CONTENTS

FOREWORD

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

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

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

This machine complies with EC directive "98/37/EEC".

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.

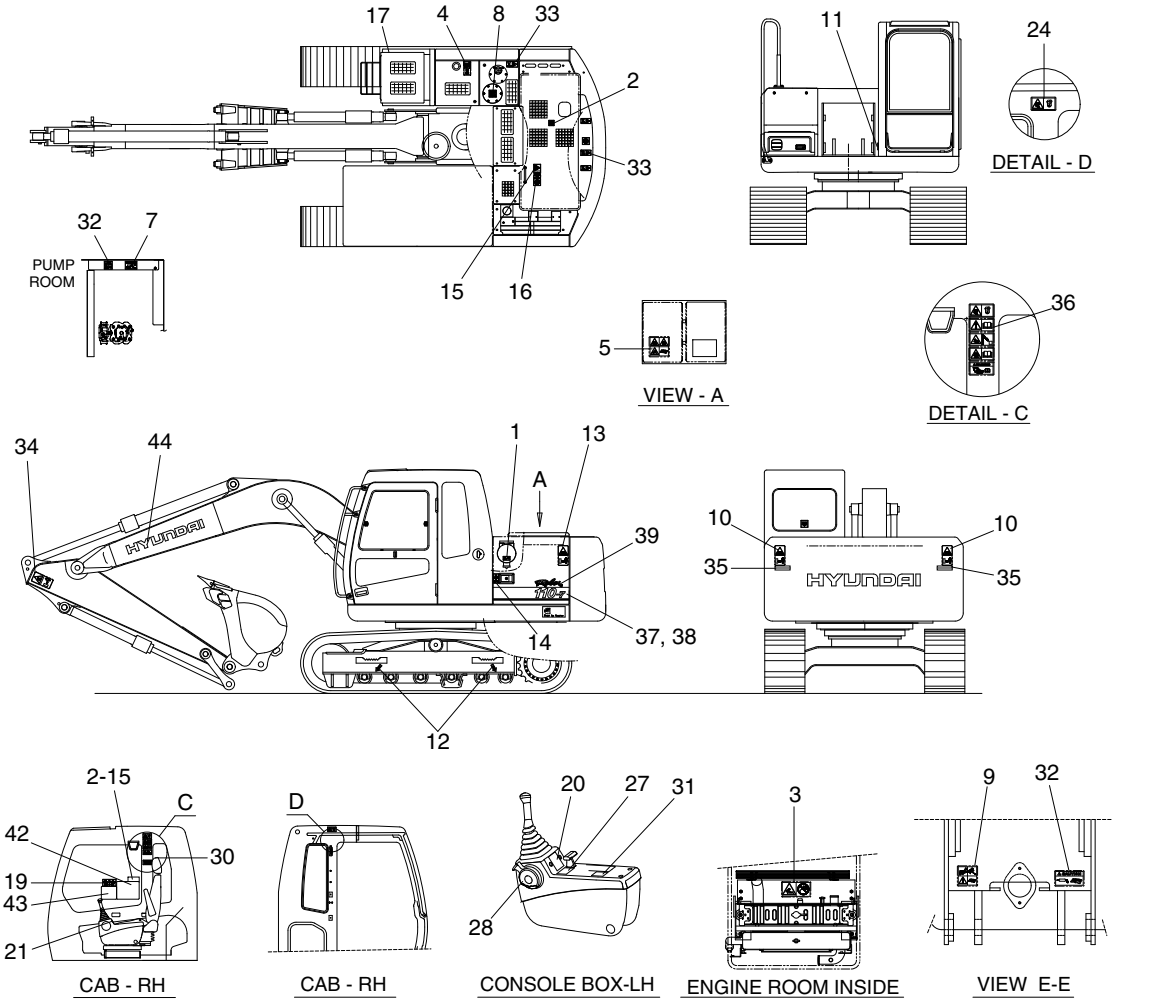
TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

Machine Serial No.	
Engine Serial No.	
Manufacturing year	
Manufacturer Address	Hyundai Construction Equipment India Pvt., Ltd. Plot No. A-2, Chakan industrial area, Vill. Khalumbre, Talut-Khed., Dist. Pune 410 510, India

SAFETY LABELS

1. LOCATION

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



D11070SL01A

1	Air cleaner filter	15	Shearing engine hood	30	Locking clamp
2	Turbo charger cover	16	No step engine hood	31	Ideogram-dozer
3	Radiator cap	17	Transporting	32	High pressure hose
4	Fueling	19	Control ideogram	33	Falling
5	Battery accident	20	Control ideogram(LH)	34	Keep clear(Boom/Arm)
7	Hydraulic oil level	21	Control ideogram(RH)	35	Reflecting
8	Hydraulic oil lubrication	22	Ref operator manual	36	Cabin RH piller
9	Reduction gear grease	23	Max height	37	Model name(LH)
10	Keep clear	24	Safety front window	38	Model name(RH)
11	Name plate	25	Alternate exit	39	Logo(ROBEX)
12	Slinging ideogram	27	Console box tilting	42	Service instruction
13	Sidekeep clear	28	Safety lever	43	Lifting chart
14	Stay fix	29	Interference	44	Trade mark(Boom)

2. DESCRIPTION

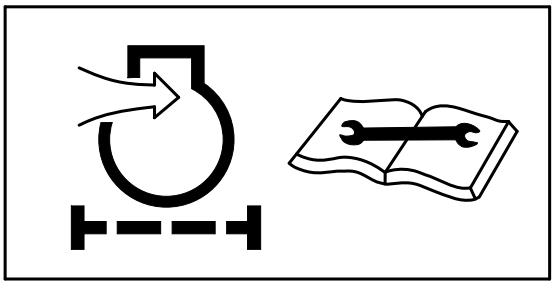
There are several specific warning labels on this machine please become familiarized with all warning labels.

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) TURBO CHARGER 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.

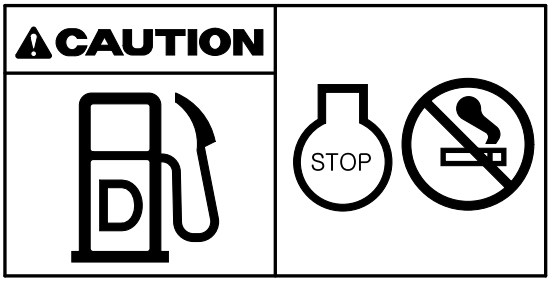
⚠ **Never open the filler cap while engine running or at high coolant temperature.**

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.

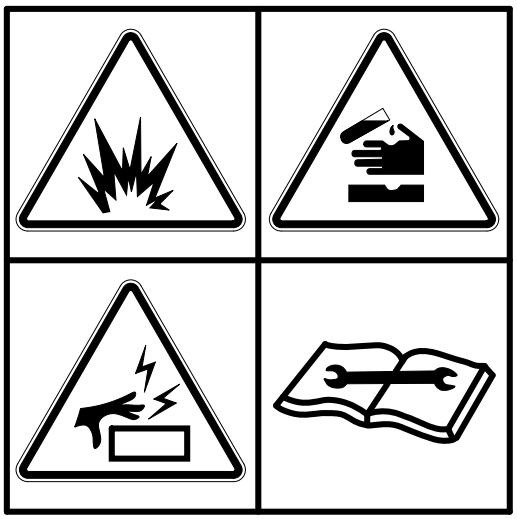
※ Maintain the electrolyte at the recommended level. Add distilled water to the battery only when starting up, never when shutting down.
With electrolyte at proper level, less space may cause the gases to be accumulated in the battery.

⚠ 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 terminals with a wet hand.



36070FW05

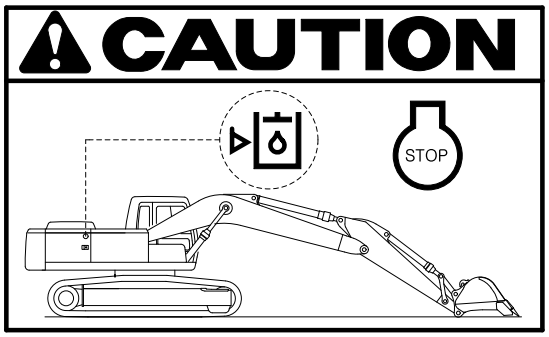
6) HYDRAULIC OIL LEVEL(Item 7)

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

7) HYDRAULIC OIL LUBRICATION(Item 8)
This warning label is positioned on the right side of air breather.

※ Do not mix with different brand oils.

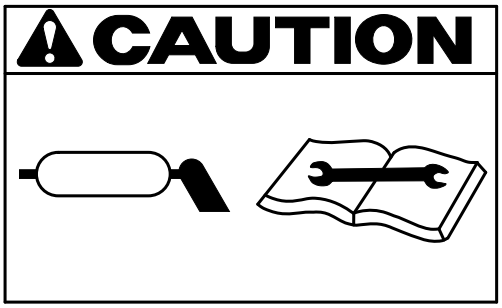
⚠ Never open the filler cap while engine running or at high hydraulic oil temperature.

⚠ Loosen the cap slowly and release internal pressure completely.

21070FW08

8) REDUCTION GEAR GREASE(Item 9)
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.

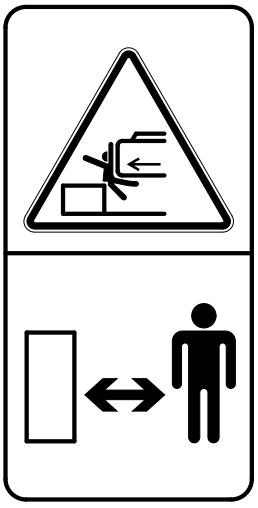


21070FW35

9) KEEP CLEAR(Item 10)
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.



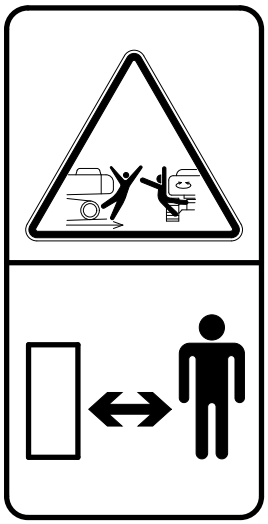
21070FW09

10) **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.**



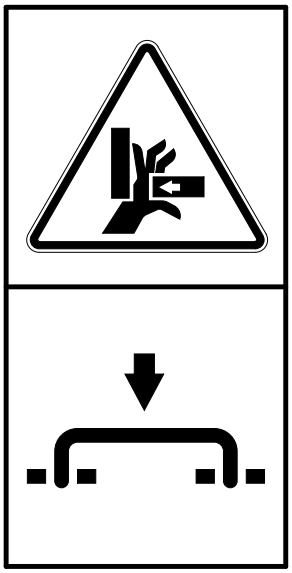
21070FW13

11) **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.**



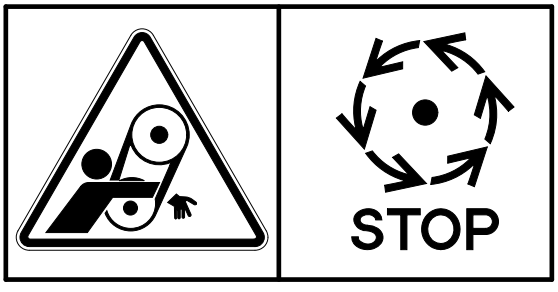
21070FW14

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

This warning label is positioned on the engine hood.

⚠ **Do not open the engine hood during the engine's running.**

⚠ **Do not touch exhaust pipe or it may cause severe burn.**



21070FW15

13) NO STEP-ENGINE HOOD(Item 16)

This warning label is positioned on the engine hood.

△ Do not step on the engine hood.

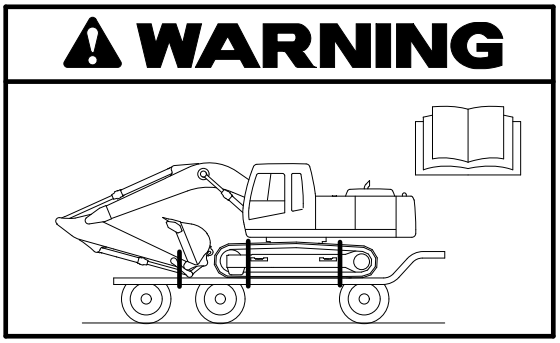
21070FW16

14) 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

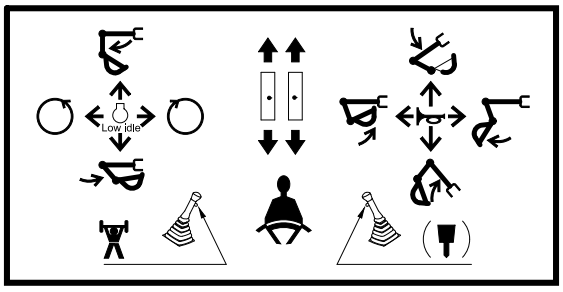
15) CONTROL IDEOGRAM(Item 19)

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 4-12 for details.



36070FW19

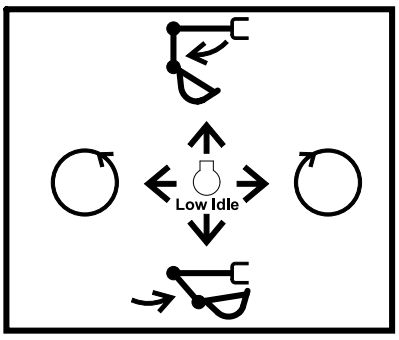
16) CONTROL IDEOGRAM-LH(Item 20)

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 4-12 for details.



11070FW20

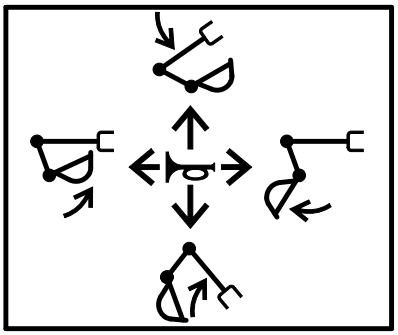
17) CONTROL IDEOGRAM-RH(Item 21)

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 4-12 for details.

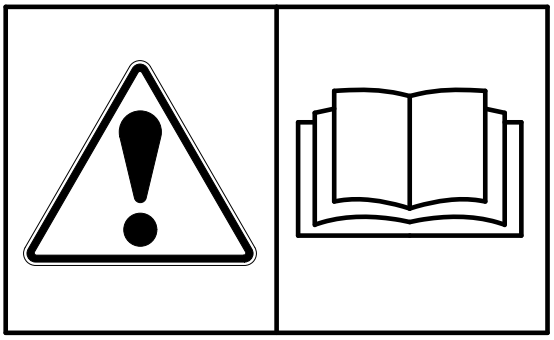


21070FW21

18) REF OPERATOR MANUAL(Item 22)

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

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



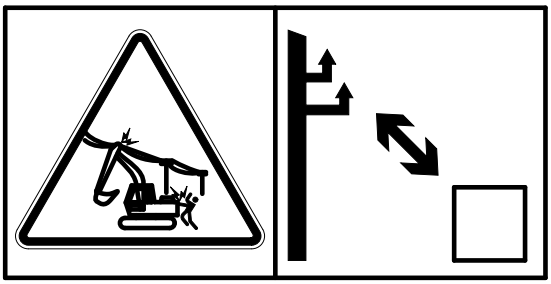
21070FW22

19) MAX HEIGHT(Item 23)

This warning label is positioned on the right side frame 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.

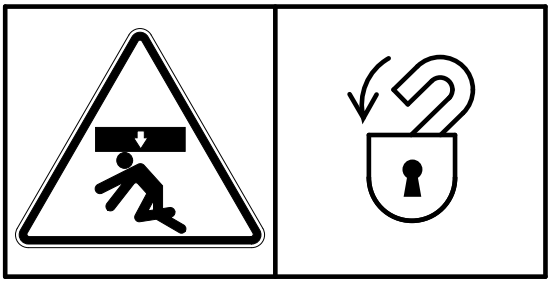


21070FW23

20) SAFETY FRONT WINDOW(Item 24)

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

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



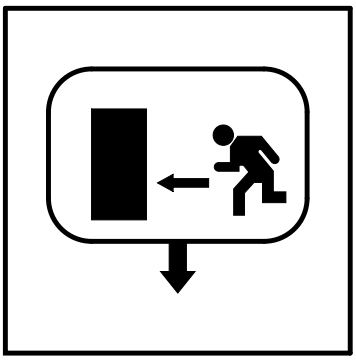
21070FW24

21) 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.**

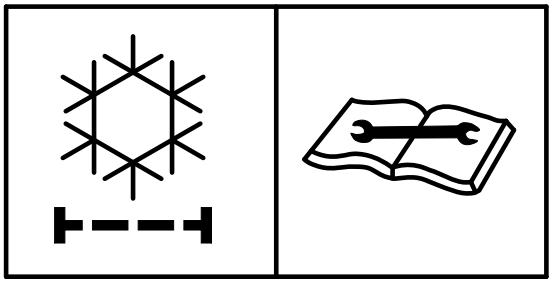


21070FW25

22) AIR CONDITIONER FILTER(Item 26)

This warning label is positioned on the air conditioner cover up.

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

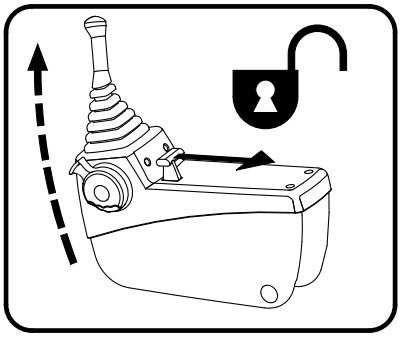


21070FW26

23) 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.**

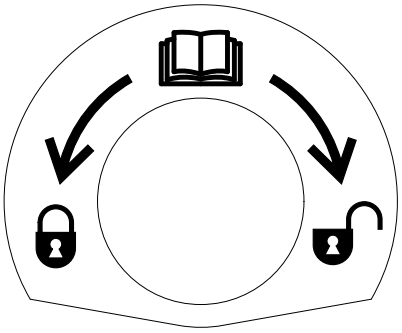


21070FW27

24) SAFETY LEVER(Item 28)

This warning label is positioned on the cover safety.

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



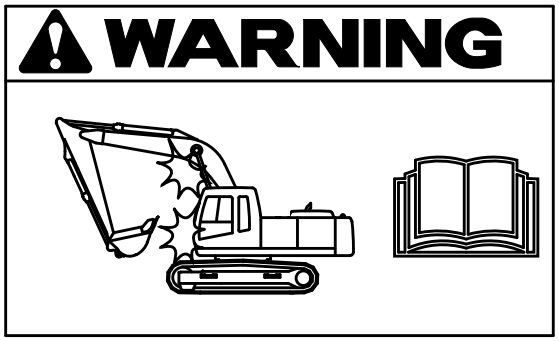
21070FW28

25) INTERFERENCE(Item 29)

This warning label is positioned on the right side frame 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.



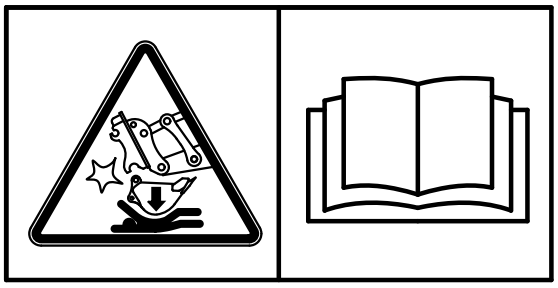
14070FW62

26) CLAMP-LOCKING(Item 30)

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

27) HIGH PRESSURE HOSE(Item 32)

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.

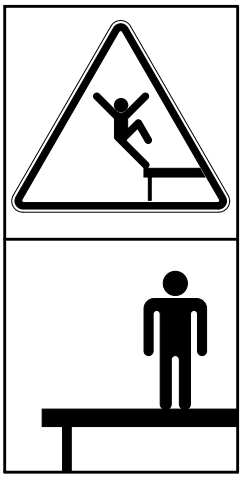
14070FW29

28) **FALLING**(Item 33)

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.**



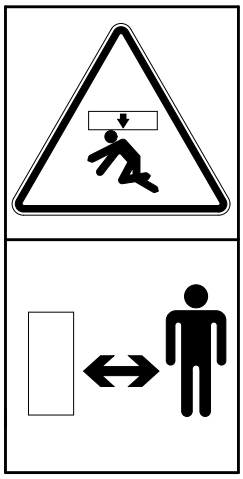
14070FW30

29) **KEEP CLEAR-BOOM/ARM**(Item 34)

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.**

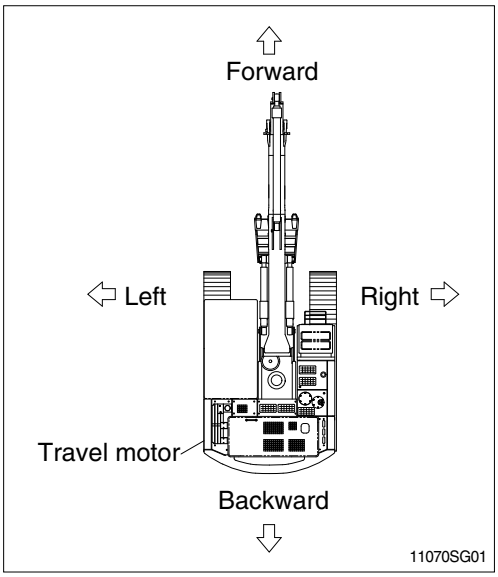


14070FW31

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.

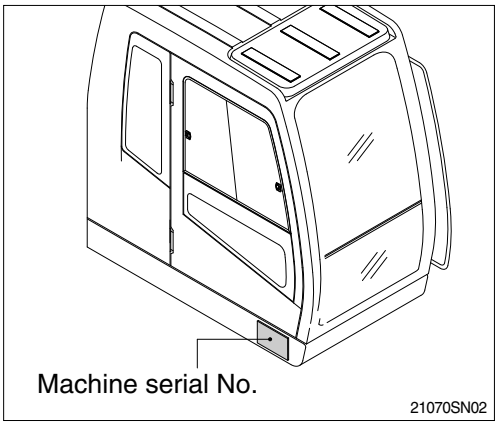


2. SERIAL NUMBER

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

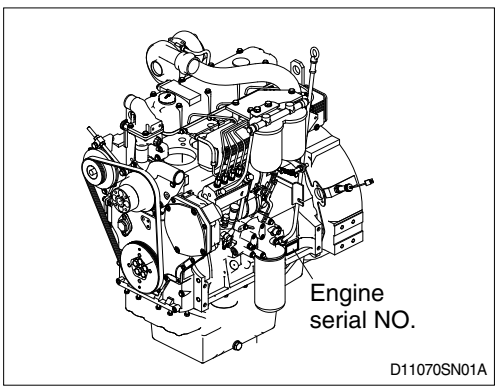
1) MACHINE SERIAL NUMBER

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

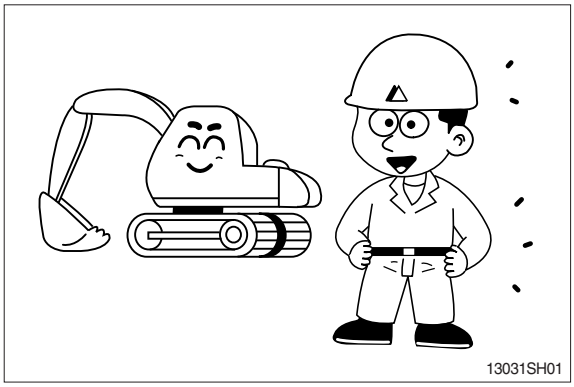
⚠ Important safety hint.

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

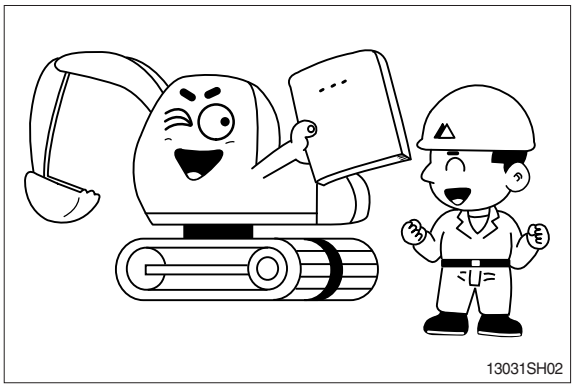
※ It indicates the useful information for operator.

1. BEFORE OPERATING THE MACHINE

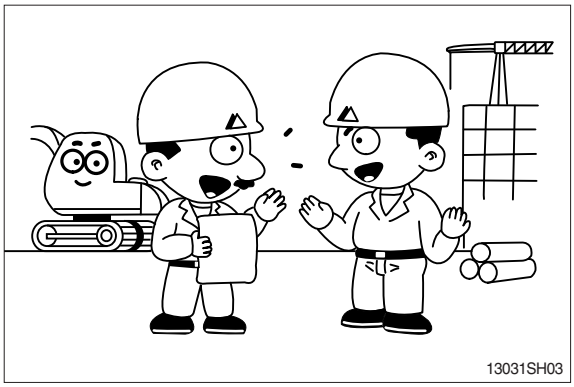
Think-safety first.
In special situation, wear protective clothing including a safety helmet, safety shoes, gloves, safety glasses and ear protection as required by the job condition.
Almost every accident is caused by disregarding the simple and fundamental safety hints.


13031SH01

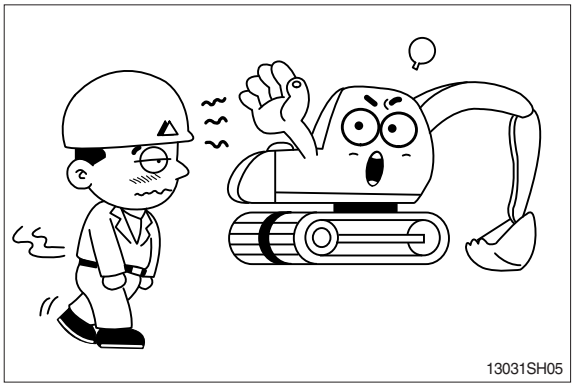
Be sure to understand thoroughly all about the operator's manual before operating the machine.
Proper care is your responsibility.


13031SH02

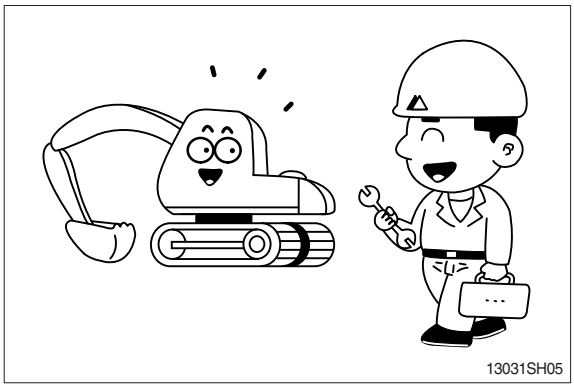
Fully understand the details and process of the construction before starting the work.
If you find anything dangerous on the job, consult with the job supervisor for the preventive measures before operating the machine.


13031SH03

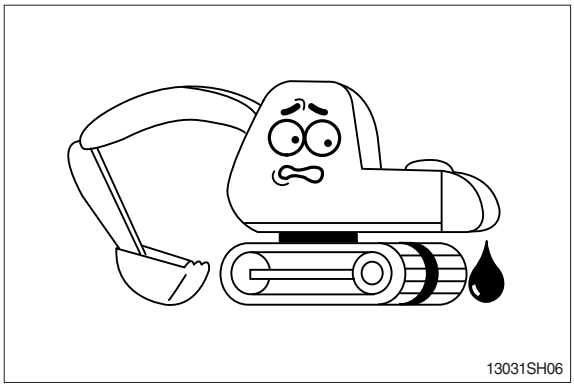
Do not operate when tired, or after drinking alcoholic beverages or any type of drugs.


13031SH05

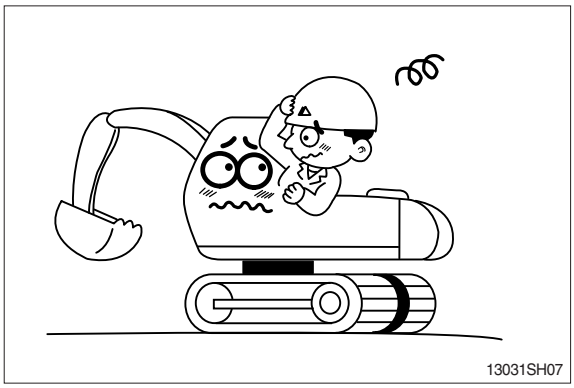
Check daily according to the operation manual.
Repair the damaged parts and tighten the loosened bolts.



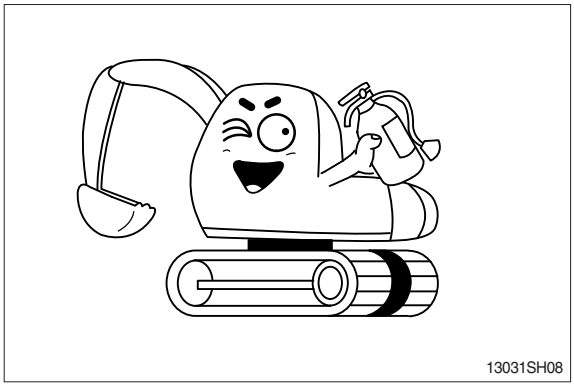
Check for leakage of engine oil, hydraulic oil, fuel and coolant.
Keep machine clean, clean machine regularly.



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.

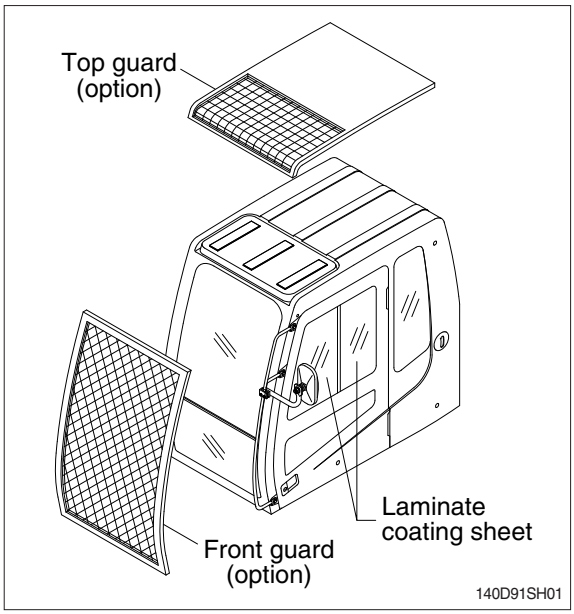


PROTECTION AGAINST FLYING OBJECTS

If there is any danger of 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 flying objects.



UNAUTHORIZED MODIFICATION

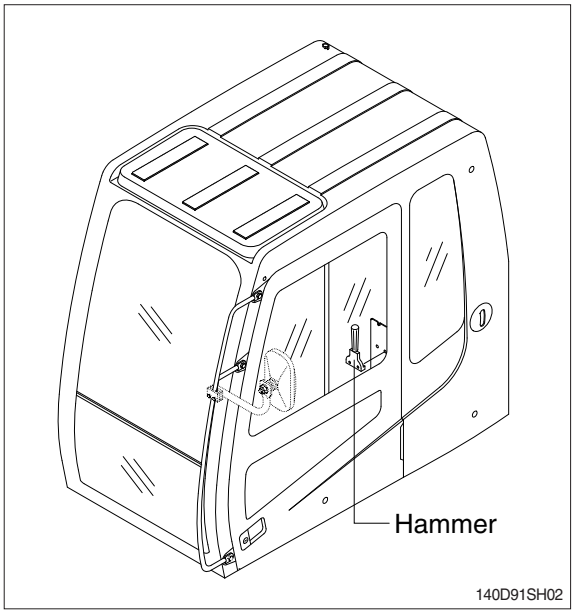
Any modification made without authorization from Hyundai can create hazards.

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.

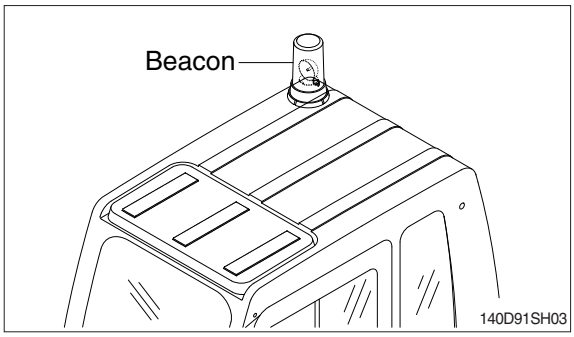
Be sure you know the phone numbers of persons you should contact in case of an emergency.



ROTATING BEACON

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

Please contact your Hyundai distributor to install it.



PRECAUTIONS FOR ATTACHMENTS

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

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

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

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

SAFETY RULES

Only trained and authorized personnel can operate and maintain the machine.
Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
When working with another operator or a person on worksite traffic duty, be sure all personnel understand all hand signals that are to be used.

SAFETY FEATURES

Be sure all guards and covers are in their proper position. Have guards and covers repaired if damaged.
Use safety features such as safety lock and seat belts properly.
Never remove any safety features. **Always** keep them in good operating condition.
Improper use of safety features could result in serious bodily injury or death.

MACHINE CONTROL PATTERN

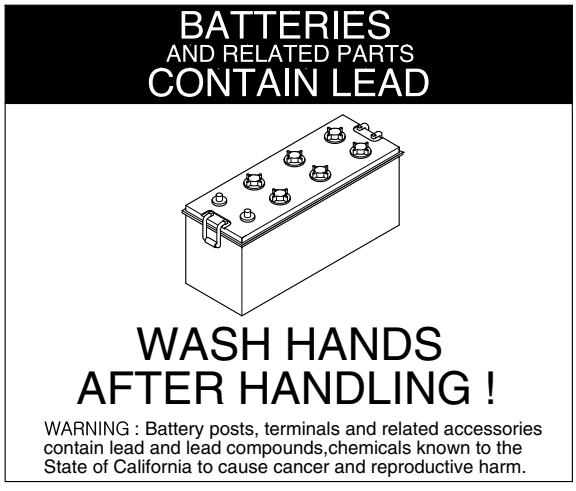
Check machine control pattern for conformance to pattern on label in cab.
If not, change label to match pattern before operating machine.
Failure to do so could result in injury.

CALIFORNIA PROPOSITION 65

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

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

Battery posts, terminals and related accessories contain lead and lead compounds.
WASH HANDS AFTER HANDLING



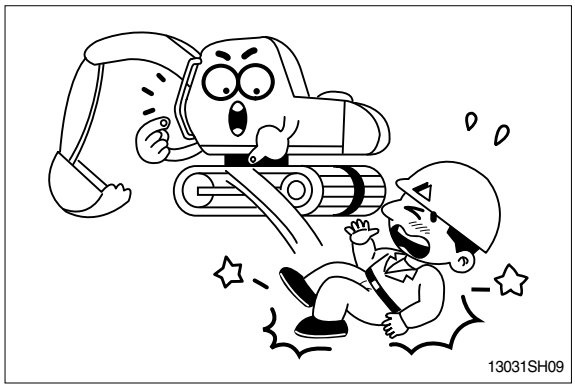
13031SH55

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

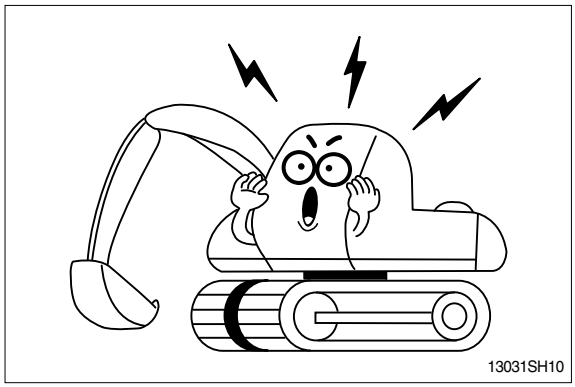
⚠ **The wrong loading method can result in serious bodily injury or death.**

2. DURING OPERATING THE MACHINE

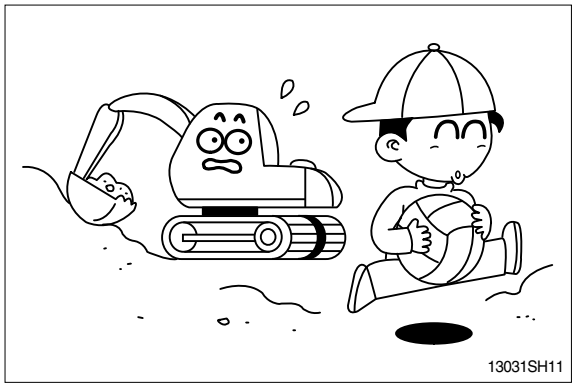
Use the handle and footstep when getting on or off the machine.
Do not jump on or off the machine.



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.

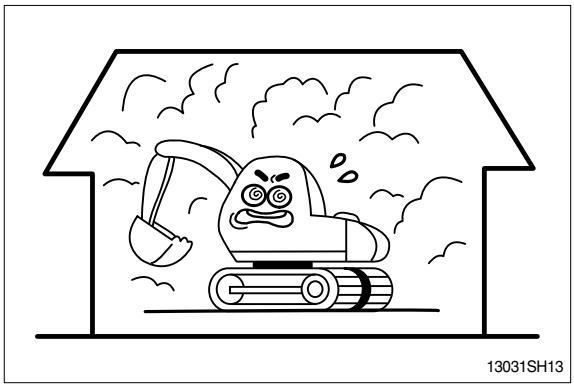


Operate carefully to make sure all personnel or obstacles are clear within the working range of the machine.
Place safety guards if necessary.

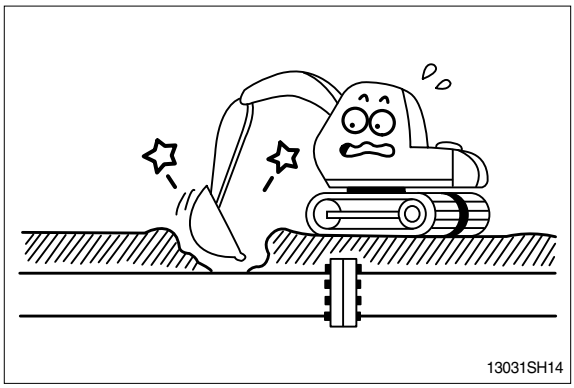


When using the work equipment, pay attention to job site.

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

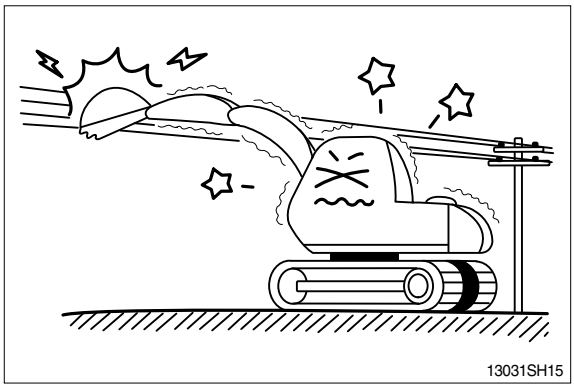


Check the locations of underground gas pipes or water line and secure the safety before operation.

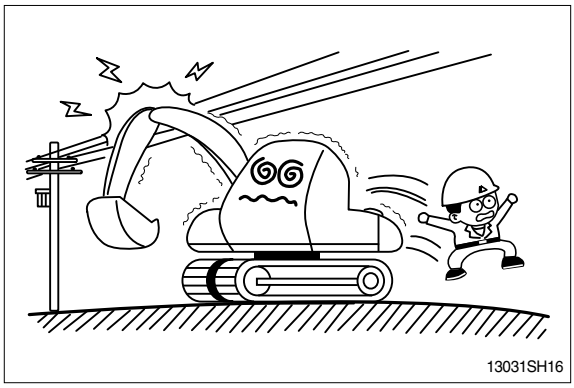


The operating near the electrical lines is very dangerous.
Operate within safe working range permitted as below.

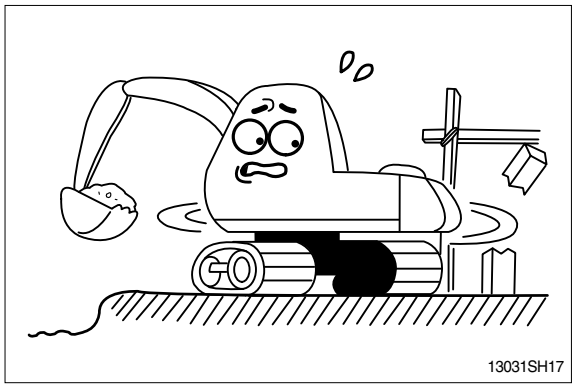
Supply voltage	Min safe separation
6.6kV	3m(10ft)
33.0kV	4m(13ft)
66.0kV	5m(16ft)
154.0kV	8m(26ft)
275.0kV	10m(33ft)



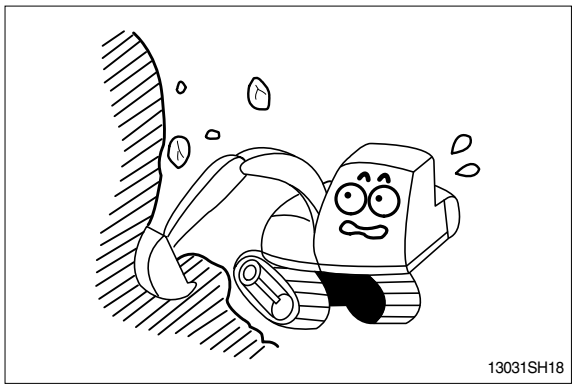
If the machine touches the electric power lines, keep sitting on the operator's seat and make sure the personnel on the ground not to touch the machine until turning off the electric current. Jump off the machine without contacting the machine when you need to get off.



