

OPERATION MANUAL

CRAWLER CRANE LC383M-5

Serial No. 11001 and up

WARNING

Unsafe use of this machine may cause serious injury or death. Operators must read this manual before operating this machine. This manual should be kept near the machine for reference and periodically reviewed by all personnel who will come into contact with it.

NOTICE

MAEDA has Operation Manual written in some other languages. If a foreign language manual is necessary, contact your local distributor for availability.

M A E D A



M A D A

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1. INTRODUCTION

Thank you for purchasing our Crawler Crane “LC383M-5”.

This manual is a guidebook for safe and effective use of this machine.

This manual describes the procedures for proper operation and maintenance of the machine.

Warnings and precautions defined in this manual shall be observed for safety.

Many of the accidents are caused by failure to observe the basic precautions for operation, inspection and maintenance.

Be sure to read this manual and understand the procedures for machine operation, inspection, and maintenance thoroughly before performing any operation of this machine.

Failure to observe the basic precautions defined in this manual may lead to hazardous accidents.

WARNING

Failure to use this machine properly can lead to serious personal injury or death. Operators and maintenance personnel must always read this manual prior to operation or maintenance of this machine.

Keep this manual at a designated place for reference when necessary. All personnel who work with this machine are to carry out periodic reference to the manual.

- **Only those who have a thorough understanding of the fundamental procedures provided in this manual are allowed to operate this machine.**
- **Keep this manual handy for reference when necessary.**
- **Should you lose or damage this manual, contact Maeda or our sales service agency immediately for ordering a new manual.**
- **This manual should always accompany this machine upon transfer of the machine to the next owner. However, when the machine is sold to a third party without any prior advice to us, we are not liable for any warranty.**
- **This manual has adopted data that was available at the time of the creation of the manual.**

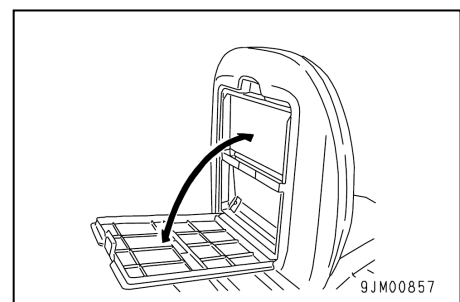
The contents of this manual, including maintenance specifications, tightening torque, pressure, measuring method, adjustment value, and illustrations, are subject to change without notice.

Machine maintenance may be subject to revisions. Always obtain the latest information from Maeda or our sales service agency before performing maintenance of this machine.

For safety instructions, see “2. For Safe Use of Machine” on page 1-3 and “Safety” on page 2-1.

[Storage location for the Operation and Maintenance Manual]

Magazine pocket on the back of operator's seat



2. FOR SAFE USE OF MACHINE

This manual classifies the risks into the following three categories to present the details of the safety labels in a easy-to-understand manner.

DANGER

This denotes that there is an imminent hazard which will cause serious personal injury or death.

The method of hazard circumvention is stated.

WARNING

This denotes that there is a hazard which can cause serious personal injury or death.

The method of hazard circumvention is stated.

CAUTION

This denotes that there is a potential hazard which may cause minor or moderate personal injury or serious damage to this machine.

The method of hazard circumvention is stated.

This manual also provides the following to indicate what must be observed for the sake of the machine and what will be of help.

CAUTION

This denotes that failure to handle the machine properly may damage the machine or shorten its life.

NOTES

This denotes helpful information.

Not only procedures for operation, inspection, and maintenance of this machine described in this manual but also safety precautions that may pertain to the case where this machine is only used for specified tasks.

Every circumstance incidental to use of this machine is unforeseeable, and therefore, cautions given in this manual and on this machine do not necessarily cover every safety-related issue.

Necessary safety actions should be taken under your responsibility if operation, inspection, and maintenance in a situation that is not described in this manual are performed.

Even in the above case, never attempt work or operations that this manual prohibits doing.

3. MACHINE OVERVIEW

3.1 SPECIFIED OPERATIONS

This machine is for use with the operations listed below.

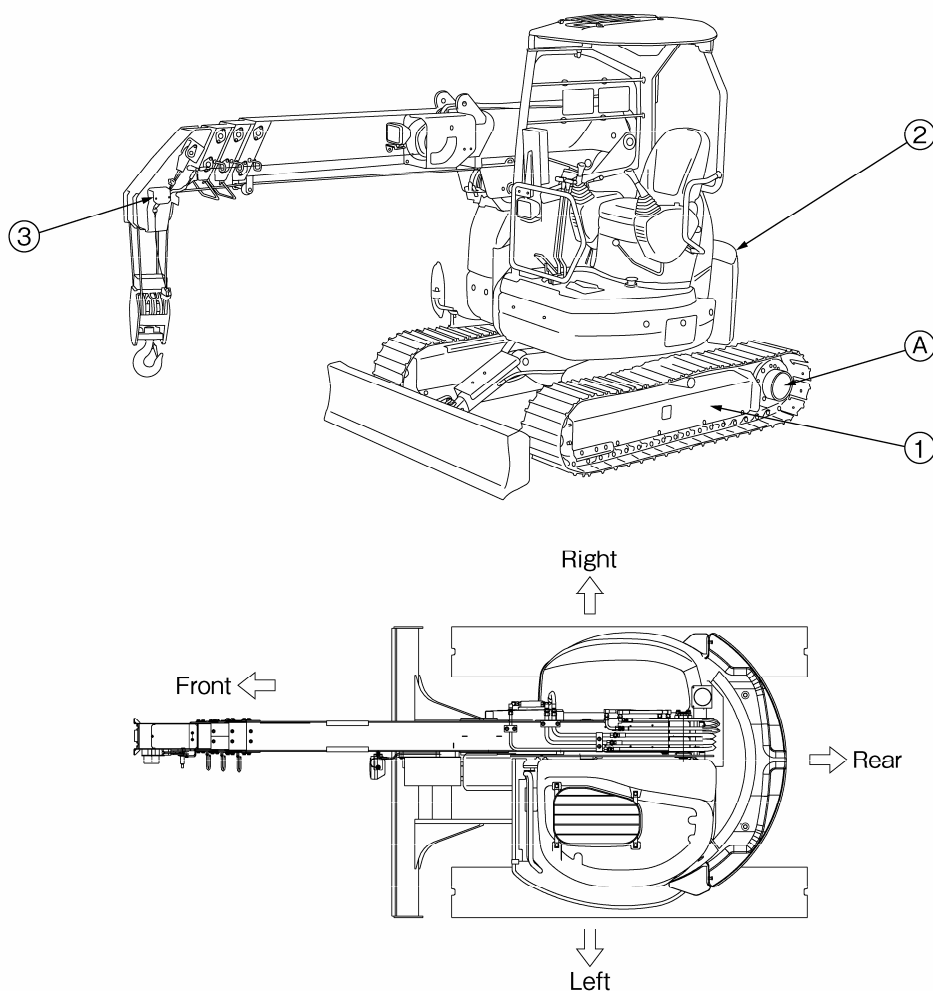
- Crane operation
- Pick & Carry operation

This machine is a mobile crane which consists of a crawler type carrier and an upper structure of a boom type crane.

This self-propelled crane is capable of moving (travelling) at the worksite and lifting an object weighing within the rated total load for normal crane operation or pick and carry operation.

3.2 MACHINE CONFIGURATION

EXTERNAL VIEW



SAM01030E

- (1) Undercarriage
- (2) Upper structure
- (3) Safety device

In this manual, the terms front, rear, left and right refer to the travel direction as viewed from the operator's seat when the operator's seat is facing the front and the sprocket (a) is at the rear of the machine. Boom slewing motion is determined with the machine viewed from immediately above; slew clockwise denotes right-handed motion and slew counterclockwise denotes left-handed motion.

This machine is comprised of the units listed below.

[1] UNDERCARRIAGE

This is comprised of a travelling gear and blade.

[2] UPPER STRUCTURE (CRANE)

This is comprised of an engine, travelling operation unit, crane operation unit, telescoping system, derrick system, slewing system, hook block, and winch system.

[3] SAFETY DEVICE

This is comprised of the following parts and devices: Over hoist detector/automatic stop device, three-winding stop alarm/automatic stop device, moment limiter (working envelope limited), slinging rope detachment protector, hydraulic safety valve, telescoping cylinder hydraulic automatic locking device, derricking cylinder hydraulic automatic locking device, alarm buzzer, machine tip-over alarm device, level, working status lamp, crane lock lever and travel lock bar.

3.3 MACHINE FUNCTIONS

[1] UNDERCARRIAGE

- The carrier is equipped with crawlers which enables this machine to enter into rough or soft terrain.
- 2 travel lever operation enables not only direction changes, forward, backward, and right/left but pivot and spin turns.

[2] UPPER STRUCTURE (CRANE)

- The upper structure allows continual 360 degree rotation.
- Due to extending/retracting, derricking up or down and/or swing operations of the boom, as well as raise and lower operation of the winch, you can move the hoisted load to the designated location, subject to staying within the rated total road and working radius.

4. QUALIFICATION FOR OPERATION

WARNING

- A high incidence of occupational accidents during crane operation are reported. Be aware that experienced engineers are no exception.
- Warnings and precautions defined in this manual shall be observed for safety assurance during operation of the machine.

4.1 QUALIFICATION FOR CRANE OPERATION

Only personnel that have obtained the required license or training stipulated by laws and regulations applicable to the place of use are qualified to operate this machine.

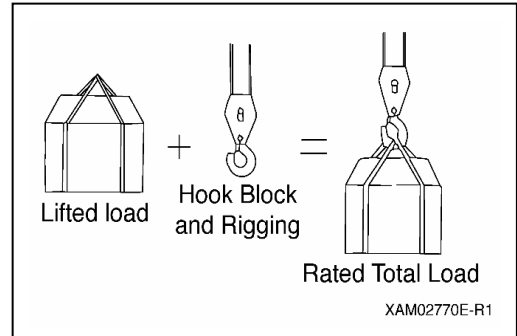
Contact the relevant government office or our sales service agency for further information.

5. TERMINOLOGY

5.1 DEFINITIONS OF TERMS

[1] RATED TOTAL LOAD

This is the maximum load that can be applied according to boom length and angle. The load includes the mass (weight) of hoisting accessories (hooks) slings, chains and ropes etc.

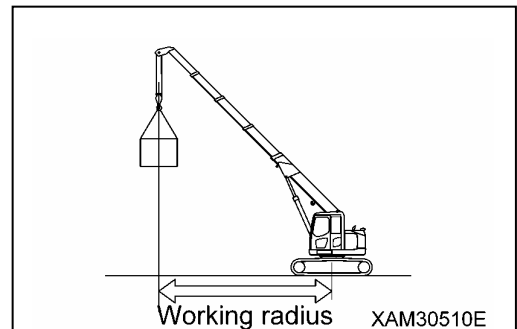


[2] LIFTED LOAD

This is a load derived by subtracting the mass (weight) of hoisting accessories (hooks) and sling etc, from the rated total load, which is a maximum load for hoisting.

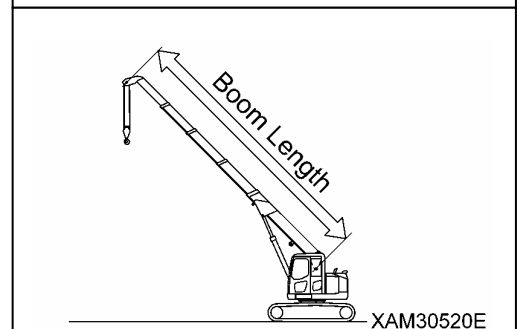
[3] WORKING RADIUS

This is a horizontal distance between the axis of slewing and the hook center.



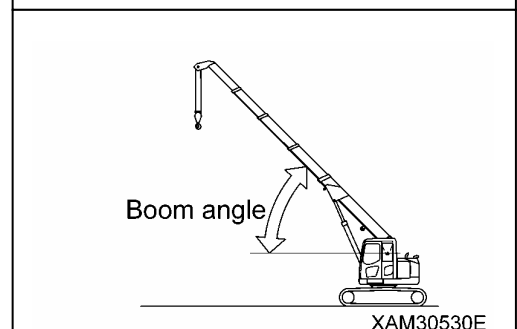
[4] BOOM LENGTH

This is a distance between the boom primary pin and the sheave pin of the end boom.



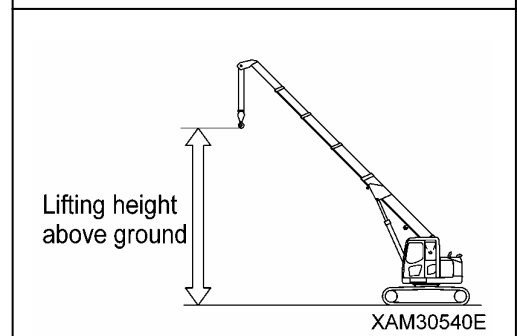
[5] BOOM ANGLE

This is an angle which the boom forms from horizontal.



