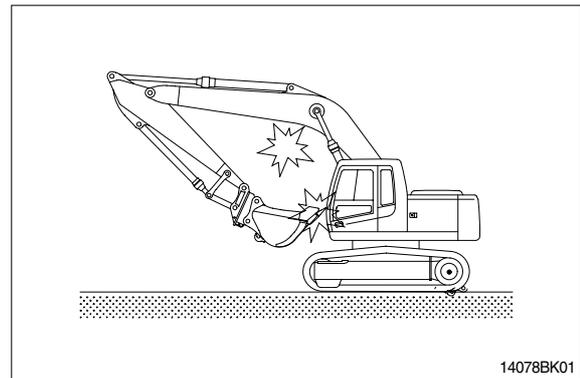
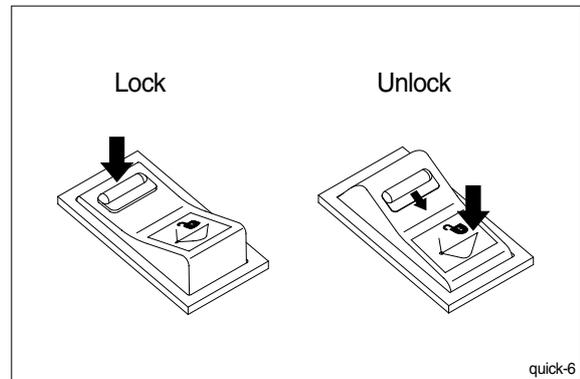
- ⚠ When operating the machine with quick clamp, confirm that the quick clamp switch is lock position and safety pin of moving hook is inserted.

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.



<b>A</b>	
Accel dial switch .....	3-14
After engine start .....	4-4
Air breather element .....	6-31
Air cleaner filter .....	6-25
Air conditioner & heater .....	3-16
Air conditioner filter .....	6-42
Alternate exit .....	0-12
Attachment lowering .....	4-24
Auto air conditioner & heater .....	3-19
<b>B</b>	
Battery .....	6-39
Before starting engine .....	4-2
Boom lowering .....	4-24
Bucket clearance adjustment .....	6-37
Bucket replacement .....	6-35
Bucket selection guide .....	2-17
Bucket tooth replacement .....	6-35
<b>C</b>	
Cab air filter .....	6-42
Cab device .....	3-1
Cassette & radio .....	3-28
CD player .....	3-34
Changing machine control pattern .....	4-27
Charge air cooler .....	6-23
Cigar lighter .....	3-23
Coolant .....	6-20
Cooling fan .....	6-24
CPU controller .....	3-26
<b>D</b>	
Drain filter .....	6-32
<b>E</b>	
Engine oil filter .....	6-18
Engine oil level .....	6-18
Engine starting & stop .....	4-3
Engine starting by booster .....	6-39
Engine stop .....	4-6
<b>F</b>	
Fan belt .....	6-24
Fuel filter .....	6-26
Fuel leakage .....	6-28
Fuel system bleeding .....	6-27
Fuel tank .....	6-25
Fuse box .....	3-25
Fuel warmer .....	3-9
<b>H</b>	
Hydraulic breaker .....	8-1
Hydraulic oil changing .....	6-29
Hydraulic oil filling .....	6-29
Hydraulic oil level .....	6-29
<b>L</b>	
LCD .....	3-5
LCD display lamp .....	3-6
LCD main operation display .....	3-3
Levers & pedals .....	3-14
Lifting capacities .....	2-11
Lubricant specification .....	2-26
<b>M</b>	
Main light switch .....	3-14
Maintenance check list .....	6-11
Major component .....	2-1
Master switch .....	3-14
Mode selection system .....	4-7
Monitor display .....	4-11
Monitor panel .....	3-2
Mounting and dismounting .....	1-12
<b>N</b>	
New machine operation .....	4-1
<b>O</b>	
Oil cooler .....	6-23
Operating pattern .....	4-27
<b>P</b>	
Pedals .....	3-14
Periodical replacement parts .....	3-14
Pilot line filter .....	6-31
Pin & bushing adjustment .....	6-38
Prefilter .....	6-26
<b>Q</b>	
Quick clamp switch .....	3-14

## R

Radiator flushing .....	6-20
Radio .....	3-20
RCV lever lubricate .....	6-34
Recommended oils .....	2-20, 6-10
Relieving pressure .....	6-3
Resistor .....	3-26
Return filter .....	6-30

## S

Safety hints .....	1-1
Safety labels .....	0-5
Safety parts .....	6-5
Seat .....	3-24
Seat belt .....	3-24
Service meter .....	3-26
Speciation for major component .....	2-16
Specification .....	2-2
Start switch .....	3-13
Storage .....	4-25
Suction strainer .....	6-30
Swing bearing grease .....	6-32
Swing gear & pinion grease .....	6-33
Swing reduction gear oil .....	6-32
Switch panel .....	3-7
Switches .....	3-9

## T

Torques-major component .....	6-8
Torques-fastener .....	6-6
Towing machine .....	4-16
Track adjustment .....	6-34
Track shoe selection .....	2-141
Transportation .....	5-1
Travel reduction gear oil .....	6-33
Travelling machine .....	4-14
Troubleshooting guide .....	7-1

## U

Undercarriage .....	2-14
---------------------	------

## W

Warming up operation .....	4-5
Warning lamps .....	3-3
Weight .....	2-8
Working device operation .....	4-13
Working method .....	4-17
Working range .....	2-5