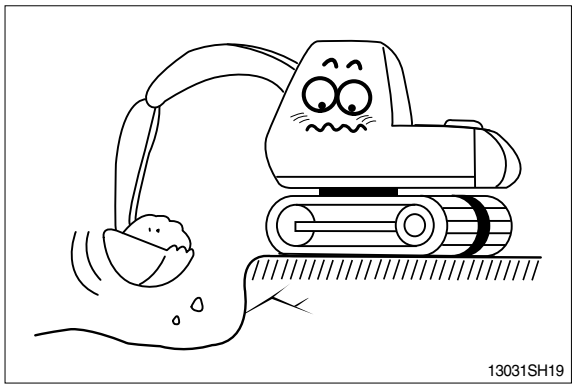
Watch out for obstacles.
Be particularly careful to check the machine clearance during the swing.



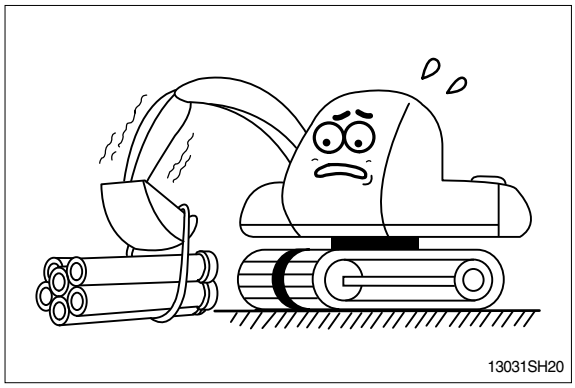
When using the machine as breaker or working in a place where stones may fall down, cab roof guard and head guard should be provided for proper protection.



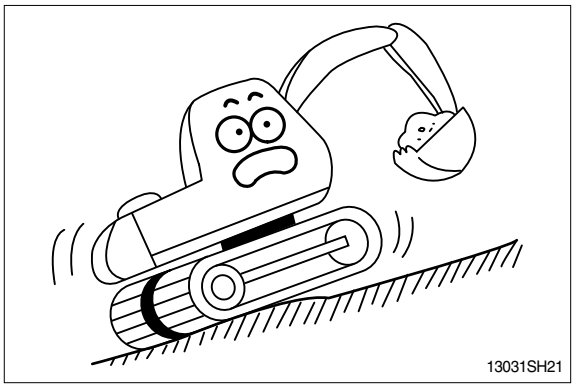
Avoid operating on a cliff or soft ground as there is danger of rolling over.
Make sure to get off easily as keeping the track at a right angle and putting the travel motor into the backward position when working on a cliff or soft ground inevitably.



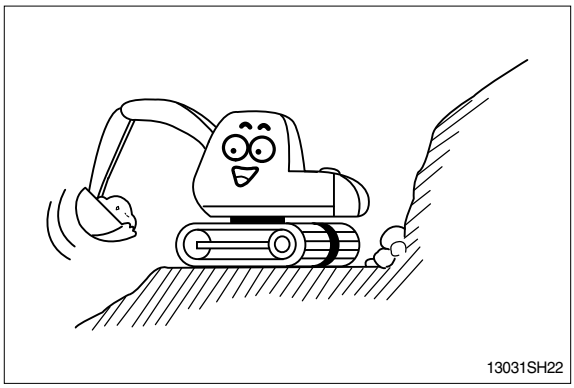
Operate for the lifting work considering the capacity of machine, weight and width of the load.
Be careful not to lift exceeding the machine capacity as it can be the cause of machine damage and safety accident.



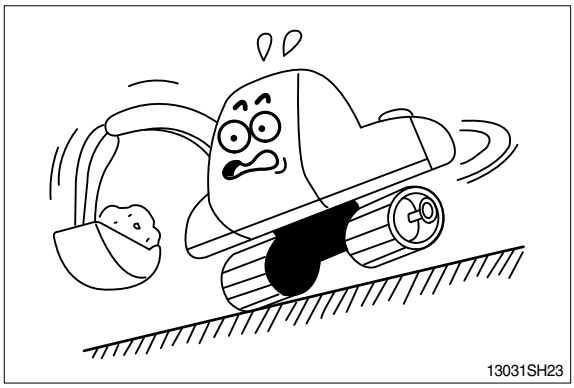
The operation on a slope is dangerous.
Avoid operating the machine on a slope of over 10 degree.



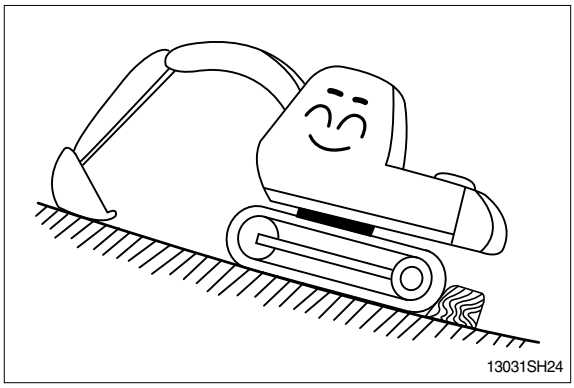
Operate the machine after making ground flat when operation is required on a slope.



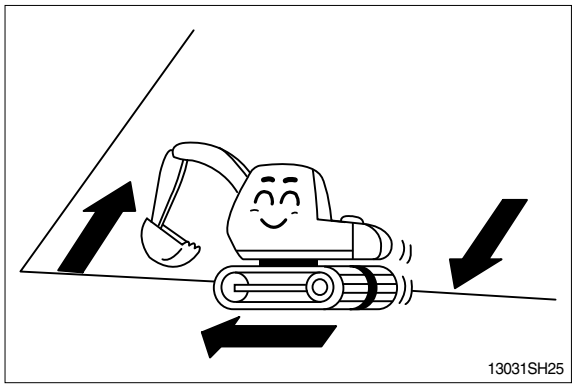
The swing on the slope can be danger of rolling over.
Do not operate to swing the machine with the bucket loaded on a slope since the machine may lose its balance under such an instance.



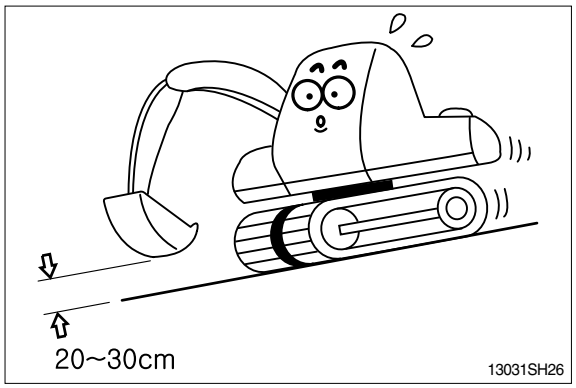
Avoid parking and stopping on a slope.
Lower the bucket to the ground and block the track when parking.



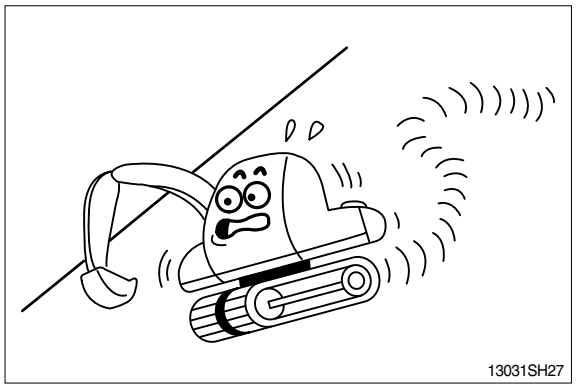
Avoid traveling in a cross direction on a slope as it can cause the danger of rolling over and sliding.



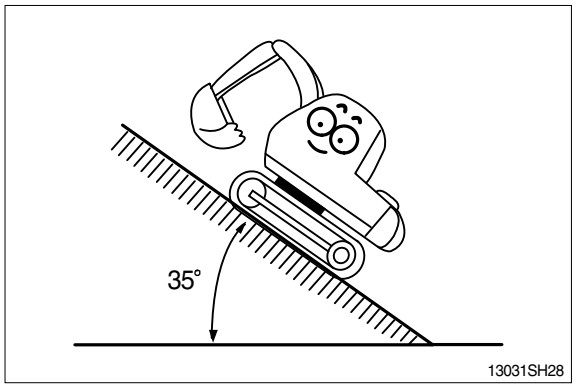
Traveling on a slope is dangerous.
Be sure to operate slowly when traveling down a slope and maintain the bucket at a height of 20~30㎝(1ft) above the ground so that it can be used as brake in an emergency.



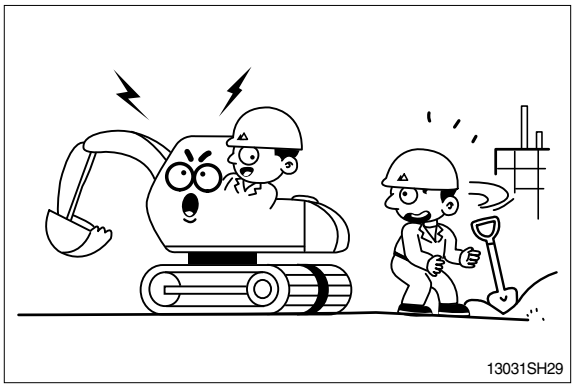
Steering of the machine while traveling on a slope is dangerous.
When an inevitable turning of direction is required, turn on the flat and solid ground.



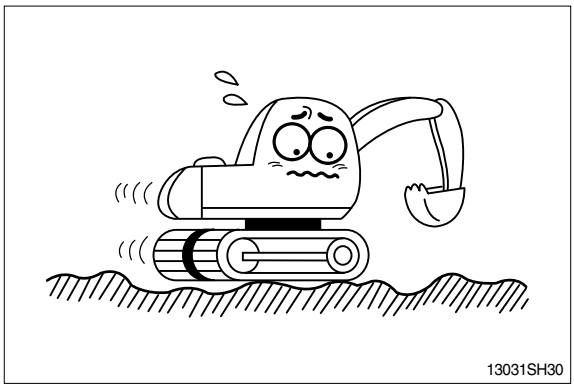
The engine angularity limits are 35 degree.
Do not operate by more than the engine limits in any case.



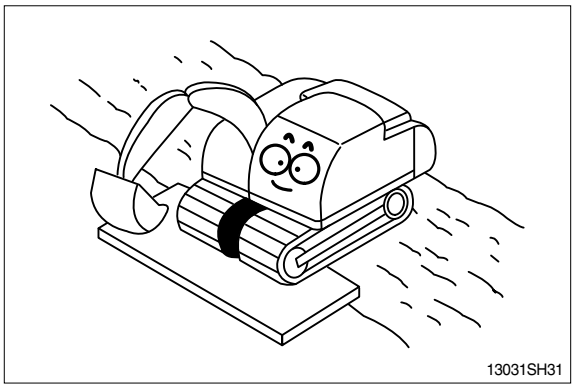
Before traveling the machine, sound the horn to warn nearby personnel.
Operate forward and backward correctly with confirming the location of the travel motor.



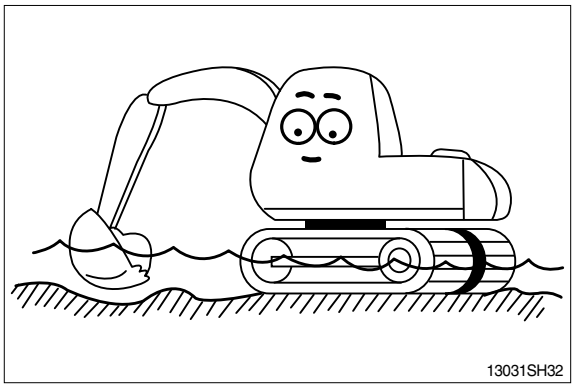
Slow down when traveling through obstacles or uneven ground.



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.

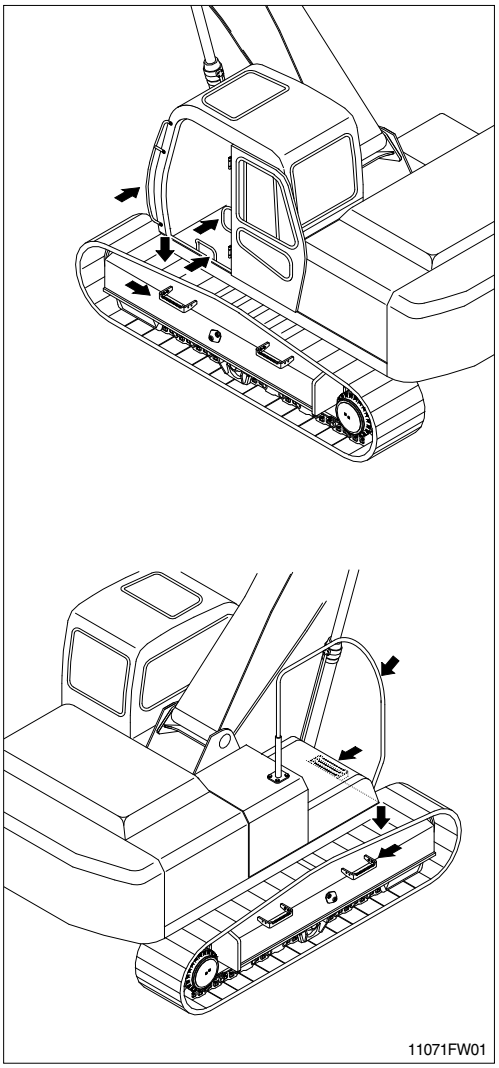
When mounting or dismounting, always face the machine and use the handrails, machine or track frame steps, and track shoes. Additional track frame step can be fitted for wider optional shoe. In this case please contact your Hyundai distributor.

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.

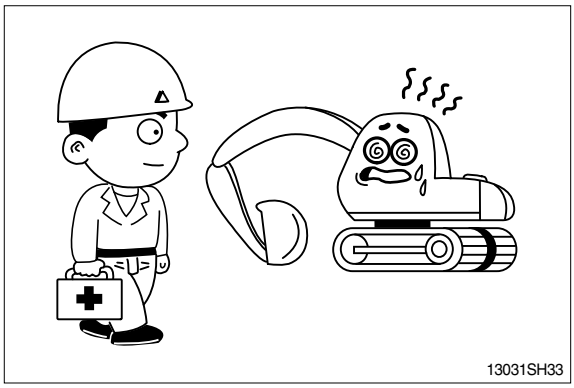
Always remove any oil or mud from the handrails, steps and track shoes. If they are damaged, repair them and tighten any loose bolts.

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.

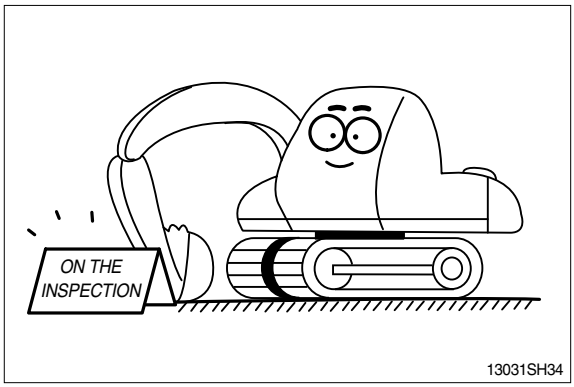


3. DURING MAINTENANCE

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.

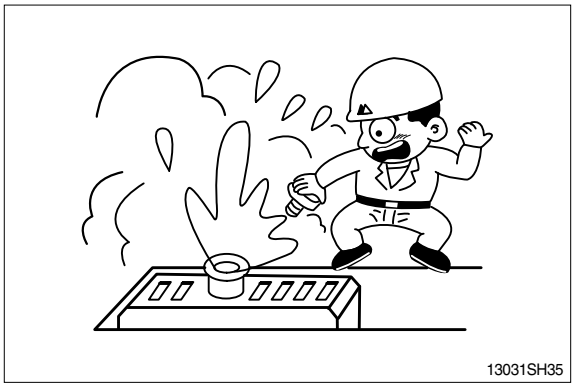

13031SH33

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.

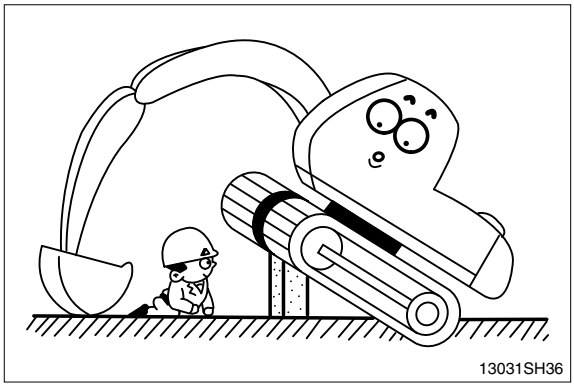


13031SH34

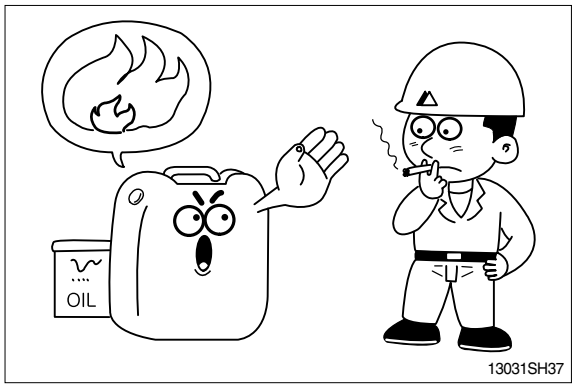
Do not remove the radiator cap from hot engine.
Open the cap after the engine cools, below 50° C(112°F) to prevent personal injury from heated coolant spray or steam.


13031SH35

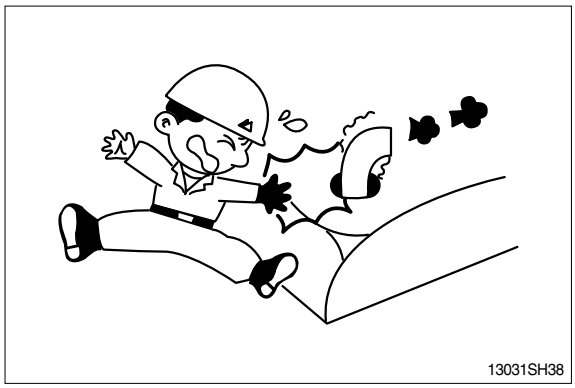
Do not work below the machine.
Be sure to work with proper safety supports.
Do not depend on the hydraulic cylinders to hold up the equipment and attachment.


13031SH36

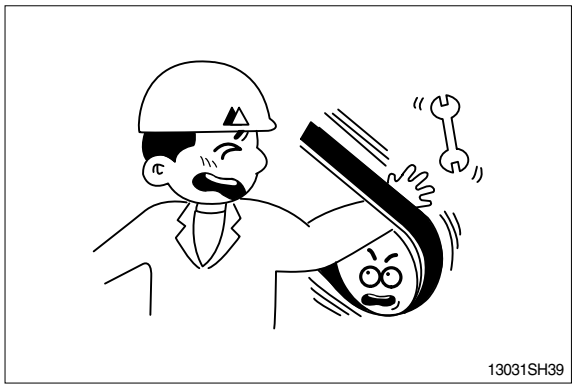
There is the danger of fire in fuel and oil.
Store in cool and dry area, away from any open flames.



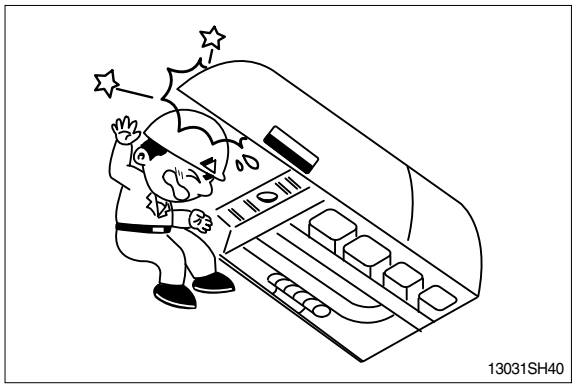
Do not touch exhaust pipe, or may cause severe burn.



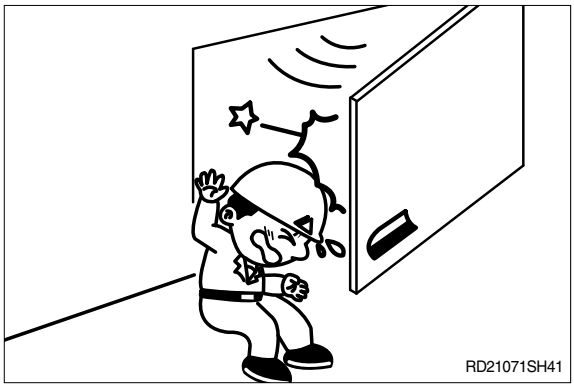
Do not open the engine hood and covers while the engine is running.



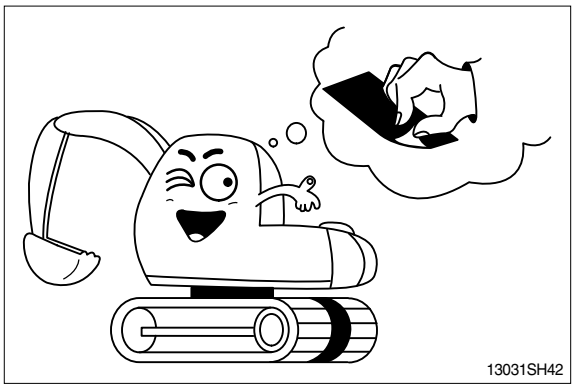
Be careful of not hitting the edges when you service engine.



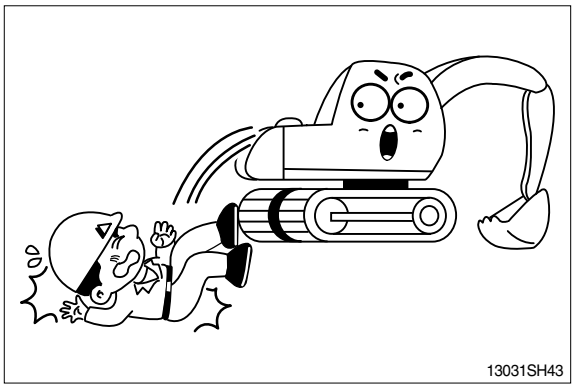
Be careful that the front window may be promptly closed.
Be sure to support stay, when the side door needs to be opened.
Be careful that the open side door may closed by the external or natural force like strong wind.



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.

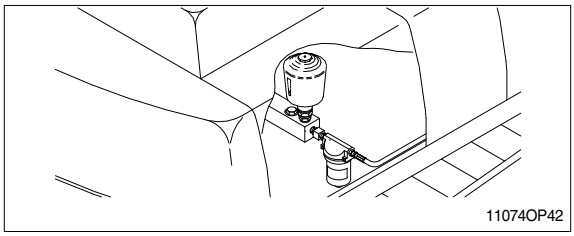


Be careful of not touching slip, fall down etc., when you work at the upper frame to service engine and/or other component.



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.

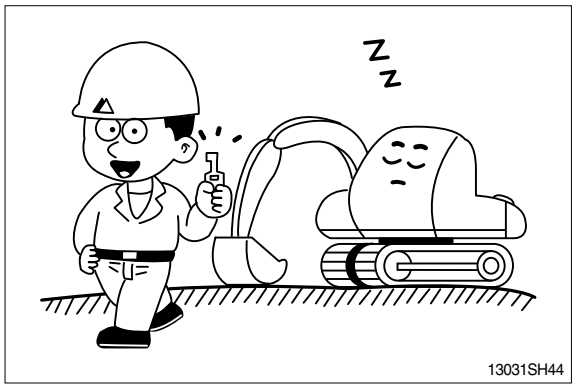


LIFT EYES CAN FAIL

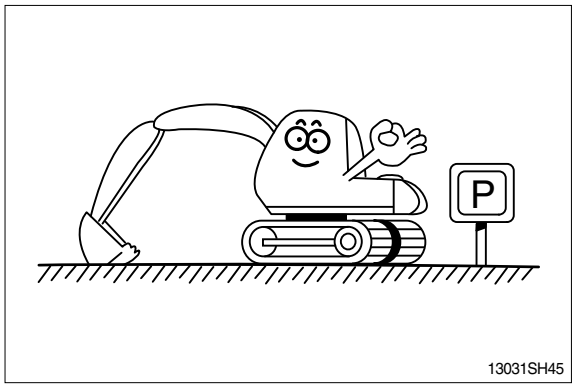
Lift eyes or tank can fail when lifting tank containing fluids resulting in possible personal injury.
Drain tank of all fluids before lifting.

4. PARKING

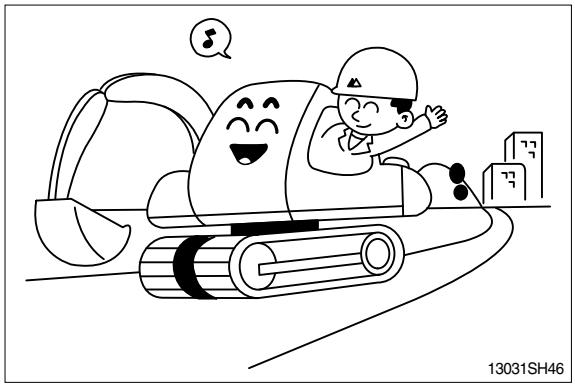
When leaving the machine after parking, lower the bucket to the ground completely and put the safety lever at parking position then remove the key.
Lock the cab door.



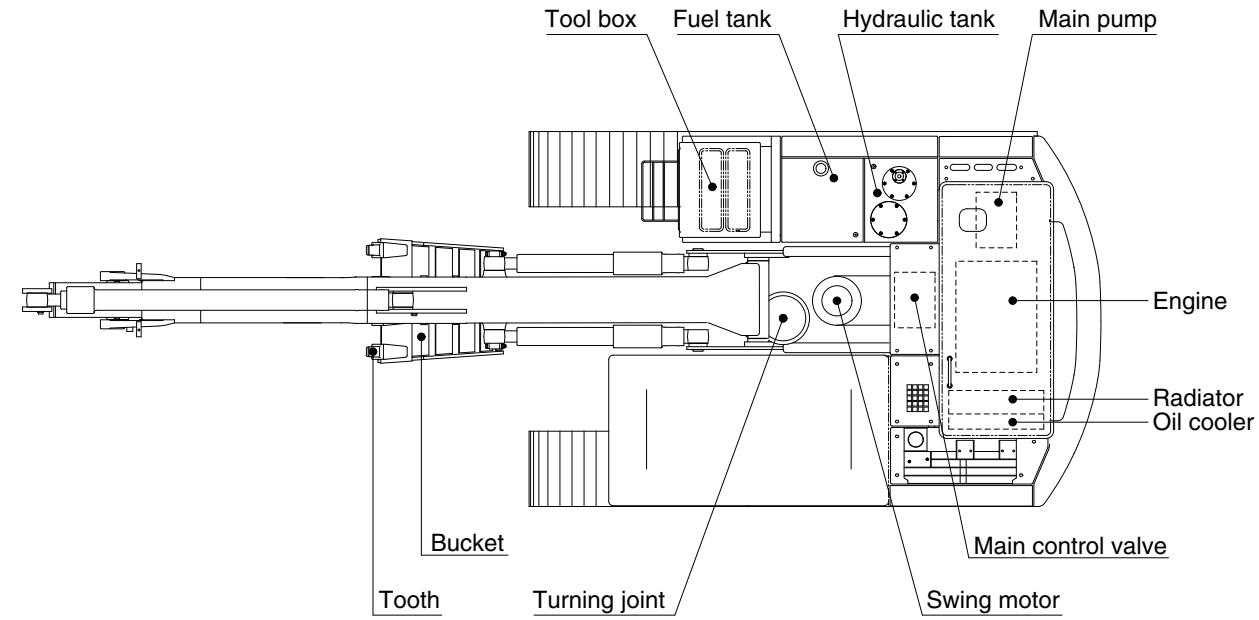
Park the machine in the flat and safe place.

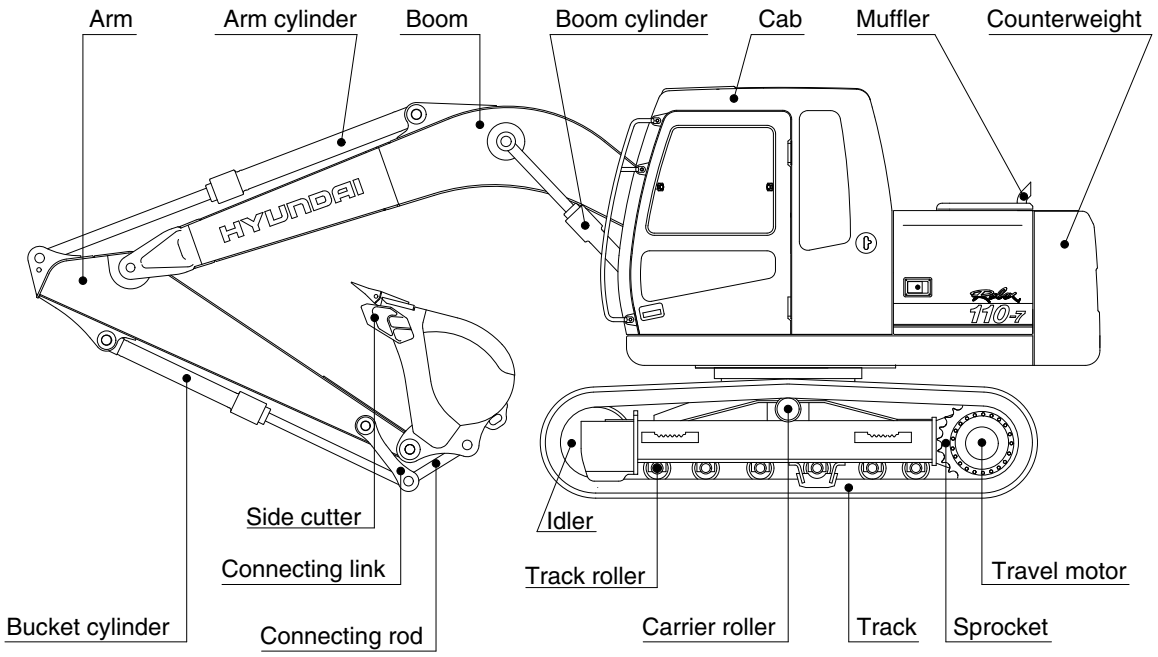


Hope you can work easily and safely observing safety rules.
For safe operation, observe all safety rules.



1. MAJOR COMPONENT



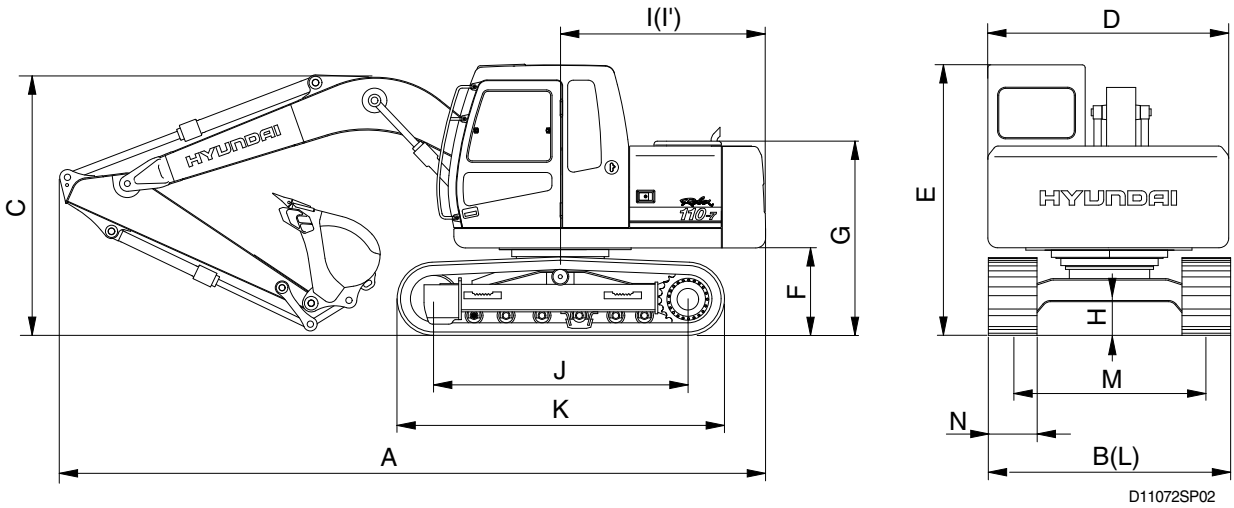


D11072SP01

2. SPECIFICATIONS

1) R110-7

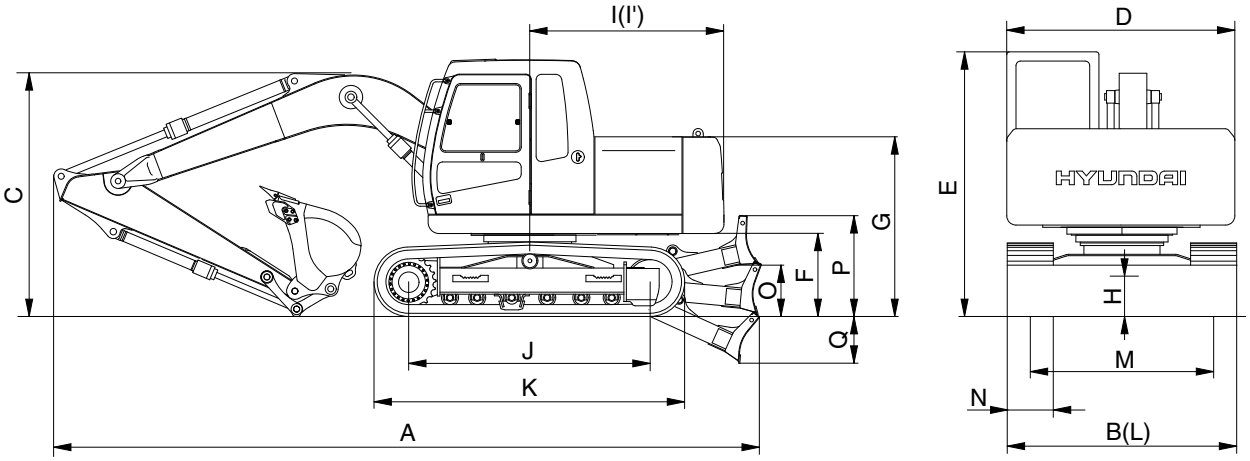
(1) 4.3m(14' 1") MONO BOOM, 1.96m(6' 5") ARM



Description		Unit	Specification
Operating weight		kg(lb)	11060(24380)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	0.60(0.78)
Overall length	A	mm(ft-in)	7240(23' 9")
Overall width, with 500mm shoe	B		2490(8' 2")
Overall height	C		2550(8' 4")
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)	3.4/5.5(2.1/3.4)
Swing speed		rpm	13.0
Gradeability		Degree(%)	35(70)
Ground pressure(500mm shoe)		$kgf/cm^2(psi)$	0.39(5.55)

2) R110D-7

(1) 4.3m(14' 1") MONO BOOM, 1.96m(6' 5") ARM AND REAR DOZER BLADE



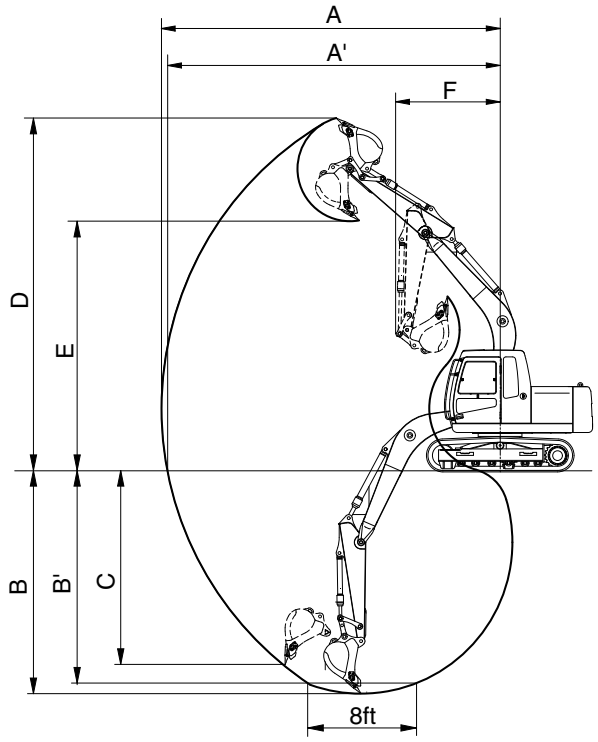
D11072SP02A

Description		Unit	Specification
Operating weight		kg(lb)	11940(26320)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	0.60(0.78)
Overall length	A	mm(ft-in)	7620(25' 0")
Overall width, with 500mm shoe	B		2490(8' 2")
Overall height	C		2550(8' 4")
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")
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)	3.4/5.5(2.1/3.4)
Swing speed		rpm	13.0
Gradeability		Degree(%)	35(70)
Ground pressure(500mm shoe)		$kgf/cm^2(psi)$	0.42(5.97)

3. WORKING RANGE

1) R110-7

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

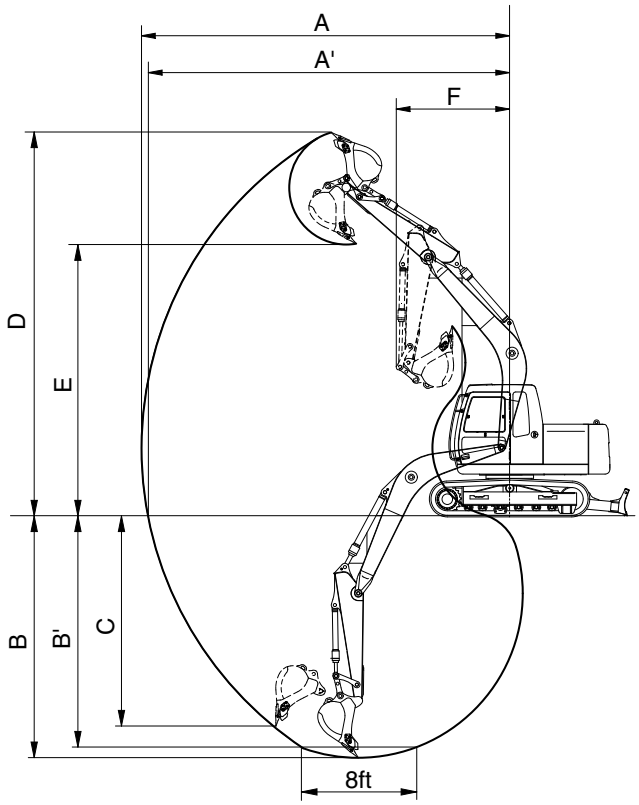


D11072SP03

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 kN	78.5 kN	78.5 kN
		8000 kgf	8000 kgf	8000 kgf
		17640 lbf	17640 lbf	17640 lbf
	ISO	90.2 kN	90.2 kN	90.2 kN
		9200 kgf	9200 kgf	9200 kgf
		20280 lbf	20280 lbf	20280 lbf
Arm digging force	SAE	60.2 kN	55.7 kN	48.1 kN
		6140 kgf	5680 kgf	4900 kgf
		13540 lbf	12520 lbf	10800 lbf
	ISO	62.9 kN	58.1 kN	49.7 kN
		6410 kgf	5920 kgf	5070 kgf
		14130 lbf	13050 lbf	11180 lbf

2) R110D-7

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



D11072SP04

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 kN	78.5 kN	78.5 kN
		8000 kgf	8000 kgf	8000 kgf
		17640 lbf	17640 lbf	17640 lbf
	ISO	90.2 kN	90.2 kN	90.2 kN
		9200 kgf	9200 kgf	9200 kgf
		20280 lbf	20280 lbf	20280 lbf
Arm digging force	SAE	60.2 kN	55.7 kN	48.1 kN
		6140 kgf	5680 kgf	4900 kgf
		13540 lbf	12520 lbf	10800 lbf
	ISO	62.9 kN	58.1 kN	49.7 kN
		6410 kgf	5920 kgf	5070 kgf
		14130 lbf	13050 lbf	11180 lbf

4. WEIGHT

1) R110-7

Item	kg	lb
Upperstructure assembly	3300	7280
Main frame weld assembly	1030	2270
Engine assembly	550	1210
Main pump assembly	90	200
Main control valve assembly	130	260
Swing motor assembly	80	180
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(500㎜ standard triple grouser shoe)	1350	2980
Front attachment assembly(4.3m boom, 1.96m arm, 0.60m^3 SAE heaped bucket)	1680	3700
4.3m boom assembly	740	1630
1.96m arm assembly	320	710
0.60m^3 SAE heaped bucket	500	1100
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 110-7

(1) 4.3m(14' 1") boom, 2.26m(7' 5") arm equipped with 0.45m³(SAE heaped) bucket and 500mm(20") triple grouser shoe.