[6] LIFTING HEIGHT ABOVE GROUND

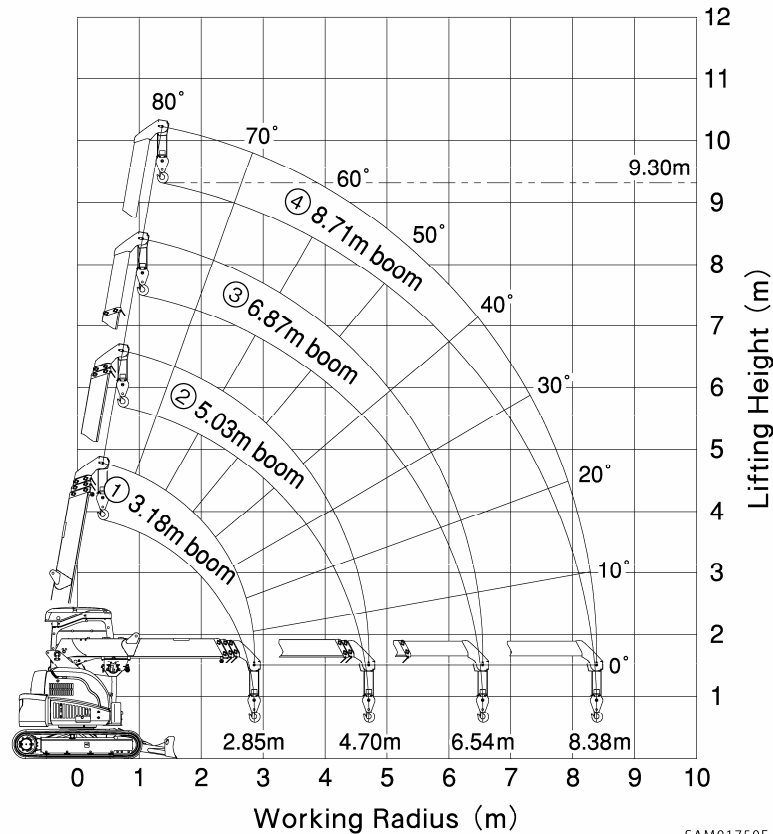
This is a vertical distance between the hook bottom and the ground with the hook raised to the upper limit.



5.2 DIAGRAM OF WORKING RADIUS AND LIFTING HEIGHT

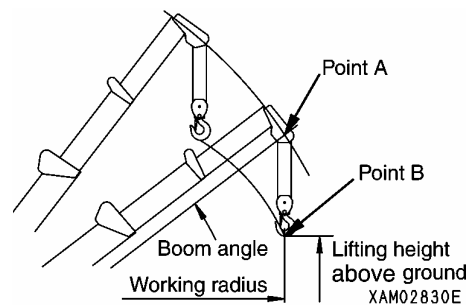
⚠ WARNING

- The diagram of working radius and lifting height shows the relationships the working radius of this machine, boom angle, and lifting height above the ground with no object hoisted. The diagram has been made allowing for no deflection in the boom.
- The boom (3) in the diagram of working radius and lifting height represents a state that half of the “ mark” passes boom (2).

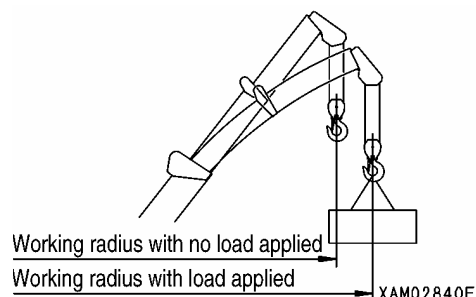


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1. Point A denotes a boom angle and point B denotes a lifting height above ground in the figure at right. The same working radius is applied to points A and B.



2. The “diagram of working radius and lifting height” shows the relationships of the working radius, boom angle, and lifting height at no load, allowing for no deflection in the boom. A deflection occurs in the boom when an object is hoisted, which causes the working radius to increase slightly. The rated total load decreases with an increase in the working radius. Actual crane operation requires the planning of work, allowing for sufficient tolerance of more than that shown in the diagram.



5.3 RATED TOTAL LOAD CHART

CAUTION

- All the values provided in the rated total load chart are based on the assumption that the machine is placed on a level and firm surface.
- The values in the rated total load chart are determined based on the working radius allowing for deflection that is developed when load is applied to the boom.
- When extending boom (2) even if only slightly, crane operation should proceed to the extent of performance of “Boom (2)”.
- When extending boom (3) even if only slightly, crane operation should proceed to the extent of performance of “Boom (3)”.
- When half of the “ mark” on boom (3) passes boom (2), crane operation should proceed to the extent of performance of “Boom (4)”.
- If the working radius exceeds that stated in the table even if only slightly, crane operation should proceed with respect to the rated total load corresponding to the working radius in the following table.
- The rated total load is a load including the mass of a hoisting accessory (hook: 30kg).

LC383M—5 Rated Total Load Chart

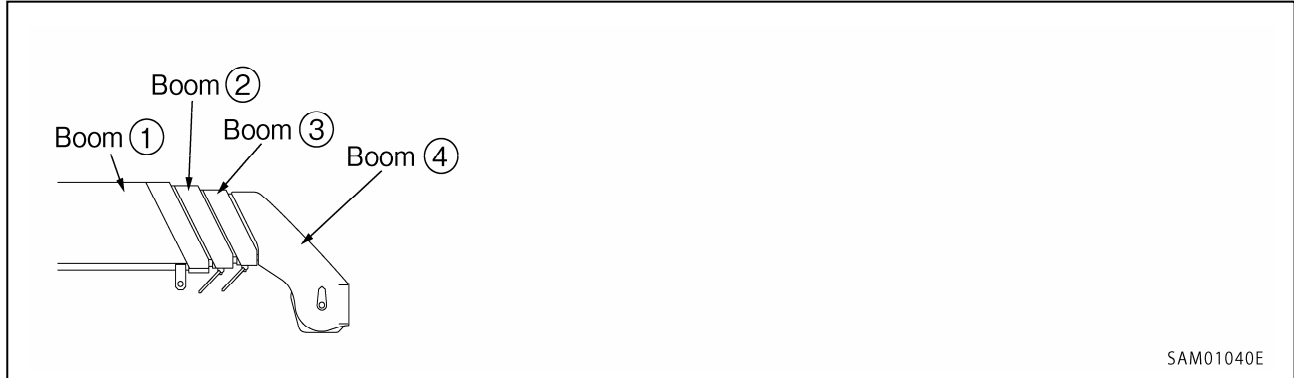
Working radius (m)	3.18m boom		5.03m boom		6.87m boom	8.71m boom
	Stationary	Pick & Carry	Stationary	Pick & Carry	Stationary	Pick & Carry
1.50	2930	1465	2930	1465	1870	1190
2.00	1730	865	1710	855	1710	1190
2.50	1200	600	1190	595	1190	1190
2.85	980	490	980	490	980	980
3.00			900	450	900	900
3.50			720	360	720	720
4.00			600	300	600	600
4.50			500	250	500	500
4.70			460	230	460	460
5.00					430	430
5.50					370	370
6.00					330	330
6.54					290	290
7.00						260
7.50						235
8.00						215
8.38						200
Boom Angle(°)	0~42.9		0~64.2		0~72.3	0~76.5

The rated total load chart provides the maximum loads that the crane is capable of hoisting objects in parallel with the length of the boom. The loads are specified by working radius.

[1] BOOM LENGTH

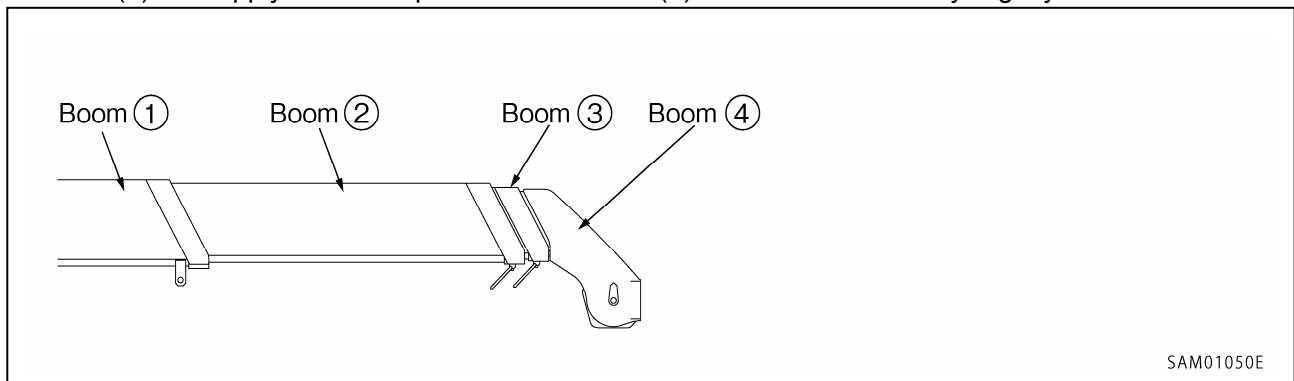
The following figures illustrate the condition of the booms, “(1) 3.18m Boom”, “(2) 5.03m Boom”, “(3) 6.87m Boom”, and “(4) 8.71m Boom” in the preceding boxes in the rated total load chart.

1. “(1) 3.18m Boom”: All the booms are retracted.



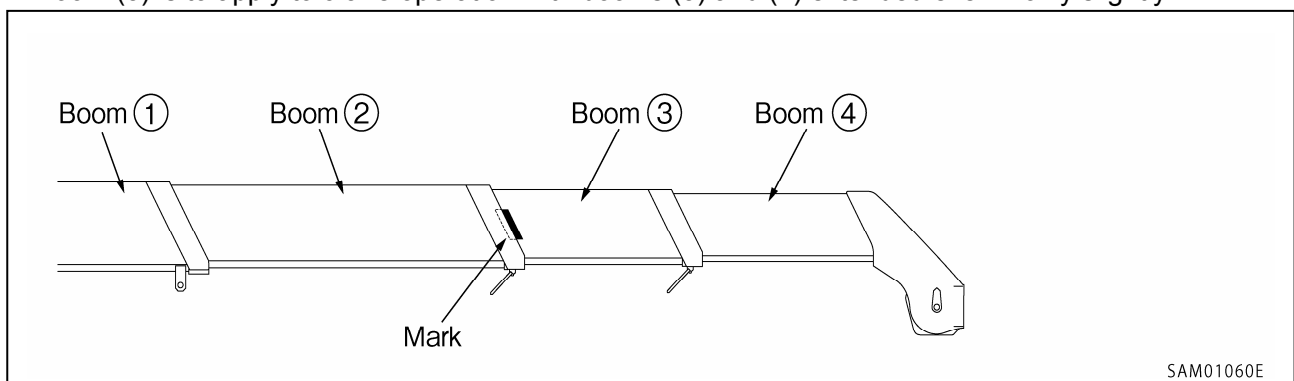
2. “(2) 5.03m Boom”: With booms (3), and (4) retracted, boom (2) is fully extended.

Boom (2) is to apply to crane operation with boom (2) extended even if only slightly.



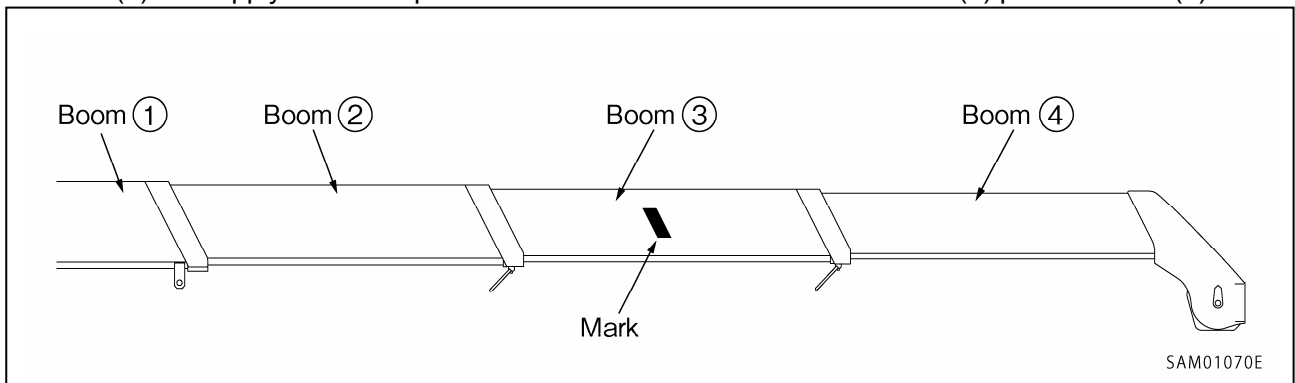
3. “(3) 6.87m Boom”: With boom (2) fully extended, booms (3) and (4) are extended midway (half of the “ mark” passes boom (2)).

Boom (3) is to apply to crane operation with booms (3) and (4) extended even if only slightly.



5. “(4) 8.71m Boom”: All the booms are fully extended.

Boom (4) is to apply to crane operation with half of the “ mark” on boom (3) passes boom (2).

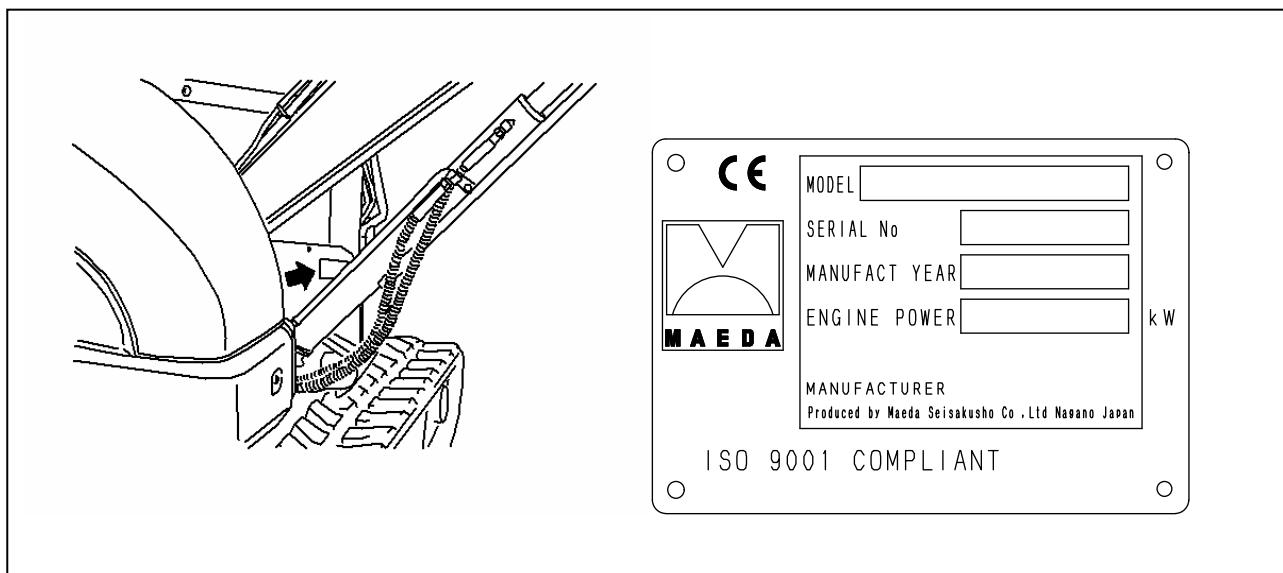


6. Necessary information for service

The following information is required for us or our sales service agency at the time of requesting repair service or ordering spare parts.

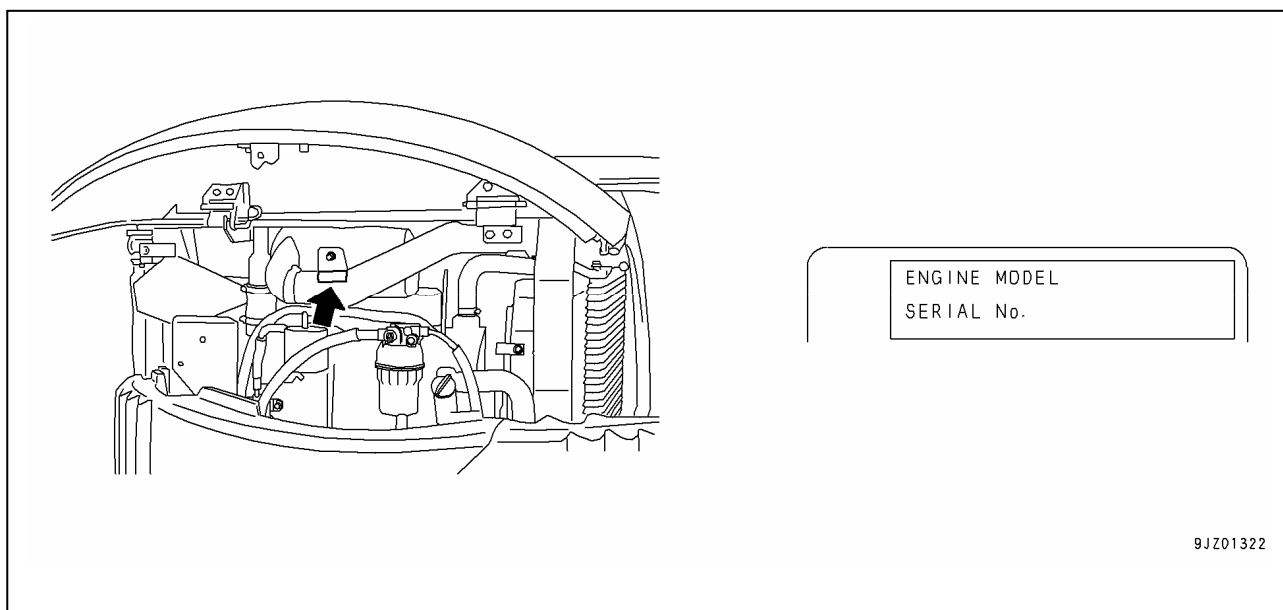
Machine serial number engraved on plate

Located at the lower right part of canopy.



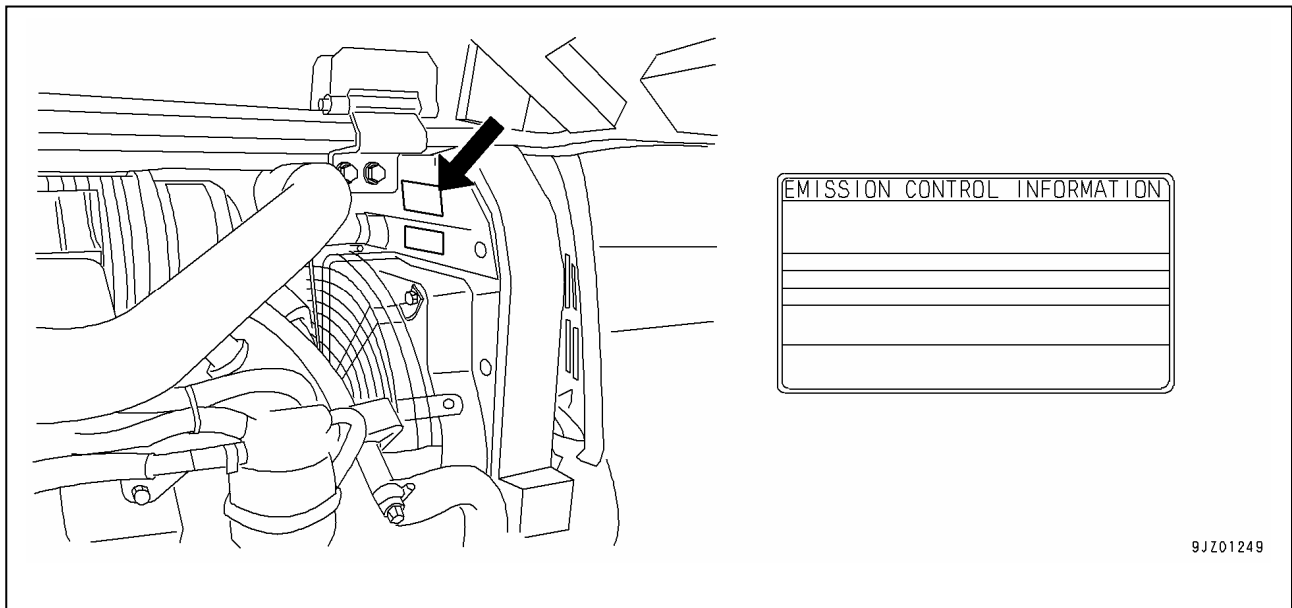
Engine serial number engraved on plate

Located on the top of engine cylinder head cover.



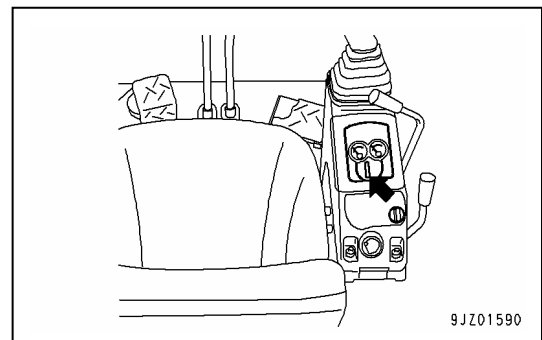
Information of EPA

EPA plate is located on radiator bracket.



Gauges and meters

Located at machine monitor.



SAFETY

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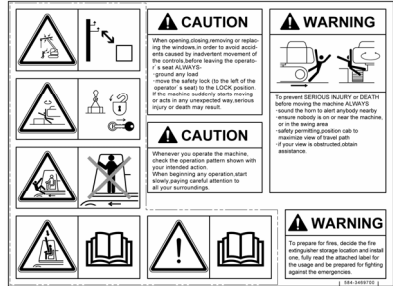
WARNING

All the safety precautions defined in this manual should always be read and observed.
Failure to follow the safety precautions can cause serious personal injury or death.

1. BASIC PRECAUTIONS

Failure to operate or maintain this machine properly can lead to serious personal injury or death. Be sure to read this manual and each safety label thoroughly before performing any operation or maintenance of this machine and observe the safety precautions.

1.1 PRECAUTIONS FOR BEFORE STARTING OPERATION

OBSERVE THE MANUAL AND SAFETY LABELS	
- Study and understand this manual as well as the safety labels labeled on various part of this Machine. Any attempt to drive/operate without understanding it fully may result in incorrect operation that may cause personal or equipment accidents. - Fully understand the proper use and inspection/maintenance procedures, and exercise safe working practices. - Make sure this manual and the safety labels fixed on various part of this Machine are legible at all times. Whenever illegibility or loss occurs, order from us or our sales service agency and put the safety label back to the original location.	

DRIVING LICENSE
- Licenses or training certificates are necessary to drive this Machine. Always obtain a license or training certificate before driving. ★ See “Introduction 4. Qualification for Operation” for details - The drivers are requested to receive education and training in the handling methods and other subjects from the applicable office, and obtain sufficient driving operation skills before work.

COMMIT TO SAFE OPERATION
- Obey the instructions and signs given by the manager and work supervisor, and observe safety first during the work. - Obey the crane work basics during operation. - Before starting driving or work, always carry out the inspections first. - Do not work under bad weather for instance strong wind, thunder or mist. - Do not drive under any condition when you are overtired, have drunk alcohol or after taking a sedatory drug. - Obey all of the workplace rules, safety regulations and operation method sequences during driving operations and inspection/maintenance. - Pay attention to surrounding conditions and pedestrians at all times when driving or working. If pedestrians approach the working area, abort working and take action to warn and remove them from the area. - When driving, be mentally prepared for any unexpected situations so that you can take the appropriate action immediately. - Do not attempt any use outside of the capabilities and purposes described in this manual under any circumstance. - Observe the designated rated total load and working range when driving. - Always pay attention when driving, making sure your operation is smooth and controlled . - Remove the ignition key when leaving operation seat.

1.2 PREPARATIONS OF SAFETY OPERATION

PROVIDE SAFETY DEVICES FOR SURE

- Check that all guards, covers, and mirrors are attached properly. Repair immediately if damaged.
- Understand how to use the safety devices correctly and use properly.
- Do not detach any safety device under any circumstance. Keep control to achieve proper operation at all times.
- Improper use of safety devices can lead to serious bodily accidents.
- Do not rely solely on safety devices.

PREPARE FOR ABNORMALITY

- Carry out secure inspections and services, and be careful to prevent accidents before they happen.
- Whenever you feel an abnormality of the Machine, abort working immediately, ensure safety and report to the manager.
- Assign in advance a person to take care of the solution to prevent secondary accidents.
- Do not drive the Machine when fuel or hydraulic oil is leaking from the Machine. Report to the manager any abnormality, and fully repair the fuel/hydraulic oil leak before use.
The fuel for this Machine is diesel oil. Be especially careful of any fuel leak.
- Before leaving the Machine, lower the hoisted load to the ground, stop the engine and remove the engine ignition key.

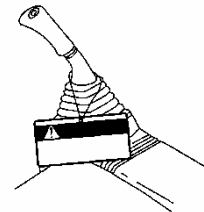


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TEMPORARY STORAGE WHEN ABNORMALITY IS FOUND WITH MACHINE

if the Machine is found to have an abnormality and is therefore placed in storage awaiting service, apply the following measures to notify all persons in the office that its use is prohibited due to failure.

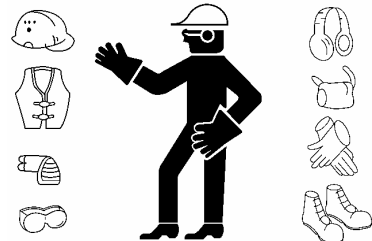
- Attach warning tags on the operation lever and other applicable parts.
Clearly write the information regarding the abnormality. The name and contact of the storage manager, and the term of storage.
- Make sure the machine cannot move when parking, by placing blocks under the rubber tracks.
- Remove the engine ignition key and take it with you.



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WEAR PROTECTIVE EQUIPMENT AND CLOTHES SUITABLE FOR WORK

- Always wear a helmet and safety shoes. Make sure to wear goggles, mask, gloves, hearing protectors, and safety belt suitable for the relevant working condition.
- Long hair coming out under helmet can be caught in machine. Make sure to tie to prevent accident.
- Do not wear loose garments or accessory items that may catch an operation lever, starter switch, emergency stop switch or any protrusions that could cause unexpected movement of the Machine.
- Make sure for proper function of each protective equipment.



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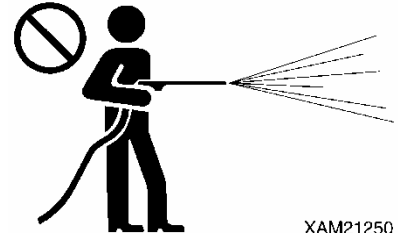
USE OF MACHINE THAT WAS RENTED OR PREVIOUSLY USED BY SOMEONE ELSE

Check the following subjects in writing before using any Machine that was rented or previously used by someone else. In addition, check the inspection record table for the maintenance conditions such as the periodic inspections.

- (1) Crane capacity
- (2) Crane maintenance condition
- (3) Behavior and disadvantage unique to the crane
- (4) Other subjects that require attention when driving
 - (a) operating condition of the brakes, clutches and others
 - (b) Presence/absence of lights and their condition. Check lights of rotating lamps
 - (c) Operation condition of hook, winches, boom, outriggers and other related items

KEEP MACHINE CLEAN

- If inspection and maintenance is carried out when the machine is still dirty with mud or oil, there is a hazard that you will slip and fall, or that dirt or mud will get into your eyes. Always keep the machine clean.
- If water gets into the electrical system, there is a hazard that it will cause malfunctions or miss-operation. Do not use water or steam to wash the electrical system (sensors, connectors).



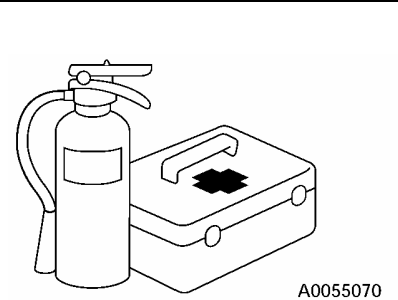
KEEP OPERATOR'S COMPARTMENT CLEAN

- When entering operator's compartment, always remove all mud and oil from the soles of your shoes. If you operate the pedal with mud or oil on to your shoes, your foot may slip and this may cause a serious accident.
- Do not leave parts or tools lying around the operator's compartment.
- Do not stick suction pads to the window glass. Suction pads act as a lens and may cause fire.
- Never bring any dangerous objects such as flammable or explosive items into the operator's compartment.
- Do not use cellular telephones inside operator's compartment when driving or operating the machine.