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

(2) 4.3m(14' 1") boom, 1.96m(6' 5") arm equipped with 0.60m³(SAE heaped) bucket and 500mm(20") triple grouser shoe.

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					*1730	*1730			*1770	1670	5.62
	lb					*3810	*3810			*3900	3680	(18.4)
4.5m (15ft)	kg					*1900	*1900			1570	1140	6.62
	lb					*4190	*4190			3460	2510	(21.7)
3.0m (10ft)	kg			*3110	*3110	*2360	2350	1830	1340	1310	930	7.10
	lb			*6860	*6860	*5200	5180	4030	2950	2890	2050	(23.3)
1.5m (5ft)	kg			*4890	4110	2890	2110	1740	1250	1240	870	7.18
	lb			*10780	9060	6370	4650	3840	2760	2730	1920	(23.6)
Ground Line	kg			5440	3750	2700	1940	1660	1180	1320	920	6.89
	lb			11990	8270	5950	4280	3660	2600	2910	2030	(22.6)
-1.5m (-5ft)	kg	*6140	*6140	5390	3700	2630	1870			1630	1160	6.15
	lb	*13540	*13540	11880	8160	5800	4120			3590	2560	(20.2)
-3.0m (-10ft)	kg	*9120	*9120	*5020	3830	2710	1940					
	lb	*20110	*20110	*11070	8440	5970	4280					

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 0.60m³(SAE heaped) bucket and 500mm(20") triple grouser shoe.

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

(4) 4.3m(14' 1") boom, 2.26m(7' 5") arm equipped with 0.45m³(SAE heaped) bucket and 500mm(20") triple grouser shoe, 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 ***3860**	*1750 ***3860**			*1750 ***3860**	*1750 ***3860**	5.99 **(19.7)**
4.5m (15ft)	kg lb					*1790 ***3950**	*1790 ***3950**	*1530 ***3370**	*1530 ***3370**	1650 **3640**	1340 **2950**	6.92 **(22.7)**
3.0m (10ft)	kg lb			*2820 ***6220**	*2820 ***6220**	*2270 ***5000**	*2270 ***5000**	*2060 ***4540**	1710 **3770**	1420 **3130**	1140 **2510**	7.38 **(24.2)**
1.5m (5ft)	kg lb			*4700 ***10360**	*4700 ***10360**	*2970 ***6550**	2650 **5840**	2000 **4410**	1620 **3570**	1360 **3000**	1080 **2380**	7.46 **(24.5)**
Ground Line	kg lb			*5860 ***12920**	4750 **10470**	3060 **6750**	2460 **5420**	1910 **4210**	1540 **3400**	1430 **3150**	1140 **2510**	7.18 **(23.6)**
-1.5m (-5ft)	kg lb	*5580 ***12300**	*5580 ***12300**	5980 **13180**	4640 **10230**	2970 **6550**	2370 **5220**	1880 **4140**	1500 **3310**	1700 **3750**	1360 **3000**	6.49 **(21.3)**
-3.0m (-10ft)	kg lb	*8530 ***18810**	*8530 ***18810**	*5440 ***11990**	4720 **10410**	3000 **6610**	2400 **5290**			*2270 ***5000**	2050 **4520**	5.17 **(17.0)**

(5) 4.3m(14' 1") boom, 1.96m(6' 5") arm equipped with 0.60m³(SAE heaped) bucket and 500mm(20") triple grouser shoe, and rear dozer blade down.

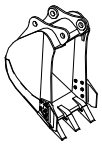
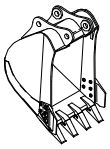
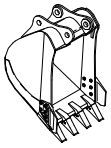
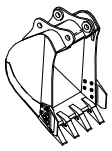
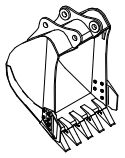
Load point height		Load radius								At max. reach		
		1.5m(5ft)		3.0m(10ft)		4.5m(15ft)		6.0m(20ft)		Capacity		Reach
												m(ft)
6.0m (20ft)	kg					*1730	*1730			*1770	*1770	5.62
	lb					*3810	*3810			*3900	*3900	(18.4)
4.5m (15ft)	kg					*1900	*1900			1700	1370	6.62
	lb					*4190	*4190			3750	3020	(21.7)
3.0m (10ft)	kg			*3110	*3110	*2360	*2360	1990	1600	1440	1140	7.10
	lb			*6860	*6860	*5200	*5200	4390	3530	3170	2510	(23.3)
1.5m (5ft)	kg			*4890	*4890	*3010	2510	1900	1520	1360	1070	7.18
	lb			*10780	*10780	*6640	5530	4190	3350	3000	2360	(23.6)
Ground Line	kg			*5810	4540	2930	2330	1820	1440	1450	1140	6.89
	lb			*12810	10010	6460	5140	4010	3170	3200	2510	(22.6)
-1.5m (-5ft)	kg	*6140	*6140	*5810	4490	2860	2270			1780	1410	6.15
	lb	*13540	*13540	*12810	9900	6310	5000			3920	3110	(20.2)
-3.0m (-10ft)	kg	*9120	*9120	*5020	4620	2940	2340					
	lb	*20110	*20110	*11070	10190	6480	5160					

(6) 4.3m(14' 1") boom, 2.81m(9' 3") arm equipped with 0.45m³(SAE heaped) bucket and 500mm(20") triple grouser shoe, 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									*1570	*1520	6.66
	lb									*3460	*3350	(21.9)
4.5m (15ft)	kg							*1640	*1640	1450	1170	7.50
	lb							*3620	*3620	3200	2580	(24.6)
3.0m (10ft)	kg					*1920	*1920	*1830	1770	1270	1020	7.92
	lb					*4230	*4230	*4030	3900	2800	2250	(26.0)
1.5m (5ft)	kg			*4050	*4050	*2690	*2690	2050	1670	1210	960	7.99
	lb			*8930	*8930	*5930	*5930	4520	3680	2670	2120	(26.2)
Ground Line	kg	*3230	*3230	*5580	4910	3130	2530	1950	1570	1290	1000	7.74
	lb	*7120	*7120	*12300	10820	6900	5580	4300	3460	2780	2200	(25.4)
-1.5m (-5ft)	kg	*4960	*4960	6060	4710	3000	2410	1890	1510	1460	1170	7.11
	lb	*10930	*10930	13360	10380	6610	5310	4170	3330	3220	2580	(23.3)
-3.0m (-10ft)	kg	*7230	*7230	*5830	4720	2980	2390			1990	1610	5.96
	lb	*15940	*15940	*12850	10410	6570	5270			4390	3550	(19.6)
-4.5m (-15ft)	kg			*4480	*4480							
	lb			*9880	*9880							

6. BUCKET SELECTION GUIDE

1) GENERAL BUCKET

				
0.30m³ SAE heaped bucket	0.40m³ SAE heaped bucket	0.45m³ SAE heaped bucket	0.50m³ SAE heaped bucket	※0.60m³ 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")
0.30m³ (0.39yd³)	0.27m³ (0.35yd³)	610mm (24.0")	720mm (28.3")	360kg (790lb)			
0.40m³ (0.52yd³)	0.36m³ (0.47yd³)	760mm (29.9")	870mm (34.3")	410kg (900lb)			
0.45m³ (0.59yd³)	0.40m³ (0.52yd³)	830mm (32.7")	940mm (37.0")	430kg (950lb)			
0.50m³ (0.65yd³)	0.45m³ (0.59yd³)	900mm (35.4")	1010mm (39.8")	450kg (990lb)			
※0.60m³ (0.79yd³)	0.52m³ (0.68yd³)	1020mm (40.2")	1130mm (44.5")	490kg (1080lb)			

※ : Standard bucket

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

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

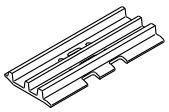
Applicable for materials with density of 1100kg/m³ (1850lb/yd³) or less

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		
					
R110-7	Shoe width	mm(in)	500(20)	600(24)	700(28)
	Operating weight	kg(lb)	11200(24690)	11500(25350)	11800(26010)
	Ground pressure	kgf/cm^2(psi)	0.39(5.55)	0.34(4.83)	0.30(4.27)
	Overall width	mm(ft-in)	2490(8' 2")	2590(8' 6")	2690(8'10")
R110D-7	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	· Travel at low speed on rough ground with large obstacles such as boulders or fallen trees
B	Normal soil, soft ground	· These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles
C	Extremely soft ground (Swampy ground)	· Use the shoes only in the conditions that the machine sinks and it is impossible to use the shoes of category A or B · These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles

8. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	KIRLOSKA 4R1040T
Type	4-cycle turbocharged diesel engine
Cooling method	Water cooling
Number of cylinders and arrangement	4 cylinders, in-line
Firing order	1-3-4-2
Combustion chamber type	Direct injection type
Cylinder bore × stroke	105 × 120mm(4.13" × 4.72")
Piston displacement	4160cc(254cu in)
Compression ratio	17:1
Rated gross horse power(SAE J1995)	94Hp at 1950rpm(70kW at 1950rpm)
Maximum torque at 1500rpm	38.3kgf · m(276lbf · ft)
Engine oil quantity	11.5 ℓ (3.0U.S. gal)
Dry weight	550kg(1213lb)
High idling speed	2069+50rpm
Low idling speed	750±50rpm
Rated fuel consumption	163g/Hp · hr at 1950rpm
Starting motor	LUCAS 24V, 5.0 kW
Alternator	LUCAS 24V, 55A
Battery	2 × 12V × 80Ah

2) MAIN PUMP

Item	Specification
Type	Variable displacement tandem axis piston pumps
Capacity	2 × 57.5cc/rev
Maximum pressure	330kgf/cm^2 (4694psi)
Rated oil flow	2 × 112 ℓ /min (2 × 29.6U.S.gpm)
Rated speed	1950rpm

3) GEAR PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	15cc/rev
Maximum pressure	35kgf/cm^2(500psi)
Rated oil flow	29.3 ℓ /min(7.7U.S.gpm/6.4U.K.gpm)

4) MAIN CONTROL VALVE

Item	Specification
Type	11 spools mono-block
Operating method	Hydraulic pilot system
Main relief valve pressure	330kgf/cm^2(4695psi)
Overload relief valve pressure	380kgf/cm^2(5550psi)

5) SWING MOTOR

Item	Specification
Type	Axial piston motor
Capacity	64.3cc/rev
Relief pressure	240kgf/cm^2(3414psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	25kgf · m^2(181lbf · ft)
Brake release pressure	33~50kgf/cm^{22}(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^2(4695psi)
Reduction gear type	2 stage planetary
Braking system	Automatic, spring applied hydraulic released
Brake release pressure	Less then 9kgf/cm^{22}(128psi)
Braking torque	24.36kgf · m^2(176lbf · ft)

7) REMOTE CONTROL VALVE

Item		Specification
Type		Pressure reducing type
Operating pressure	Minimum	6.5kgf/cm²(92psi)
	Maximum	26kgf/cm²(370psi)
Single operation stroke	Lever	61mm(2.4in)
	Pedal	123mm(4.84in)

8) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	ø95 × ø70 × 1015mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	ø110 × ø75 × 1070mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	ø95 × ø65 × 855mm
	Cushion	Extend only
Dozer cylinder	Bore dia × Rod dia × Stroke	ø100 × ø70 × 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
R110-7	Standard	500mm(20")	0.39kgf/cm²(5.55psi)	41	2490mm(8' 2")
	Option	600mm(24")	0.34kgf/cm²(4.83psi)	41	2590mm(8' 6")
	Option	700mm(28")	0.30kgf/cm²(4.27psi)	41	2690mm(8' 10")

10) BUCKET

Item		Capacity		Tooth quantity	Width	
		SAE heaped	CECE heaped		Without side cutter	With side cutter
R110-7	STD	0.60m³(0.79yd³)	0.52m³(0.68yd³)	5	1020mm(40.2")	1130mm(44.5")
	OPT	0.30m³(0.39yd³)	0.27m³(0.35yd³)	3	610mm(24.0")	720mm(28.3")
		0.40m³(0.52yd³)	0.36m³(0.47yd³)	4	760mm(29.9")	870mm(34.3")
		0.45m³(0.59yd³)	0.40m³(0.52yd³)	4	830mm(32.7")	940mm(37.0")
		0.50m³(0.65yd³)	0.45m³(0.59yd³)	4	900mm(35.4")	1010mm(39.8")

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 ℃(˚F) -20 (-4) / -10 (14) / 0 (32) / 10 (50) / 20 (68) / 30 (86) / 40 (104)
Engine oil pan	Engine oil	11.50(3.04)	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	0.35(0.09)	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	250(66.0)	ASTM D975 NO.1 ASTM D975 NO.2
Fitting (Grease nipple)	Grease	As required	NLGI NO.1 NLGI NO.2
Radiator (Reservoir tank)	Mixture of antifreeze and water 50 : 50	24(6.3)	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

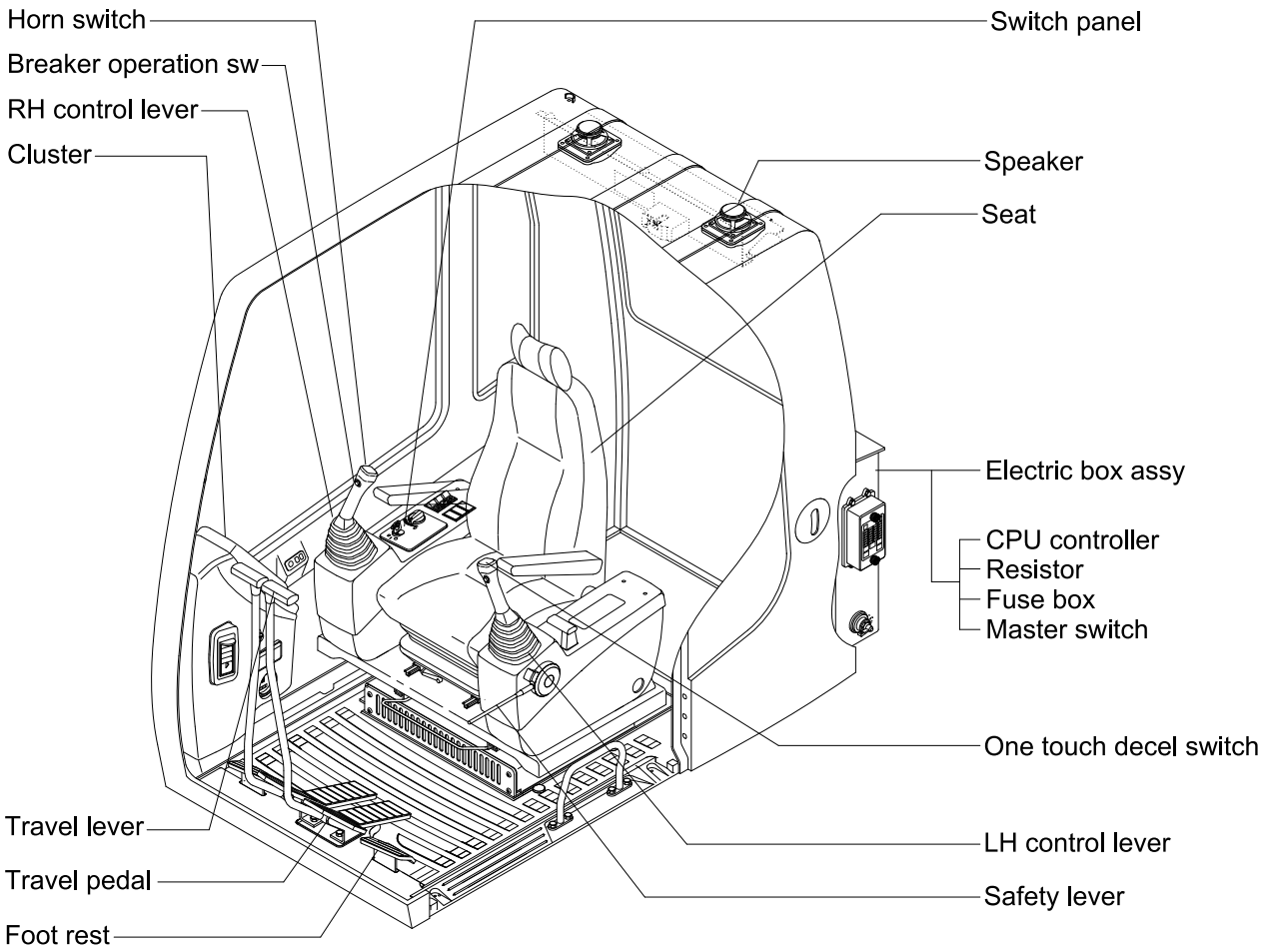
1. CAB DEVICES

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.



RD11073CD01A

2. CLUSTER(Machine serial No. : -#0265)

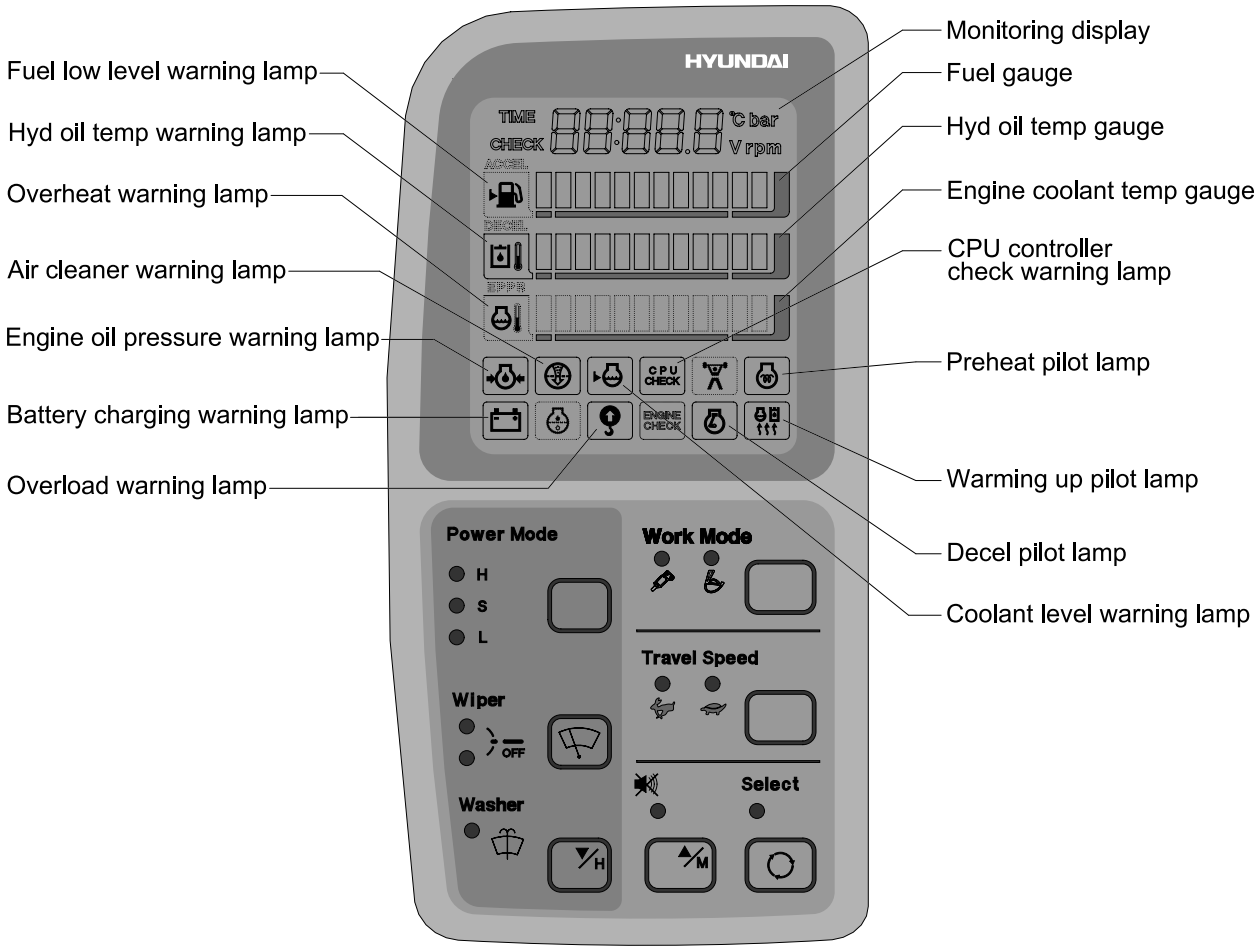
1) MONITOR PANEL

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

- Gauges : 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.**

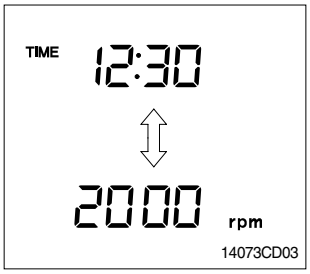
※ **When the monitor provides a warning immediately check the problem, and perform the required action.**



D11073CD02

※ **The warming 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 warming lamp lights until the problem is cleared.**

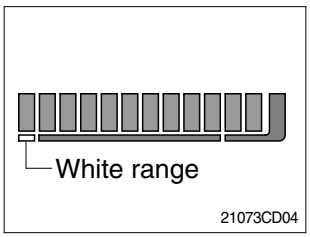
(1) Monitoring display



① This displays the current time and machine information such as engine rpm, coolant/hydraulic oil temperature, hydraulic oil pressure and also error codes.

※ **Refer to the page 4-11 for details.**

(2) Fuel gauge

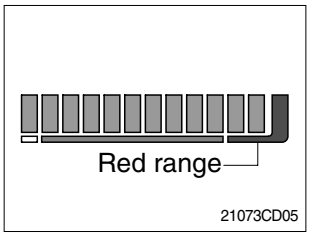


① This gauge indicates the amount of fuel in the fuel tank.

② Fill the fuel when the white range or warning lamp blinks.

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

(3) Hydraulic oil temperature gauge



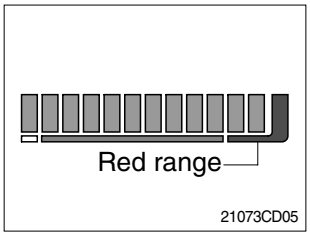
① This indicates the temperature of hydraulic oil.
- White range : Below 30°C(86°F)
- Green range : 30-100°C(86-212°F)
- Red range : Above 102°C(215.6°F)

② The green range illuminates when operating.

③ Keep idling engine at low speed until the green range illuminates before operation of machine.

④ When the red range illuminates, reduce the load on the system. If the gauge stays in the red range, stop the machine and check the cause of the problem.

(4) Engine coolant temperature gauge



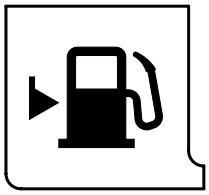
① This indicates the temperature of coolant.
- White range : Below 30°C(86°F)
- Green range : 30-100°C(86-212°
- Red range : Above 102°C(215.6°F)

② The green range illuminates when operating.

③ Keep idling engine at low speed until the green range illuminates before operation of machine.

④ When the red range illuminates, turn OFF the engine, check the radiator and engine.

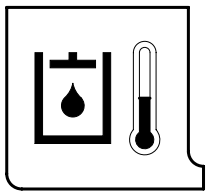
(5) Fuel low level warning lamp



21073CD04A

① This lamp blinks and the buzzer sounds when the level of fuel is below 28 ℓ (7.4U.S. gal).
② Fill the fuel immediately when the lamp blinks.

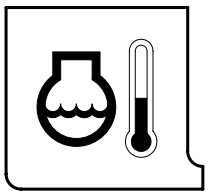
(6) Hydraulic oil temperature warning lamp



21073CD05A

① This warning lamp operates and the buzzer sounds when the temperature of hydraulic oil is over 102°C(215.6°F) .
② Check the hydraulic oil level when the lamp blinks.
③ Check for debris between oil cooler and radiator.

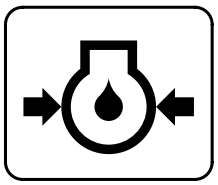
(7) Overheat warning lamp



21073CD06A

① This lamp blinks and the buzzer sounds when the temperature of coolant is over the normal temperature 102°C(215.6°F) .
② Check the cooling system when the lamp blinks.

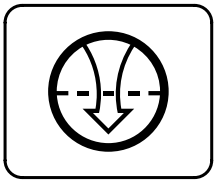
(8) Engine oil pressure warning lamp



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.

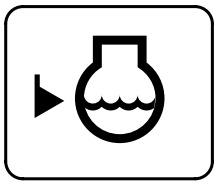
(9) Air cleaner warning lamp



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.

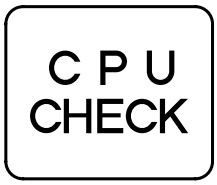
(10) Coolant level warning lamp



21073CD09

① This lamp blinks and the buzzer sounds when the coolant is below LOW in the reservoir tank of radiator.
② Check the reservoir tank when the lamp blinks.

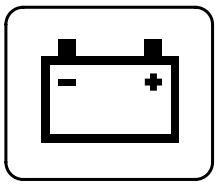
(11) CPU controller check warning lamp



21073CD10

① Communication problem between CPU controller and cluster makes the lamp blinks and the buzzer sounds.
② Check if any fuse for CPU burnt off.
③ If not check the communication line between them.

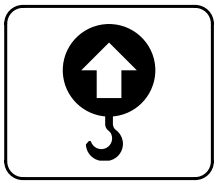
(12) Battery charging warning lamp



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.

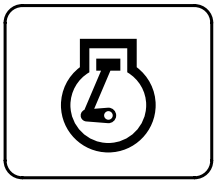
(13) Overload warning lamp



21073CD15

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

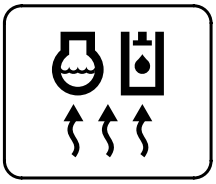
(14) Decel pilot lamp



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.

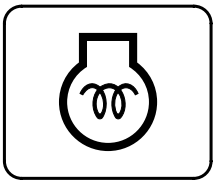
(15) Warming up pilot lamp



21073CD18

① This lamp is turned ON when the coolant temperature is below 30℃(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.

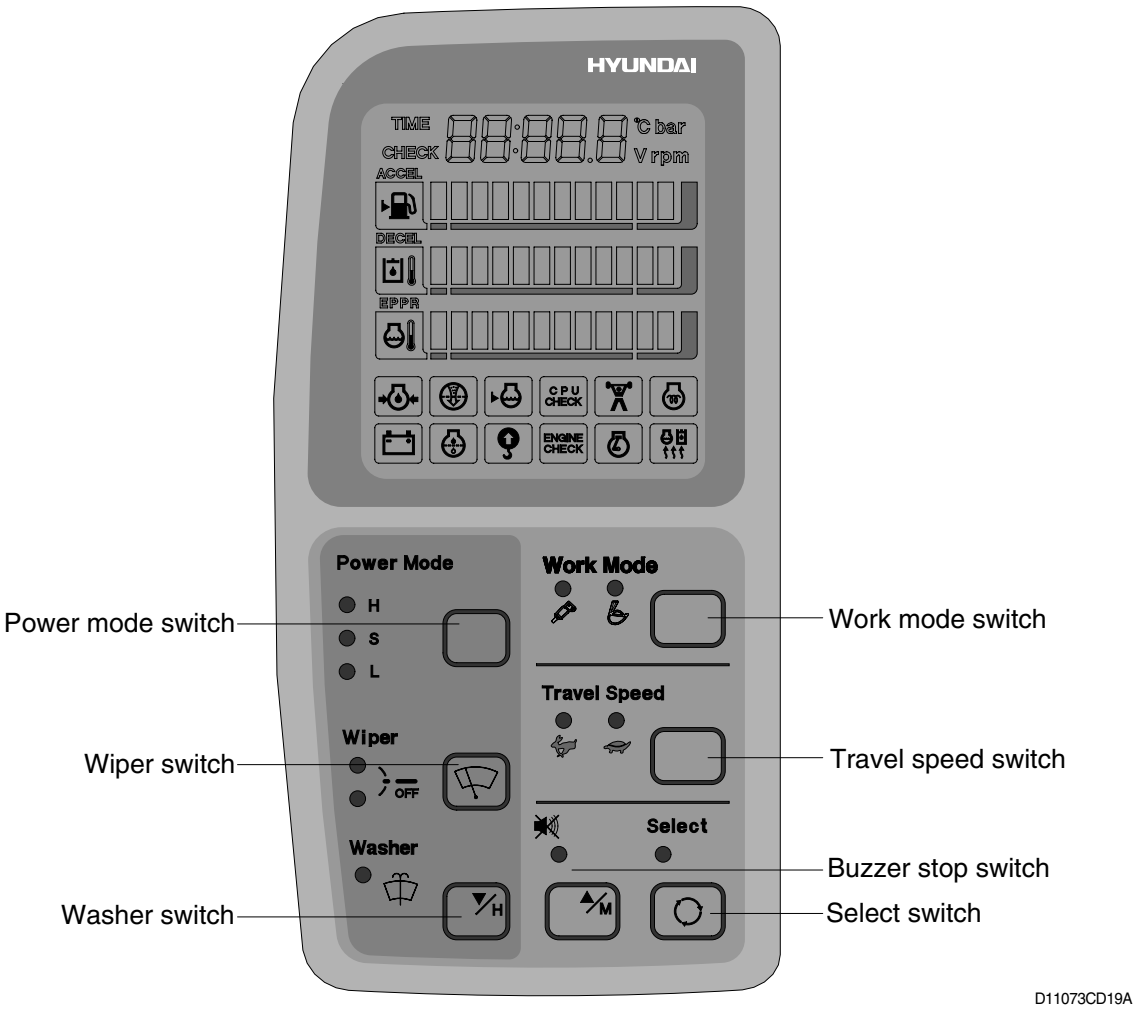
(16) Preheat pilot lamp



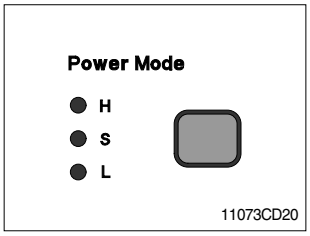
21073CD12

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

2) SWITCH PANEL



(1) Power mode switch

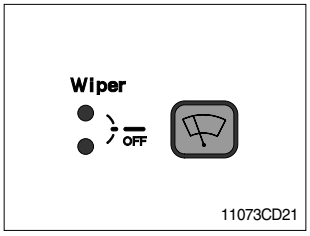


① This switch is to select the machine power mode, which shifts from high power work to standard power work and light power work in a raw by pressing the switch.

- **H** : This is used for high power work
- **S** : This is used for standard power work
- **L** : This is used for light power work

※ **Refer to the page 4-7 for details.**

(2) Wiper mode switch



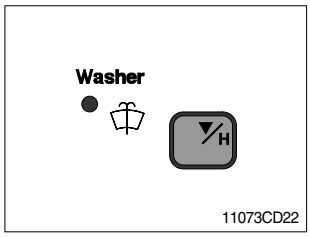
① This switch is used to operate wiper.

- 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.**

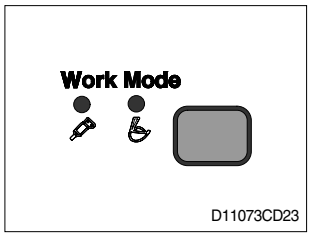
※ **If wiper does not operate with the switch in the ON position, turn the switch off immediately. Check the cause. If the switch remains ON, it can result in motor failure.**

(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.

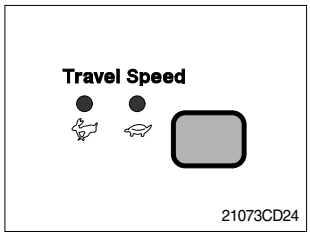
(4) Work mode switch



① This switch is to select the machine operation mode, which shifts from general operation mode to heavy operation mode and breaker mode in a raw by pressing the switch.
- : Heavy duty work mode
- : Breaker operation mode

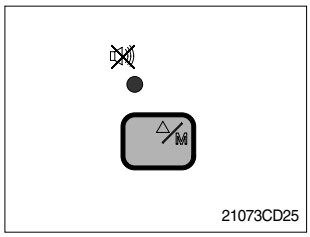
※ **Refer to the page 4-7 for details.**

(5) Travel speed control switch



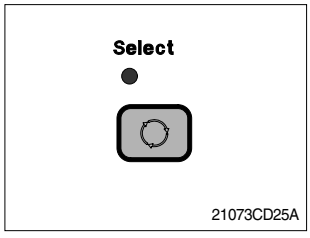
① This switch is to control the travel speed which is changed to high speed(Rabbit mark) by pressing the switch and low speed(Turtle mark) by pressing it again.

(6) Buzzer stop switch



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

(7) Select switch



① This switch is used to select the monitor display function.
※ **Refer to the page 4-11 for details.**
② If the switch is pressed for 3 seconds in time display mode, it moves to time adjusting function, and you can adjust the time as below.
- Hour by auto decel( )switch
- Minute by buzzer stop( ) switch.

③ After time set, the switch is pressed, it returns to clock display.

■ CLUSTER(Machine serial No. : #0266-)

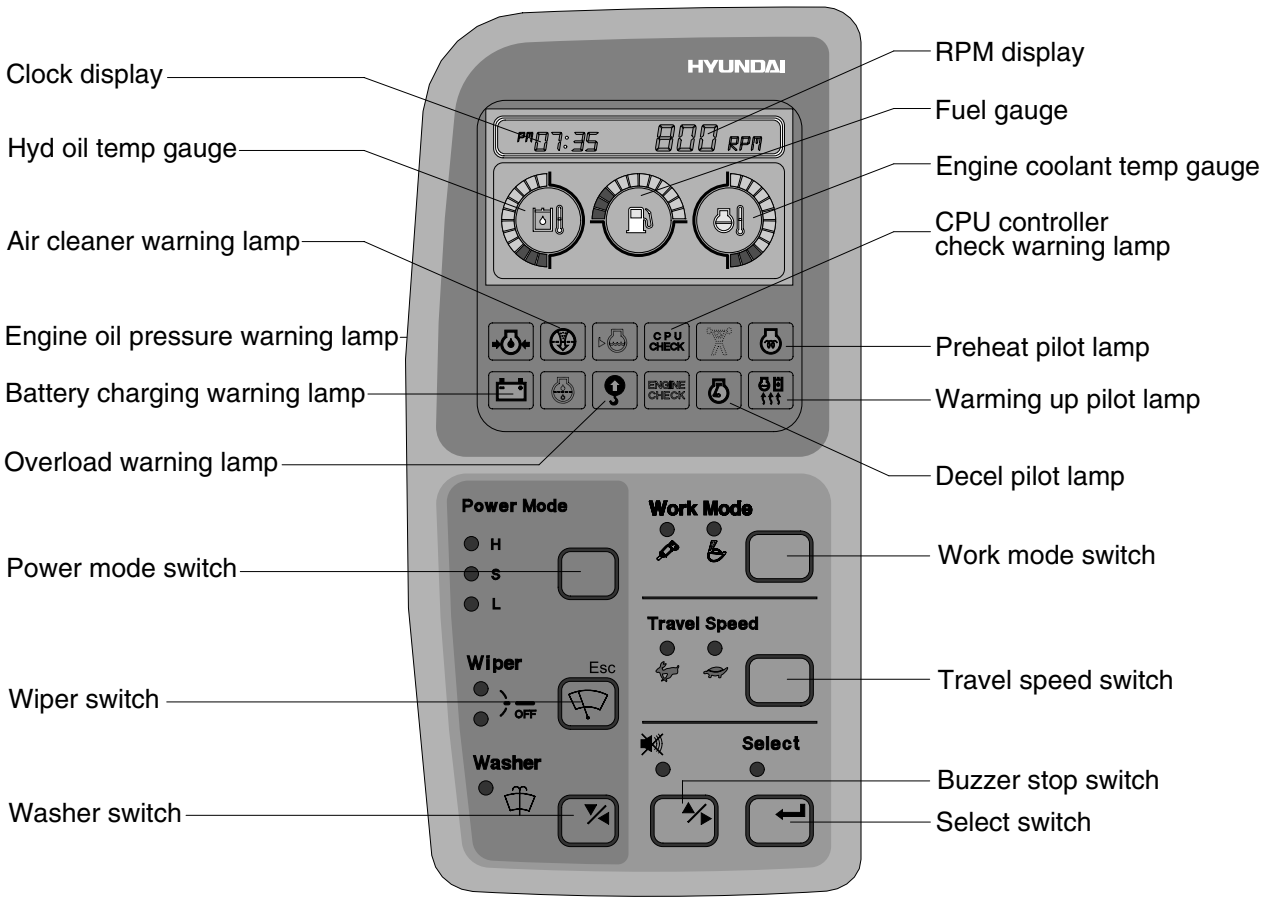
1. MONITOR PANEL

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

- Gauges : 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.**



RD8075MS08

※ **The warming 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 warming lamp lights until the problem is cleared.**

2. LCD main operation display

Default screen

1607A3CD02A

Option screen

1607A3CD02B

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

1) Time display

1607A3CD02C

① This displays the current time.

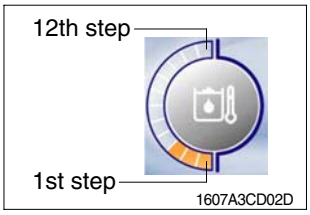
※ **Refer to the page 3-8-6 to set time for details.**

2) RPM display

1607A3CD02C

① This displays the engine rpm.

3) Hydraulic oil temperature gauge



1607A3CD02D

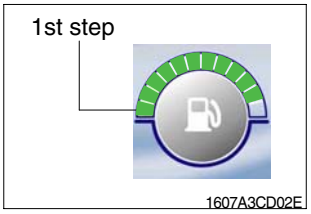
① This gauge indicates the temperature of hydraulic oil in 12 step gauge.
- 1st step : Below 30℃(86℉)
- 2nd~10th step : 30-105 ℃(86-221℉)
- 11th~12th step : Above 105℃(221℉)

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



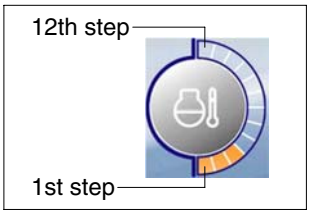
1607A3CD02E

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



1607A3CD02F

① This gauge indicates the temperature of coolant in 12 step gauge.
- 1st step : Below 30℃(86℉)
- 2nd~10th step : 30-105 ℃(86-221℉)
- 11th~12th step : Above 105℃(221℉)

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 ℃(221 ℉) .
- 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

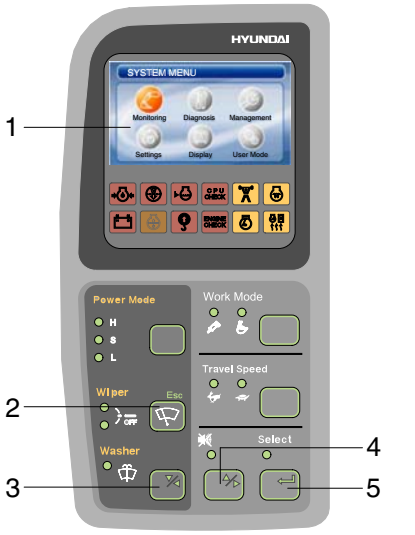
- Communication problem between MCU controller and cluster makes the lamp blinks and the buzzer sounds.
- Check if any fuse for MCU burnt off.
  If not check the communication line between them.