PROVISION OF FIRE EXTINGUISHER AND FIRST AID BOX

Always observe the following to prepare for injuries and fires.

- In case of fire, decide on the fire extinguisher storage location and install one, fully read the attached label for its uses and be prepared for fighting any emergencies.
- Decide on the location to store the first aid box. Inspect the first aid box periodically and replenish the contents as necessary.
- Consider the measures to take upon an injury or fire.
- Know how to contact the emergency services (for instance the emergency physician, ambulance or fire department), and show the contact information at a designated position so any person can make the contact.



1.3 PRECAUTIONS FOR FIRE PREVENTION

ACTION IF FIRE OCCURS

If a fire occurs, escape from the machine as follows.

- Turn starter switch OFF to stop engine.
- Use the handrails and steps to get off the machine.

FIRE PREVENTION AND EXPLOSION PREVENTION

• FIRE CAUSED BY FUEL, OIL, OR ANTIFREEZE.

Fuel, oil, or antifreeze are particularly flammable and can be hazardous. To prevent fire, always observe the following:

- Do not smoke or use any flame near fuel oil, or antifreeze.
- Stop the engine before refueling.
- Do not leave the machine while adding fuel or oil.
- Tighten all fuel and oil caps securely.
- Do not spill fuel on overheated surfaces or on parts of the electrical system.
- After adding fuel or oil, wipe up any spilled fuel or oil.
- Put greasy rags and other flammable materials into a safe container to maintain safety at the work place.
- When washing parts with oil, use a non-flammable oil. Diesel oil and gasoline may catch fire, so do not use them.
- Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.
- Use well-ventilated areas for adding or storing oil and fuel.
- Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.
- When carrying out grinding or welding work on the chassis, move any flammable materials to a safe place before starting.

• FIRE CAUSED BY ACCUMULATION OF FLAMMABLE MATERIAL.

Remove any dry leaves, chips, pieces of paper, dust, or any other flammable materials accumulated or affixed around the engine, exhaust manifold, muffler, battery, or inside the covers.

• FIRE COMING FROM ELECTRIC WIRING

Short circuit in the electrical system can cause fire.

- Always keep electric wiring connections clean and tightened.
- Check the wiring every day for looseness or damage. Tighten any loose connectors or wiring clamps. Repair or replace any damaged wiring.

• FIRE COMING FROM HYDRAULIC LINE

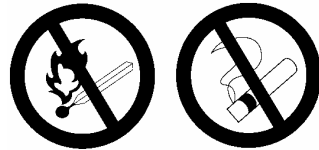
Check that all the hose and tube clamps, guards, and cushions are securely fixed in position. If they are loose, they may vibrate during operation and rub against other parts. This may lead to damage to the hoses, and cause high-pressure oil to spurt out, leading to fire damage or serious injury.

• EXPLOSION CAUSED BY LIGHTING EQUIPMENT

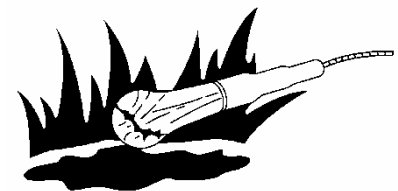
- When checking fuel, oil, battery, electrolyte, window washer fluid, or coolant, always use lighting with anti-explosion specifications. If such lighting equipment is not used, there is danger of explosion that may cause serious injury.
- When using electrical power for the lighting from the machine, follow the instructions in this manual.



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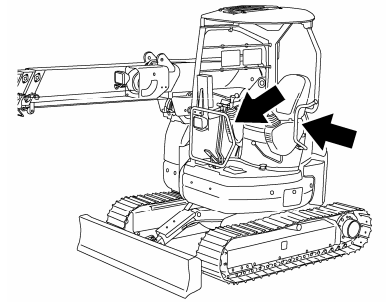
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1.4 PRECAUTIONS WHEN GETTING ON OR OFF

USE HANDRAILS AND STEPS WHEN GETTING ON OR OFF

To prevent personal injury caused by slipping or falling off the machine, always do as follows.

- Use the handrails and steps marked by arrows in the diagram on the right when getting on or off the machine.
- To ensure safety, always face the machine and maintain three-point contact (both feet and one hand, or both hands and one foot) with the handrails and steps (including the track shoe) to ensure that you support yourself.
- Before getting on or off the machine, check the handrails and steps (including the track shoe). If there is any oil, grease, or mud on the handrails and steps (including the track shoe), wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.
- Do not grip the control levers, or lock lever when getting on or off the machine.
- Never climb on the engine hood or covers where there are no non-slip pads.
- Do not get on or off the machine while holding tools in your hand.
- Never jump on or off the machine, Never jump on or off a moving machine.
- If the machine starts to move when there is no operator on the machine, do not jump on to the machine and try to stop it.



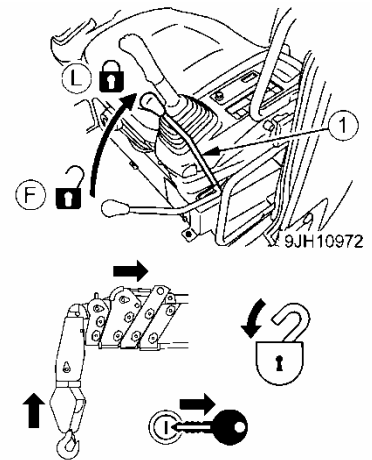
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PRECAUTIONS WHEN LEAVING OR STANDING UP FROM OPERATOR'S SEAT

- Before standing up from operator's seat (such as when adjusting the operator's seat), always store the crane completely, set lock lever (1) securely to the LOCK position (L), then stop the engine. If you accidentally touch the control levers or pedals when they are not locked, there is a hazard that the machine may suddenly move and cause serious injury or property damage.
- When leaving the machine, always store the crane completely, set lock lever (1) securely to the LOCK position (L), then stop the engine. Use the key to lock all the equipment. Always remove the key, take it with you, and keep it in the specified place.



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1.5 OTHER PRECAUTIONS

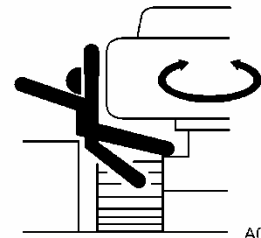
PRECAUTION NOT TO GET CAUGHT IN THE MACHINE

Around the upper structure and craning devices, movement of the derricking cylinder and/or winch make the opening space vary. When one becomes caught in such an opening, it may result serious personal injury or death.

Always keep persons away from any rotating or telescoping parts.

Especially, avoid putting oneself or your body into locations as below:

- Clearance between boom and upper structure
- Clearance between boom and derricking cylinder
- Clearance between winch drum and wire rope
- Clearance between each sheaves and wire rope



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DO NOT MODIFY

Do not modify the Machine without our written consent under any circumstance. Especially, welding work which can damage safety devices badly.

Any modification raises a safety issue, so consult us or our sales service agency beforehand.

We cannot be held responsible for any bodily accident or failure caused by a modification that was performed without consulting us.

ATTACHMENT INSTALLATION

- When installing optional parts or attachments, there may be problems with safety or legal restrictions. Therefore contact our sales service agency for advice.
- Any injuries, accidents, or product failures resulting from the use of unauthorized attachments or parts will not be the responsibility of Maeda.
- When installing and using optional attachments, read the instruction manual for the attachment, and the general information related to attachments in this manual.

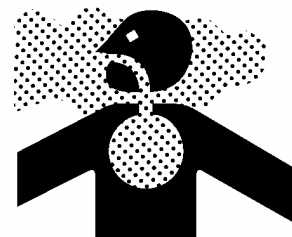
CAB WINDOW GLASSES

- The roof window and right side window are made of organic glass (polycarbonate), and as such it is apt to break easily when receiving damage on the surface, thereby deteriorating its protective characteristic. If there is a crack or damage caused by a fallen object, or when any sign of damage is noticed, replace it with a new window.

BEWARE OF EXHAUST GAS

When starting the engine or handling fuel/cleaning oil/paint indoors or at a location with bad ventilation condition, prevent gas-poisoning risk by improving the ventilation by opening the windows and exits.

If the ventilation is insufficient even after opening the windows and exits, set up a ventilation fan.



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2. DRIVING RELATED PRECAUTIONS

2.1 PRECAUTIONS FOR JOBSITE

SAFETY AT JOBSITE

Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous.

- When carrying out operations near combustible materials such as thatched roofs, dry leaves or dry grass, there is a hazard of fire, so be careful when operating.
- Check the terrain and condition of the ground at the worksite, and determine the safest method of operation. Do not operate where there is a hazard of landslides or falling rocks.
- Flatten the inclination of the working site as much as possible before starting work.
- When working over the roadway, enforce a no entry zone, for instance, placing guides or surrounding with barriers, to ensure the safety of the traffic vehicles and pedestrians.
- Enforce a no entry zone to prevent people from entering the working site and apply measures to prevent people from approaching. Attempting to approach a moving Machine may result in a collision by contact or pinching, and may result in serious bodily accidents and deaths.
- When travelling or operating in shallow water or on soft ground, check the sharpness and condition of the bedrock, and the depth and speed of flow of the water before starting operations.
- Avoid travelling or operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such area. If the ground collapses under the weight or vibration of the machine, there is a hazard that the machine may fall or tip over. Remember that the soil after heavy rain or blasting or after earthquakes is weak in this area.
- When working on embankments or near excavated ditches, there is a hazard that weight and vibration of the machine will cause the soil to collapse. Before starting operations, take steps to ensure that the ground is safe and to prevent the machine from rolling over or falling.

ENSURE GOOD VISIBILITY

This machine is equipped with mirrors to improve the visibility, but even with mirrors, there are places, which cannot be seen from the operator's seat, so always be careful when operating.

When operating or travelling in places with poor visibility, if it is impossible to confirm the condition of the job side or obstacle is in the area around the machine, there is danger that the machine may suffer damage or the operator may suffer serious personal injury.

When operating or travelling in places with poor visibility, always observe the following items strictly.

- If the visibility cannot be sufficiently assured, position a flagman if necessary. The operator should pay careful attention to the signs and follow the instruction of the flagman.
- The signals should be given only by one flagman
- When working in dark places, turn on the working lamps and front lamps of the machine, and if necessary, set up additional lighting in the area.
- Stop operations if there is poor visibility, such as in fog, snow, rain, or sand storms.
- Check the mirror on the machine before starting operations every day. Clean off any dirt and adjust the view to ensure good visibility.

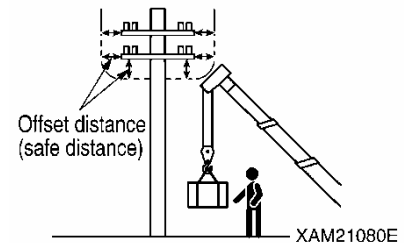
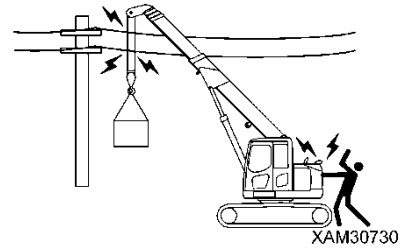
SIGNALMAN'S SIGNAL AND SIGNS

- Set up signs to inform of road shoulders and soft ground. If the visibility is not good, position a signalman if necessary. Operators should pay careful attention to the signs and follow the instructions from the signalman.
- Only one signalman should give signals.
- Make sure that all workers understand the meaning of all signals and signs before starting work.

BEWARE OF ELECTRICAL CABLE ABOVE

- Do not let the Machine come in contact with electrical cables overhead.
- High voltage cables may inflict electrical shock by just approaching.
- Persons who sling are likely to suffer electrical shocks.
- Always observe followings to prevent accidents.
- If the boom or the wire ropes may contact an electrical cable in the workplace, consult the electricity company and make sure that the measures (measures for instance placement of a guard personnel or application of wrap tubes and warning tags to the electrical cable) stipulated by the related regulations are taken before starting work.
- Put on rubber soled shoes and rubber gloves, and be careful that the body parts unprotected by rubber or other insulation do not contact the wire rope or the Machine frame.
- Place a guide and let him/her watch so that the boom, wire rope or Machine frame does not go too close to the electrical cable.
- Before doing so, decide on the emergency signs and other necessities.
- Ask the electricity company for the voltage in the electrical cables in the working site.
- Ensure the offset distances (safe distance) shown in the following table between the boom/Machine frame and electrical cables. Also check local regulations as they may require larger safety factors.

	Voltage of Electrical Cable	Minimum Safe Distance
Low voltage (Distribution line)	100-200V	2m
	6,600V	2m
Special (Transmission line)	22,000V	3m
	66,000V	4m
	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m



MEASURES WHEN CHARGE ACCIDENT OCCURS

If an electrical charge accident occurs, do not panic and stay calm, apply the solution in the following sequence.

1. Report

Immediately report to the electricity company or related management company, and receive instructions to stop the power transmission, emergency procedures and any related procedures.

2. Evacuation of related personnel from vicinity of Machine

Remove all personnel including workers from vicinity of the Machine to prevent any secondary disasters.

Personnel who suffered electrical shock by holding a sling rope, guide rope or other conductors when the Machine was charged should evacuate by his/her own effort.

Do not try to help such persons. Otherwise a secondary electrical shock accident can occur.

3. Emergency procedure

Take the solution by the following sequence in case of urgency where personnel received electrical shock because the Machine was charged.

(1) If the Machine can be operated, immediately move the Machine away from the contact and out of the range of the cause of the charge. Be careful not to snip the distribution power cable.

(2) Evacuate the Machine completely away from the cause of the charge, make sure the Machine is not charged, rescue the electrically shocked personnel and immediately carry to the hospital.