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	

3) LCD



RD8075MS10

1 : LCD

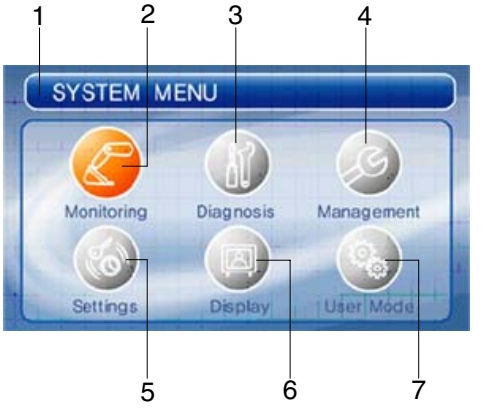
2 Esc : Escape,
Return to the previous menu

3 : Down/Left Direction

4 : Up/Right Direction

5 : Select(Enter)
Activate the currently chosen item

(1) Main menu



2507A4OP94

1 SYSTEM MENU : Menu information

2 : Monitoring
- Equipment, Switch, Output

3 : Diagnosis
- Current error, Recorded error

4 : Maintenance

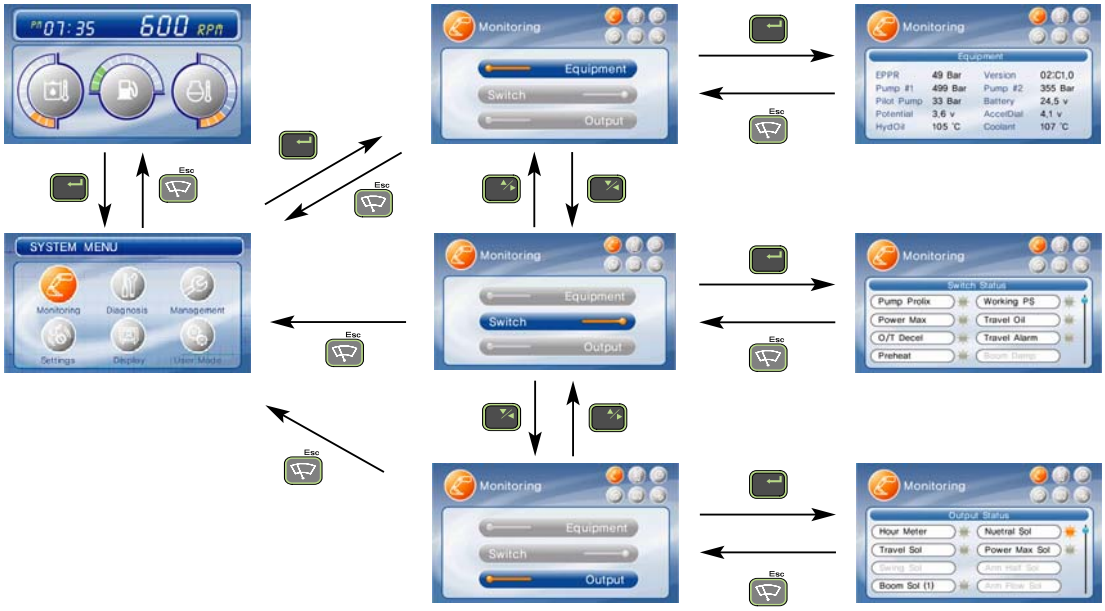
5 : Settings
- Time set, Dual mode
- System lock(Reserved)

6 : Display
- Operation skin, Brightness, Language

7 : User mode(null)

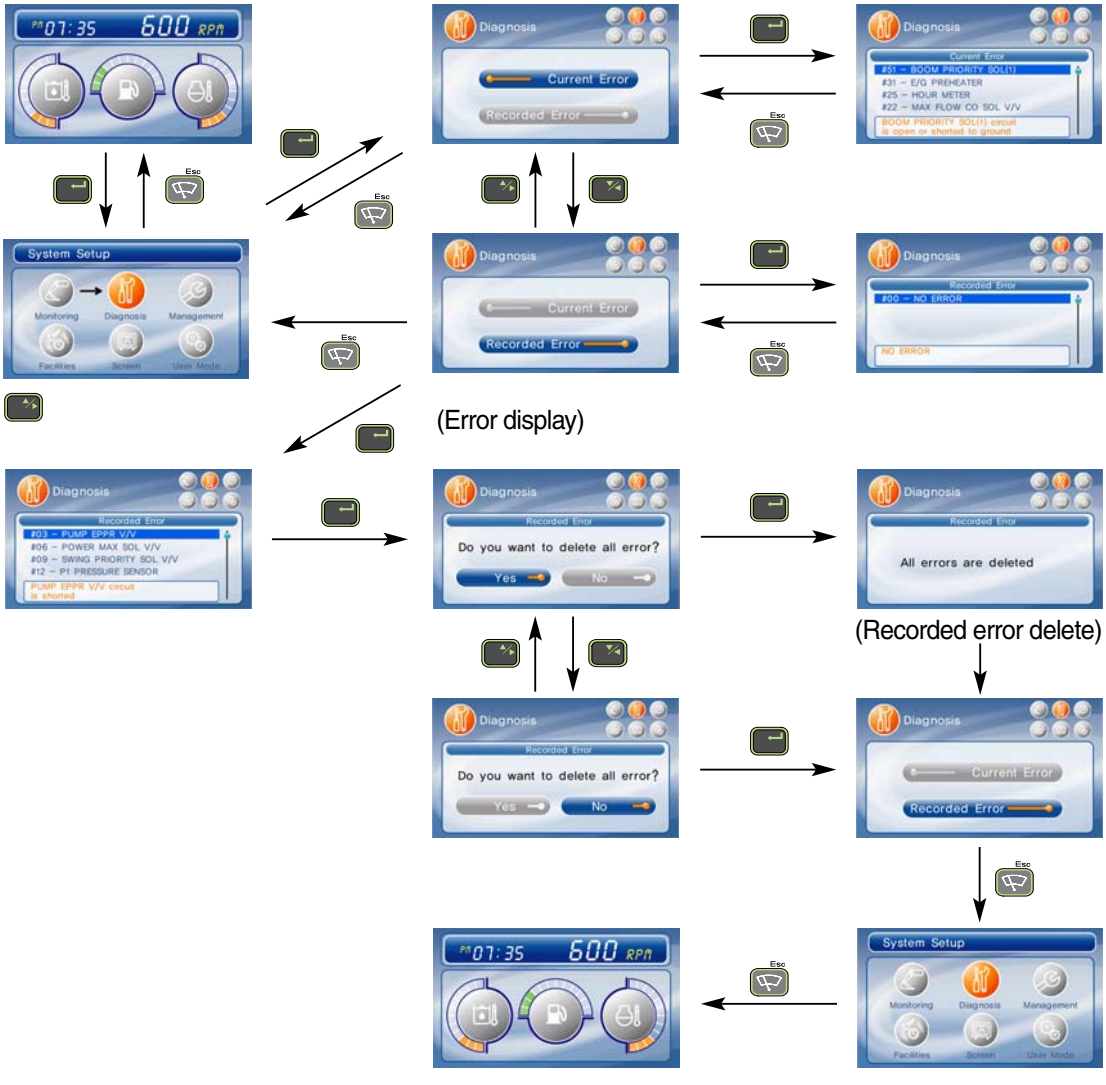
(2) Display map

① Monitoring



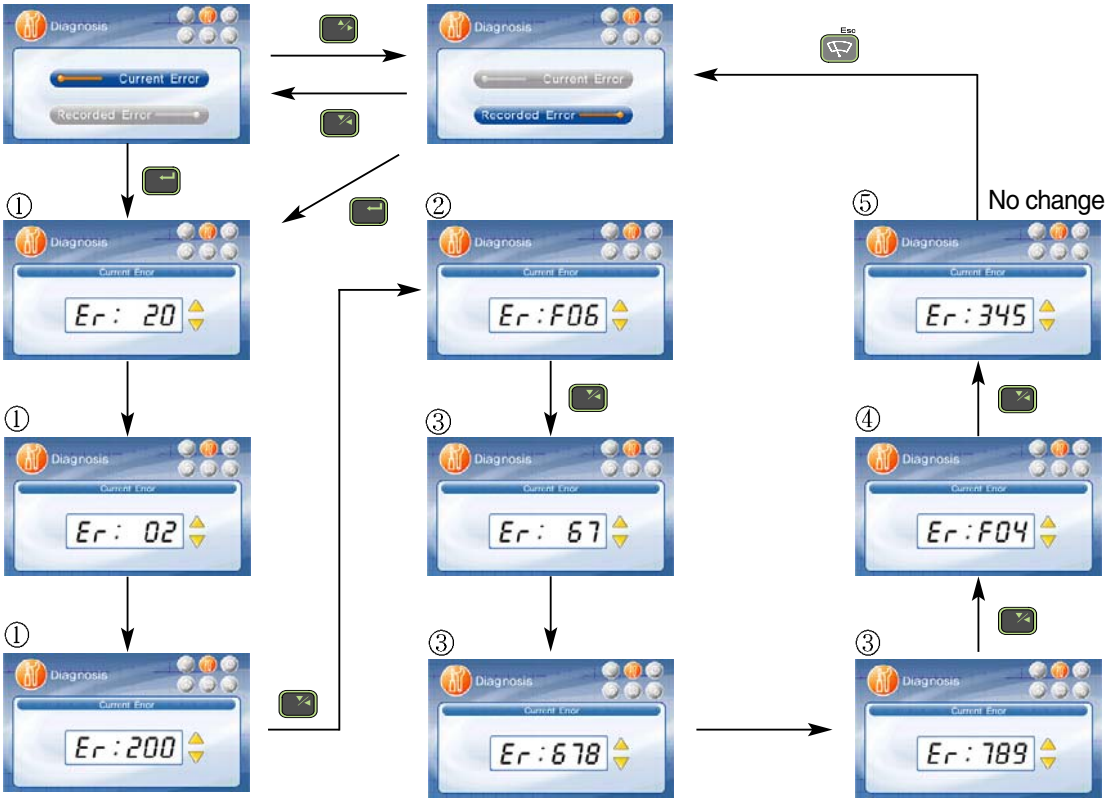
② Diagnosis

a. Protocol type 1

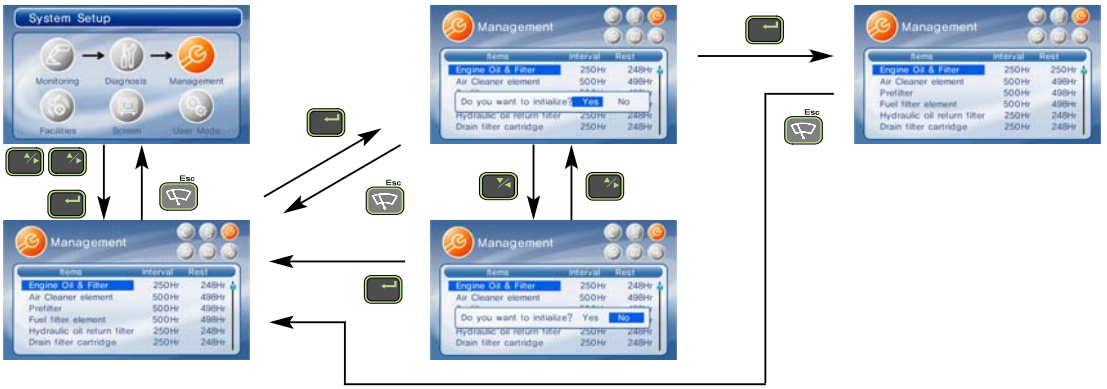


b. Protocol type 2

- 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

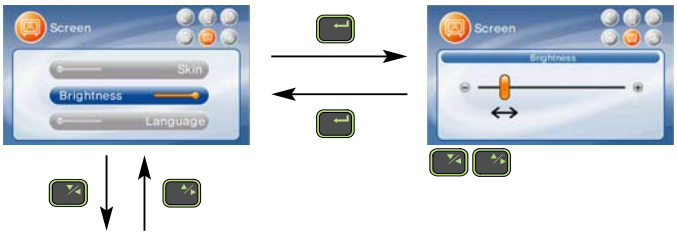
b. System lock - Reserved

c. Dual mode
- Changing the MCU mode

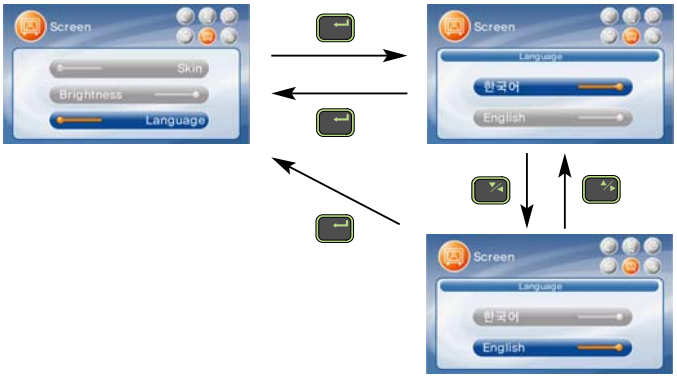
⑤ Display

a. Operation skin

b. Brightness

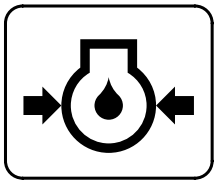


c. Language



4) Warning and pilot lamp

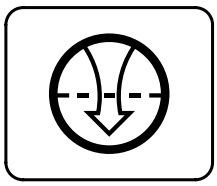
(1) Engine oil pressure warning lamp



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.

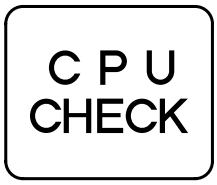
(2) Air cleaner warning lamp



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.

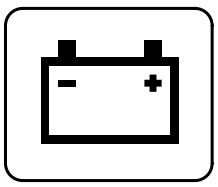
(3) MCU controller check warning lamp



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.

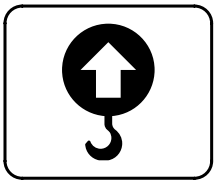
(4) Battery charging warning lamp



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.

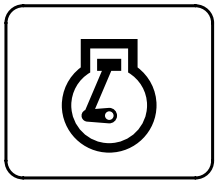
(5) Overload warning lamp



21073CD15

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

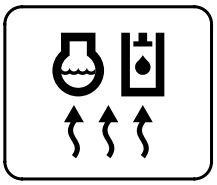
(6) Decel pilot lamp



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.

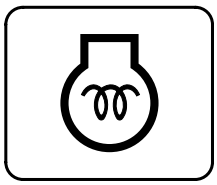
(7) Warming up pilot lamp



21073CD18

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

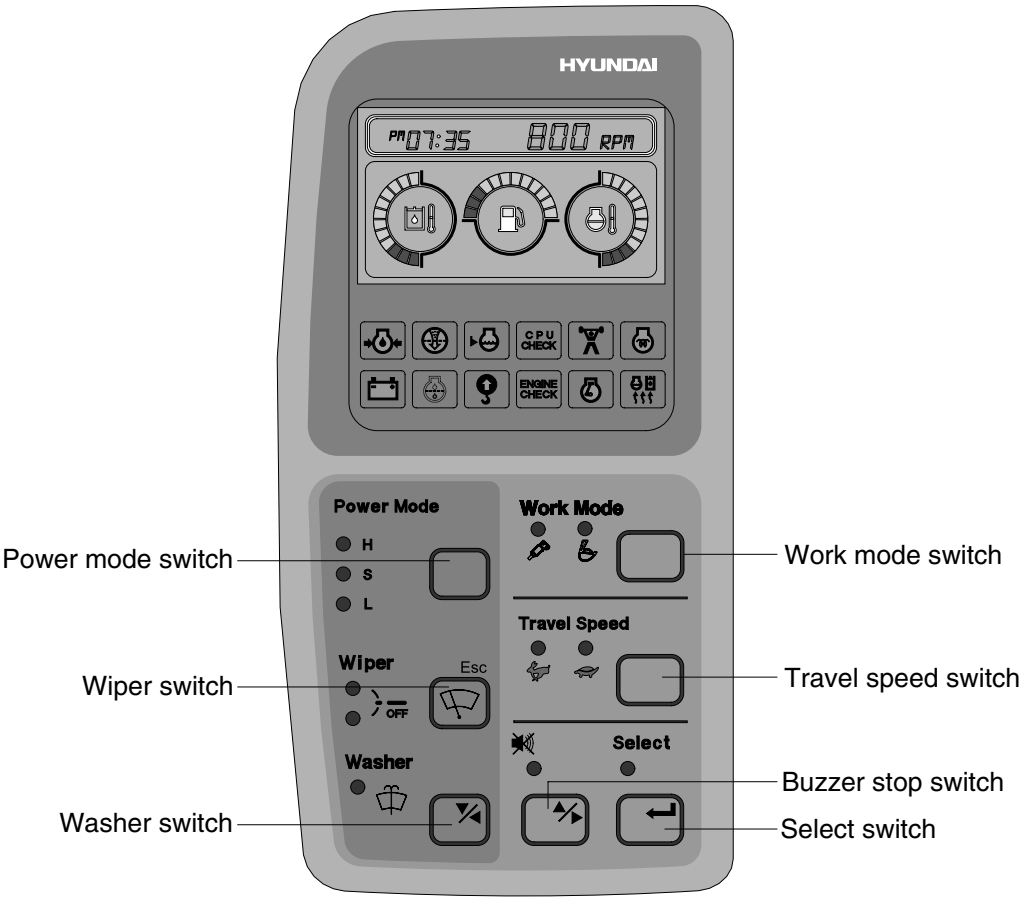
(8) Preheat pilot lamp



21073CD12

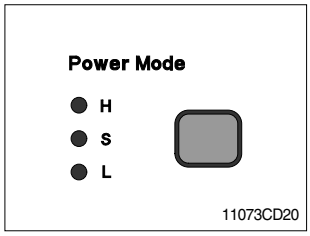
① Turning the start key switch ON position starts preheating in cold weather.
② Start the engine as this lamp is OFF.

5) SWITCH PANEL



RD8075MS11

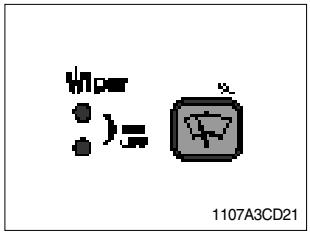
(1) Power mode switch



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 raw by pressing the switch.

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

(2) Wiper mode switch



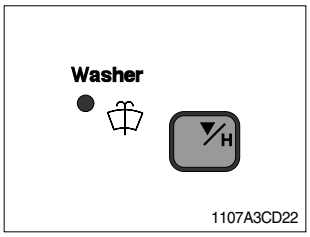
① This switch is used to operate wiper.

- 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.**

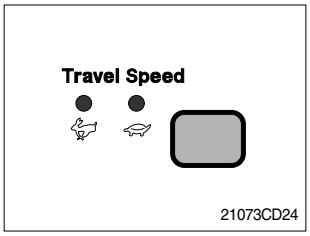
※ **If wiper does not operate with the start switch in the ON position, turn the switch off immediately. Check the cause. If the switch remains ON, it can result in motor failure.**

(3) Washer switch



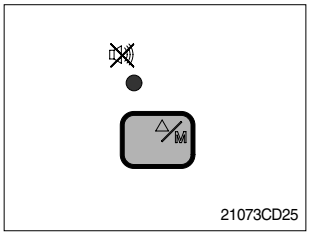
① The washer liquid is sprayed and the wiper is operated only while pressing this switch.
② The indicator lamp is turned ON when operating this switch.

(4) Travel speed control switch



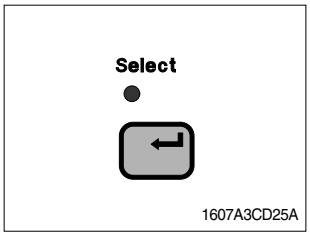
① This switch is to control the travel speed which is changed to high speed(Rabbit mark) by pressing the switch and low speed(Turtle mark) by pressing it again.

(5) Buzzer stop switch



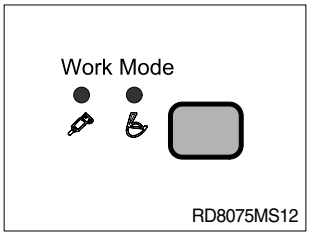
① When the starting switch is turned ON first, normally the alarm buzzer sounds for 2 seconds during lamp check operation.
② The red lamp lights ON and the buzzer sounds when the machine has a problem.
In this case, press this switch and buzzer stops, but the red lamp lights until the problem is cleared.

(6) Select switch



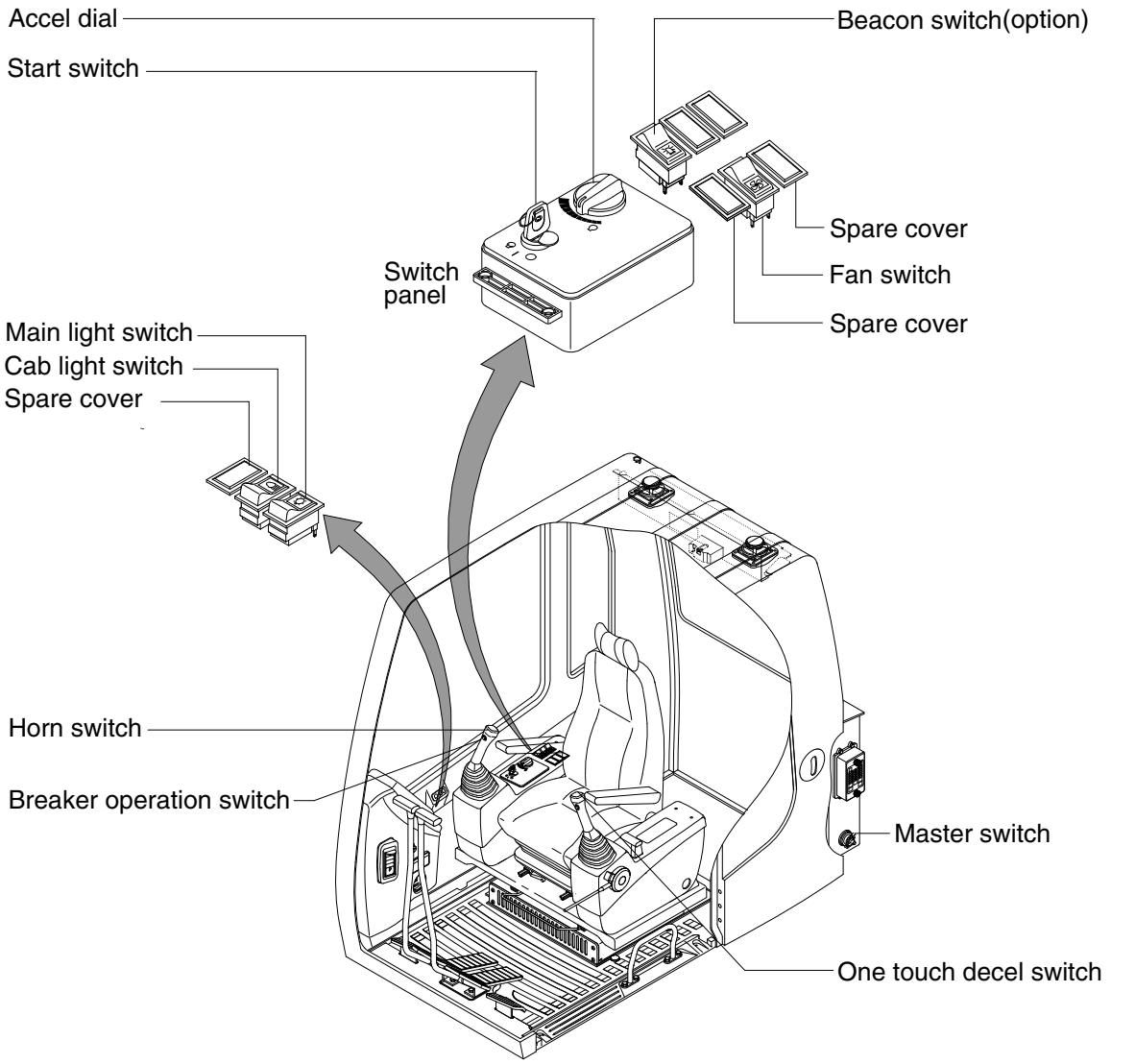
① This switch is used to enter main menu and sub menu for LCD.
※ **Refer to the page 3-8-4 for details.**

(7) Work mode switch

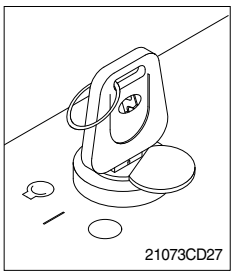


① This switch is to select the machine operation mode, which shifts from general operation mode to breaker mode by pressing the switch.
- : General work mode
- : Breaker operation mode

3. SWITCHES



1) STARTING SWITCH

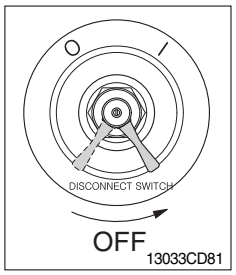


(1) There are three positions, OFF, ON and START.

- ◯ (OFF) : None of electrical circuits activate.
- | (ON) : All the systems of machine operate.
- ⏻ (START) : Use when starting the engine. Release key immediately after starting.

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

2) MASTER SWITCH

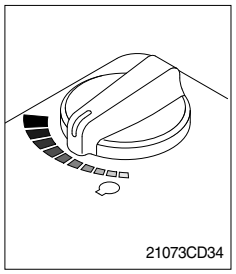


(1) This switch is used to shut off the entire electrical system.

(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



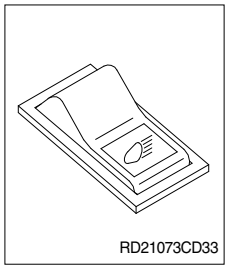
(1) There are 10 dial setting.

(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

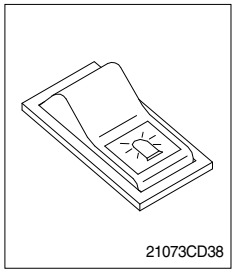
(1) This switch use to operates the head light and work light by two step.
- First step : Head light and cluster illumination lamp comes ON.
- Second step : Work light comes ON. Also, the below indicator lamp comes ON.

5) CAB LIGHT SWITCH



(1) This switch is used to turns ON the cab light on the cab.

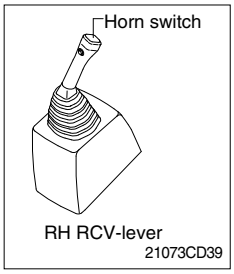
6) BEACON SWITCH(Option)



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

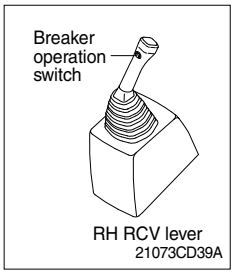
(2) The below indicator lamp is turned ON when operating this switch.

7) HORN SWITCH



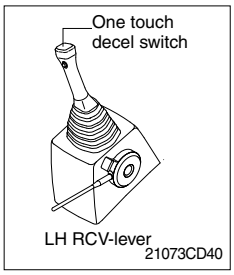
(1) This switch is at the top of right side control lever.
On pressing, the horn sounds.

8) BREAKER OPERATION SWITCH



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

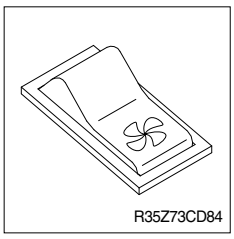
9) ONE TOUCH DECEL SWITCH



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

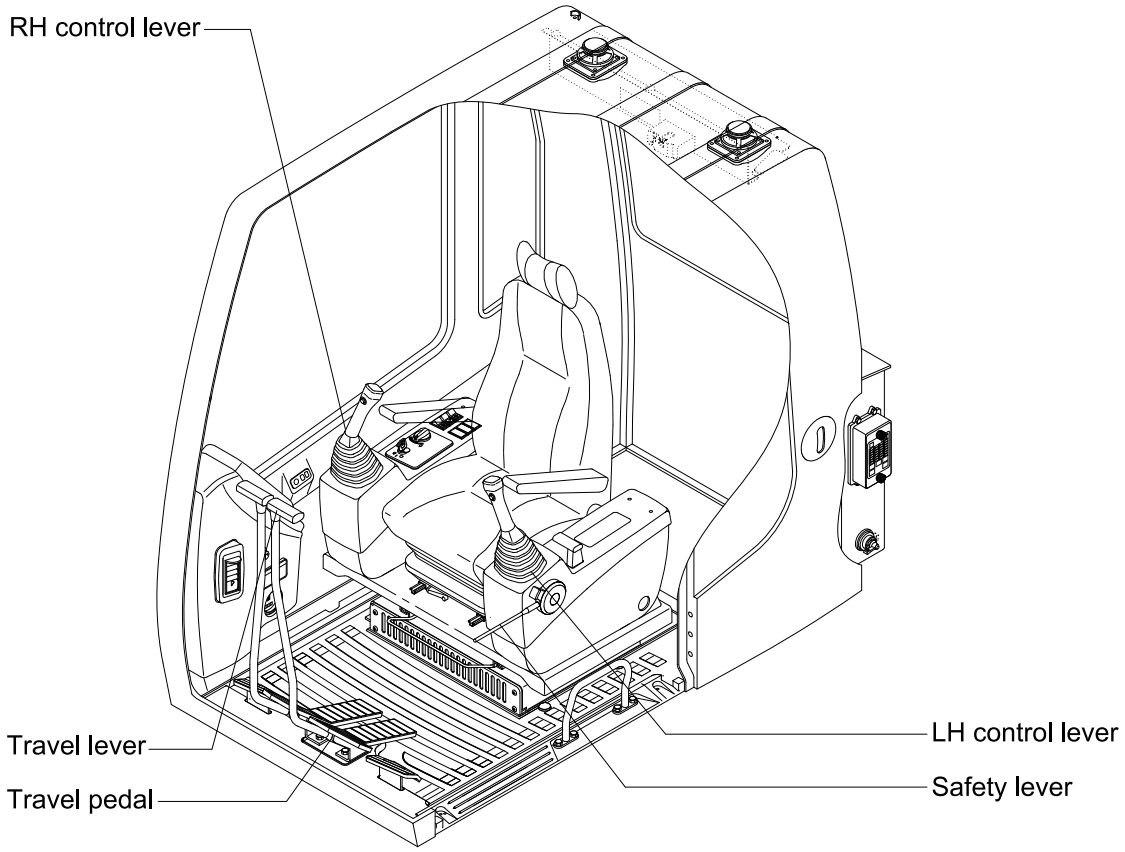
(2) The engine speed is increased to previous setting value by pressing the switch again.

12) FAN SWITCH



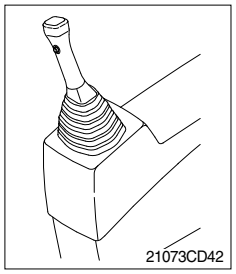
(1) This switch is used to operate fan.

4. LEVERS AND PEDALS



RD11073CD41A

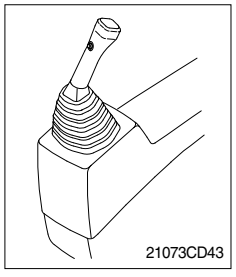
1) LH CONTROL LEVER



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

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

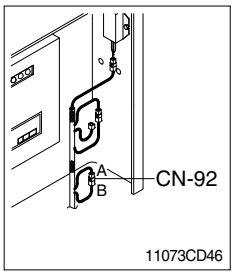
2) RH CONTROL LEVER



(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) EMERGENCY ENGINE STARTING CONNECTOR

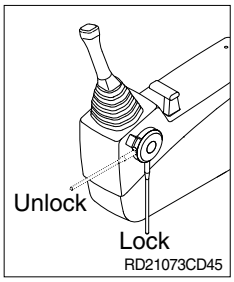


(1) If the CPU controller is removed, the engine does not start.

(2) Before starting the engine, connect the connector CN-92 A with B.

※ **Do not connect these connectors when the CPU is not removed.**

4) SAFETY LEVER



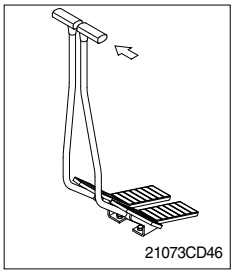
(1) All control levers and pedals are disabled from operation by locating the lever to lock position as shown.

※ **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.**

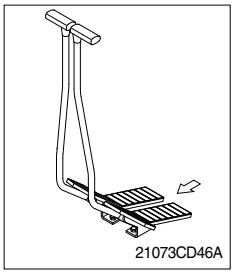
5) TRAVEL LEVER



(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.

6) TRAVEL PEDAL

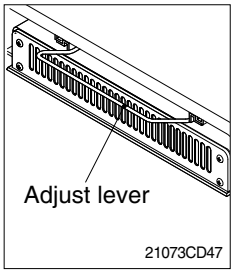


(1) This pedal is used to move the machine forward or backward.

(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.

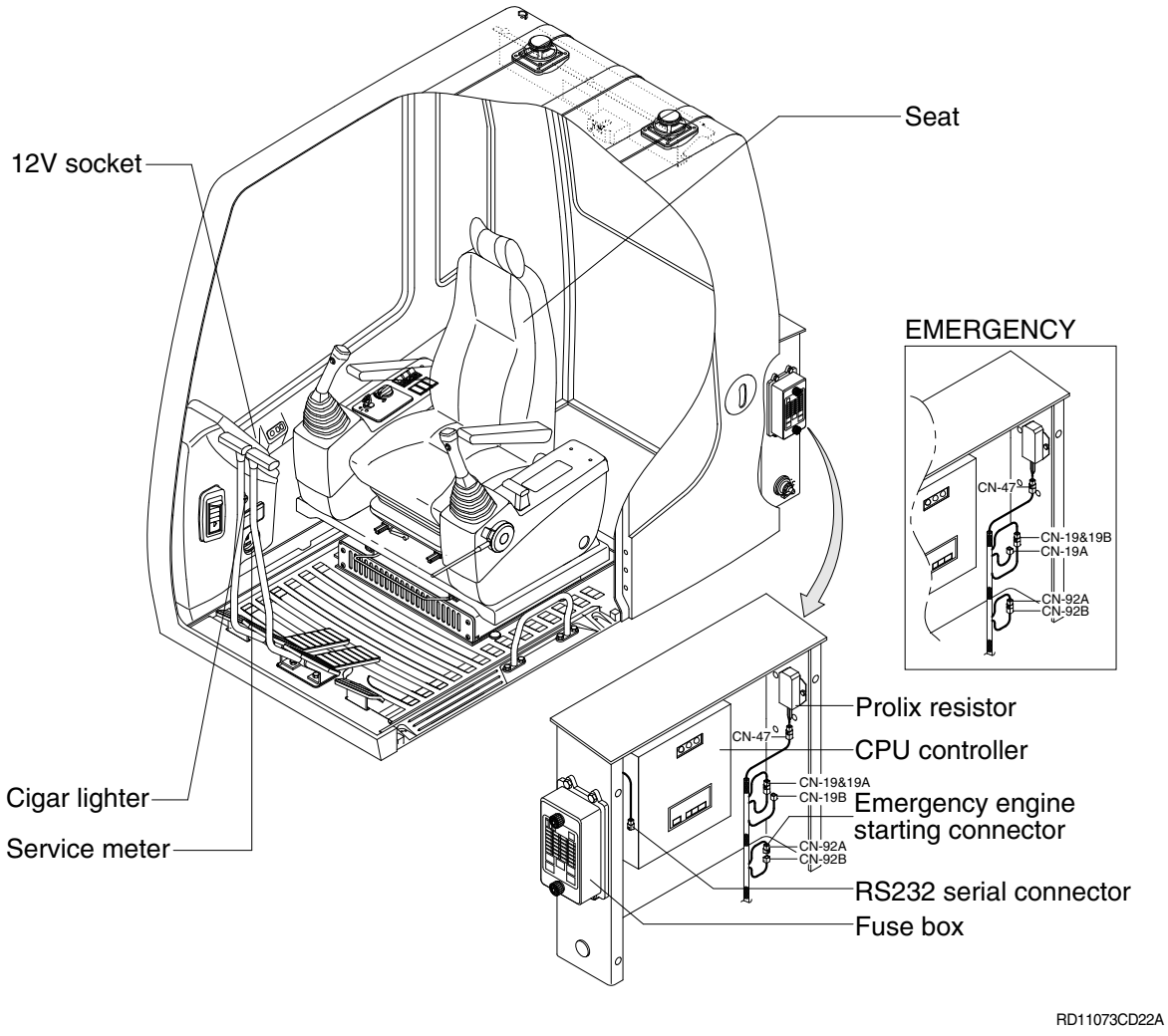
7) SEAT AND CONSOLE BOX ADJUST LEVER



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

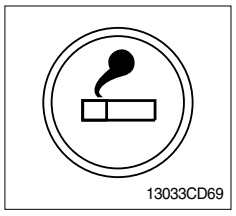
(2) Pull the lever to adjust forward or backward over 170㎜(6.7").

5. OTHERS



RD11073CD22A

1) CIGAR LIGHTER

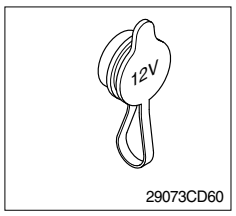


(1) This can be used when the engine starting switch is ON.

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

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

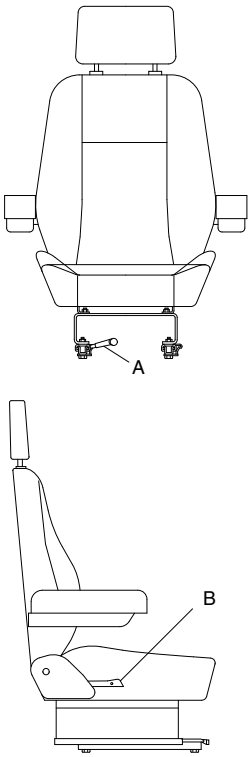
2) 12V SOCKET(Option)



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

3) 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.



RD21073CD16

(1) Forward/Backward adjustment(A)

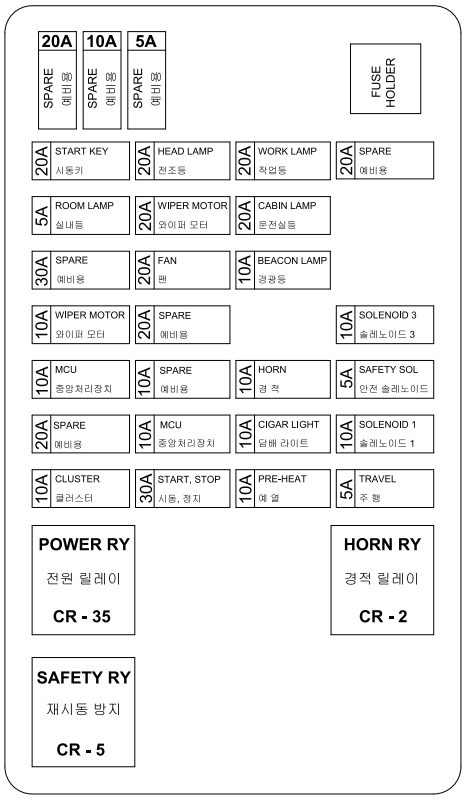
① Pull lever A to adjust seat forward or backward.

② The seat can be moved forward and backward over 140mm(5.5") in 7 steps.

(2) Reclining adjustment(B)

Pull lever B to adjust seat back rest.

4) FUSE BOX



RD11073CD55

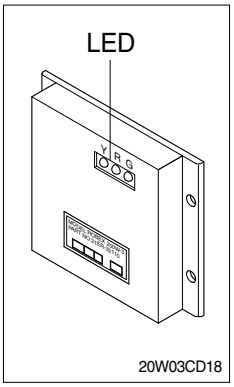
(1) The fuses protect the electrical parts and wiring from burning out.

(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) CPU CONTROLLER



20W03CD18

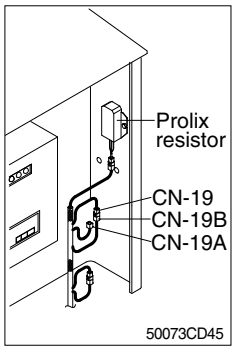
(1) To match the engine torque with the pump absorption torque, CPU controller varies EPPR valve output pressure, which control pump discharge amount whenever feedbacked engine speed drops under the reference rpm of each mode set.

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

LED lamp	Trouble	Service
G is turned ON	Normal	-
G and R are turned ON	Trouble on CPU 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 CPU controller power	· Check if the input power wire (24V, GND) of controller is disconnected · Check the fuse

G : green, R : red, Y : yellow

6) PROLIX RESISTOR(Option)

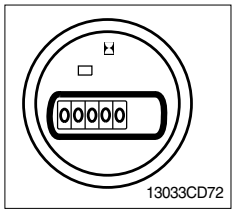


(1) This resistor is used to continuous working in case of malfunction of the CPU controller.

※ **Never connect connector CN-19 with connector CN-19B when CPU controller is in normal operation.**

- **Normal** : CN-19 connect with connector CN-19A
- **Emergency** : CN-19 connect with connector CN-19B

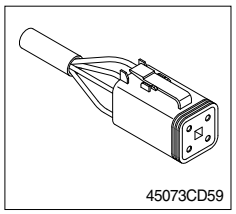
7) SERVICE METER



(1) This meter shows the total operation hours of the machine.

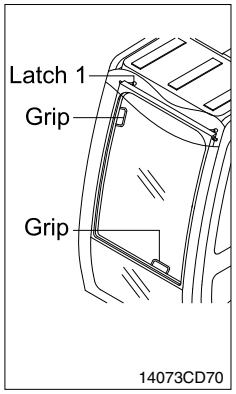
(2) Always ensure the operating condition of the meter during the machine operation. Inspect and service the machine based on hours as indicated in chapter 6, **maintenance.**

8) RS232 SERIAL CONNECTOR



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

9) UPPER WINDSHIELD

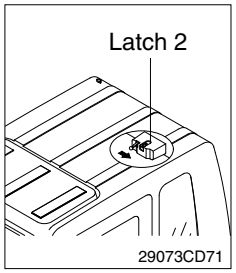


(1) Perform the following procedure in order to open the upper windshield.

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.

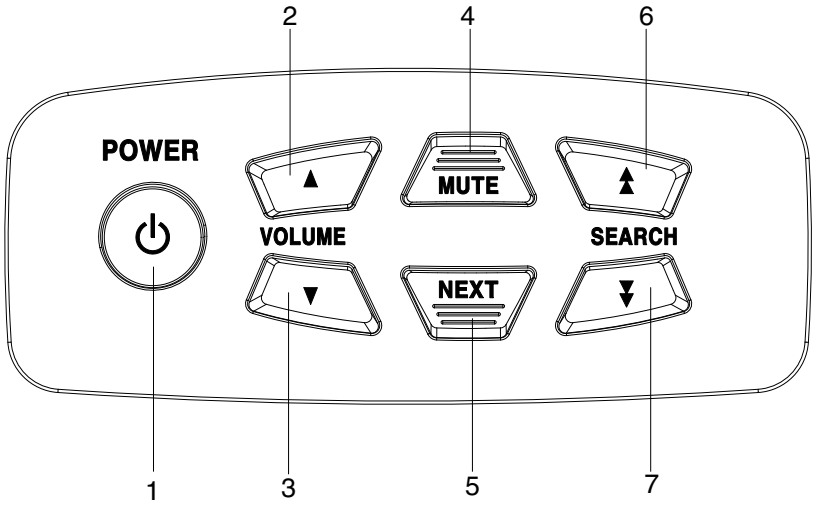


(2) Perform the following procedure in order to close the upper windshield.

① Move the lever of the auto lock latch(2) in the direction of the arrow in order to release the auto lock latch.

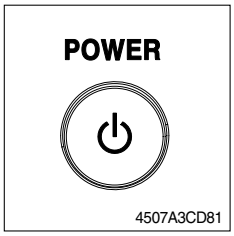
② Reverse step ① through step ③ in order to close the upper windshield.

11) 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

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.

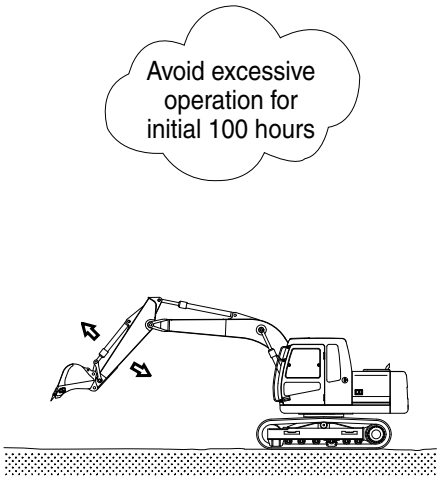
(4) Warm up the machine fully before operation.

(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	



D11074OP01

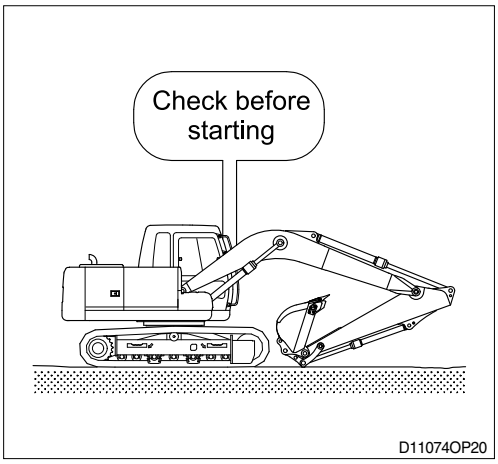
2. CHECK BEFORE STARTING THE ENGINE

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.



D11074OP20

3. STARTING AND STOP THE ENGINE

1) CHECK INDICATOR LIGHTS

(1) Check if all the operating lever is on the neutral position.

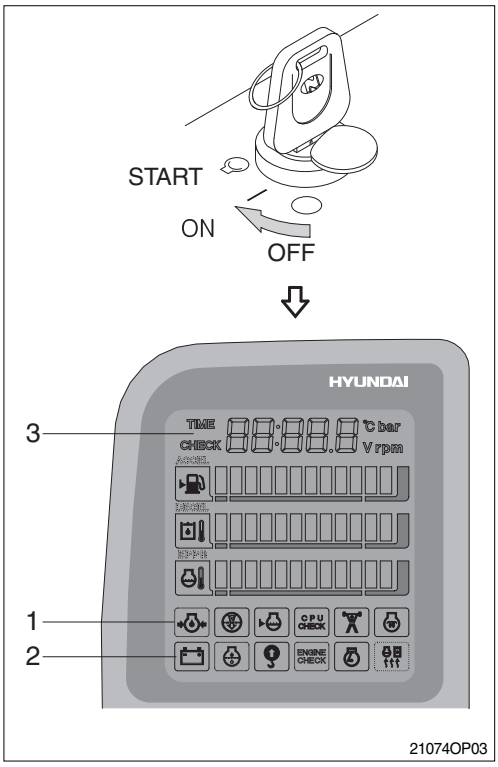
(2) Turn the starting switch to the ON position, and check following.

① If all the lamps light ON and buzzer sounding for 2 seconds.

② After lamp check **CL : 2.0**, the version of cluster program, is displayed on **Monitoring display(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.

- Battery charging warning lamp(2)
- Engine oil pressure warning lamp(1)



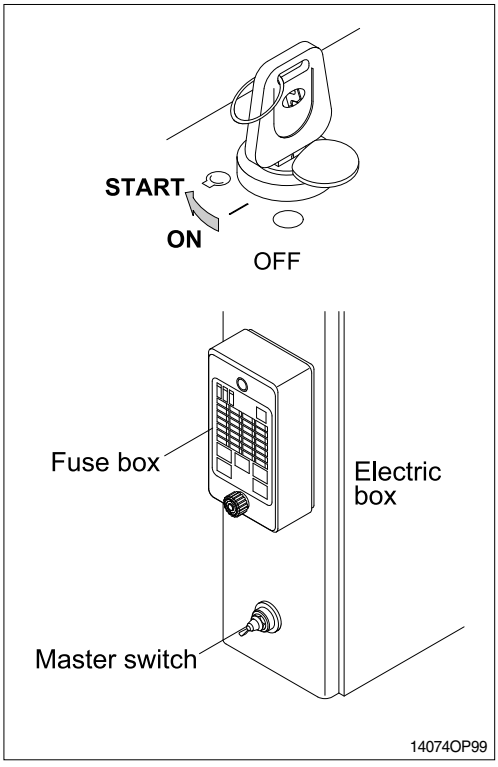
2) STARTING ENGINE IN NORMAL TEMPERATURE

※ **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.**

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

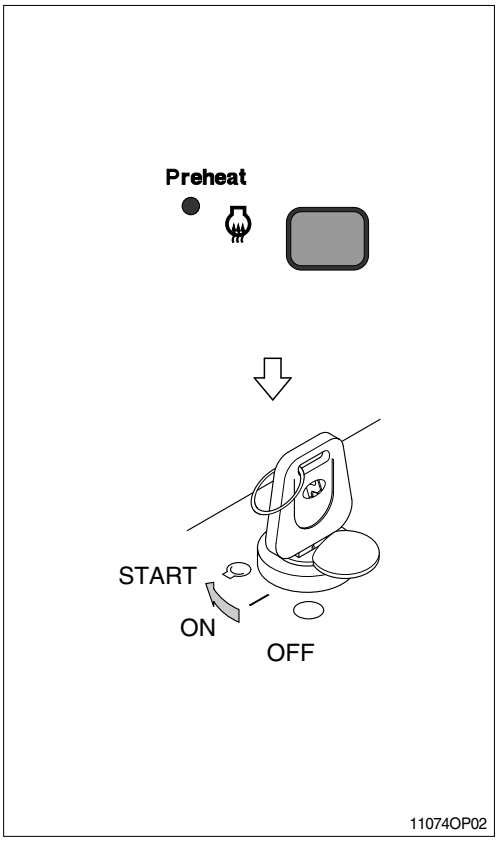
(2) Turn the starting switch to ON position, and wait the preheat pilot lamp OFF.

(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.



11074OP02

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(1-7)?

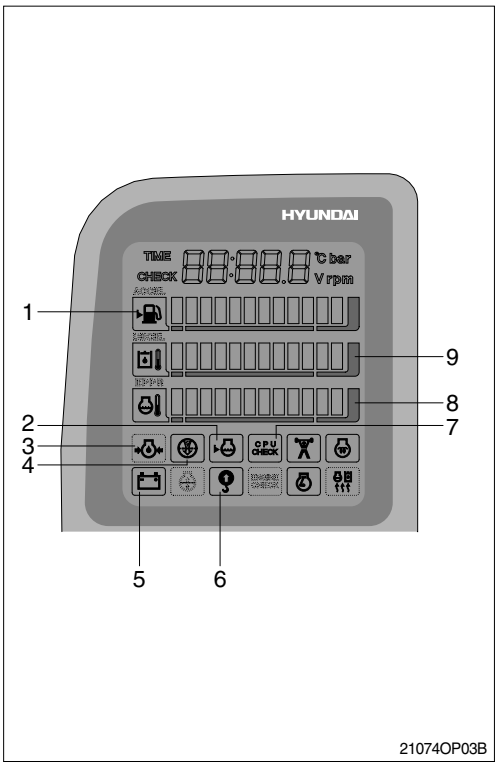
(4) Is the indicator of engine coolant temperature gauge(8) and hydraulic oil temperature gauge(9) in the green zone?

(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.**



21074OP03B

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.

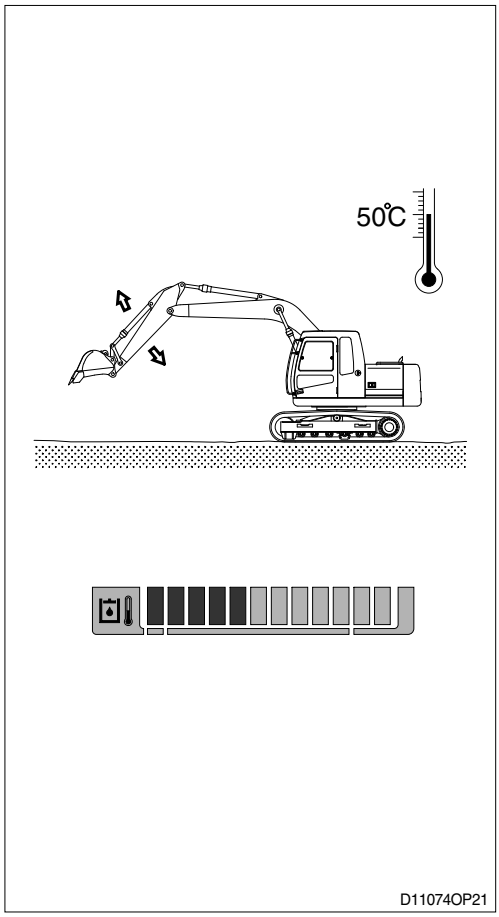
※ **Do not operate anything except bucket lever.**

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

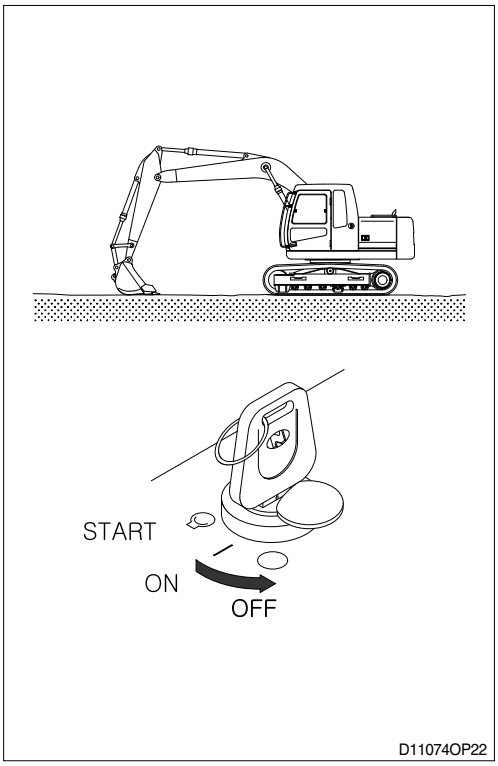
(1) Down the bucket on the ground then put all the levers in the neutral position.

(2) Run the engine at low 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**

This mode is used for standard work.

③ **L mode**

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

(2) Work mode

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

① **Heavy duty work mode**

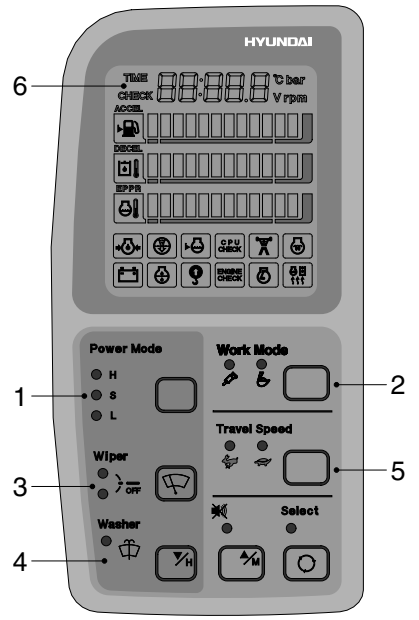
The boom priority solenoid is activated to make the boom operation speed faster.

② **Breaker operation mode**

It sets the pump flow to the optimal operation of breaker by activating the max flow cut-off solenoid.

(3) 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.



D11074OP03

1 Power mode
2 Work mode
3 Wiper switch
4 Washer switch
5 Travel speed switch
6 Monitoring display

(4) Washer switch

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

(5) Travel speed switch

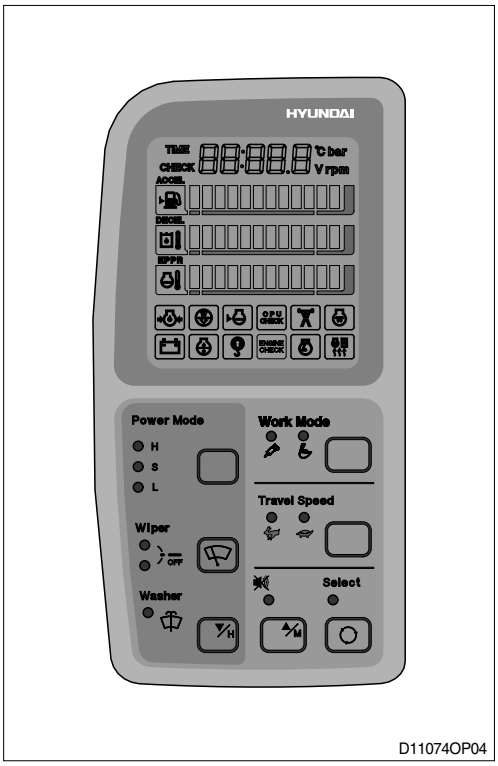
: Low speed traveling.

: High speed traveling.

(6) Monitoring system

Information of machine performance as monitored by the machine control unit(MCU) can be displayed on the **monitoring display**.

※ **Refer to 4-11 page for details.**



(7) Self diagnostic system

The MCU diagnoses problems in the CAPO system caused by electric parts' malfunction and by open or short circuit, which are displayed on the **monitoring display** as error codes.

(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 the battery charging warning lamp and the engine oil pressure warning lamp keep turned ON until engine starting.

② After lamp check **CL : 2.0**, the version of cluster program, is displayed on **Monitoring display** 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, one touch 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.

※ **Refer to 4-11 page for details.**

D11074OP05

(2) After engine start

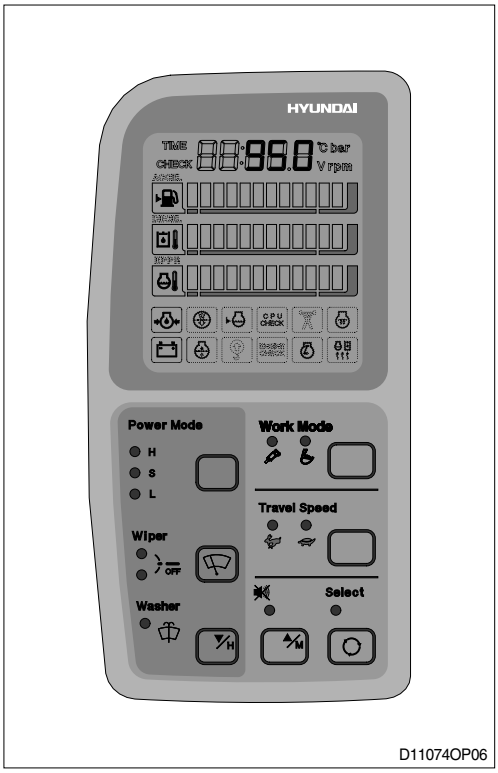
① When the engine is started, three lamps are ON as below.

Mode		Status
Power mode	S	ON
Travel speed	Low( )	ON
One touch decel		ON

- In this condition, tachometer indicates low idle.
- If coolant temperature is below 30°C, after 10 seconds the engine speed increases to 1200±100rpm 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 4-11 page for details.**



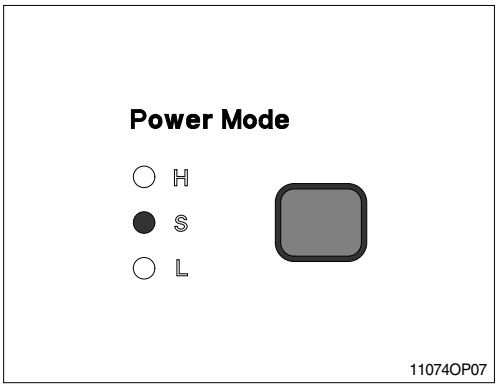
D11074OP06

3) SELECTION OF POWER MODE

(1) S mode (Standard power)

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

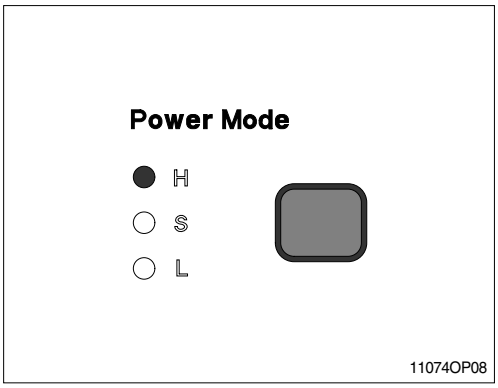
※ **When the accel dial is located below 9 the engine speed decreases about 50~100rpm per dial set.**



(2) H mode

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

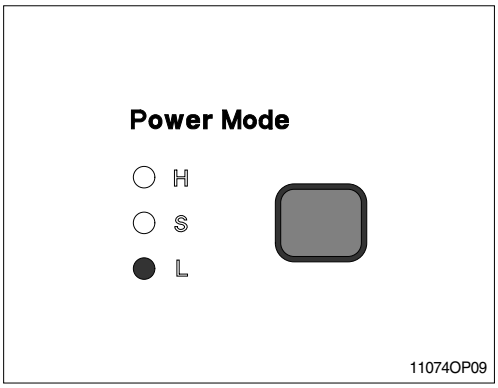
※ **When the accel dial is located below 9 the engine speed decreases about 50~100rpm per dial set.**



(3) L mode (Default, for fuel economic)

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

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



4) MONITORING DISPLAY

Information of machine performance as monitored by the CPU controller can be displayed on the cluster when the operator selects a display mode by touching **SELECT** switch alone or with **BUZZER STOP** switch on the cluster as below.

Display group	How to select display mode		Name	Display on the cluster
	Group selection	Display mode selection		
Group 0 (Default)	Way 1 Key switch **ON** or **START** Way 2 Touch **WASHER** switch while pressing **BUZZER STOP** at group 1~4.	Initial	Engine rpm	1750 rpm
		Touch **SELECT** 1 time	Time	TIME 12:30
		Touch **SELECT** 2 times	Power shift pressure (EPPR valve)	EP:38 bar
		Touch **SELECT** 3 times	CPU model & version	11:C 1.0
Group 1 (Volt, temp, EPPR press, version)	Touch **SELECT** switch **once** while pressing **BUZZER STOP.** In this group **SELECT** LED **ON**	Default	Battery voltage(V)	b:24.8v
		Touch **SELECT** 1 time	Potentiometer voltage(V)	Po: 2.5v
		Touch **SELECT** 2 times	Accel dial voltage(V)	dL: 3.8v
		Touch **SELECT** 3 times	Hydraulic oil temperature(°C)	Hd: 105℃
		Touch **SELECT** 4 times	Coolant temperature(°C)	Ct: 107℃
Group 2 (Error code)	Touch **SELECT** switch **twice** while pressing **BUZZER STOP.** In this group **BUZZER STOP** LED blinks	Default	Current error	CHECK Er: 03
		Touch **SELECT** 1 time	Recorded error (Only key switch ON)	TIME Er: 03
		Press down(▼) & **SELECT** at the same time	Recorded error deletion (Only key switch ON)	TIME Er: 00
Group 3 (Switch input)	Touch **SELECT** switch **3 times** while pressing **BUZZER STOP.** In this group **SELECT** LED blinks at 0.5sec interval	Default	Power boost switch	Pb:on or oFF
		Touch **SELECT** 1 time	One touch decel switch	od:on or oFF
		Touch **SELECT** 2 times	Preheat switch	PH:on or oFF
		Touch **SELECT** 3 times	Overload pressure switch	o l:on or oFF
Group 4 (Output)	Touch **SELECT** switch **4 times** while pressing **BUZZER STOP.** In this group **SELECT** LED blinks at 1sec interval	Default	Hourmeter	Ho:on or oFF
		Touch **SELECT** 1 time	Neutral relay (Anti-restart relay)	nr:on or oFF
		Touch **SELECT** 2 times	Travel speed solenoid	SS:on or oFF
		Touch **SELECT** 3 times	Power boost solenoid (2-stage relief solenoid)	PS:on or oFF
		Touch **SELECT** 4 times	Preheat relay	PR:on or oFF

※ By touching **SELECT** switch once while pressing **BUZZER STOP**, display group shifts.
Example : Group 0 → 1 → 2 → 3 → 4 → 0

5. OPERATION OF WORKING DEVICE

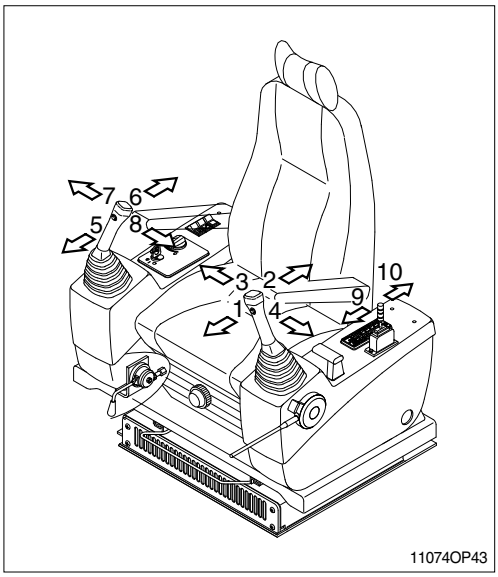
※ **Confirm the operation of control lever and working device.**

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.

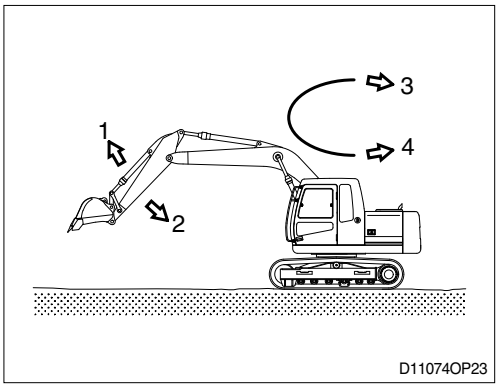
※ **When operating swing, consider the swing distance by inertia.**



11074OP43

※ **Left control lever**

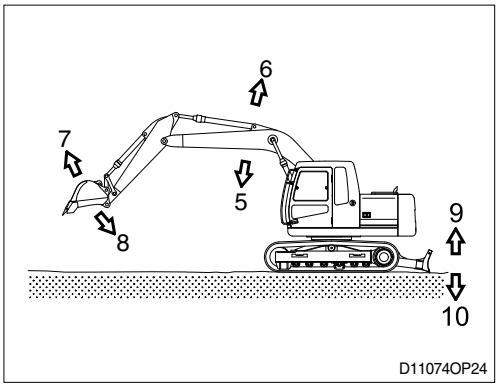
1 Arm roll-out
2 Arm roll-in
3 Swing right
4 Swing left



D11074OP23

※ **Right control lever**

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



D11074OP24

※ **Dozer control lever**

9 Dozer blade up
10 Dozer blade down

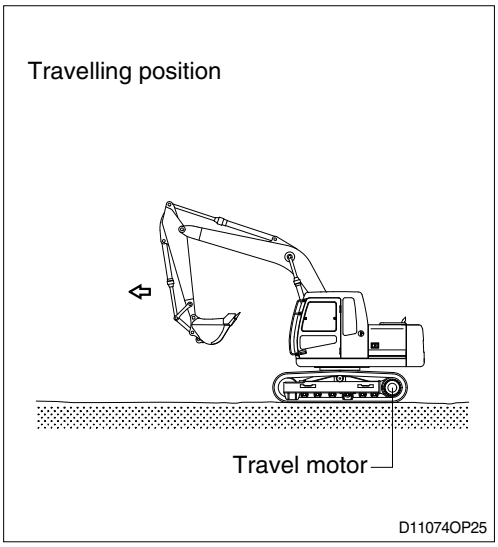
6. TRAVELING OF THE MACHINE

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 swinged 180 degree.**



(2) Traveling operation

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

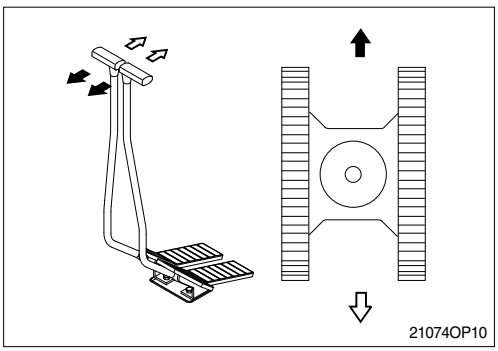
※ **Do not travel continuously for a long time.**

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

(3) Forward and backward traveling

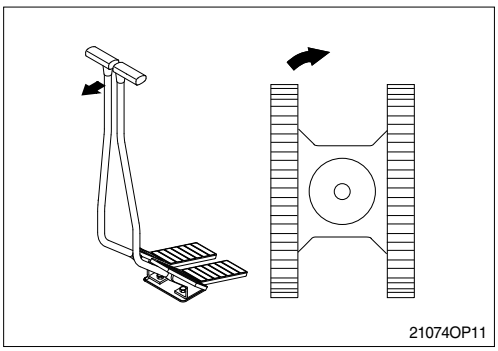
When the left and right travel lever or pedal are pushed at the same time, the machine will travel forward or backward.

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



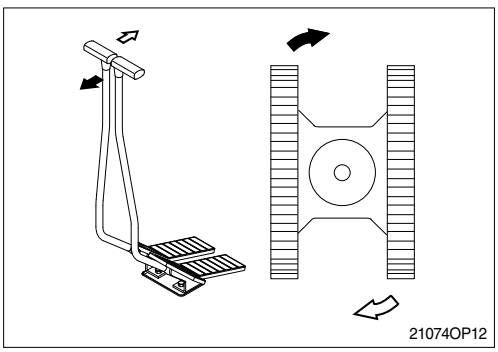
(4) Pivot turning

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



(5) Counter rotation

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



2) TRAVELING ON A SLOPE

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

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

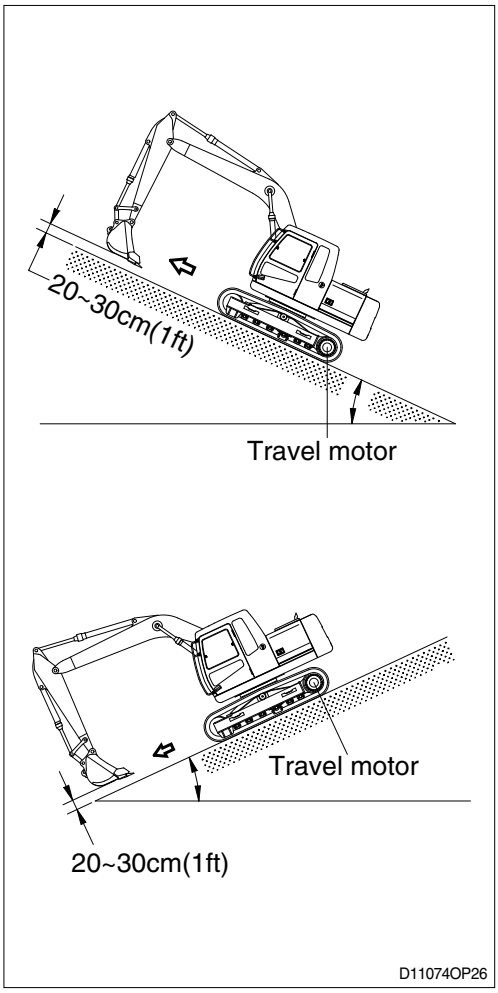
(3) If the machine starts to slide or loses stability, lower the bucket immediately and brake the machine.

(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.**



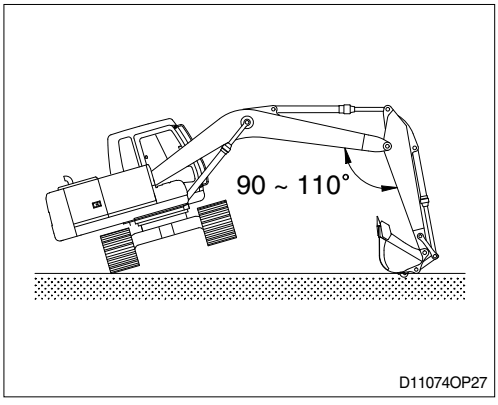
3) TRAVELING ON SOFT GROUND

※ **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

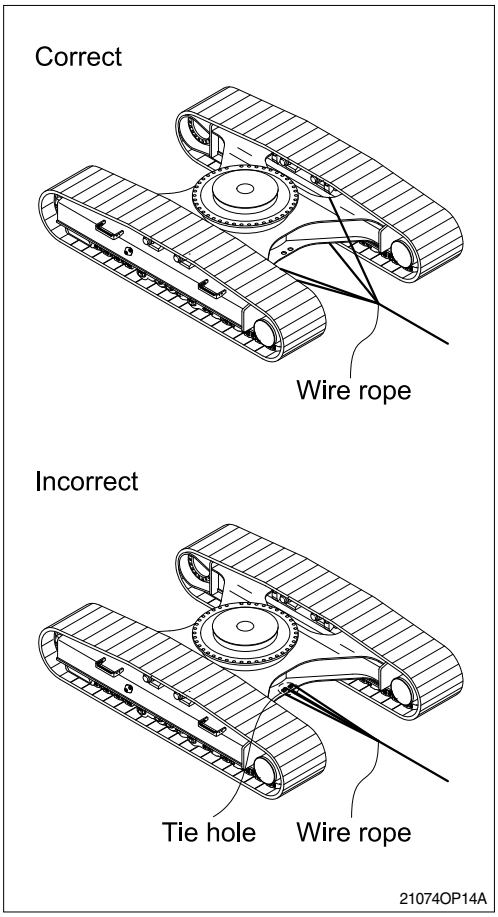
Tow the machine as follows when it can not move on it's own.

(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.

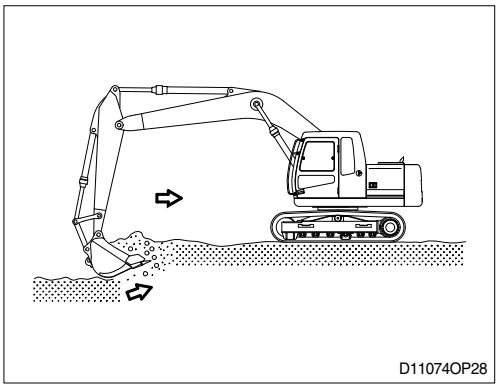
※ **Never tow the machine using only the tie hole, because this may break.**

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

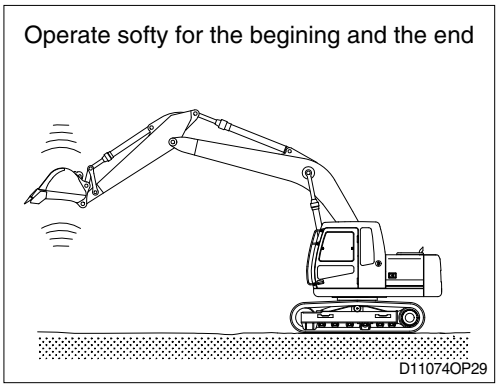


7. EFFICIENT WORKING METHOD

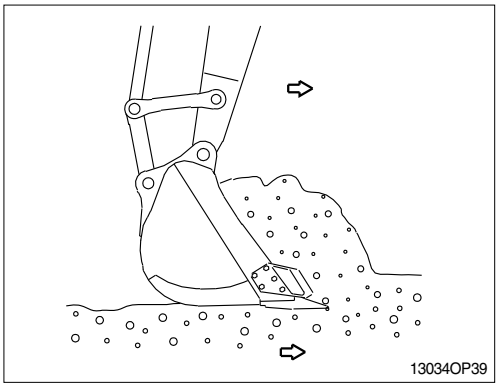
1) Do the digging work by arm.
   Use the pulling force of arm for digging and use together with the digging force of the bucket if necessary.



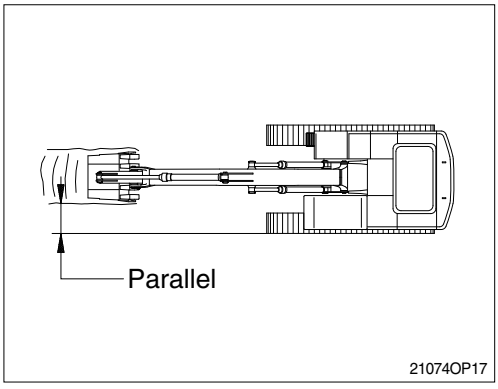
2) When lowering and raising the boom operate softly for the beginning and the end.
   In particularly, sudden stops while lowering the boom may cause damage to the machine.



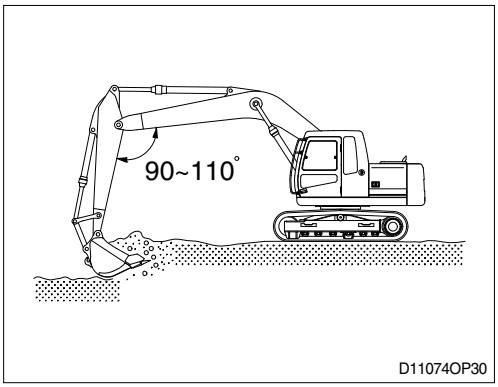
3) The digging resistance and wearing of tooth can be reduced by putting the end of bucket tooth to the digging direction.



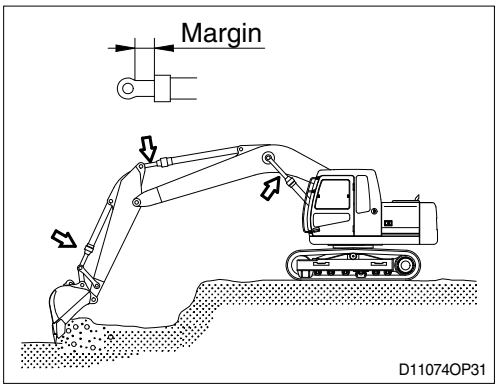
4) Set the tracks parallel to the line of the ditch to be excavated when digging ditch. Do not swing while digging.



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

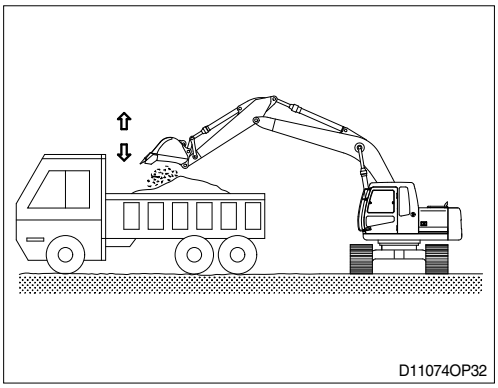


6) Operate leaving a small safety margin of cylinder stroke to prevent damage of cylinder when working with the machine.

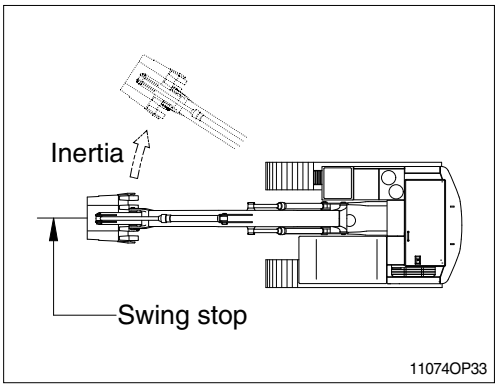


7) Keep the bucket to the dumping position and the arm horizontal when dumping the soil from the bucket.
Operate bucket lever 2 or 3 times when hard to dump.

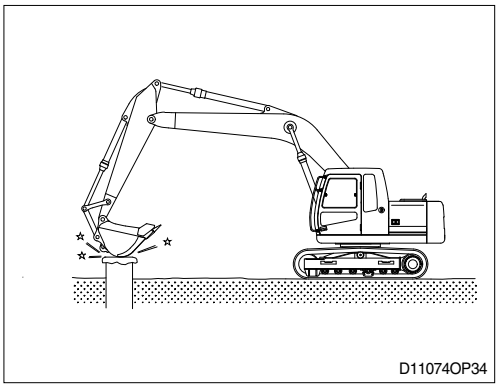
※ **Do not use the impact of bucket tooth when dumping.**



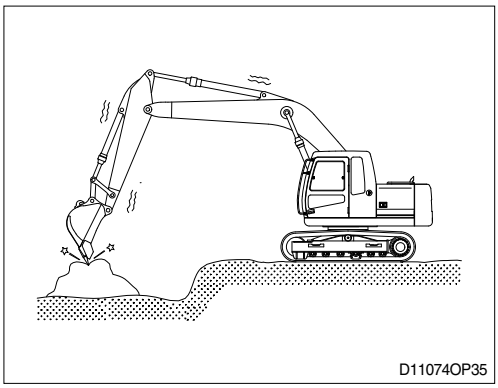
8) Operate stop of swing considering the swing slip distance is created by inertia after neutralizing the swing lever.



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

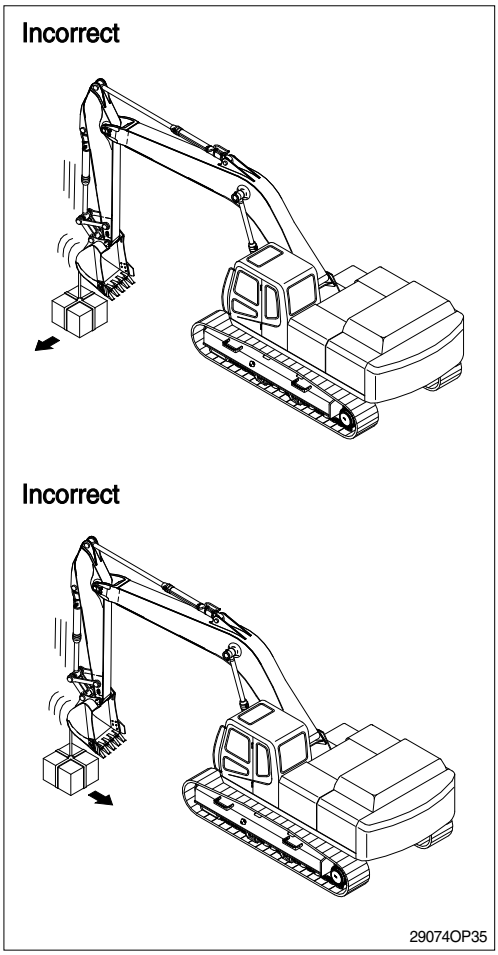


10) Do not use the bucket to crack hard objects like concrete or rocks.
This may break a tooth or pin, or bend boom.



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.

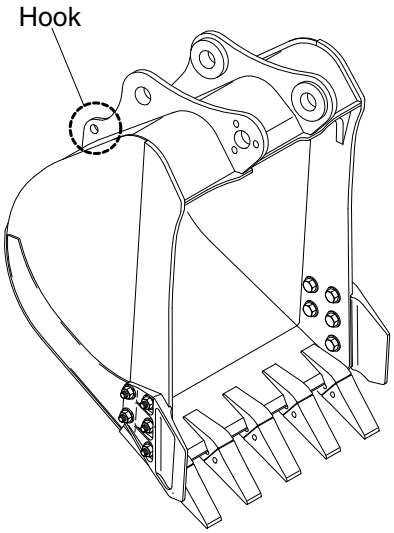
When performing lifting operation, never raise or lower a person.