4. Measure after accident

After the accident, do not put the machine back into service. Attempting to do so may cause unexpected accidents and enhances failures. Ask us or our sales service agency for repair.

CAUTIONS WHEN WORKING WITH THE CRANE IN A LOCATION WITH HIGH OUTPUT OF MICROWAVE EMISSION

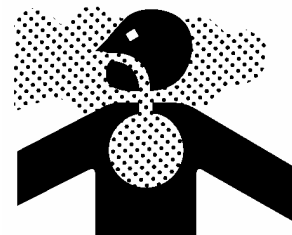
Working with the crane near a high output of microwave emission equipment such as radar or TV/radio broadcast antenna may causes the crane construction to be exposed to the microwave and generates induced current, therefore it is very dangerous. In addition, the machine electronics may become disturbed.

Establish grounding between the Machine frame and the ground when working in such location. In addition, slingers are requested to wear rubber boots and rubber gloves since risk of electrical shock by contacting parts such as the hook or wire exists.

BEWARE OF ASBESTOS DUST

Inhalation of air containing asbestos may result in lung cancer. This Machine does not use any asbestos, but asbestos may be contained in the wall, ceiling or other part of construction within the work area of this Machine. In addition, be careful of the followings when working with a material that may be using asbestos.

- Put on designated dust free mask and/or other equipment as necessary.
- Do not use compressed air for cleaning.
- Spray water when cleaning to prevent asbestos dusts from flying into air.
- Always work at a windward location when driving the Machine at a site that may contain asbestos dusts.
- Enforce a restriction zone to prevent people from entering the working site.
- Strictly observe the assigned rules related to the working site and environmental standard.



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2.2 PRECAUTIONS WHEN ENGINE STARTING

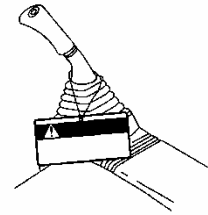
PRECAUTIONS FOR WARNING TAG

If there is a warning tag hanging from working equipment control lever, do not start the engine or touch the levers.

DANGER

Do NOT operate

When this tag is not being used, keep it in the storage compartment. If there is no storage compartment, keep it in the operation manual case.



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DANGER

Do NOT operate

When this tag is not being used keep it in the storage compartment. Still more, when there is no storage compartment, keep it in the operation manual case.

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INSPECTION BEFORE STARTING ENGINE

Check the instructions in "Operation 3.1 Checking Before Operation" as well as the following, without starting the engine and before starting work every day:

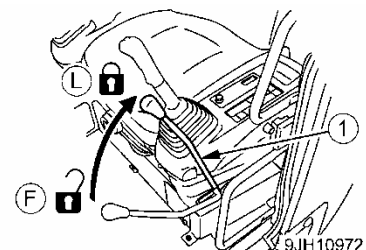
Omitting these inspections may result in serious bodily accidents.

- Do not fail to perform the check before operation.
- Remove all dirt from the surface of the window glass to ensure a good view.
- Remove all dirt from the surface of the lens of the working lamps, and check that they light up correctly.
- Check/refill engine coolant, fuel and the engine oil pan, and check for air cleaner clogging or electrical circuit breakage.
- Adjust the operator's seat to a position where it is easy to carry out operations, and check that there is no damage or wear to the seat belt or mounting clamps.
 - ★ See "Operation 3.1.2 Checking Before Starting Engine (Adjusting Operator's Seat)" for details.
- Adjust the mirrors so that the rear of the machine, and winch drum can be seen clearly from the operator's seat.
 - ★ See "Operation 3.1.2 Checking Before Starting Engine (Adjusting Mirrors)" for details.
- Check pedals for piled up mud or alien substances which may disturb their movement, and remove, to ensure correct function.
- Check the operation of the instruments and gauges, and check that the control levers are all at the Neutral position.

Always repair if any of the above is faulty.

CHECKS BEFORE STARTING ENGINE

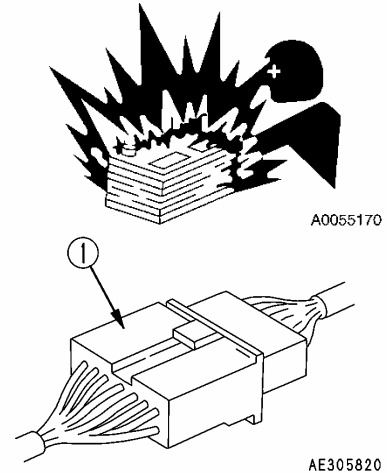
- Make sure no person or object is within the boom swing radius area before starting engine.
- Make sure no person is on, below or around the machine, and also that no person or object is within the boom swing radius area, before starting engine.
- Do not allow anyone apart from the operator to ride on the machine.
- Start and operate the machine only while seated.
- Before starting engine, check that the control levers are all at the Neutral position.
- Before starting engine, check that lock lever (1) is in LOCK position (I).
- When starting the engine, sound the horn as a warning.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause a serious bodily injury or fire.



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CAUTIONS UNDER COLD WEATHER

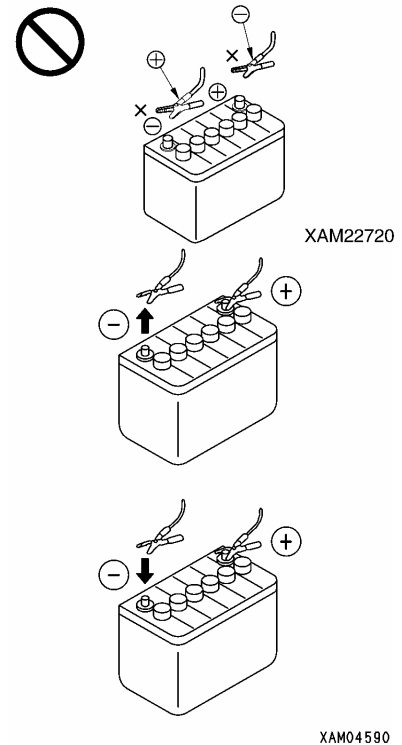
- Remove snow from and unfreeze the swing gear, boom and winch related parts, and check the movements before work.
 - Warm up the engine and hydraulics. Attempting to operate the control levers and pedals without enough warm up causes the Machine to react poorly, and may result in unexpected accidents.
 - If the battery fluid is frozen, do not charge the battery or start the engine using any other power source. Such an act may cause the battery to catch fire. Before charging or starting up using other power source, unfreeze the battery fluid and check that failures such as a battery fluid leak do not exist.
 - After the end of the work, wipe off and apply wraps if substances such as condensation, snow or mud are stuck to the wire harness, connector (1), switches, sensors or similar part.
- If the infiltrated condensation and/or similar substances freeze, the Machine may operate improperly upon its next use and cause unexpected accidents.



CAUTIONS WHEN STARTING UP USING BOOSTER CABLE

The wrong booster cable connection method may result in fire, so always observe the followings.

- When starting up the engine using a booster cable is attempted, always arrange 2 persons, one in the cabin and another with the battery.
- When starting using another Machine, be careful to prevent contact between the normal Machine and broken Machine.
- Keep the starter switch key of both the normal Machine and the broken Machine in OFF position when the booster cable is connected.
- Do not connect to wrong side [connecting (+) to (-), (-) to (+)] when connecting the booster cable.
- Start connecting from (+) terminal first, but start disconnecting from (-) terminal (ground) first.
- Connect the ground to the (-) terminal of the battery of the broken Machine when connecting the ground as the last procedure.
- ★ See "Operation 8.4.4 Starting Engine with Booster Cable" for details.
- Avoid the contact between clips of the booster cable, and contact between a clip and the Machine when disconnecting the booster cable.



2.3 PRECAUTIONS WHEN STARTING TO MOVE MACHINE

CHECKS BEFORE OPERATION

Omitting the inspections after starting the engine results in delay to notice the Machine abnormalities, and may result in bodily accidents and Machine damages.

Execute inspection in a wide location with no obstacle. In addition, be sure to prevent people from approaching nearby the Machine.

- Check that the movement of the machine matches the display on the control pattern card. If it does not match, replace it immediately with the correct control pattern card.
- Inspect the equipment operation conditions, Machine travelling conditions, winch winding up and down, boom derricking, and crane operation conditions such as extension, retraction and swinging.
- Inspect the sound, vibration, heat and odor of the Machine, and check for instrument errors, air leaks, oil leaks, fuel leaks, water leaks and other such factors. Be extra careful with fuel leaks.
- Always repair the broken part whenever an abnormality is found. Attempting to use without servicing may result in unexpected bodily accidents and/or Machine failures.

CAUTIONS WHEN MOVING FORWARD/BACKWARD OR CHANGING DIRECTION

To prevent serious injuries and fatal accidents, always execute the followings before moving the Machine.

- Set the Machine to the travelling posture shown in the right diagram.
★ See "Operation 3.6 Machine Travelling Posture" for details.

Do not travel when the hook block is not contained.

- Before travelling, set the machine so that sprocket (A) is behind the operator's seat. If sprocket (A) is in front of the operator's cab, the machine will move in the opposite direction from the operation of the levers (front and rear travel is reversed, left and right steering is reversed). Be extremely careful when operating the machine in this situation.

- Have the boom fully lowered and retracted.
- Fix the hook block to the containment position.

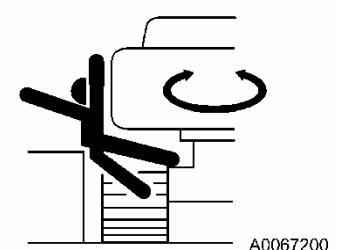
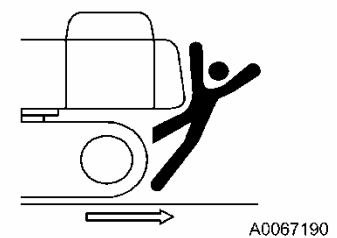
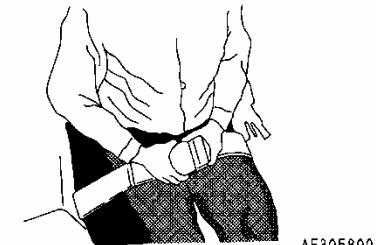
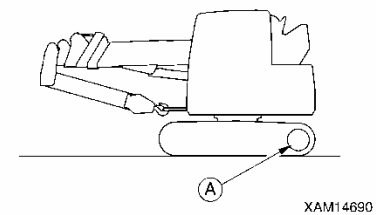
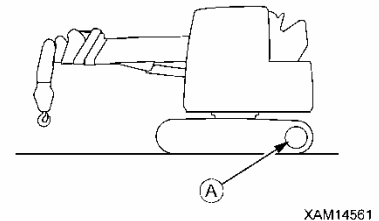
For short distance travel, secure the hook block to the stowage position below the boom tip. For longer travel, secure it to the regular stowage wire rope at the front of the upper structure.

- In an environment where anyone is around the machine, the machine may smash or catch him/her, which results in death or serious injury.

Before starting to travel observe strictly as follows:

- Always operate the machine only while seated.
- Always fasten your seat belt.
- Before travelling, check again that there is no one in the surrounding area, and that there are no obstacles.
- Before travelling, sound the horn to warn people in the area.
- After starting to travel, check that the travel alarm correctly sounds.
- If there is an area to the rear of the machine which cannot be seen, position a signal person. Take special care not to hit other machines or people when turning or swinging the machine.

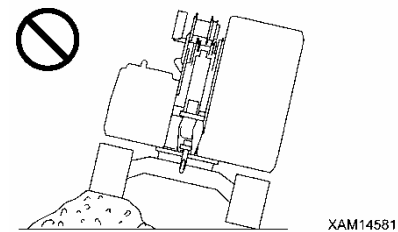
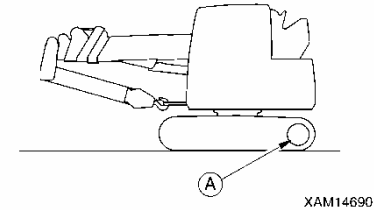
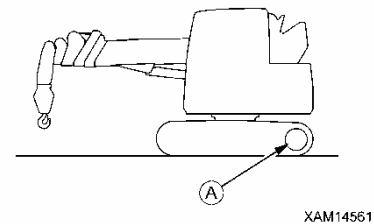
Though this machine is equipped with back mirrors and a rear view camera, always arrange a person to guide safety travelling.



CAUTIONS WHEN TRAVELLING

Always observe the following to prevent serious injuries and fatal accidents when the Machine is travelling.

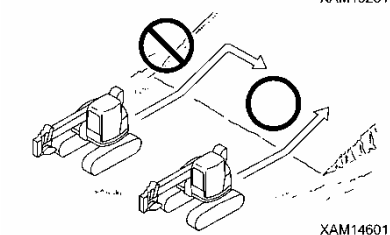
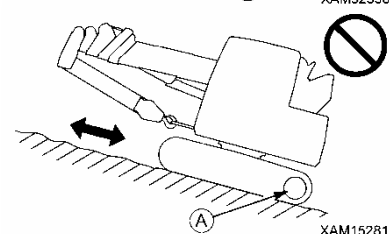
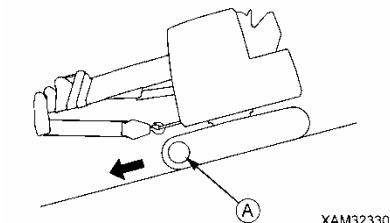
- Set the Machine to the travelling posture shown in the right diagram.
★ See "Operation 3.6 Machine Travelling Posture" for details.
- Do not attempt looking sideways or other dangerous acts when driving.
- Do not: over speed, start/stop or swing suddenly, as such acts are dangerous.
- When travelling, always keep a safe distance from people, structures, or other machines to avoid coming into contact with them.
- Avoid travelling over obstacles when possible. If the machine has to travel over an obstacle, keep travel at low speed. Never travel over an obstacle which makes the machine tilt strongly to one side.
- When travelling on rough ground, travel at low speed and do not operate the steering suddenly. There is a danger that the machine may turn over. The machine may lose its balance, or may damage the machine or structures in the area.
- When passing over bridges or structures, check first that the structure is strong enough to support the weight of the machine. When travelling on public roads, check first with the relevant authorities and follow their instructions.
- When operating in tunnels, under bridges, under electric wires, or other places where the height is limited, operate slowly and be extremely careful not to let the crane hit anything.