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.



21074OP24

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.

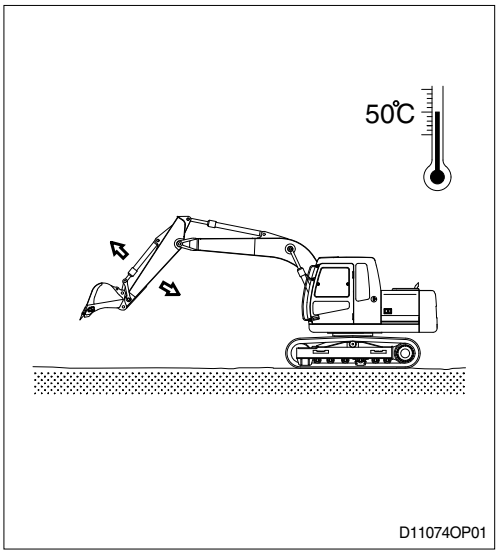
(3) Refer to the starting engine in cold weather. Start the engine and extend the warming up operation.

(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 and air breather element frequently. Also, replace the fuel filter frequently.

(5) Keep all lubricated part, such as pins and bushings, clean at all times.

(6) If the air conditioner and heater filters clogged, the heating or cooling capacity will drop. Clean or replace the filter element more frequently.

(7) Clean electrical components, especially the starting motor and alternator to avoid accumulation of dust.

3) SEA SHORE OPERATION

(1) Prevent ingress of salt by securely tightening plugs, cocks and bolts of each part.

(2) Wash machine after operation to remove salt residue.
Pay special attention to electrical parts and hydraulic cylinders to prevent corrosion.

(3) Inspection and lubrication must be carried out more frequently.
Supply sufficient grease to replace all old grease in bearings which have been submerged in water for a long time.

4) OPERATION IN MUD, WATER OR RAIN WORK SITES

(1) Perform a walk around inspection to check for any loose fittings, obvious damage to the machine or any fluid leakage.

(2) After completing operations, clean mud, rocks or debris from the machine. Inspect for damage, cracked welds or loosened parts.

(3) Perform all daily lubrication and service.

(4) If the operations were in salt water or other corrosive materials, make sure to flush the affected equipment with fresh water.

5) OPERATION IN ROCKY WORK SITES

(1) Check for damage to the undercarriage and for looseness, flaws, wear and damage in bolts and nut.

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

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

9. NORMAL OPERATION OF EXCAVATOR

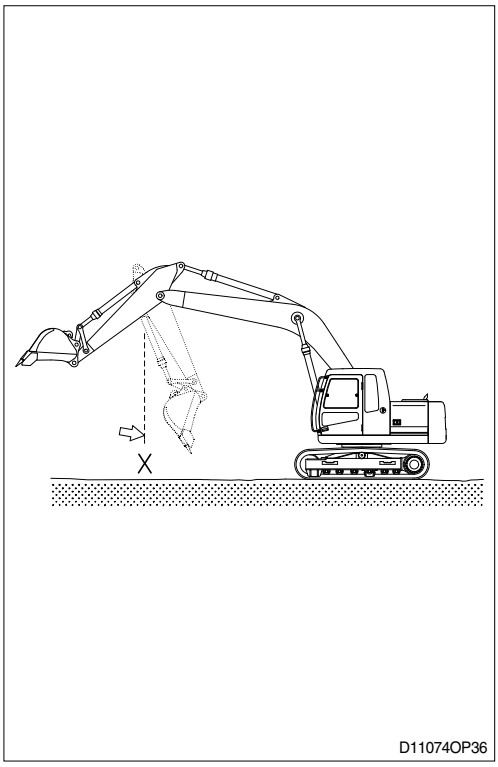
Followings may occur during operation due to the nature of a hydraulic excavator.

1) When rolling in the arm, the roll-in movement stop momentary at point **X** in the picture shown, then recovers speed again after passing point **X**.
   The reason for this phenomenon is that movement by the arm weight is faster than the speed of oil flow into the cylinder.

2) When lowering the boom, one may hear continuous sound.
   This is caused by oil flow in the valve.

3) Overloaded movement will produce sound caused by the relief valves, which are for the protection of the hydraulic systems.

4) When the machine is started swing or stopped, a noise near the swing motor may be heard. The noise is generated when the brake valve relieves.



10. STORAGE

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

1) BEFORE STORAGE

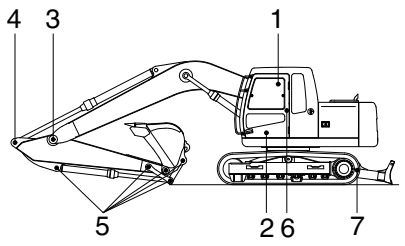
(1) CLEANING THE MACHINE

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

(2) LUBRICATION POSITION OF EACH PART

Change all oil.

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



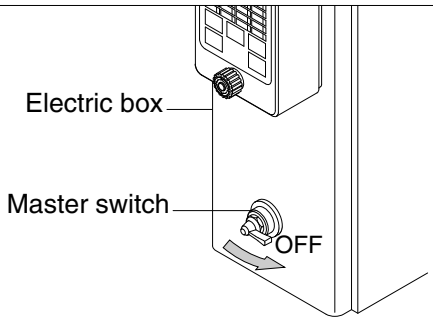
1 Lubricating manifold(5EA)
2 Boom cylinder pin(2EA)
3 Boom and arm connection pin(1EA)
4 Arm cylinder pin(rod side, 1EA)
5 Arm and bucket(5EA)
6 Boom rear bearing center(1EA)
7 Dozer blade cylinder pin(3EA)

D11074OP38

(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.



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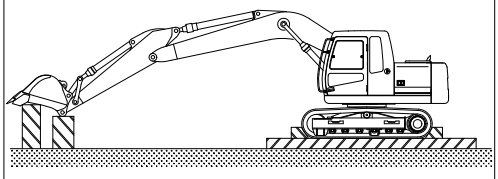
(5) PREVENTION OF DUST AND MOISTURE

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

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



D11074OP39

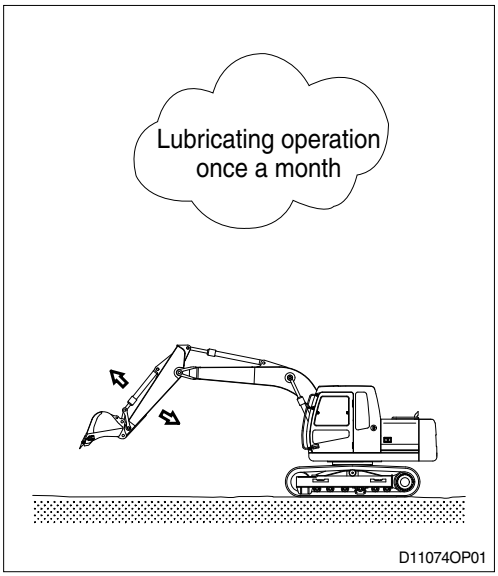
2) DURING STORAGE

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

※ **Check the level of engine oil and coolant and fill if required when starting engine.**

※ **Clean the anticorrosive on the piston rod of cylinder.**

※ **Operate the machine such as traveling, swing and work equipment operation to make sure enough lubrication of all functional components.**



3) AFTER STORAGE

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

(1) Wipe off the anticorrosive lubricant on the hydraulic piston rod.

(2) Completely fill fuel tank, lubricate and add oil.

(3) When storage period is 6 months over

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

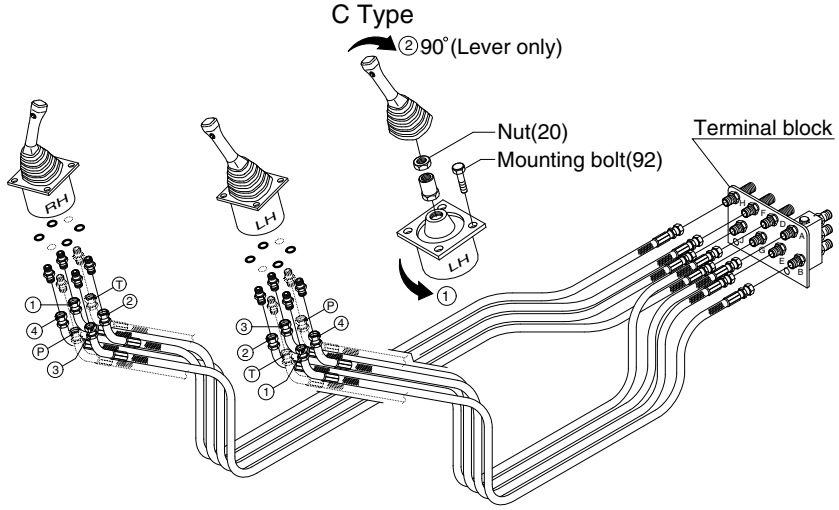
This procedure is to drain condensation water for the **swing reduction gear** durability.

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

※ **Refer to the service instruction, section 6 for the drain plug location.**

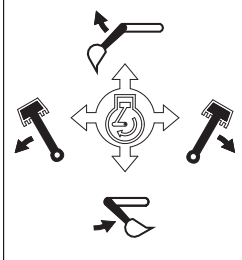
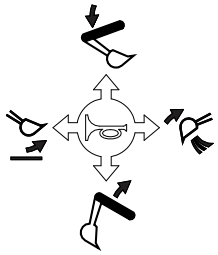
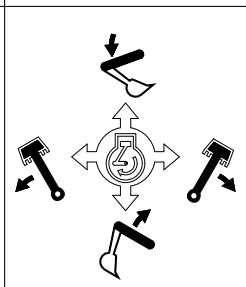
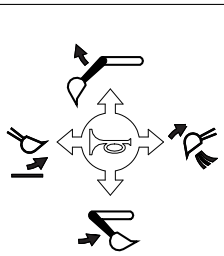
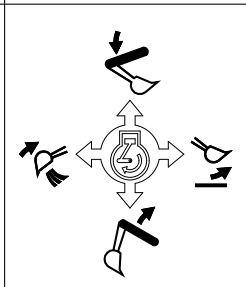
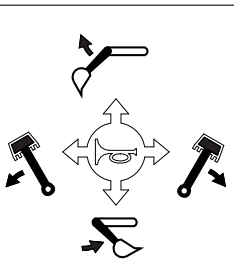
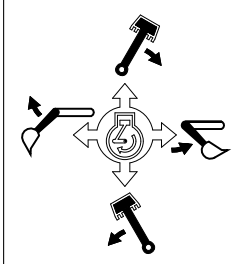
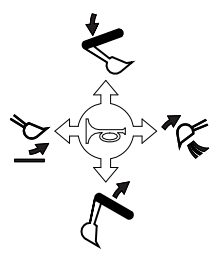
※ **If the machine is stored without carrying out the monthly lubricating operation, consult your Hyundai dealer for service.**

11. RCV LEVER OPERATING PATTERN



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

11074OP40

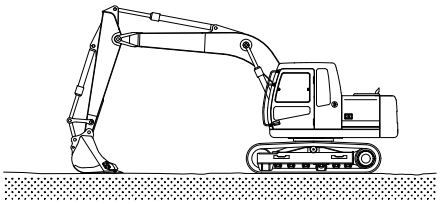
Pattern	Operation		Control function		Hose connection(Port)		
	Left	Right			RCV lever	Change of MCV port	
						From	To
ISO Type			Left	Arm out	②	D	-
				Arm in	④	E	-
				Swing right	③	A	-
				Swing left	①	B	-
			Right	Boom lower	④	J	-
				Boom raise	②	H	-
				Bucket out	①	F	-
Hyundai				Bucket in	③	G	-
A Type			Left	Boom lower	②	D	J
				Boom raise	④	E	H
				Swing right	③	A	-
				Swing left	①	B	-
			Right	Arm out	④	J	D
				Arm in	②	H	E
				Bucket out	①	F	-
				Bucket in	③	G	-
B Type			Left	Boom lower	②	D	J
				Boom raise	④	E	H
				Bucket in	③	A	G
				Bucket out	①	B	F
			Right	Arm out	④	J	D
				Arm in	②	H	E
				Swing right	①	F	A
				Swing left	③	G	B
C Type			Left	① Loosen the RCV lever mounting bolt(21) 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			

12. SWITCHING HYDRAULIC ATTACHMENT CIRCUIT(OPTION)

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.

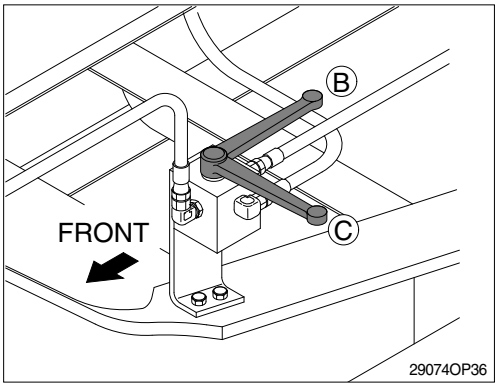


D11074OP41

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 (Ⓑ).

(2) Two way flow(Clamshell or shear)
Position the manual lever perpendicular to the piping(Ⓒ).



29074OP36

1. PREPARATION FOR TRANSPORTATION

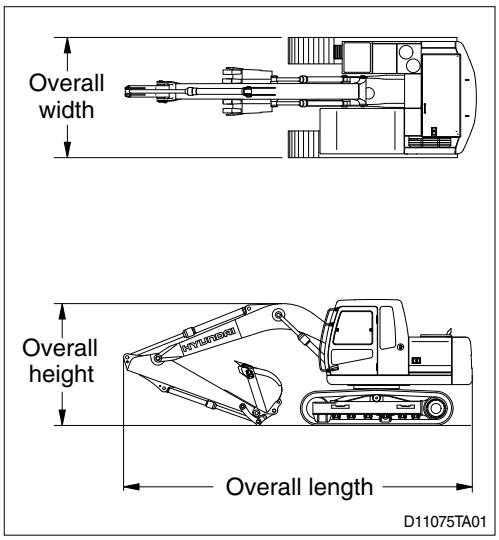
1) When transporting the machine, observe the various road rules, road transportation vehicle laws and vehicle limit ordinances, etc.

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.

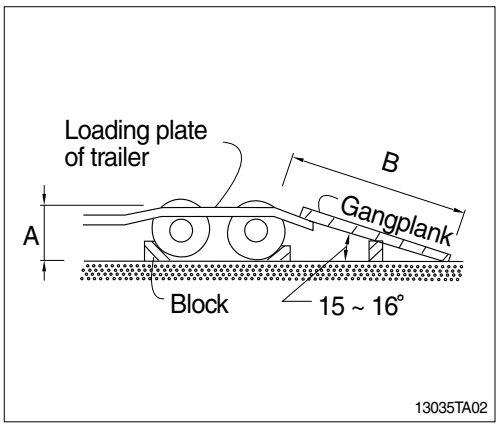
4) Get the permission from the related authority if necessary.

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



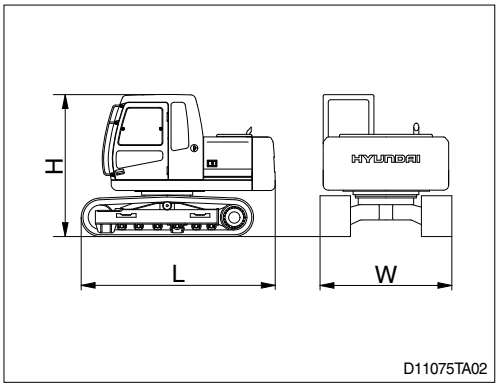
2. DIMENSION AND WEIGHT

1) ROBEX 110-7

(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)

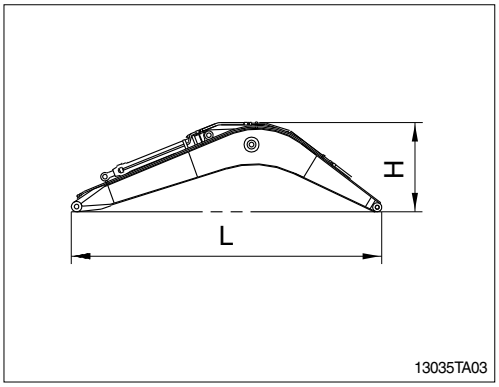
※ With 500mm(20") triple grouser shoes and 1450kg(3200lb) counterweight.



(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)

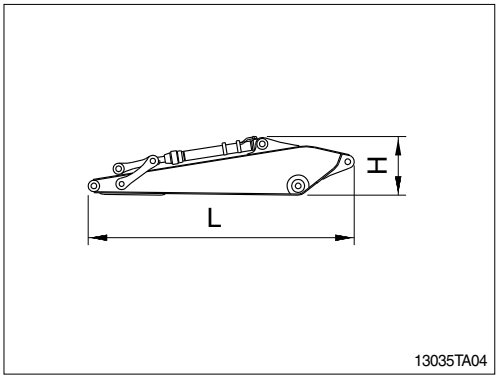
※ 4.3m(14' 1") boom with arm cylinder(Included piping and pins).



(3) Arm assembly

OMark	Description	Unit	Specification
L	Length	mm(ft-in)	2660(8' 9")
H	Height	mm(ft-in)	730(2' 5")
W	Width	mm(ft-in)	380(1' 3")
Wt	Weight	kg(lb)	510(1120)

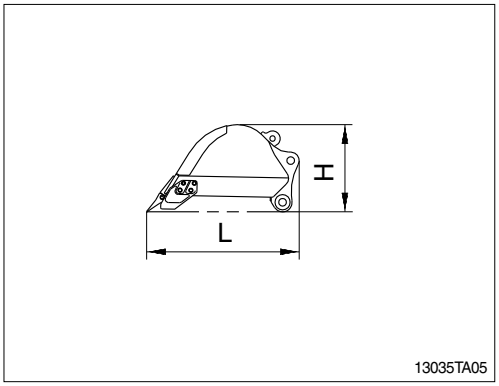
※ 1.96m(6' 5") arm with bucket cylinder(Included linkage and pins).



(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)	1130(3' 8")
Wt	Weight	kg(lb)	500(1100)

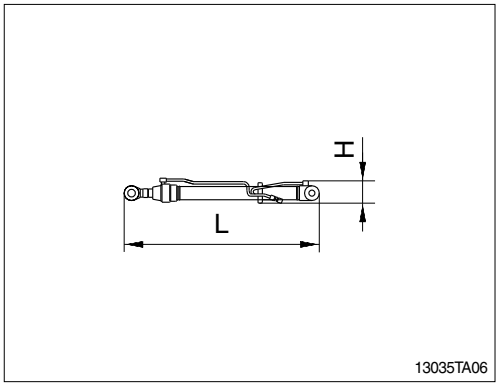
※ 0.60m^3(0.79yd^3) SAE heaped bucket(Included tooth and side cutters).



(5) Boom cylinder

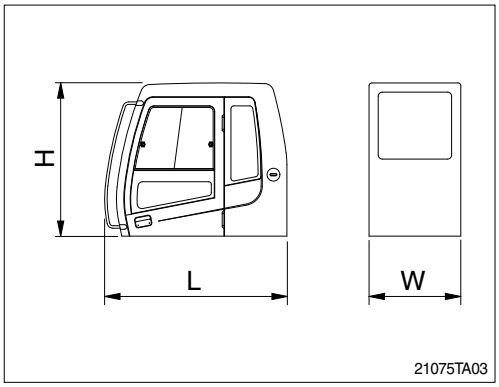
Mark	Description	Unit	Specification
L	Length	mm(ft-in)	1650(5' 5")
H	Height	mm(ft-in)	216(0' 9")
W	Width	mm(ft-in)	310(1' 0")
Wt	Weight(2EA)	kg(lb)	230(510)

※ Included piping.



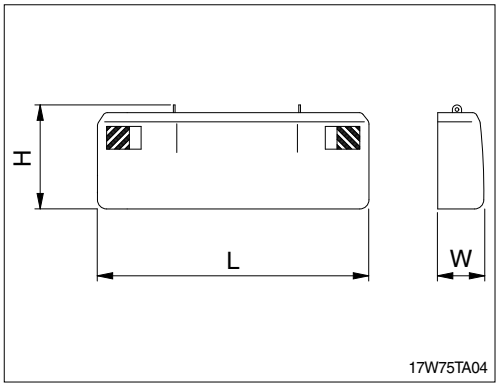
(6) Cab assembly

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)

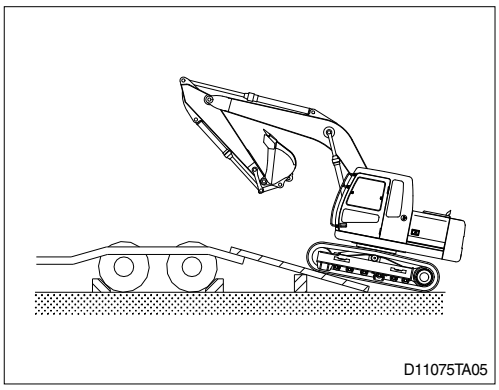


3. LOADING THE MACHINE

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

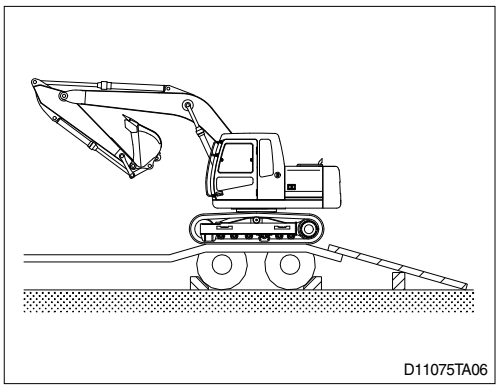
2) Use the gangplank with sufficient length, width, thickness and gradient.

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.

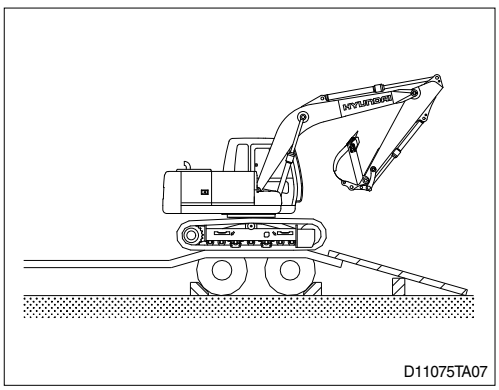

D11075TA05

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.


D11075TA06

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


D11075TA07

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

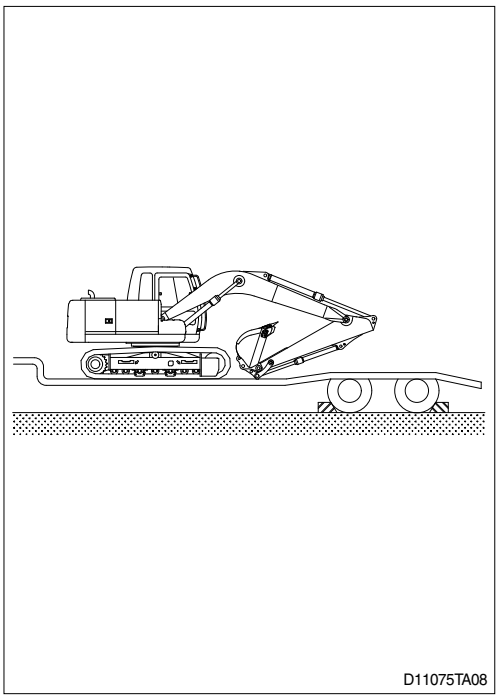
※ **Place rectangular timber under the bucket cylinder to prevent the damage of it during transportation.**

⚠ **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.**

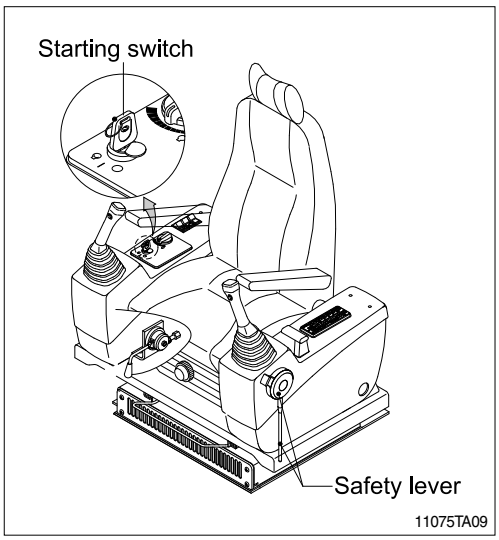
⚠ **Do not operate any other device when loading.**

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

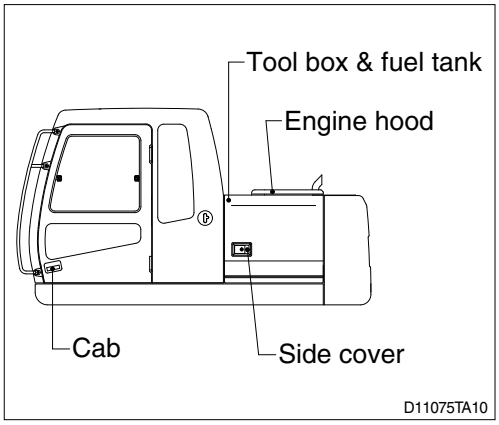

D11075TA08

4. FIXING THE MACHINE

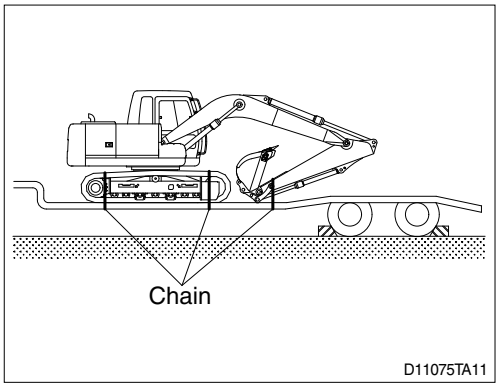
1) Place the swing lock lever on the LOCK position.
2) Lower down the working device on the loading plate of trailer.
3) Keep the safety lever on the LOCK position.
4) Turn OFF all the switches and remove the key.



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.

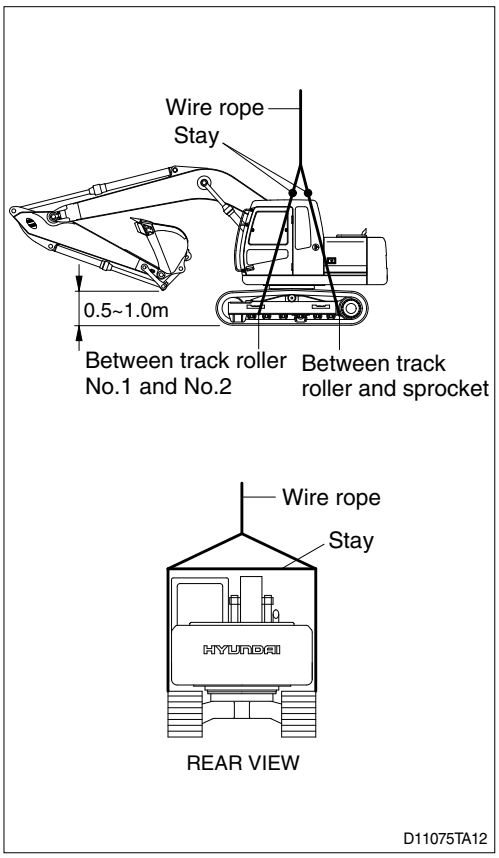
⚠ **Make sure wire rope is proper size.**

⚠ **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.**



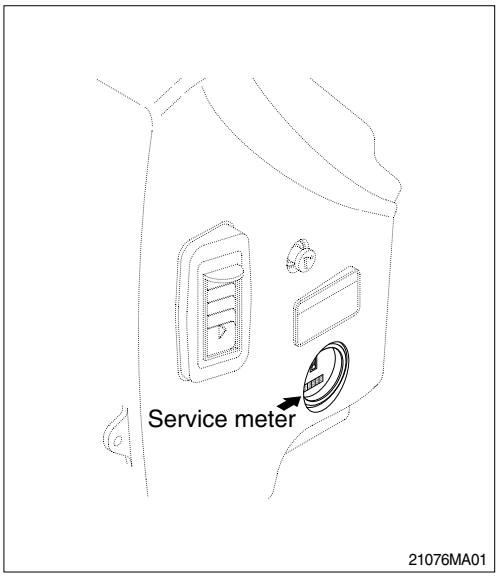
1. INSTRUCTION

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.

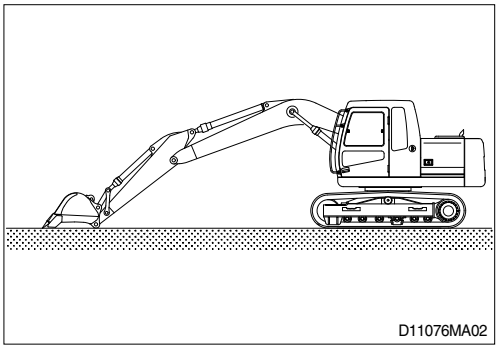
(9) For more detail information of maintenance, please contact local Hyundai dealer.

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

4) RELIEVING THE PRESSURE IN THE HYDRAULIC SYSTEM

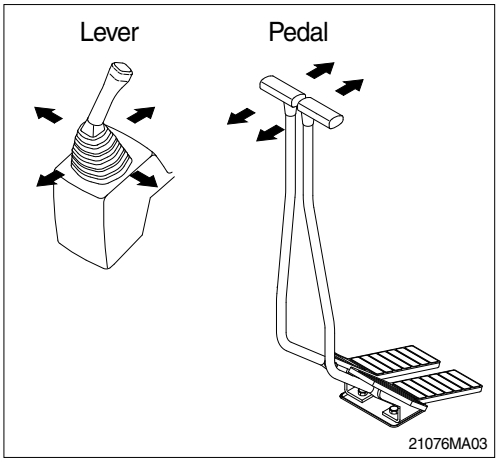
※ **Spouting of oil can cause the accident when loosening the cap or hose right after the operating of machine as the machine or oil is on the high pressure on the condition.**
Be sure to relieve the pressure in the system before repairing hydraulic system.

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

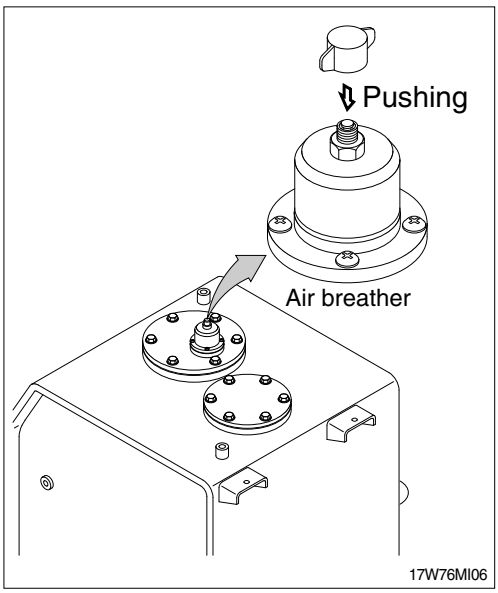


(2) Set the safety lever completely in the release position, operate the control levers and pedals fully to the front, rear, left and right, to release the pressure in the hydraulic circuit.

※ **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)	
Hydrauli c 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

Thread size	Width across flat(mm)	kgf · m	lbf · ft
1/4"	19	3	21.7
3/8"	22	4	28.9
1/2"	27	5	36.2
3/4"	36	12	86.8
1"	41	14	101

3) 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	6	43.4
3/4"	36	13	94.0
1"	41	15	109

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±0.5	72.3±3.6
2		Engine mounting bolt(Bracket-Frame, FR)	M16 × 2.0	55±3.5	398±25.3
3		Engine mounting bolt(Bracket-Frame, RR)	M20 × 2.5	30±3.5	253±25.3
4		Radiator mounting bolt, nut	M12 × 1.75	12.2±1.3	88.2±9.4
5		Coupling mounting bolt	M16 × 2.0	22.0±1.0	159±7.2
6	Hydraulic system	Main pump mounting bolt	M16 × 2.0	22.1±2.4	159±17.3
7		Main control valve mounting bolt	M12 × 1.75	12.2±1.3	88.2±9.4
8		Fuel tank mounting bolt	M20 × 2.5	45±5.1	325±36.9
9		Hydraulic oil tank mounting bolt	M20 × 2.5	45±5.1	325±36.9
10		Turning joint mounting bolt, nut	M12 × 1.75	12.3±1.3	88.2±9.4
11	Power train system	Swing motor mounting bolt	M16 × 2.0	29.6±3.2	214±23.1
12		Swing bearing upper mounting bolt	M18 × 2.0	41.3±4.5	299±32.5
13		Swing bearing lower mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
14		Travel motor mounting bolt	M16 × 2.0	23±2.5	166±18.1
15		Sprocket mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
16		Carrier roller mounting bolt, nut	M16 × 2.0	29.7±4.5	215±32.5
17	Under carriage	Track roller mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
18		Track tension cylinder mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
19		Track shoe mounting bolt, nut	M16 × 1.5	31.3±4.7	226±34.0
20		Track guard mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
21	Others	Counter weight mounting bolt	M24 × 3.0	97.8±10	707±72.3
22		Cab mounting bolt, nut	M12 × 1.75	12.2±1.3	88.2±9.4
23		Operator's seat mounting bolt	M 8 × 1.25	1.17±0.1	8.5±0.7

3. FUEL, COOLANT AND LUBRICANTS

1) NEW MACHINE

New machine used and filled with following lubricants.

Description	Specification
Engine oil	SAE 15W-40(API CH4)
Hydraulic oil	ISO VG 68
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 ℃(°F) -20 (-4) / -10 (14) / 0 (32) / 10 (50) / 20 (68) / 30 (86) / 40 (104)
Engine oil pan	Engine oil	11.50(3.04)	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	6.0(1.55)	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	250(66.0)	ASTM D975 NO.1 ASTM D975 NO.2
Fitting (Grease nipple)	Grease	As required	NLGI NO.1 NLGI NO.2
Radiator (Reservoir tank)	Mixture of antifreeze and water 50 : 50	24(6.3)	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	6-27
Engine oil level	Check, Add	6-18
Coolant level	Check, Add	6-20
Control panel & pilot lamp	Check, Clean	6-38
Water separator	Check, Drain	6-26
Fan belt tension and damage	Check, Adjust	6-24

2) EVERY 50 HOURS SERVICE

Check items	Service	Page
Fuel tank	Drain	6-25
Track tension	Check, Adjust	6-33
Swing bearing grease	Lubricate	6-31
Swing reduction gear oil	Check, Add	6-31
Swing reduction gear grease	Check, Add	6-31
Lubricate pin and bushing	Lubricate	6-37
· Boom cylinder tube end		
· Boom foot		
· Boom cylinder rod end		
· Arm cylinder tube end		
· Arm cylinder rod end		
· Boom + Arm connecting		
· Bucket cylinder tube end		
· Bucket cylinder rod end		
· Arm + Bucket connecting		
· Arm + Link, Bucket control		
· Bucket control rod		

3) INITIAL 50 HOURS SERVICE

Check items	Service	Page
Engine oil	Change	6-18, 19
Engine oil filter	Replace	6-18, 19
Pilot line filter	Replace	6-30
Hydraulic return filter	Replace	6-29
Drain filter cartridge	Replace	6-30
Fuel filter	Replace	6-26
Bolts & Nuts	Check, Tight	6-8
· Sprocket mounting bolts		
· Travel motor mounting bolts		
· Swing motor mounting bolts		
· Swing bearing mounting bolts		
· Engine mounting bolts		
· Counterweight mounting bolts		
· Turning joint locating bolts		
· Track shoe mounting bolts and nuts		
· Hydraulic pump mounting bolts		

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	6-29
★ Pilot line filter	Replace	6-30
★ Element in hydraulic tank breather	Replace	6-30
★ Drain cartridge filter	Replace	6-30

★ Replace 4 filters for continuous hydraulic breaker operation only.

5) EVERY 250 HOURS SERVICE

Check items	Service	Page
Battery (Electrolyte, voltage)	Check, Add	6-38
Hydraulic oil return filter	Replace	6-29
Drain filter cartridge	Replace	6-30
★ Swing reduction gear oil	Change	6-31
★ Swing reduction gear grease	Check, Add	6-31
Pilot line filter	Replace	6-30
Element in hydraulic tank breather	Replace	6-30
Bolts & Nuts	Check, Tight	6-8
· Sprocket mounting bolts		
· Travel motor mounting bolts		
· Swing motor mounting bolts		
· Swing bearing mounting bolts		
· Engine mounting bolts		
· Counterweight mounting bolts		
· Turning joint locating bolts		
· Track shoe mounting bolts and nuts		
· Hydraulic pump mounting bolts		

★ Change oil and add grease after initial 250 hours of operation.

6) EVERY 500 HOURS SERVICE

Check items	Service	Page
★Engine oil	Change	6-18, 19
★Engine oil filter	Replace	6-18, 19
Radiator and oil cooler	Check, Clean	6-23
⊙Air cleaner element(Primary)	Inspect, Clean	6-25
Fuel filter element	Replace	6-26
Travel reduction gear oil	Check, Add	6-32
◈Travel reduction gear oil	Change	6-32

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

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

◈ Change oil after initial 500 hours of operation.

7) EVERY 1000 HOURS SERVICE

Check items	Service	Page
Travel motor reduction gear oil	Change	6-32
Swing reduction gear oil	Change	6-31
Swing reduction grease	Refill	6-31
Grease in swing gear and pinion	Change	6-32

8) EVERY 2000 HOURS SERVICE

Check items	Service	Page
Hydraulic tank		
★ · Oil	Change	6-28
· Suction strainer	Check, Clean	6-29
Coolant	Change	6-20, 21, 22, 23

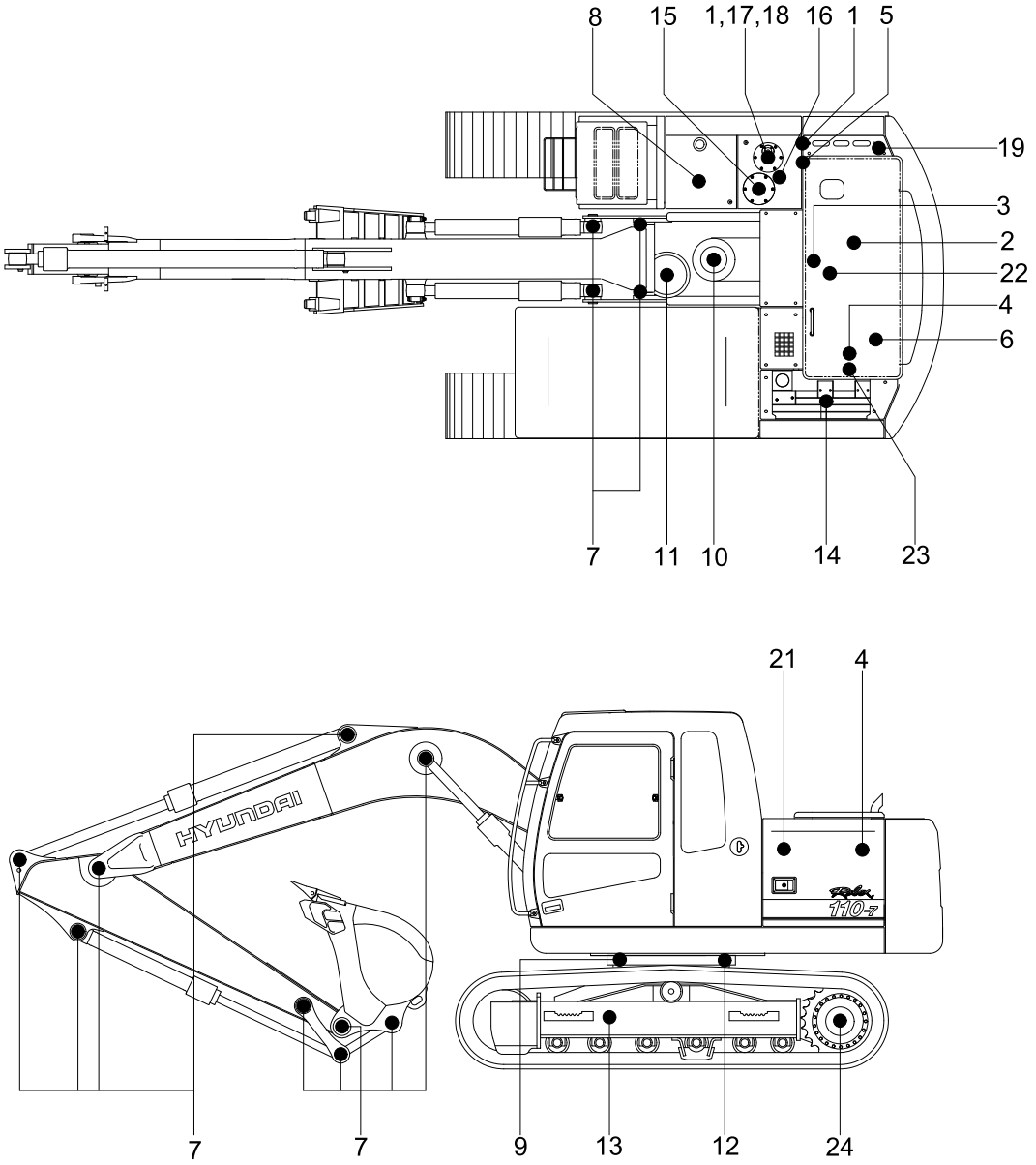
★Change oil every 600 hours of continuous hydraulic breaker operation.

9) WHEN REQUIRED

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

Check items	Service	Page
Fuel system		
· Fuel tank	Drain or Clean	6-25
· Water separator	Drain or Replace	6-26
· Fuel filter element	Replace	6-26
Engine lubrication system		
· Engine oil	Change	6-18, 19
· Engine oil filter	Replace	6-18, 19
Engine cooling system		
· Coolant	Add or Change	6-20, 21, 22, 23
· Radiator	Clean or Flush	6-20, 21, 22, 23
Engine air system		
· Air cleaner element(Primary, safety)	Replace	6-25
Hydraulic system		
· Hydraulic oil	Add or Change	6-28
· Return filter	Replace	6-29
· Drain line filter	Replace	6-30
· Pilot line filter	Replace	6-30
· Element of breather	Replace	6-30
· Suction strainer	Clean	6-29
Under carriage		
· Track tension	Check, Adjust	6-33
Bucket		
· Tooth	Replace	6-35
· Side cutter	Replace	6-35
· Linkage	Adjust	6-34
· Bucket assy	Replace	6-34

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	11.50(3.04)	1
	4	Radiator coolant	Check, Add	C	20(5.2)	1
	5	Fuel filter & water separator	Check, Drain	-	-	1
	6	Fan belt tension and damage	Check, Adjust	-	-	1
50 Hours or weekly	7	Attachment pins and 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(0.7)	1
	13	Track tension	Check, Adjust	-	-	2
250 Hours	14	Battery(voltage)	Check, Add	-	-	1
	15	Hydraulic oil return filter	Replace	-	-	1
	16	Drain filter cartridge	Replace	-	-	1
	17	Air breather element	Replace	-	-	1
	19	Line filter element	Replace	-	-	1
500 Hours	2	Engine oil	Change	EO	11.50(3.04)	1
	3	Engine oil filter	Replace	-	-	1
	5	Fuel filter & water separator	Check, Drain	-	-	1
	21	Air cleaner element(primary)	Clean	-	-	1
	22	Fuel filter element	Replace	-	-	1
	23	Radiator and oil cooler	Check, Clean	-	-	2
1000 Hours	10	Swing reduction gear case	Change	GO	2.5(0.7)	1
	11	Swing reduction gear grease	Check, Add	PGL	0.32(0.7)	1
	12	Swing gear and pinion	Change	PGL	5.3(11.7)	1
	24	Travel reduction gear case	Change	GO	2.5(0.7)	2
2000 Hours	1	Hydraulic oil level	Change	HO	100(26.4)	1
	4	Radiator coolant	Change	C	20(5.2)	1
	18	Hydraulic oil suction strainer	Check, Clean	-	-	1
As required	21	Air cleaner element(primary, safety)	Check, Replace	-	-	2

※ **Oil symbol**

Please refer to the recommended lubricants for specification.

DF : Diesel fuel GO : Gear oil

HO : Hydraulic oil C : Coolant

PGL : Grease EO : Engine oil

1) CHECK ENGINE OIL LEVEL

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

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

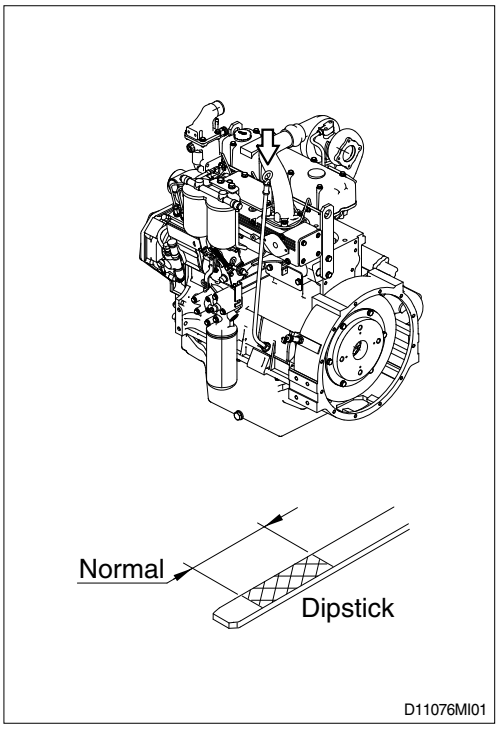
(2) Check the oil level by inserting the dipstick completely into the hole and pulling out again.

(3) If oil level is LOW, add oil and then check again.

※ **If the oil is contaminated or diluted, change the oil regardless of the regular change interval.**

※ **Check oil level after engine has been stopped for 15 minutes.**

⚠ **Do not operate unless the oil level is in the normal range.**

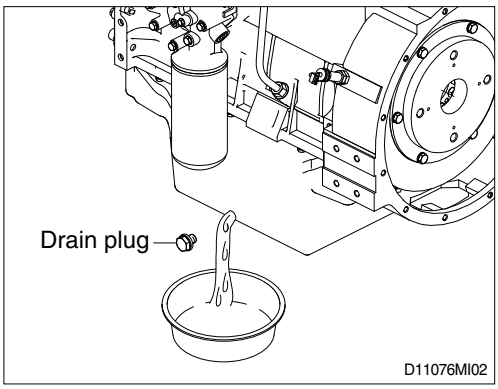


2) REPLACEMENT OF ENGINE OIL AND OIL FILTER

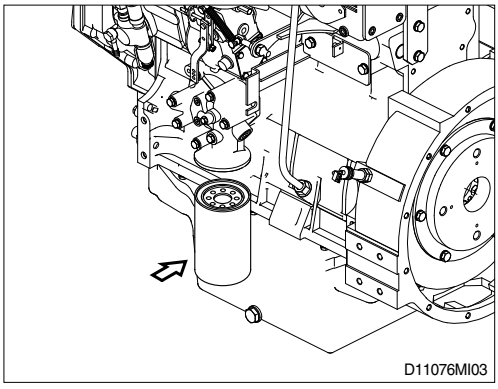
(1) Warm up the engine.

(2) Turn the lever to open position.

※ **A drain pan with a capacity of 11.5 liters (3.04U.S. gallons) will be adequate.**

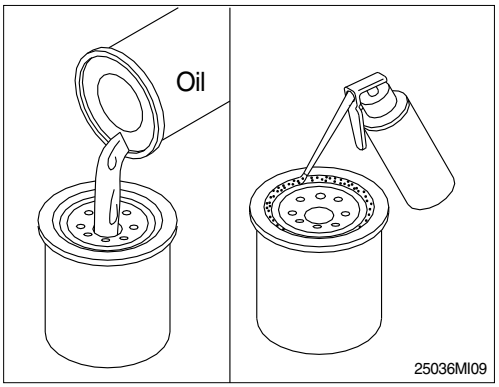


(3) Clean around the filter head, remove the filter with a filter wrench and clean the gasket surface.



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

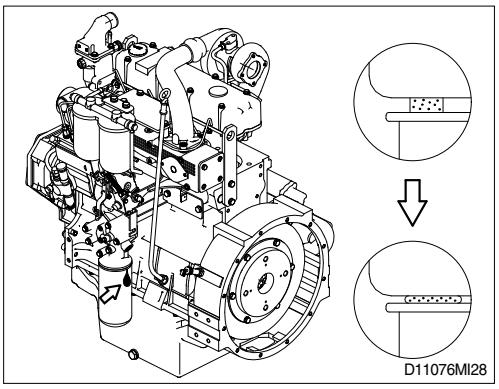
※ **Fill the filters with clean lubricating oil.**



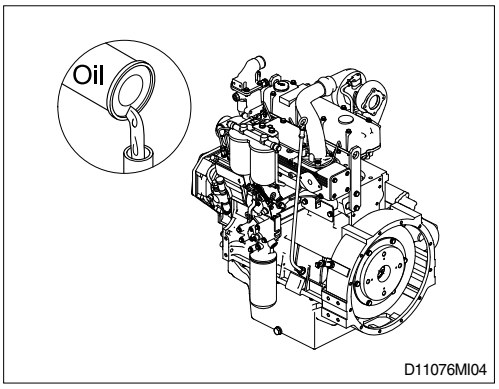
(5) Install the filter to the filter head.

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

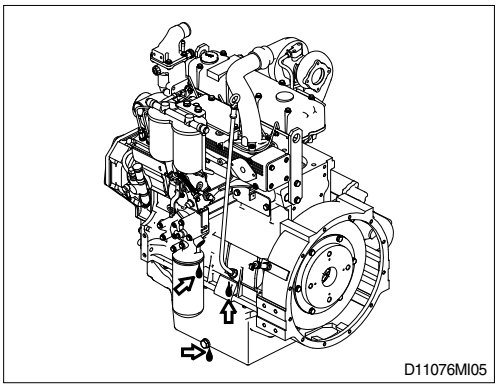
· Install the filter as specified by the filter manufacturer.



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



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



3) CHECK COOLANT

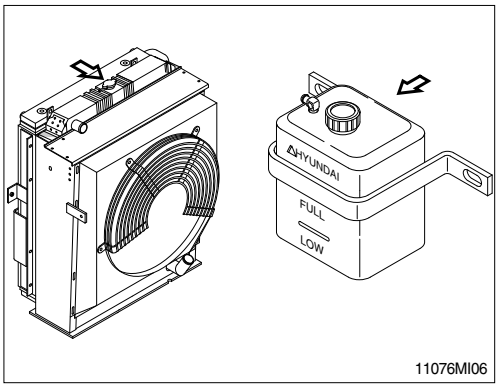
(1) Check if the level of coolant in reservoir tank is between FULL and LOW.

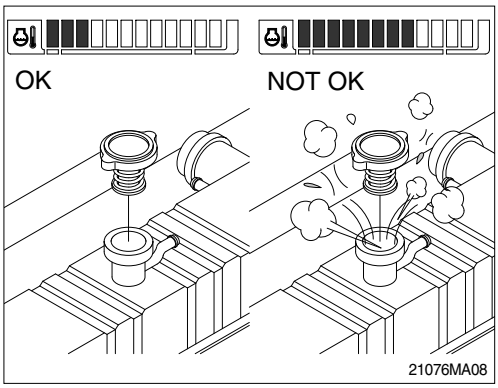
(2) Add the mixture of antifreeze and water after removing the cap of the reservoir tank if coolant is not sufficient.

(3) Be sure to add the coolant by opening the cap of radiator when coolant level is below LOW.

(4) Replace gasket of radiator cap when it is damaged.

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



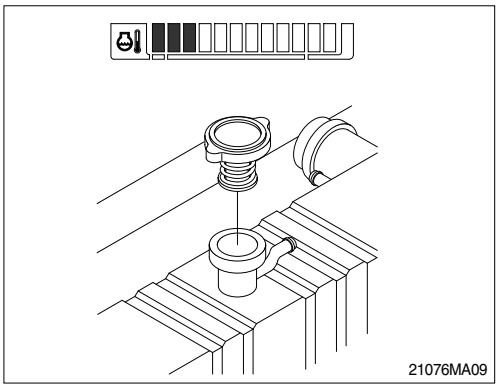


4) FLUSHING AND REFILLING OF RADIATOR

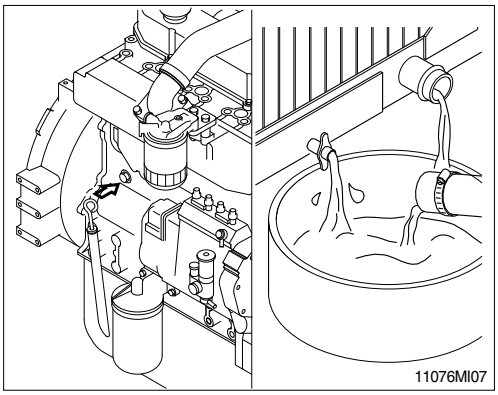
(1) Change coolant

⚠ **Avoid prolonged and repeated skin contact with used antifreeze. Such prolonged repeated contact can cause skin disorders or other bodily injury.**
Avoid excessive contact-wash thoroughly after contact.
Keep out of reach of children.

※ **Protect the environment : Handling and disposal of used antifreeze can be subject to federal, state, and local law regulation.**
Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze.
If in doubt, contact your local authorities for guidance as to proper handling of used antifreeze.



⚠ **Wait until the temperature is below 50°C (122°F) before removing the coolant system pressure cap.**
Failure to do so can cause personal injury from heated coolant spray.
Drain the cooling system by opening the drain valve on the radiator and removing the plug in the bottom of the water inlet. A drain pan with a capacity of 17.5 liters(4.6U.S.gallons) will be adequate in most applications.

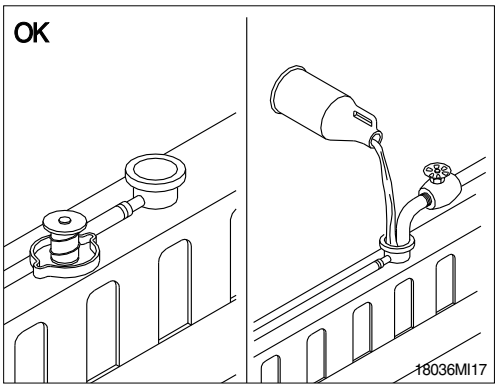


(2) Flushing of cooling system

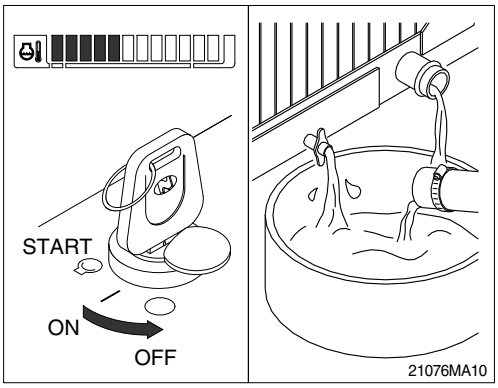
① Fill the system with a mixture of sodium carbonate and water(or a commercially available equivalent).

※ **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.**



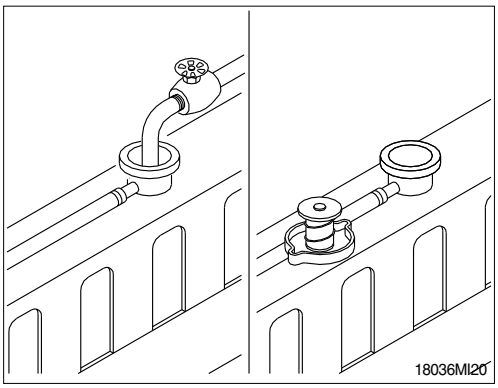
② Operate the engine for 5 minutes with the coolant temperature above 80℃(176℉).
Shut the engine off, and drain the cooling system.



③ Fill the cooling system with clean water.

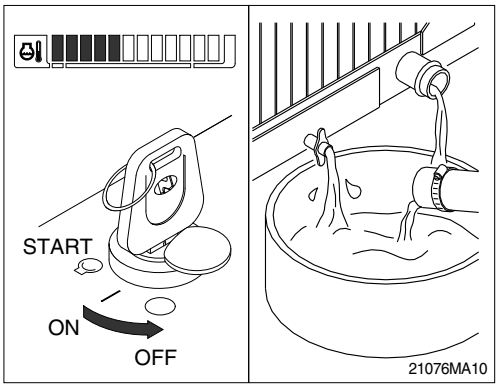
※ **Be sure to vent the engine and aftercooler for complete filling.**

※ **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.

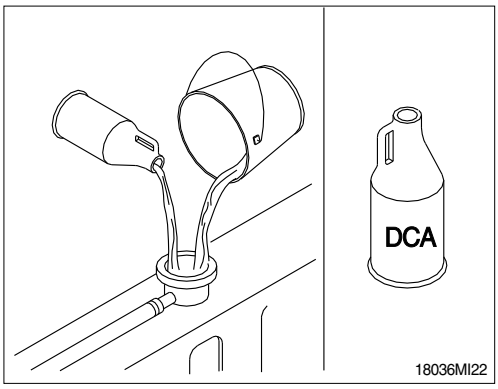
※ **If the water being drained is still dirty, the system must be flushed again until the water is clean.**



(3) Cooling system filling

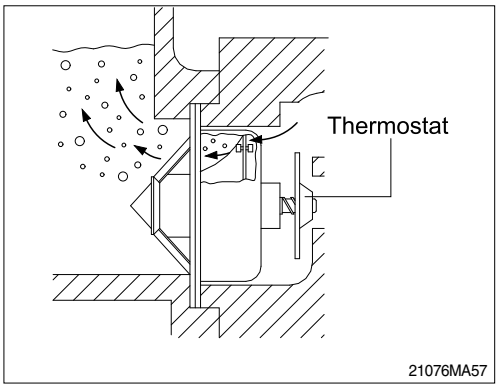
① Use a mixture of 50 percent water and 50 percent ethylene glycol antifreeze to fill the cooling system.
Coolant capacity(engine only) : 6 ℓ (1.6U.S. gallons)

※ **Use the correct amount of DCA4 corrosion inhibitor to protect the cooling system.**

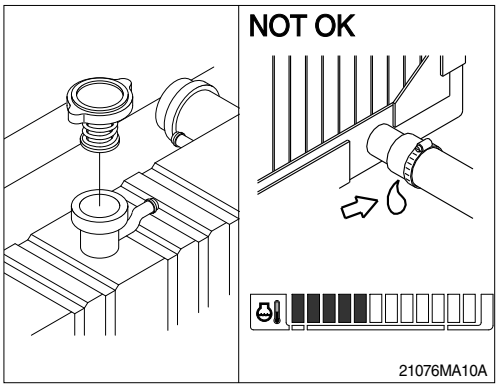


② The system has a maximum fill rate of 14 liters(3.5U.S. gallons) per minute.
Do not exceed this fill rate.

※ **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.

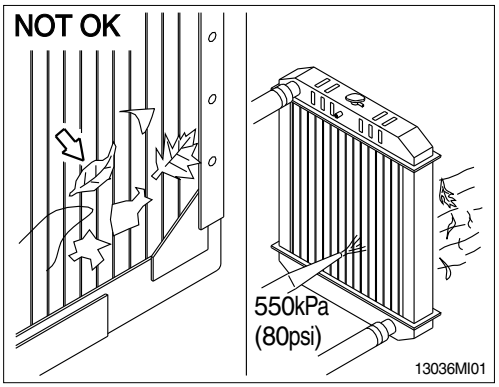


5) CLEAN RADIATOR AND OIL COOLER

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.

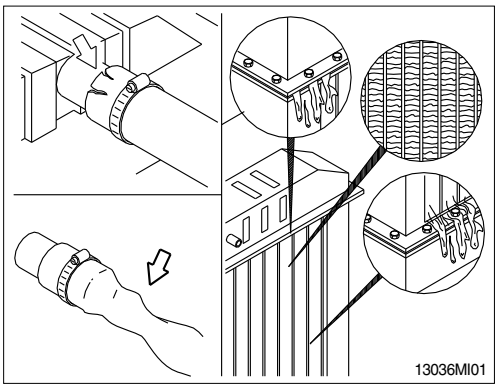
(2) Use 550kPa(80psi) air pressure to blow the dirt and debris from the fins.
Blow the air in the opposite direction of the fan air flow.



(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.**

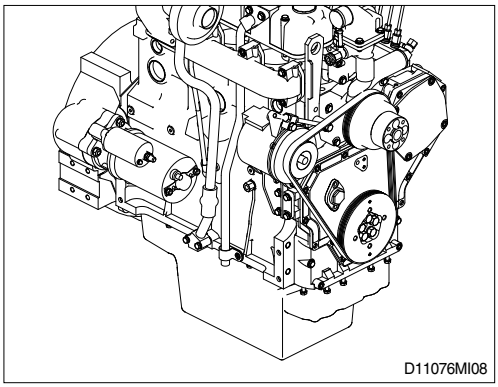
(4) Visually inspect the radiator for core and gasket leaks.



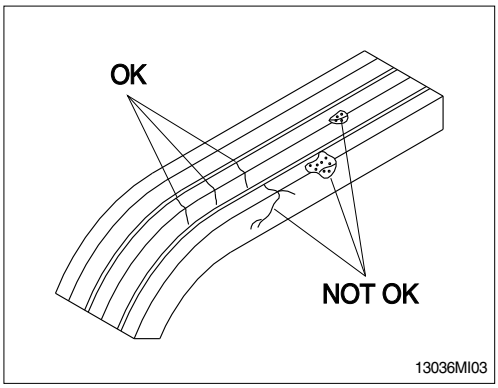
6) FAN BELT TENSION

(1) Measure the belt deflection at the longest span of the belt.

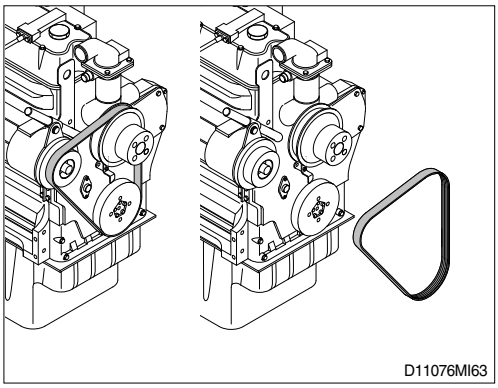
· Maximum deflection : 12㎜(0.5in)



(2) Inspect the drive for damage.



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



7) 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.

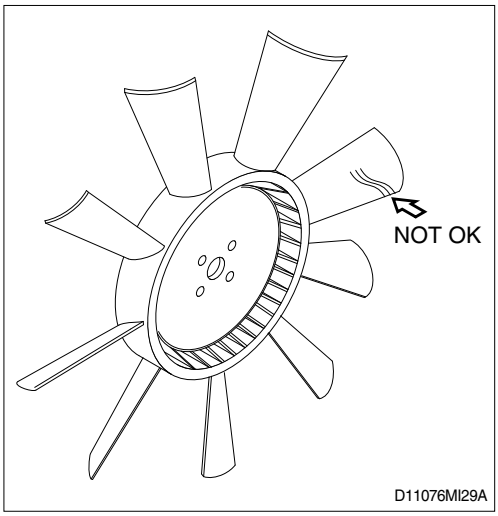
※ Rotate the crankshaft by using the engine barring gear.

※ 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.



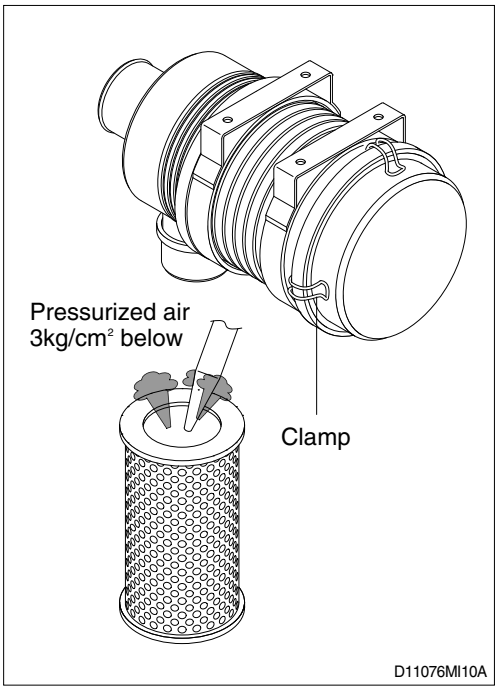
8) CLEANING OF AIR CLEANER

(1) Primary element

① Loosen the latch and remove the element.
② Clean the inside of the body.
③ Clean the element either with pressurized air or washing.
- **Using pressurized air**
  Remove the dust inside of the element by the pressurized air(below 3kgf/cm², 40psi) forward and backward equally.
- **Washing**
  Wash the element with a neutral detergent which does not cause bubbles.
  Dry off after washing with water.

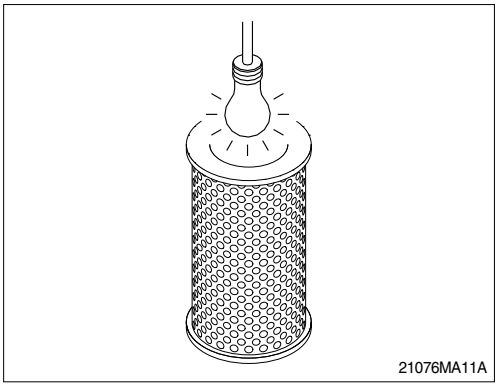
④ Inspect for cracks or damage of element by putting a light bulb inside of the element.
⑤ Insert element and tighten clamp.

※ **Replace the element with new one if damage is found.**
※ **Clean the air cleaner element when the air cleaner warning lamp on the cluster lights ON.**



(2) Safety element

※ **Replace the safety element only when the primary element is cleaned for the 4 times.**
※ **Always replace the safety element. Never attempt to reuse the safety element by cleaning the element.**

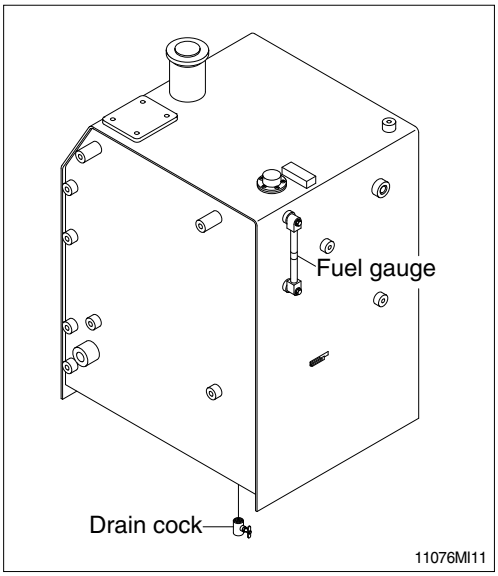


9) FUEL TANK

(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.



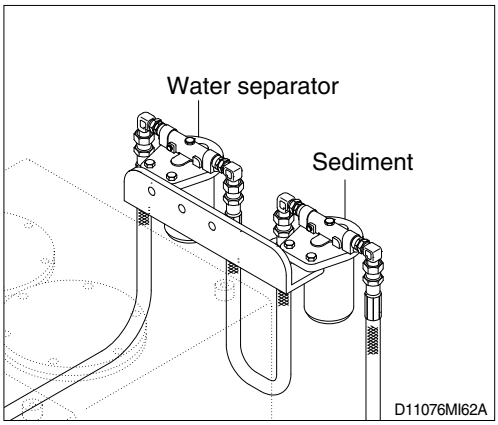
10) WATER SEPARATOR

(1) Drain the water and sediment by loosening the drain plug.

(2) Retighten the drain plug.

(3) Check for leakage.

※ **Bleed the air if the air is mingled on the fuel line when draining water.**



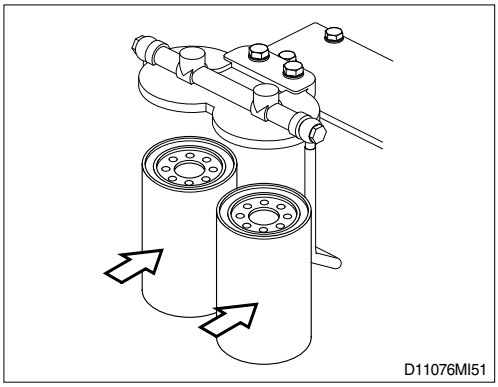
11) REPLACEMENT OF FUEL FILTER

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

(2) Apply a small amount of fuel to the O-ring of new cartridge.

(3) Install new cartridge by hand.

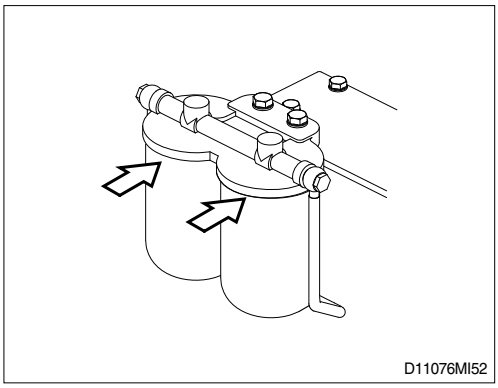
※ **Do not add fuel to the new cartridge. Invisible particles of dirt which might get inside the injection pump can damage its finely finished parts.**



(4) Relieve the air after mounting.

※ **Check for fuel leakage after the engine starts.**

※ **If air is in the fuel system, the engine will not start. Start engine after bleeding the air according to the method of bleeding air.**



12) BLEEDING THE FUEL SYSTEM

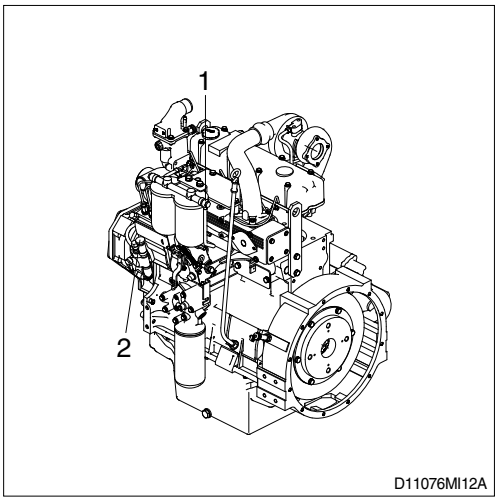
(1) Loosen air vent plug 1(Approximately 1.5 turns).

(2) Unlock priming pump plunger 2 and operate the pump.

(3) When the fuel flows free of air bubbles, lock the priming pump, then tighten the plug.

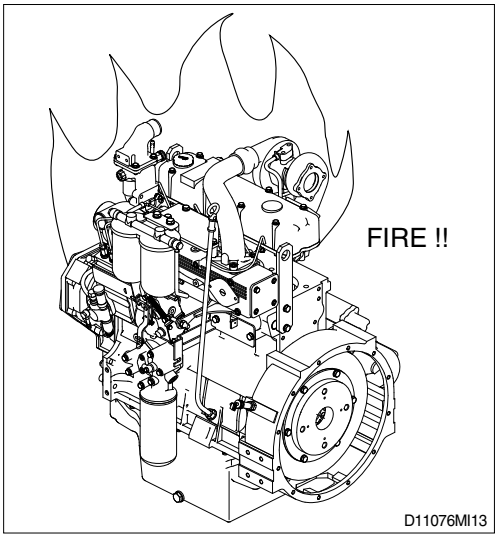
※ **If the vent plug is dosed before the priming pump plunger is locked, fuel pressure acts on the feed pump, resulting in inability to restore the plunger.**

※ **Clean up fuel spillage.**



13) 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.**

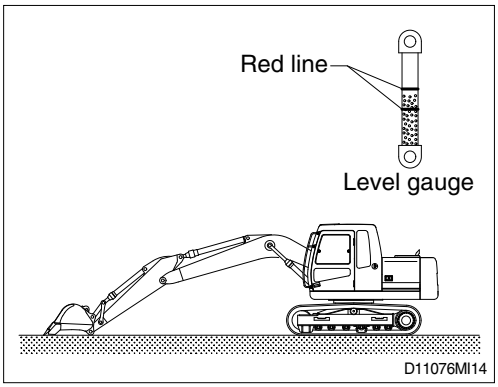


14) HYDRAULIC OIL CHECK

(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.



15) FILLING HYDRAULIC OIL

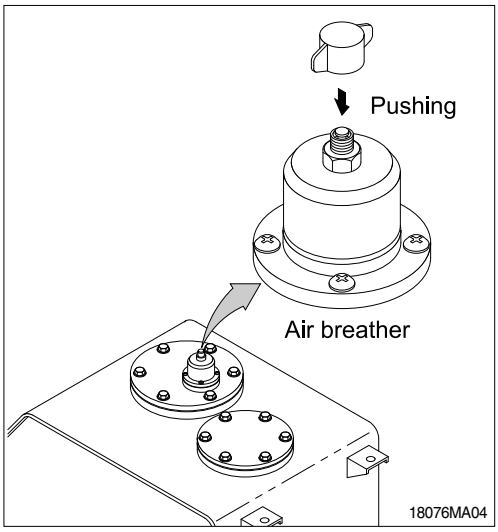
(1) Stop the engine to the position of level check.

(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±0.3kgf · m (10.4±2.1lbf · 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.



16) 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±1.4kgf · m (50±10lbf · ft)

(4) Prepare a suitable container.

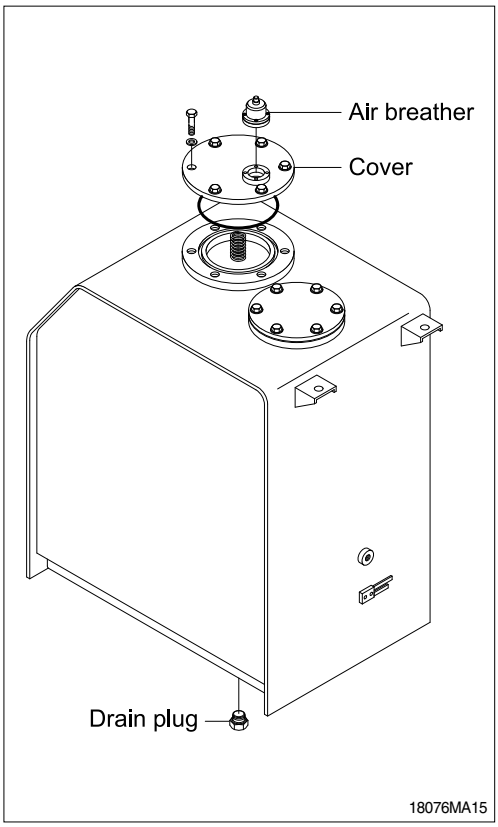
(5) To drain the oil loosen the drain plug at the bottom of the oil tank.

(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.



17) CLEAN SUCTION STRAINER

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

(1) Remove the cover on the top of the oil tank.
- Tightening torque : 6.9±1.4kgf · m (50±10lbf · ft)

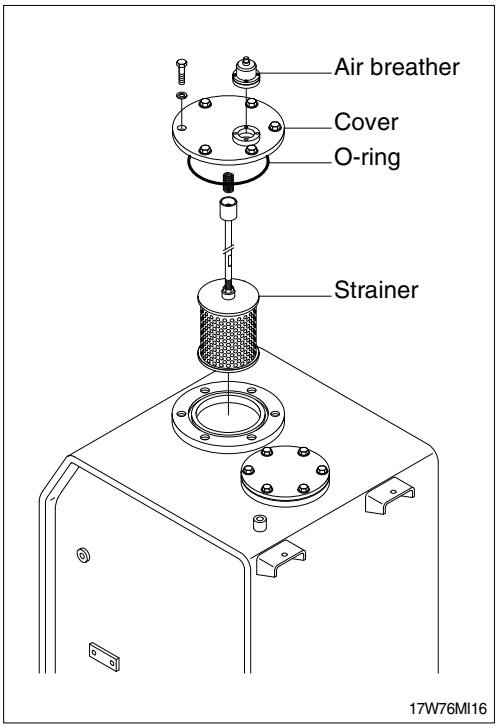
(2) Pull out the strainer in the tank.

(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.**



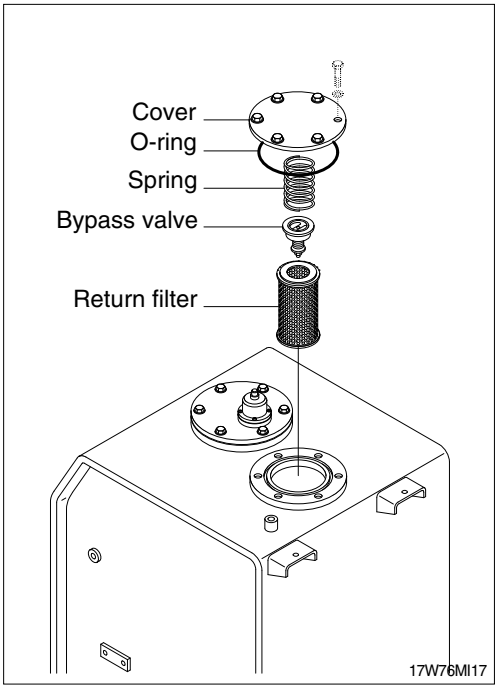
18) REPLACEMENT OF RETURN FILTER

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

(1) Remove the cover.
- Tightening torque : 6.9±1.4kgf · m (50±10lbf · ft)

(2) Remove the spring, by-pass valve, and return filter in the tank.

(3) Replace the element with new one.



19) 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.

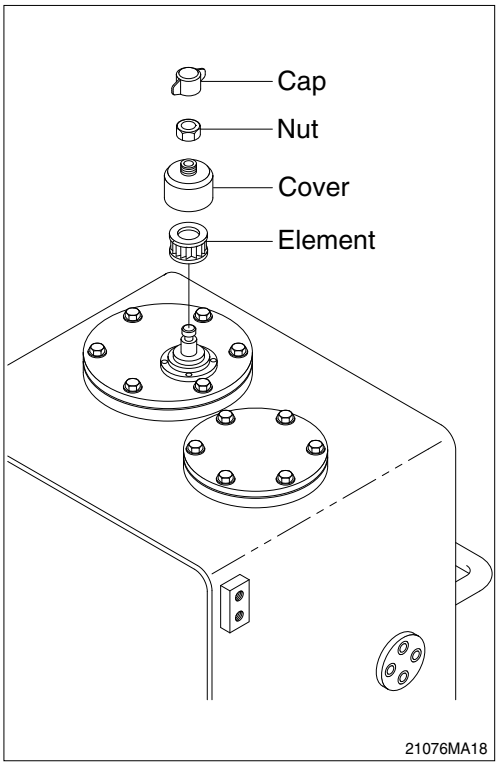
(2) Loosen the lock nut and remove the cover.

(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)

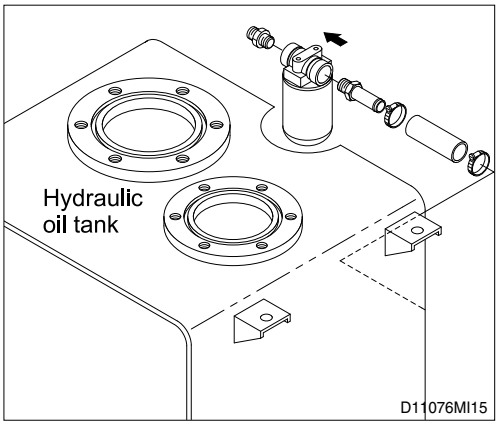


20) REPLACE OF DRAIN FILTER CARTRIDGE

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 50 hours of operation. Thereafter, change cartridge every 250 hours.**



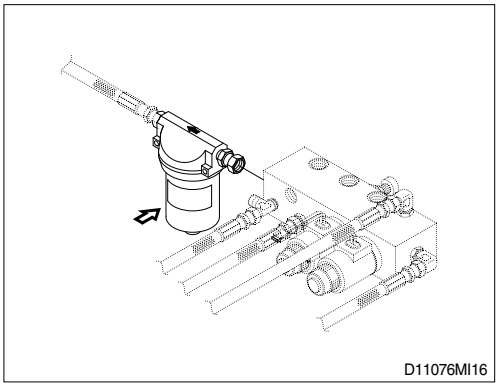
21) REPLACE OF PILOT LINE FILTER

(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 50 hours of operation. Thereafter, change cartridge every 250 hours.**

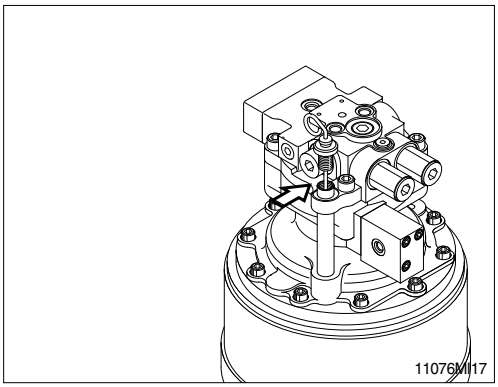


22) CHECK THE SWING REDUCTION GEAR OIL

(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.



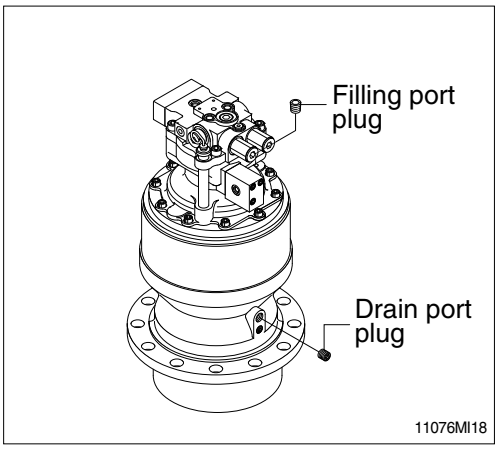
23) CHANGE SWING REDUCTION GEAR OIL

(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 (0.7U.S.gal)



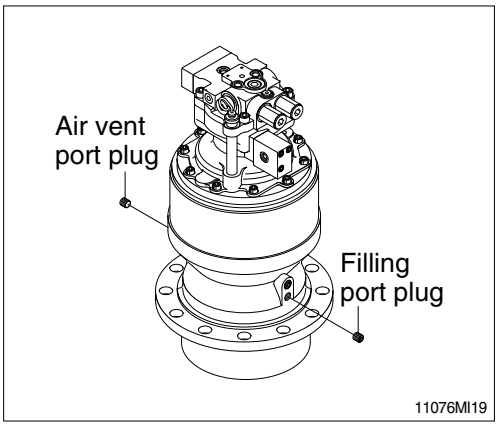
24) LUBRICATE BEARING OF OUTPUT SHAFT IN REDUCTION GEAR

(1) Remove air vent plug.