BE CAREFUL WHEN TRAVELLING OVER SLOPES

ALWAYS observe the following to prevent serious injuries and fatal accidents when travelling over a slope for unavoidable reasons.

- For travelling on a slope, always keep the correct travelling posture with the hook block secured to the hook block stowage wire rope in the front of the upper structure. When the hook block is temporary stowed below the boom tip, it may become slack during travelling.
★ See "Operation 3.6 Machine Travelling Posture" for details.
- In a 10 degrees or more slope, use reverse travelling to climb it and forward travel for descend. Always direct the machine front to the downward of the slope. Where forward travelling to climb up and reverse travelling for descend is used, it makes the machine unstable and brings risks of overturning or drifting.
- Always travel straight up or down a slope. Traveling at an angle or across the slope is extremely dangerous.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change the position of the machine, then travel on to the slope again.
- When traveling downhill, lower engine speed, keep the travel lever close to the neutral position, and travel at low speed.
- Travel on grass, fallen leaves, or wet steel plates with low speed. Even with slight slopes there is a hazard that the machine may slip.
- If the engine stops when the machine is traveling on a slope, move the control levers immediately to the neutral position and start the engine again.



BE CAREFUL OF TIPPING ON UNSTABLE GROUND

Always observe the followings to prevent serious injuries and fatal accidents when travelling over unstable ground for any reason.

- Do not enter any soft ground area. The Machine is difficult to remove from this type of ground.
- Ground near a cliff, roadside or a deep gully may be unstable, so avoid going near such ground as much as possible.

The Machine may tip or fall when the ground loosens due to mass and/or vibration of the Machine. Be especially careful that the ground may have loosened after rain, use of dynamite or earthquake.

- Avoid going near earth fills or the vicinity of excavated gutters that are instable.
- Crumbling caused by mass and/or vibration of the Machine may cause the Machine to tilt.

CAUTIONS WHEN SNOW COVERED OR FROZEN

Always observe the following to prevent serious injuries or fatal accidents when travelling over snow covered ground or frozen roads for any reason.

- Snow covered ground and frozen roads can cause slips even when the inclination is slight, so decrease the speed when travelling and avoid starting, stopping, and swinging suddenly. Uphill and downhill are especially likely to cause slips and thus dangerous.
- The ground of a frozen road becomes soft when the air temperature rises and causes the Machine travel and other operations to be unstable. Be very careful.
- During cold weather, check that the load to be hoisted is not frozen or stuck to the ground or any other surface. Attempting to hoist without knowing the load is frozen or stuck to the ground or other surfaces is dangerous.
- Do not touch the metal surface with any part of your body, such as a finger or hand during cold weather.

Attempting to contact a metal surface of the Machine under harsh cold weather may cause the skin to stick to the metal surface.

- Remove snow and/or ice from the Machine that causes the safety nameplates to be hard to read. Be especially careful to remove ice or snow that is on the boom and may fall.

CAUTIONS WHEN PARKING

- Park the machine on firm, level ground.
- Select a place where there is no hazard from falling rocks, landslides, or of flooding if the land is low.
- Set the Machine to the travelling posture shown in the right diagram.
- Fully lower and retract the boom.
- Fix the hook block to the containment position.

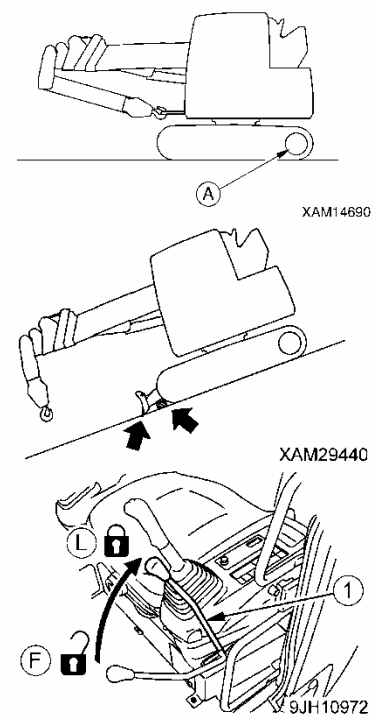
When parking for a short time, secure the hook block to the stowage position below the boom tip. For longer periods of parking, secure it to the regular stowage wire rope at the front of the upper structure.

- Where it is un-avoidable to park the machine on a slope, strictly observe the following:

- Fully lower and retract the boom
- Fix the hook block to the containment position.

When parking for short periods, secure the hook block to the stowage position below the boom tip. For longer periods of parking, secure it to the regular stowage wire rope at the front of the upper structure.

- Set the front of the machine (blade) on the downhill side. Then dig it into the ground.
- Put blocks under the tracks to prevent the machine from moving.
- When you leave the machine, strictly observe as follows:
 - Set lock lever (1) to LOCK position (L), and then stop the engine.
 - Always remove the key, take it with you, and leave it in the specified place.



2.4 PRECAUTIONS WHEN WORKING WITH CRANE

INSPECTION BEFORE STARTING WORK

Check that the safety devices and crane operate properly.

- Operate each of the operation levers, pedals and switches under no load, and check that operations take place without abnormality.
Repair immediately if any abnormality exists.
- Check that the safety devices such as the moment limiter, over hoist detector device and three-winding stop alarm device activate properly.

CAUTIONS WHEN HANDLING MOMENT LIMITER

- Use/store the moment limiter under the following ranges of ambient temperature.
★Temperature of use: -10 to 50 degrees C Storage temperature: -30 to 70 °C
- Avoid direct sunlight so that the temperature of the atmosphere surrounding the moment limiter does not exceed the above range.
- Avoid locations with a strong acid or alkaline atmosphere as much as possible. Otherwise, unexpected failures may occur.
- Avoid impact to the moment limiter body, for instance colliding with an object.
Doing so may damage the case and result in failures and improper operations.
- Avoid excessive pressure to the panel sheet of the moment limiter body or pushing with a sharp object such as the tip of a screwdriver. Doing so may damage the panel sheet and could result in failures and improper operations.
- Do not remove the case cover or panel sheet from, or disassemble the moment limiter body. Doing so may damage the case and/or panel sheet and could result in failures and improper operations.

CAUTIONS WHEN SETTING UP MOMENT LIMITER

- The moment limiter calculates the moments assuming the Machine is level.
If you work with the crane when the Machine is not level, warnings and alarms are not issued even when the rated total load is near. Always use the level to ensure that the machine is not at an angle.
- Before using the moment limiter, check that the boom angle display, boom length display and real load display are displayed correctly following the crane movements. Attempting to use without the correct display results in failure to obtain the correct measurement and may result in serious bodily accidents caused by reasons such as tipping over and/or breakage of the machine.
- Always make sure the fall mode setting of the moment limiter matches with the wire rope fall of the crane. Attempting to use unmatched wire rope falls may result in failure to obtain the correct measurement and could result in serious accidents caused for instance by a breakage of the wire rope.
- Do not change the setting when measuring with the moment limiter. Doing so could result in failure to obtain the correct measurement and may result in serious bodily accidents caused by reasons such as tipping over and/or breakage of the machine.

PRECAUTIONS WHEN DECIDING THE CRANE OPERATION SITE

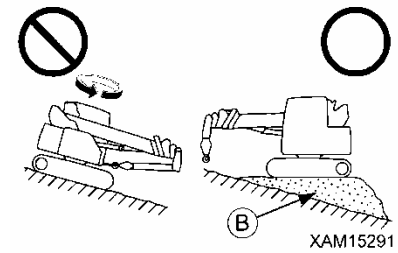
Always place the machine on the level and solid ground.

Crane operation is dangerous when the machine is placed in an area such as below:

- Temporary asphalt pavements
- Thin concrete pavements
- Stone pavements
- Where the surface looks solid but the soil under it is soft, or the soil below a pavement has been washed by water and become hollow.
- Soft ground which may collapse, is near a shoulder of a road or an excavated hole.
- Slopes

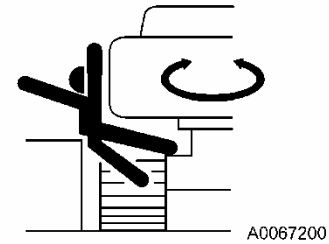
PRECAUTIONS FOR CRANE OPERATION ON A SLOPE

Where a crane operation on a slope is un-avoidable, firstly fill some soil (B) to prepare a level and solid platform, and then place the machine on it, so that overturning is prevented. Unless this is done the crane is not placed level and attempting to hoist will mean that the moment limiter (over-load detector) will not work accurately, as well as a un-foreseeable force to the machine which may overturn or damage it.



FOLLOW INSTRUCTIONS AND SIGNS WHEN WORKING

- When working with the crane, appoint a work supervisor and agree signals beforehand, and obey the work supervisor and his signals during work.
- When working at a location where any areas are out of sight of the driver, be especially careful to follow the instructions and signals of the work supervisor and pay attention when driving.
- When working with the crane, the clearance between the boom and the upper structure and also the gaps between the movable parts of the derrick cylinder may catch body parts such as an arm or finger. The driver is requested to make sure no one is within the working radius of the crane before operating crane.



CAUTIONS UNDER COLD WEATHER

- Remove snow from and unfreeze the swing gear, boom and winch related parts, and check the movements before work.
- Check the operation of winch brake.
- Warm up the machine. Attempting to operate the operation levers, pedals and switches without enough warm-up time causes the Machine to react dull, and may result in unexpected accidents.
★ For details of warm up operation, see "Operation 3.3.1 Engine Warm Up".
- Accumulation of snow within the working range of the crane can cause the suspended load to overturn. Workers may also trip over. Remove snow sufficiently before starting crane operation.
- If the load to be hoisted is stuck to the ground because it is covered with snow or frozen, do not force hoisting of the load. Thoroughly remove the snow or unfreeze before crane operation.
- After ending work, wipe off and apply wraps if substances such as condensation, snow or mud are stuck to the wire harness, connector (1), switches, sensors or similar parts.
If the infiltrated condensation and/or similar substance freeze, the Machine may operate improperly upon next being used and cause unexpected accidents.

PAY ATTENTION TO WEATHER INFORMATION

- During a thunderstorm, risk of lightning exists, so abort working with the crane, immediately lower the load and contain the boom.
 - Exposing the hoisted load to wind causes the load to swing and the Machine to become unstable, this is dangerous. Immediately lower the load and contain the boom when the wind is causing the load to swing.
 - If the maximum instantaneous wind speed is 10 m/s or greater, abort working with crane, immediately lower the load and contain the boom.
 - Even when the maximum instantaneous wind speed is below 10 m/s, the bigger the hoisted load, the higher the hoisted load position, and the longer the boom, the wind effect will increase accordingly. Be very careful during work.
 - When the boom is extended full or nearly full, take notice of that the winch wire ropes and electrical cable for signals are also affected by the wind. In addition, the wind speed may increase when it blows through a high-rise building. Thus, be very careful when working near high-rise buildings.
 - When a load such as a steel plate that has a large area exposed to wind is being hoisted, the wind arriving from front/rear/side of the boom may cause the Machine to tip or damage the boom. Be very careful when working.
 - In a condition where wind blows to the front face of the boom, the higher the boom is raised, the more you may run a risk of overturning backward. Be very careful when working in such conditions.
 - When an earthquake occurs, abort working and wait until the earthquake is over.
- ★The following table indicates approximate relation between the wind speed and wind effect. The wind speed mentioned in the weather forecast is mean wind velocity (m/s) during 10 m at 10 m above the ground.

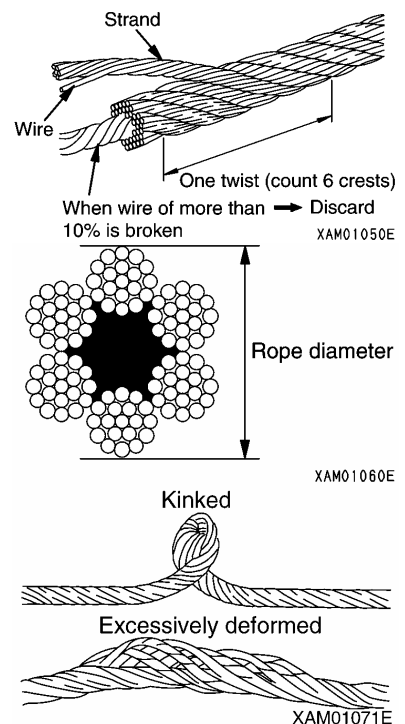
Force	Wind Speed (m/s)	Effect On Land
0	Less than 0.3	Smoke rises vertically.
1	0.3 - below 1.6	Wind motion visible in smoke.
2	1.6 - below 3.4	Wind felt on exposed skin.
3	3.4 - below 5.5	Leaves and smaller twigs in constant motion.
4	5.5 - below 8.0	Dust and loose paper raised. Small branches begin to move.
5	8.0 - below 10.8	Smaller trees sway. Some foam and spray.
6	10.8 - below 13.9	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	13.9 - below 17.2	Whole trees in motion. Effort needed to walk against the wind.
8	17.2 - below 20.8	Twigs broken from trees. Progress impeded.
9	20.8 - below 24.5	Light structure damage. Slates blown off.
10	24.5 - below 28.5	Trees uprooted. Considerable structural damage.
11	28.5 - below 32.7	Widespread structural damage.