(2) Remove grease fill plug and install grease fitting at that place.

(3) Lubricate NLGI No.2 with grease gun until comes out new grease from air vent port.

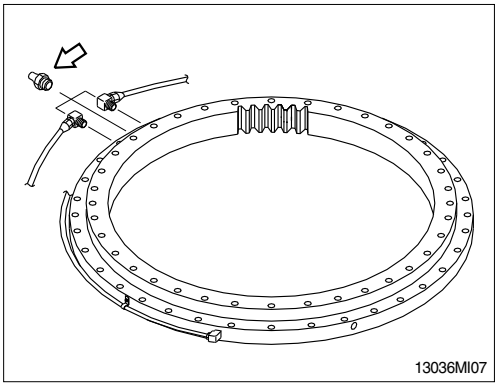
※ **Lubricate every 1000 hours.**



25) LUBRICATE SWING BEARING

(1) Grease at 3 fitting.

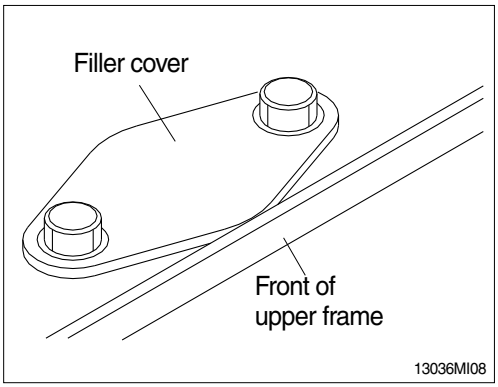
※ **Lubricate every 50 hours.**



26) SWING GEAR AND PINION

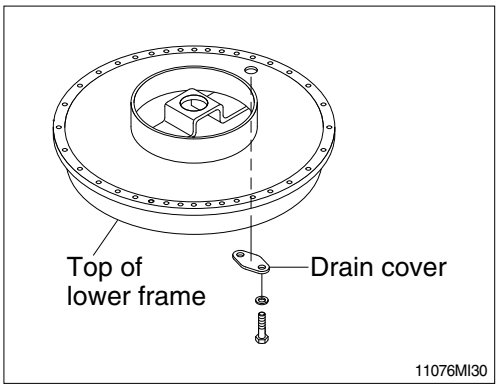
(1) Drain old grease

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

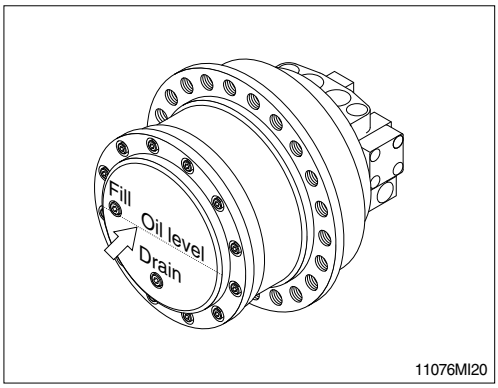
① Install drain cover.
② Fill with new grease.
③ Install filler cover.
· Capacity : 4.0 ℓ (1.1 U.S.gal)



27) 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)



28) CHANGE OF THE TRAVEL REDUCTION GEAR OIL

(1) Raise the temperature of the oil by traveling machine first.

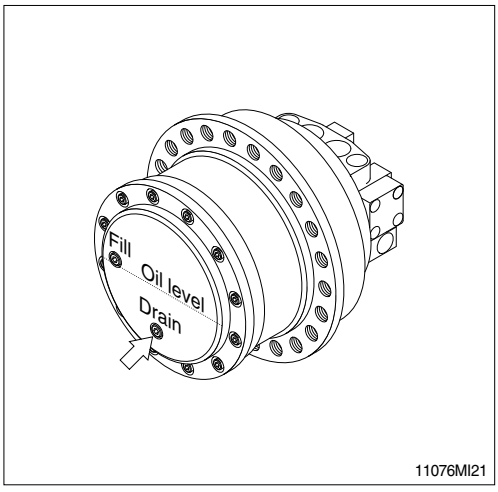
(2) Stop when the position of the drain plug is down.

(3) Loosen the level plug and then the drain plug.

(4) Drain the oil to adequate container.

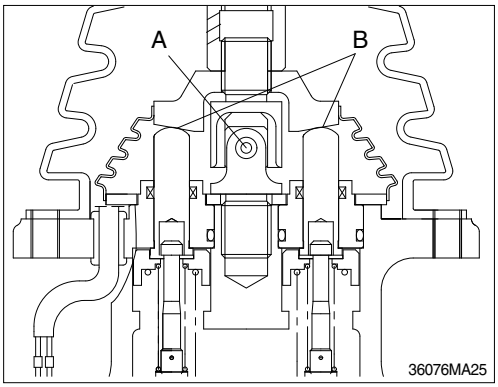
(5) Tighten the drain plug and fill specified amount of oil at filling port.

(6) Tighten the level plug and travel slowly to check if there is any leakage of oil.



29) LUBRICATE RCV LEVER

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



30) ADJUSTMENT OF TRACK TENSION

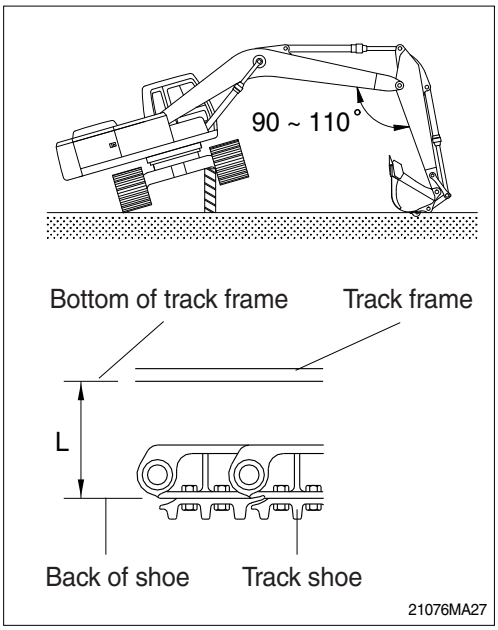
※ It is important to adjust the tension of track properly to extend the lifetime of track and traveling device.

※ 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"

31) REPLACEMENT OF BUCKET

⚠ **When knocking the pin in with a hammer, metal particles may fly and cause serious injury, particularly if they get into your eyes. When carrying out this operation, always wear goggles, helmet, gloves, and other protective equipment.**

※ **When the bucket is removed, place it in a stable condition.**

※ **When performing joint work, make sure signals to each other and work carefully for safety's sake.**

(1) Lower the bucket on the ground as the picture shown in the right.

(2) Lock the safety lever to the LOCK position and stop the engine.

(3) Remove the stopper bolts(1) and nuts(2), then remove pins(3, 4) and remove the bucket.

※ **When removing the pins, place the bucket so that it is in light contact with the ground.**

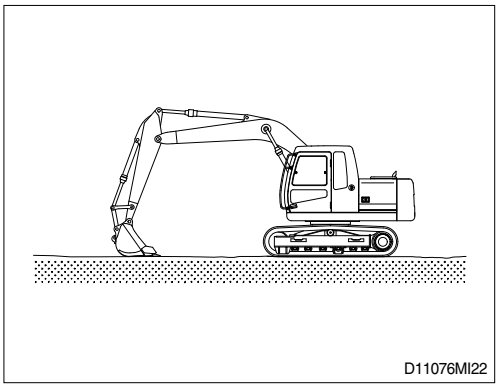
※ **If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.**

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

(4) Align the arm with holes(A) and the link with holes(B), then coat with grease and install pins(3, 4)

※ **When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the bucket as shown in the picture. After knocking the pin, move the O-ring down to the regular groove.**

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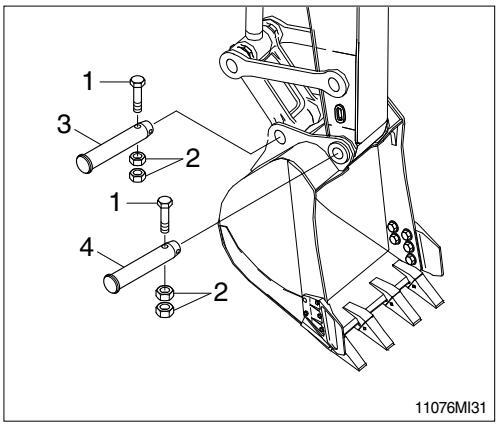

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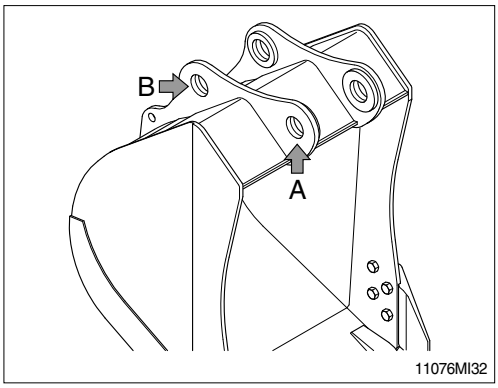

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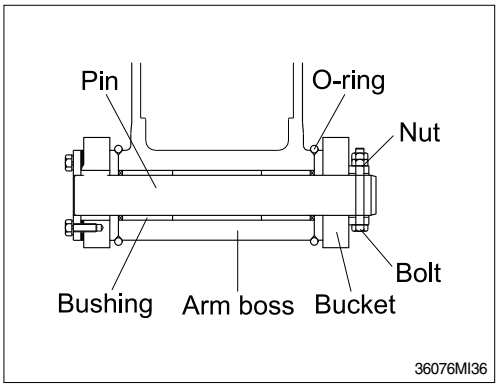

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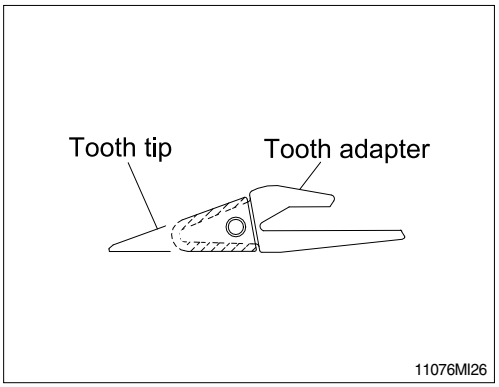
32) REPLACEMENT OF BUCKET TOOTH

(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.

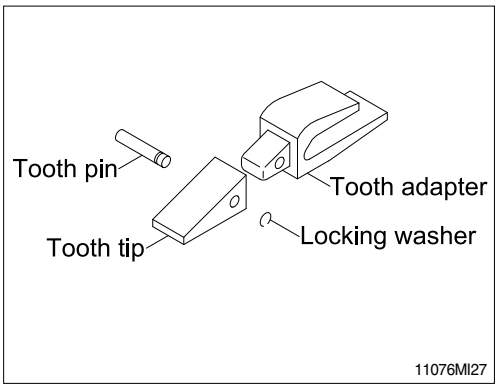
② Remove dust and mud from surface of tooth adapter by using knife.

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.



33) ADJUSTMENT OF BUCKET CLEARANCE

(1) Lower the bucket on the ground as the picture shown in the right.

(2) Swing to the left and keep the arm boss to be contact to the bucket left.

(3) Lock the safety lever to the LOCK position and stop the engine.

(4) Measure the clearance(A) between bucket and arm boss. This is the total clearance.

(5) Adjusting

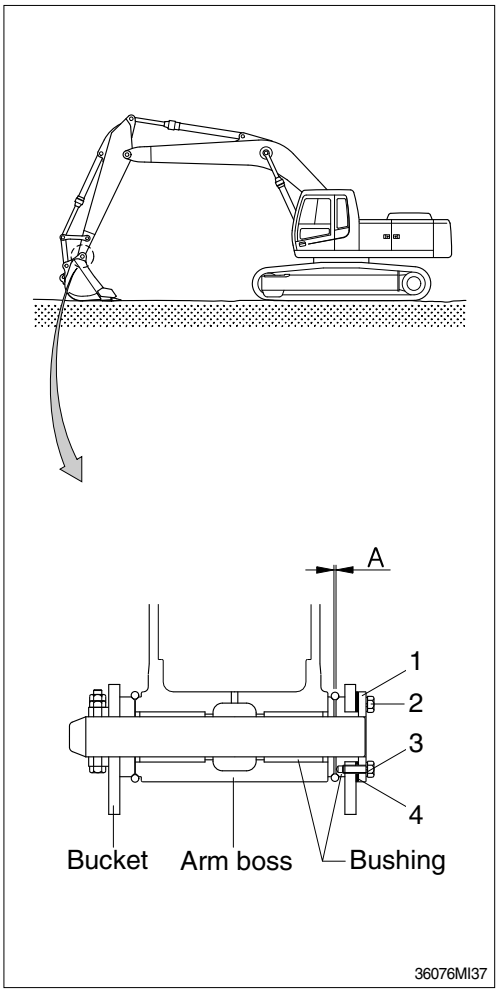
① Loosen bolt(2), and remove washer(3), plate(1) and shim(4).

② Remove the shim equivalent value with measuring value.

③ Assemble the parts in the reverse order of removal.

- Tightening torque : 29.6±3.2kgf · m (214.0±23.1lbf · ft)
- Normal clearance : 0 ~ 0.5mm (0 ~ 0.02in)

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

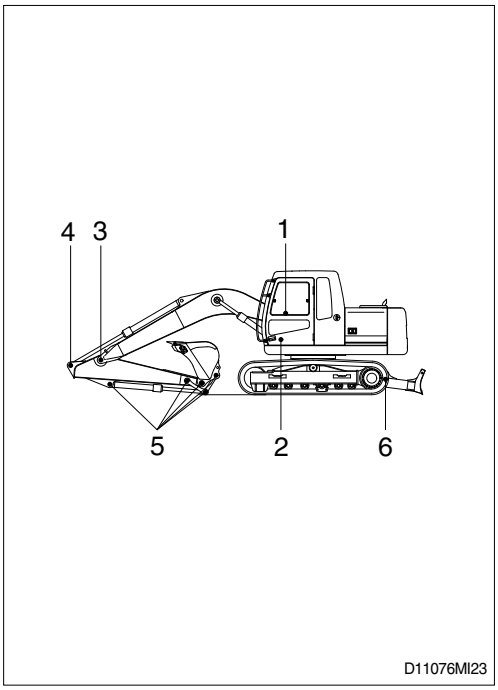


34) LUBRICATE PIN AND BUSHING

(1) Lubricate to each pin of working device

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

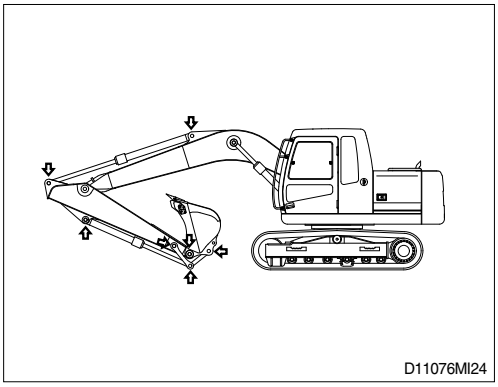
No.	Description	Qty
1	Lubrication manifold at boom	5
2	Boom cylinder pin	1
3	Boom and arm connection pin	1
4	Arm cylinder pin(Rod side)	1
5	Bucket cylinder pin(Head, rod)	2
	Bucket link(Control rod)	3
	Arm and bucket connection pin	1
	Arm and control link connection pin	1
6	Dozer blade cylinder pin	3



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

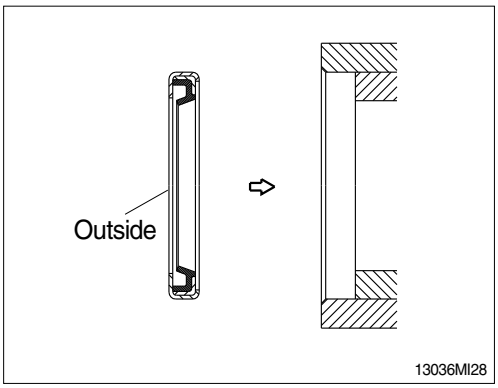
(2) Dust seals are mounted on the rotating part of working device to extend the lubricating interval.

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



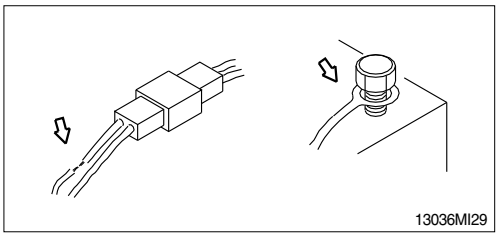
※ **If it is assembled in wrong direction, it will cause fast wear of pin and bushing, and create noise and vibration during operation.**

※ **Assemble the seal same direction with picture and use with plastic hammer when replace.**



1) WIRING, GAUGES

Check regularly and repair loose or malfunctioning gauges when found.



2) BATTERY

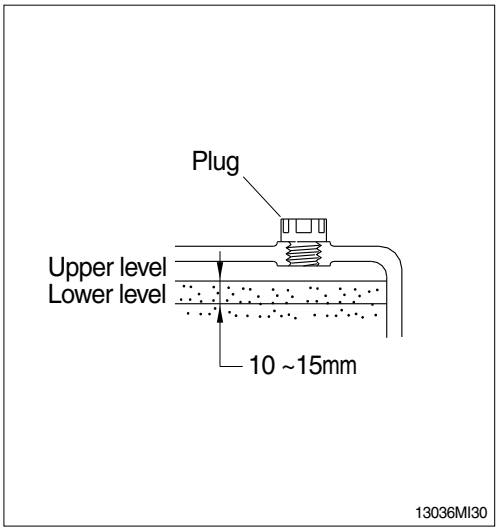
(1) Check and repair

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.

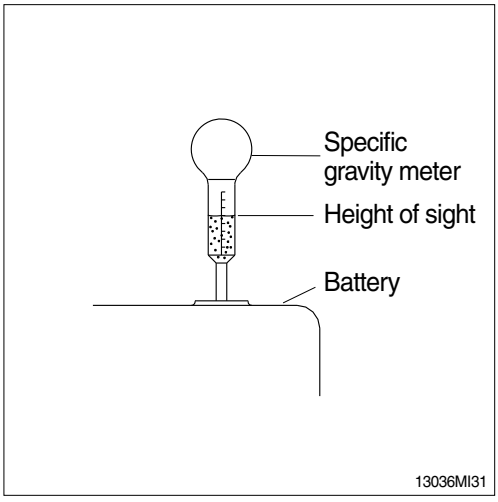


(2) Specific gravity of battery

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

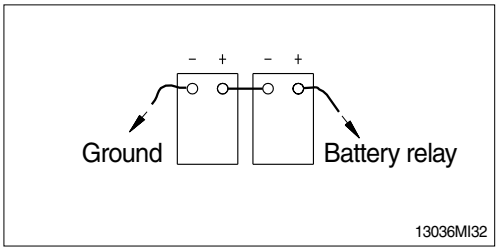
Check the charging rate by referring to the chart below.

Temperature / Charging rate	20℃ (68°F)	10°C (50°F)	-10°C (14°F)
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

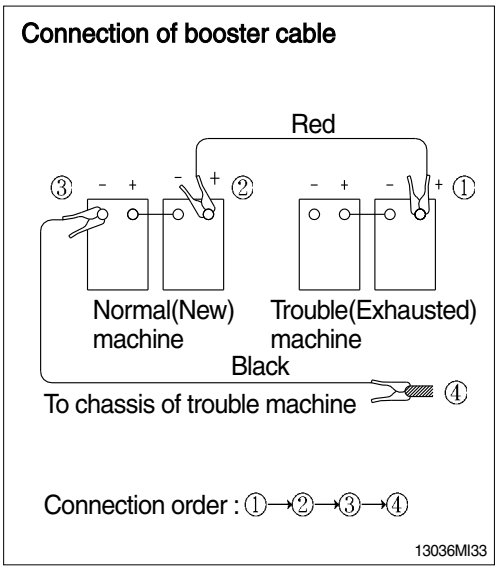
※ **Use the same capacity of battery for starting.**

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.**

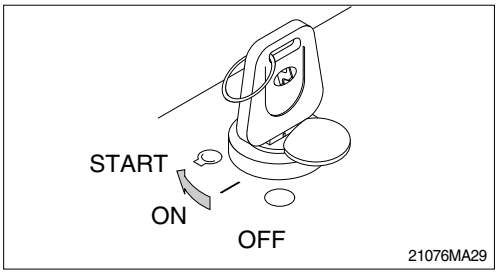


(2) Starting the engine

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.

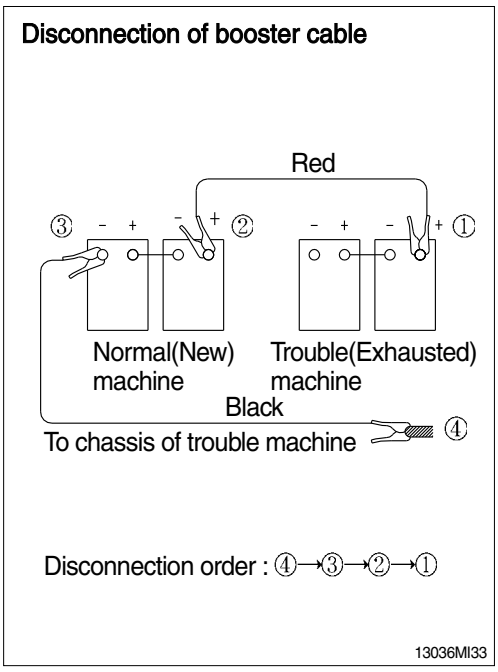
③ Run engine with high idle until charging the exhausted battery by alternator, fully.

⚠ **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.

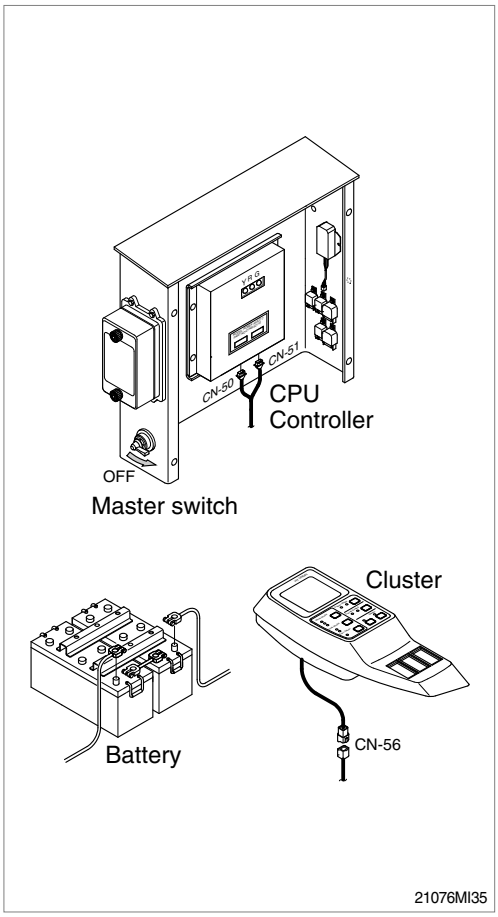
③ Before carrying out any electric welding on the machine, the battery cables should be disconnected and the connectors pulled out of the electronic control units(CPU, cluster etc).

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.



1. ENGINE

This guide is not intended to cover every conditions, however many of the more common possibilities are listed.

Trouble	Service	Remark
The engine oil pressure lamp lights ON when engine speed is raised after completion of warm up.	· Add the oil to the specified level. · Replace the oil filter cartridge. · Check oil leakage from the pipe or the joint. · Replace the monitor.	
Steam is emitted from the top part of the radiator(The pressure valve). Coolant level warning lamp lights ON.	· Supply the coolant and check leakage. · Adjust fan belt tension. · Wash out inside of cooling system. · Clean or repair the radiator fin. · Check the thermostat. · Tighten the radiator cap firmly or replace the packing of it. · Replace the monitor.	
The engine does not start when the starting motor is turned over.	· Add fuel. · Repair where air is leaking into fuel system. · Check the injection pump or the nozzle. · Check the valve clearance. · Check engine compression pressure.	
Exhaust gas is white or blue.	· Adjust to specified oil quantity. · Replace with specified fuel.	
Exhaust gas occasionally turns black.	· Clean or replace the air cleaner element. · Check the nozzle. · Check engine compression pressure. · Clean or replace the turbocharger.	
Combustion noise occasionally changes to breathing sound.	· Check the nozzle.	
Unusual combustion noise or mechanical noise.	· Check with specified fuel. · Check over-heating · Replace the muffler. · Adjust valve clearance.	

2. ELECTRICAL SYSTEM

Trouble	Service	Remark
Lamp does not glow brightly even when engine runs at high speed. Lamp flickers while engine runs.	· Check for loose terminals and open-circuit wiring. · Adjust belt tension.	
Battery charging lamp does not go out even when engine runs at high speed.	· Check the alternator. · Check and repair wiring.	
Unusual noise is emitted from the alternator.	· Check the alternator.	
Starting motor does not turn when starting switch is turned ON.	· Check and repair the wiring. · Charge the battery. · Check the starting motor. · Check the safety relay.	
The pinion of the starting motor keeps going in and out.	· Charge the battery. · Check the safety relay.	
Starting motor turns the engine sluggishly.	· Charge the battery. · Check the starting motor.	
The starting motor disengages before the engine starts up.	· Check and repair the wiring. · Charge the battery.	
The engine warming up lamp does not go ON.	· Check and repair wiring. · Check the monitor.	
The engine oil pressure lamp does not light up when engine is stationary(When the starting switch is in ON position.)	· Check the monitor. · Check the caution lamp switch.	
Battery charging lamp does not light up when the engine is stationary. (When the starting switch is in ON position.)	· Check the monitor. · Check and repair the wiring.	

3. OTHERS

Trouble	Service	Remark
Track slip out of place. Excessive wear of the sprocket.	· Adjust tension of track.	
Bucket either rises slowly or not at all.	· Add oil to specified level.	
Slow speed of travel, swing, boom, arm and bucket.	· Add oil to specified level.	
Unusual noise emitted from pump.	· Clean the hydraulic tank strainer.	
Excessive oil temperature rise of hydraulic oil.	· Clean the oil cooler. · Adjust fan belt tension. · Add oil to specified level.	

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 ROBEX110-7 system is 330kgf/cm²(4700psi).

4) The accumulator should be used to the breaker charging and return line.
   If the accumulator is not used, it will be damage as the input wave is delivered.

※ **Keep the pressure pulsation of pump below 60kgf/cm²(853psi) by installing the accumulator.**

5) Do not connect the breaker return line to the main control, but connect to the return line front of the cooler.
6) Do not connect the breaker return line to drain lines, such as of swing motor, travel motor or pump, otherwise they should be damaged.
7) One of spool of the main control valve should be connected to the tank.
8) Select the size of pipe laying considering the back pressure.
9) Seamless tube should be used for the piping. The hose and seal should be used Hyundai genuine parts.
10) 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

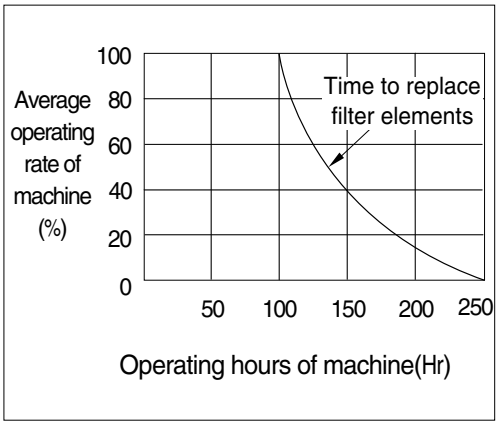
unit : hours

Attachment	Operating rate	Hydraulic oil	Filter element
Bucket	100%	2,000	250
Breaker	100%	600	100

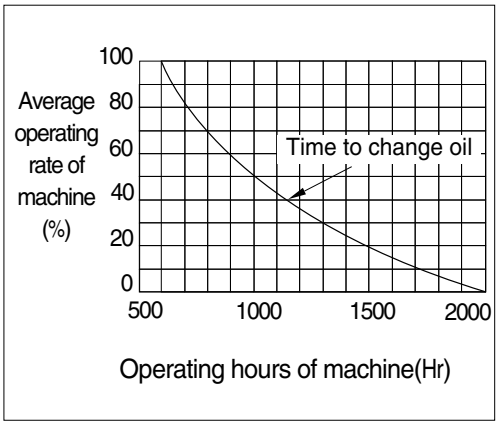
● **Replace following filter same time**

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

Filter replace guide for hydraulic breaker



Oil change guide for hydraulic breaker

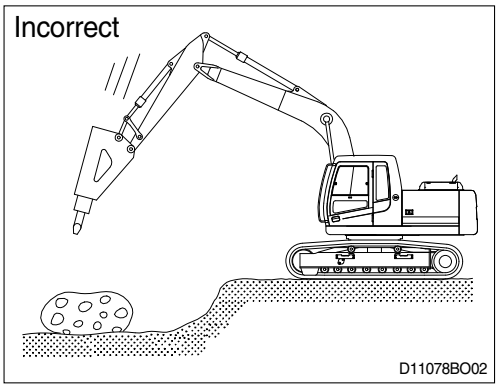


4. PRECAUTIONS WHILE OPERATING THE BREAKER

1) DO NOT BREAK ROCK WHILE LOWERING

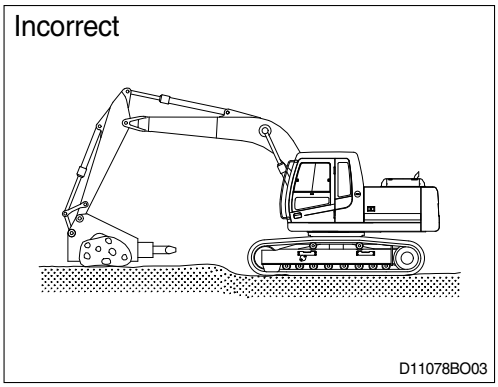
As the breaker is heavy in comparison with bucket, it must be operated slowly.

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



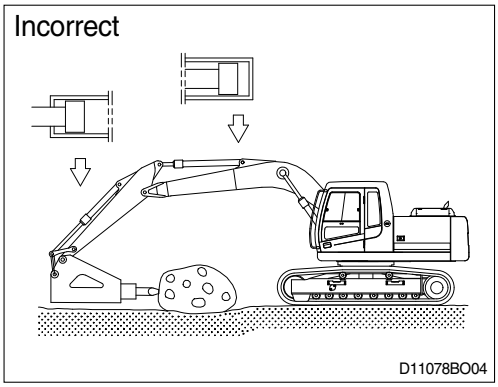
2) DO NOT USE BREAKER TO CARRY BROKEN STONE OR ROCK BY SWING OPERATING

This may damage the operation device and swing system.



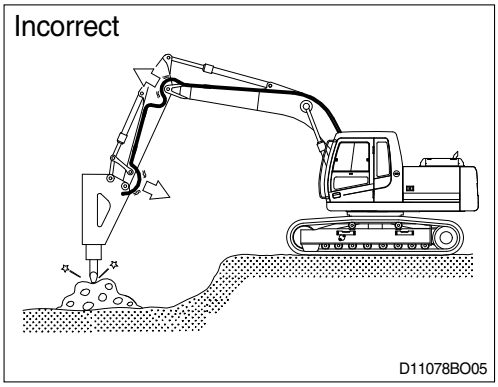
3) OPERATE BREAKER WITH A GAP IN EXCESS OF 100mm(4 inches) FROM THE END OF THE STROKE TIP

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



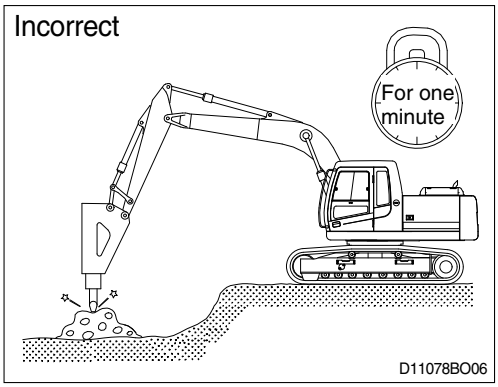
4) IF THE HYDRAULIC HOSES VIBRATE EXCESSIVELY

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

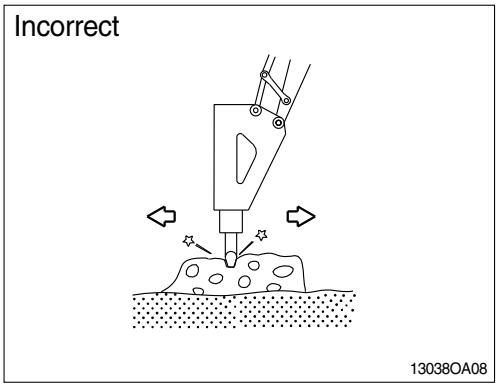
This will increase the temperature of the oil, and cause problem in the accumulator and seals.



6) DO NOT MOVE MACHINE OR BREAKER WHILE STRIKING

Do not move hammer while striking.

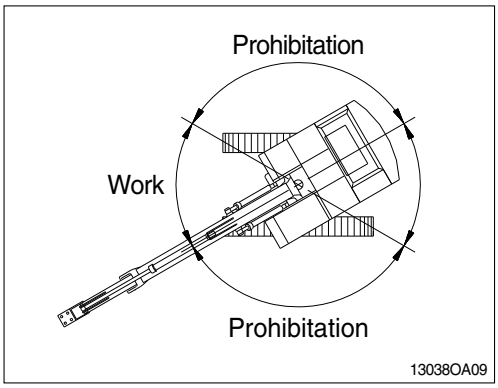
This will cause damage to the working device and the swing system.



7) DO NOT WORK WHILE SWING STATE

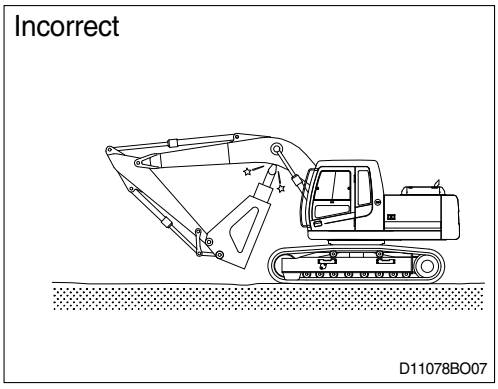
Do not work while swing position of superstructure.

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.

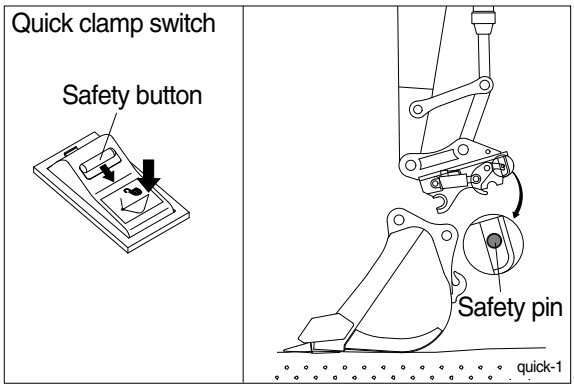


5. QUICK CLAMP

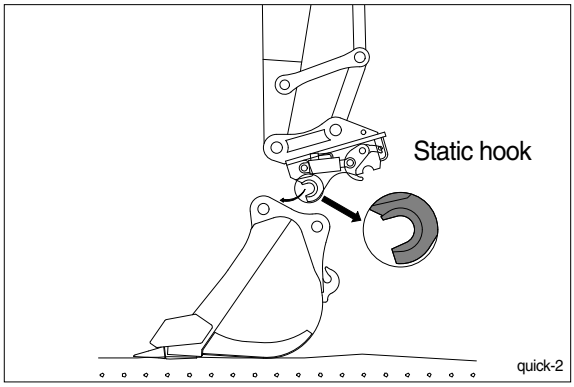
1) FIXING BUCKET WITH QUICK CLAMP

(1) Before fixing bucket, remove safety pin of the moving hook.

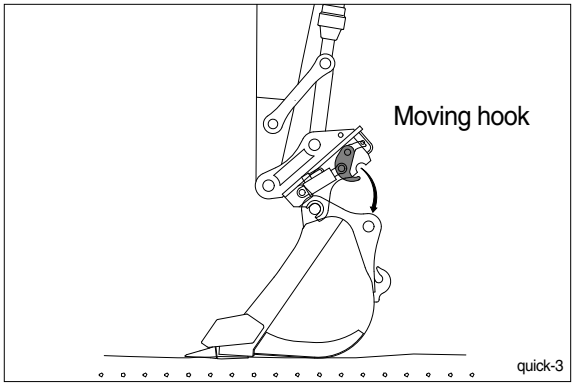
(2) Pulling safety button, press the quick clamp switch to unlock position. Then, the moving hook is placed on release position.



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

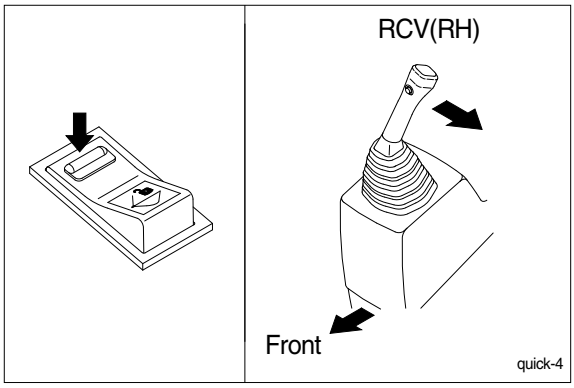


(4) Operate RCV lever to bucket-in position. Then, the moving hook is coupled with the bucket link pin.
Make sure that the moving hook is completely contacted with bucket link pin.

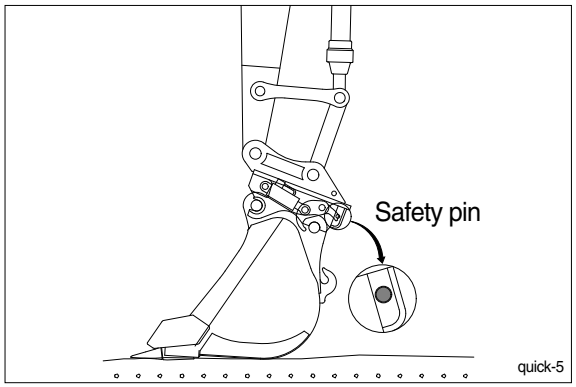


(5) Press quick clamp switch to lock position.
Operate RCV lever to bucket-in position.

※ **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**.

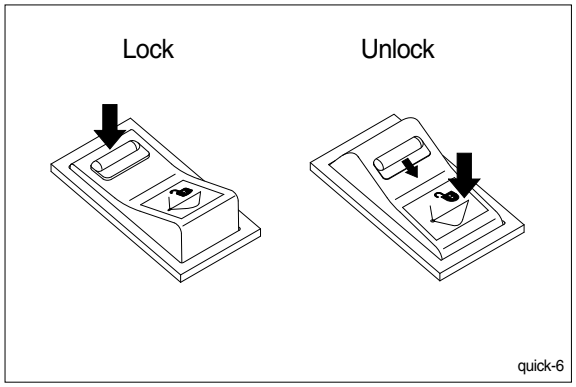


2) REMOVE BUCKET FROM QUICK CLAMP

Removing procedure is reverse of fixing.

3) PRE-CAUTION OF USING QUICK CLAMP.

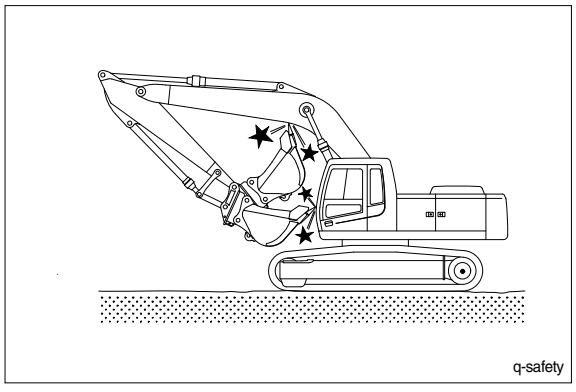
⚠ **When operating the machine with quick clamp, confirm that the quick clamp switch is lock position and safety pin of moving hook is inserted.**
Operating the machine with quick clamp switch unlocked and without safety pin of moving hook can cause the bucket to drop off and bring about the accident.



⚠ **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.**



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