CAUTIONS WHEN SLINGING

- Check the following before hoisting a load.
Attempting to hoist the load without checking may result in serious bodily accidents by dropping of the load or tipping of the crane.
- Observe the values in the rated total load chart.
- Hoist from the center of gravity of the load.
- Check that the wire ropes of the hook block are perpendicular to the ground.
- When the load leaves the ground, stop winding up the load and check whether the load is stable.
- Before hoisting a load, always check whether the sling wire rope "retainer device" of the hook block is hanging securely. If not the wire rope may leave the hook block and cause the load to fall and results in a serious accident.
- Larger sling rope angles when hoisting the load increases the force on the sling rope even when the load weight is unchanged, and can cause the sling rope to snap. Be careful when slinging in order to prevent excessive force to the sling rope.
- Do not hoist more than 1 load at a time.
This could cause the hoist bracket to hit and damage the other hoisted load, the loads may move and lose balance and cause tipping, or some other cause of a serious accident.
Do not hoist more than one load even if the total is within the rated total load.
- Hoisting of lengthy loads may cause the load to lose balance and is dangerous.
In case of lengthy loads, hoist vertically by using a clamp, or achieve balance of the hoisted load by applying a rope to both ends of the load.

CAUTIONS WHEN HANDLING WIRE ROPE

- The wire rope wears down as the time passes, so inspect every time before work, and replace immediately if at or beyond the replacement standard.
At the same time, inspect the sheave at the tip of the boom and the sheave of the hook block. Damaged sheaves accelerate the damage of the wire ropes.
- Use the wire ropes specified by us.
- Wire rope breakage causing protruding wires may injure your hands. Always put on leather gloves when handling the wire rope.
- Handling worn and damaged wire may cause injury from wire splinters.
- Do not use any wire rope of which any of the followings apply.
 - 10% or more of the wires (except the filler wires) in one twist of the wire rope are snapped off.
 - The wire rope diameter wear is beyond 7% of the nominal diameter.
 - Is kinked.
 - Is excessively deformed or corroded.
 - Affected by heat or sparks.



CAUTIONS WHEN WORKING WITH CRANE

- The stability of the crane is determined horizontally. Although the stability also increases diagonally, work exceeding the rated load causes the breakage of the boom or machine. The moment limiter (overload detector) must not be activated even in diagonal direction.
- Be sure to verify that the moment limiter emergency stop cancel switch is at OFF (auto) position before operating the crane. Do not attempt the crane operation when the moment limiter emergency stop cancel switch is at ON (cancel) position. The moment limiter emergency stop cancel switch is permitted to be at ON (cancel) position only when the moment limiter is in trouble or during the inspection or maintenance works.
- Pay attention to indication and warning on the moment limiter while working.
- Attempting to work beyond the capacity of the Machine may cause serious accidents and failures caused by for instance tripping or fluctuation. Observe the rated total load chart when working with the crane.
- Operate the crane under slow and controlled movements.
Sudden lever or accelerator operations may cause risks such as swinging or falling of the load and collision with the surroundings. Be especially careful to be slow during the swing operations.
- Determine a work supervisor for crane operation and always follow the instructions of the supervisor. Follow the instructions of the supervisor for work methods and procedures.
Determine how to give signals and follow them.
- A long load is instable when hoisted and thus, dangerous. Attach a rope to the both ends of the load to make the load stable.
- Do not let people approach the working area or stand below the load, since there is a risk of the load falling and contact with the load. Doing so may result in serious bodily accidents. Also, during the work, consider the fact that the working radius increases when the load is hoisted and the boom is deflected thus.
- Work that goes beyond the machine performance will cause accidents and failures. Particularly, the crane operation must be performed based on the rated total load chart.
- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steelwork when hoisting a load.
If caught by an obstacle, do not forcibly wind up the hoisted load, but untangle the caught part before winding up.
- Do not pull laterally, pull toward you or hoist diagonally. Doing so may cause the crane to tip or suffer damage.
- Do not attempt to work with the crane when the view is bad due to location or weather. It is dangerous. Ensure brightness by posting a work lamp or other illumination facilities in dark places.
When the view is bad because of bad weather (rain, fog, and snow), abort working and wait until the weather recovers.
- Do not use for the purpose, of raising a person using the crane hook, Unless in an approved cage, check local regulations before lifting personnel.
- If the over-winding detector alarm buzzer is heard, immediately remove your hand from the winch lever. The hook block winding will then stop. Then, operate the winch lever to Down (push forward) to wind down the hook block. Also note that the hook block is raised up when the boom is extended, so be sure to allow extra clearance between the boom and the hook block during work.
- When the boom extends, the hook block is raised up.
Operate the winch lever to Down (push forward) to wind down the hook block while you extend the boom.
- Whenever an overload occurs during work, lower the load, winding down the winch by setting the winch lever to Down (push forward).
Do not raise or lower the boom acutely. Such attempt may cause serious accidents by tipping.
- The volume of the hydraulic oil in each of the cylinders changes depending on the temperature.
By leaving idle with a load hoisted, as time passes, the oil temperature drops and the hydraulic oil volume decreases, and changes such as the boom derrick angle decrease and boom length decrease may occur.
In that case, execute boom derricking operations and boom extension operations appropriately to correct.
- Do not leave the driving operation position when a load is hoisted.
Lower the load and place lock lever to LOCK position before leaving the Machine.
- Keep the hook block raised up when not in use.
Otherwise, persons near the load may collide the hook block.
- Operator must not leave operation seat during operation.
- Any work that hoists an attachment that generates some vibration such as a VIBRO is forbidden. The vibration of the attachment may break the winch, etc.

CAUTIONS HIGH TEMPERATURE OIL WHEN WORKING WITH CRANE

When the hydraulic oil temperature exceeds 80 degrees, high pressure hoses and seals can be damaged by heat. It may cause a burn from spouting oil.

If the temperature of hydraulic oil becomes over 80 degrees, stop operation and wait until the oil cools down.

Continuous hook raising / lowering operation at high working lifting height and long periods of acceleration will raise oil temperature. Take care during these operations.

CAUTIONS WHEN OPERATING WINCH

- Select the hook appropriate for the load weight and right number of wire rope falls.

★ For details, see "Operation 4. Handling Wire Rope".

- Do not let persons enter below the hoisted load.
- When hoisting a load, always stop once at the "takeoff" position where the hoisted load leaves the ground. Check subjects such as load stability and load force, then hoist up the load.
- Do not pull laterally, towards you or hoist diagonally. Doing so may cause the crane to tip or suffer damage.
- Over-winding of the hook block may result in a collision with the boom, snapping the wire ropes and causing the hook block and load to fall, causing a serious accidents. Be very careful to prevent over-winding the hook block.
- Be careful to prevent the wire rope and/or hoisted load from contacting any obstacle such as a tree or steelwork when hoisting a load.

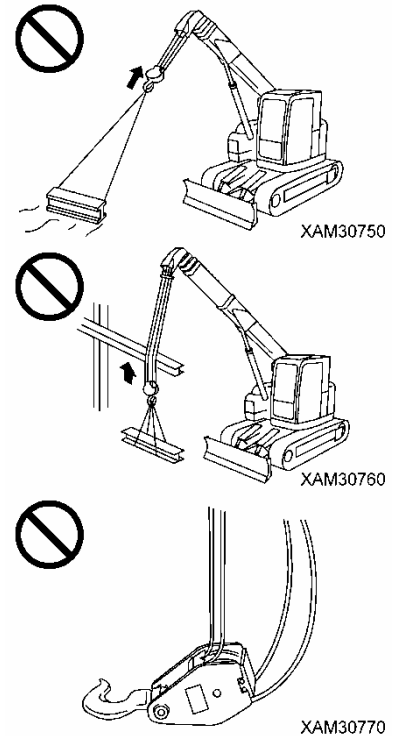
If caught by an obstacle, do not forcibly wind up the load, but untangle the caught part before winding up.

- Do not use the winch drum wire rope in a random way. Doing so will only damage the wire rope and shortens its working life, or the wire rope may snap and cause a serious accidents.

Observe the following precautions to avoid wire rope from becoming random.

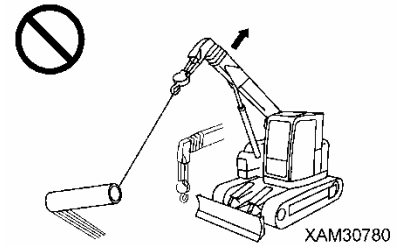
- Do not let the hook block hit the ground.
- Before leaving the hook block lowered for a long time, for instance when working below ground, leave at least three loops of wire rope in the winch drum.
- Release the accelerator pedal to decrease the engine speed, and slowly return the right working control lever to decelerate from high-speed hoisting. Returning the right working control lever quickly at high speed will result in a rapid deceleration shock to the hook, jerking the hook and leading to irregular winding.
- If the wire rope is twisted and causes the hook block to turn, fully eliminate the twist before work.

★ See "Operation 4.3 What to do with Twisted Winch Wire Rope" for details.



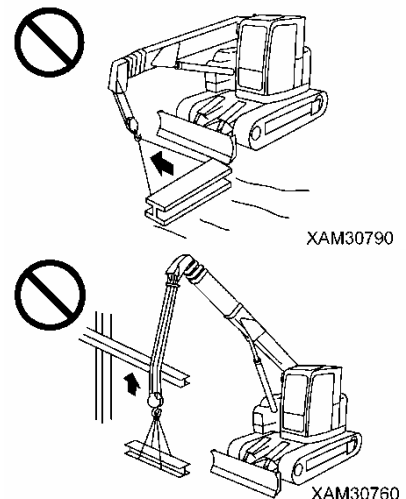
CAUTIONS WHEN OPERATING BOOM

- Be as slow as possible when operating the boom operation lever. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to swing and give a large impact to the Machine, and thus may damage the crane or tip the Machine.
- When the boom is lowered, the working radius increases, and the rated total load that can be hoisted decreases. When working while raising/lowering the boom, pay extra attention so that the mass (weight) of the load at the time the boom is most lowered does not cause overloading.
- Attempts to pull the load laterally or pull to bring the load in by raising/lowering and/or extracting/retracting operation of the boom are prohibited. Do not attempt under any circumstance.
- Be aware of the hook block windup condition and exercise caution when extending or retracting the boom.
- When the boom is extended, the working radius increases, and the rated total load that can be hoisted decreases. When working with extending/retracting the boom, pay extra attention so that the mass (weight) of the load at the time the boom is most extended does not cause overloading.



CAUTIONS DURING SWING OPERATION

- Check the safety in the vicinity and blow the horn before swinging.
 - Be as slow as possible when operating the swing lever. Make sure to start smoothly, swing slow, and stop gently. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to swing and cause the Machine to lose balance, and thus may damage the crane or tip the Machine.
 - Attempting to pull the load in or stand the load up by swinging operation are prohibited. Do not attempt under any circumstance.
 - Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steelwork when hoisting a load or when swinging.
- If caught by an obstacle, do not forcibly wind up the load, but untangle the caught part before winding up.



COOPERATION HOISTING IS PROHIBITED AS THE RULE

Tandem hoisting, that is to use more than one crane to hoist a load, is prohibited.

Tandem hoisting work is a highly hazardous work that may cause for instance the machine to tip due to uneven center of gravity, resulting in dropping the hoisted load or boom damage.

If the need to work so exists for unavoidable reason, establish a work scheme by responsibility of the user, discuss fully, let the worker fully acknowledge the work method and procedures, then work carefully under the direct leadership of the work supervisor.

And, observe the following cautions as well.

- Use cranes of the same model.
- Choose the Machine model that can handle sufficiently larger loads than the load to be hoisted.
- Make sure only one person gives signals.
- Limit the crane operations to single operations as the rule, and do not attempt any swing operation.
- Appoint one experienced slinger who will take overall responsibility.

WORKING AT A SITE WITH BELOW GROUND LIFTING

- Leave at least three loops of wire rope in the winch drum when winding down the wire rope in the case of underground work or similar. This Machine is equipped with three-winding stop alarm / automatic stop device as the safety device, but even then be very careful to prevent this safety device from activating.
- Make sure signs are communicated fully.
- Be especially careful with the crane operations.

SAFETY PRECAUTIONS FOR PICK & CARRY OPERATION

Pick and carry operation can be very unstable and dangerous.

Where such an operation is un-avoidable, strictly observe the following. Failure to observe precautions may result in death or serious injury.

- Observe the precautions specified in the operation manual:
 - ★Refer to "Operation 3.18.1 Safety Precautions for Pick and Carry Operation".
- Always keep the correct posture as specified in the operation manual:
 - ★Refer to "Operation 3.18.2 Posture for Pick and Carry Operation".
- The hoisted load should be within a safe load range and kept in a height near the ground.
- Arrange a person to guide the machine travelling.
- Remove all the obstacles in the pick and carry path and keep out all persons.
- Hoisting in the boom configuration exceeding the rated length is prohibited.
- The rated total load is applicable only to the optimum condition. Limit the load to a safety level based on the particular condition.
- To prevent the hoisted load from swinging in a pick and carry operation, keep the engine in low idling (low speed rotation) and keep the travel speed slow. Avoid operations such as sudden start and stop or using travel speed pedal.
- During a pick and carry operation, never attempt shifting to the travel speed selector switch to the "High" position, swinging the upper structure and/or other crane operations.

3. TRANSPORT PRECAUTIONS

CAUTIONS DURING TRANSPORT

When transporting the machine on a trailer, do as follows.

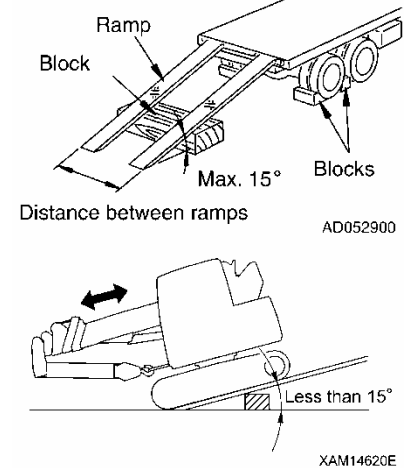
- The weight, transportation height, and overall length of the machine differ according to the crane.
- When passing over bridges or structure on private land, check first that the structure is strong enough to support the weight of the machine.
- When travelling on public roads, check first with the relevant authorities and follow their instructions.
- For details of the transportation procedure, see "Operation 6. Transportation".

CAUTIONS WHEN LOADING OR UNLOADING

When loading or unloading the machine, mistaken operation may bring the hazard of the machine tipping over or falling, so particular care is necessary. Always do as follows.

- Select a location that is level and has firm road surface when loading or unloading the Machine. In addition, keep enough distance from the roadside.
- Use the ramps at 15 degrees or less. In addition, decide on the distance between ramps to meet the center of the tracks.
- Use ramps that have the width, length and thickness, and that enable safe loading/unloading. Reinforce with blocks or other materials if the ramps deflect much.
- Remove mud and other substances from the footing to prevent the Machine from skidding over the ramps. Remove any substances stuck to the ramps such as grease, oil or ice, and keep clean. Be especially careful during rainy days where slips easily occur.
- When loading or unloading the machine, always keep it in a travelling posture and fix the hook block by the stowage wire rope.
★ See "Operation 3.6 Machine Travel Posture" for details.
- When loading or unloading, set the engine rotation to low idling (low speed rotation) and operate slowly by low speed travel.
- Always move backward when loading the Machine. Moving forward may cause a trip.
- When on the ramps, do not operate any lever except for the travel lever.
- Never correct your steering on the ramps. If necessary, drive off the ramps, correct the direction, and then enter the ramps again.
- The center of gravity of the machine will change suddenly at the point between the ramps and the truck or trailer, and there is danger of the machine losing its balance. Travel slowly over this point.
- When loading or unloading to an embankment or platform, make sure that it has suitable width, strength, and grade.
- When the machine is required to turn its direction on the carrier, keep it in a travelling posture and operate slowly, as the base is unstable.
- After loading the machine, apply wood blocks so that the machine does not move, and securely fix with wire ropes or other means.
★ See "Operation 5. Transportation" for details.
★ See "Operation 5.1 Loading/Unloading" for details.

CORRECT



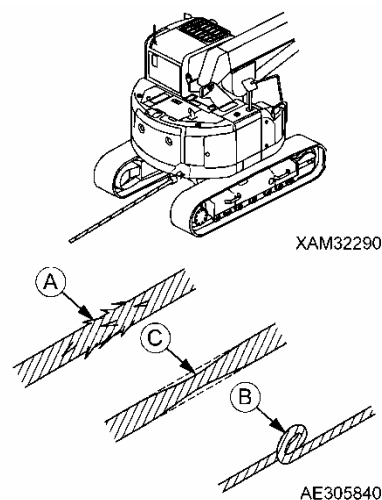
4. TOWING PRECAUTIONS

SAFETY RULES FOR TOWING

Serious injury or death could result if a disabled machine is towed incorrectly or if there is a mistake in the selection or inspection of the wire rope.

★For details of towing, see “Operation 8.3 How to tow the machine”.

- Always wear leather gloves when handling wire rope.
- During the towing operation, never stand between the towing objects and the machine being towed.
- Never tow a machine on a slope.
- Never use a wire rope which has cut strands (A), reduced diameter (C) or kinks (B). There is danger that the rope may break during the towing operation.



5. MAINTENANCE PRECAUTIONS

5.1 PRECAUTIONS BEFORE MAINTENANCE

FAILURE REPORT

Execution of any maintenance not described in our manual may cause unexpected failures. Ask us or our sales service agency for repair.

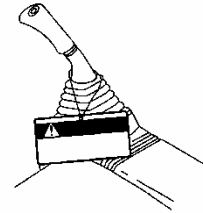
PRECAUTIONS FOR WARNING TAG

- Always attach the “Do NOT operate” warning tag to the work equipment control lever in the operator’s cab to alert others that you are performing service or maintenance on the machine. Attach additional warning tags around the machine if necessary.
★Warning tag Part No. 09963- 03001
Keep this warning tag in the tool box while it is not used. If there is no tool box, keep the tag in the operation manual pocket.
- If others start the engine, or touch or operate the work equipment control lever while you are performing service or maintenance, you could suffer serious injury or property damage.

DANGER

Do NOT operate

When this tag is not being used, keep it in the storage compartment. When there is no storage compartment; keep it in the operation manual case.



AE305910

DANGER

Do NOT operate

When this tag is not being used keep it in the storage compartment. Still more, when there is no storage compartment, keep it in the operation manual case. 09963-03001

KEEP WORK PLACE CLEAN AND TIDY

- Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean and tidy to enable you to carry out operation safety.
If the work place is not kept clean and tidy, there is the danger that you will trip, slip, or fall over and injure yourself.
- When cleaning the ceiling window which is made of organic glass (polycarbonate), use tap water and avoid use of organic solvents for cleaning. An organic solvent like benzene, toluene or methanol can invite a chemical reaction like dissolution and decomposition on the window glass, deteriorating polycarbonate in use.

SELECT A PLACE

- Stop the machine on firm, level ground.
- Select a place where there is no hazard of falling rocks or landslides, or flooding if the land is low.

PERSONNEL

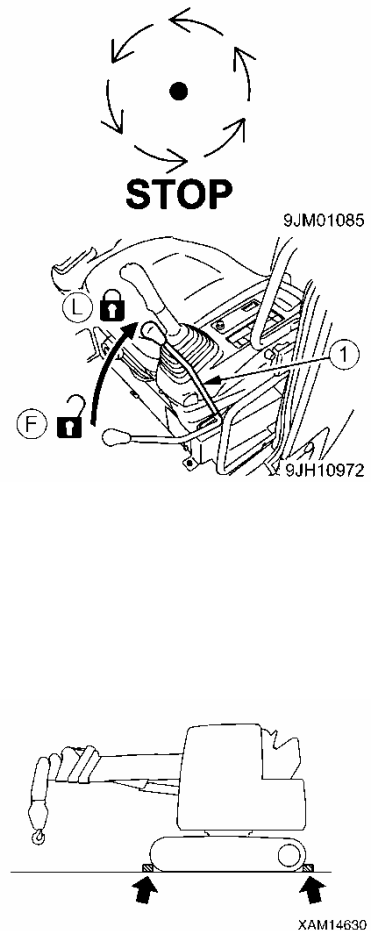
Only authorized personnel can service and repair the machine. Do not allow unauthorized personnel into the area. If necessary, employ an observer.

FOLLOW SUPERVISOR INSTRUCTION DURING TEAMWORK

Appoint a person who supervises the work and follow his/her instructions in case of Machine repair or installing/uninstalling a work device.
Unexpected accidents due to misunderstood communication between workers may occur during teamwork.

STOP ENGINE BEFORE CARRYING OUT MAINTENANCE

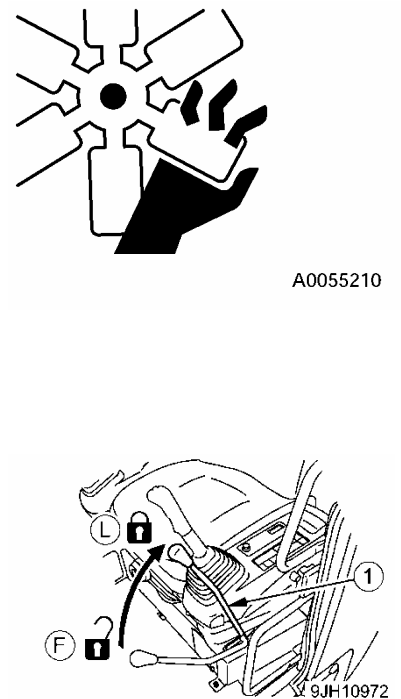
- Stop the machine on firm, level ground. Store the crane, and then stop the engine.
- Turn the starter switch to the OFF position, and push up lock lever (1) to the LOCK position (L).
- Operate the travel levers and blade lever back and forth at the full stroke 2 to 3 times to eliminate the remaining internal pressure in the hydraulic circuit.
- Set the travel lock bar to lock the travel levers, and make sure travel levers do not move.
- ★ Wait for approx. one minute after turning off the engine starter switch key and press the horn switch, and make sure it does not sound.
- Put blocks under the track to prevent the machine from moving.



TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING

To prevent injury, do not carry out maintenance with the engine running. If maintenance must be carried out with the engine running, carry out the operation with at least two workers and do as follows.

- One worker must always sit in the operator's seat and be ready to stop the engine at any time. All workers must maintain contact with the other workers.
- When carrying out operations near the fan, fan belt, winch drum, or other rotating parts, there is a hazard of being caught in the parts, so be careful not to come too close.
- Never drop or insert tools or other objects into the fan, or fan belt or winch drum, or other rotating parts. Parts may break or be sent flying.
- Do not touch any control levers or pedals. If any control levers or pedals must be operated, always give a signal to the other workers to warn them to move to a safe place.
- Release the pressure remaining in the hydraulic system and operate the lock lever (1) to "Lock" position (L).
- ★ Refer to "Maintenance 2. Basic Maintenance (Hydraulic Equipment Handling)".
- Do not touch any control levers or pedals. If any control levers or pedals must be operated, always give a signal to the other workers to warn them to move to a safe place.



USE APPROPRIATE TOOLS

Use only tools suited to the task and be sure to use tools correctly. Using damaged, low quality, faulty, makeshift tools or improper use of the tools could cause serious personal injury.



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PRECAUTIONS FOR ELEVATED WORK

For elevated work, prepare an appropriate elevated work platform with steps.

CAUTION WHEN WORKING UNDER THE MACHINE AND CRANE

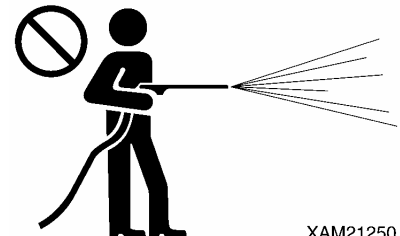
- Hoists or jacks used to lift the machine up must be capable to carry on the weight of the component and be in good condition. In addition, avoid using a hydraulic jack to lift up the damaged, bent or twisted part of the machine. Also, the wire rope for hoisting should be without any wire breakage, decreasing in the diameter and/or kink. Avoid using bent or damaged hooks.
- If it is necessary to go under the crane or the machine to carry out service and maintenance, support the crane and machine securely with blocks and stands strong enough to support the weight of the crane and machine.
- Avoid using concrete blocks to support the machine. Concrete blocks easily crush even under small loads.



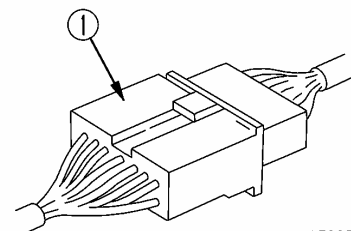
A0055140

CLEAN BEFORE INSPECTION OR MAINTAIN

- Before starting an inspection or maintenance, clean the Machine and prevent rubbish from entering the Machine and make sure that safety will be ensured during maintenance.
- Attempting to inspect or maintain the machine whilst still dirty not only lessens the chance of locating a faulty part, but may cause rubbish or mud to enter your eye, also slipping and tripping resulting in injury.
- Always observe the followings when washing the vehicle.
 - Use anti-slip shoes to prevent slips and trips caused by wet foothold.
 - Put on protective equipment when using a high pressure steam wash. Avoid accidents that the contact with high pressure water causes such as skin laceration or mud or other substances flying into eye.
 - Do not directly spray water onto electrical system (sensors, connector (1), receiving box, ML display, monitor panel and related). Entrance of water into the electrical system causes faulty operations and may trigger improper operations, thus is dangerous.
 - Do not directly spray water onto bottom side of operator's seat.



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5.2 PRECAUTIONS DURING MAINTENANCE

CAUTIONS DURING WELDING REPAIR

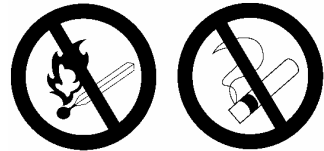
Welding operation must always be carried out by a qualified welder and in a place equipped with proper equipment. There is a hazard of gas, fire, or electrocution when carrying out welding, so never allow any unqualified personnel to carry out welding.

BATTERY HANDLING CAUTIONS

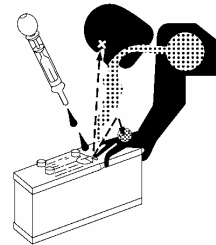
To check or handle the battery, turn the starter switch to the OFF (cut) position to cut the power line, to prevent the engine from un-expected starting during maintenance.

The battery fluid includes diluted sulfuric acid, and generates hydrogen gas, and causes bodily accidents and fires if handled improperly, so always observe the followings.

- Do not let a cigarette or any fire source approach the battery.
- Always put on protective glasses and rubber gloves before handling the battery.
- If battery fluid has contacted clothing or skin, immediately wash away by huge quantity of water.
- If the battery fluid entered an eye, wash immediately with water and see the doctor as soon as possible.
- If you have swallowed the battery fluid by mishap, immediately drink huge quantity of water, milk, raw egg or vegetable oil, and see the doctor as soon as possible.
- Wipe with a wet clean cloth when cleaning the battery upper surface or related part. Do not use organic solvent or detergent, for instance gasoline or paint thinner.
- Tighten the battery cap fully.
- If the battery fluid is frozen, do not charge battery or start the engine using other power source. Such acts may cause the battery to catch fire.
- Before charging or starting up using another power source, defreeze the battery fluid and check that failures such as battery fluid leaks do not exist.
- Always detach the battery from the Machine frame before charging the battery.



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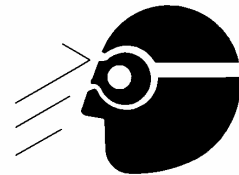
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BEWARE OF CHIPS WHEN WORKING WITH HAMMER

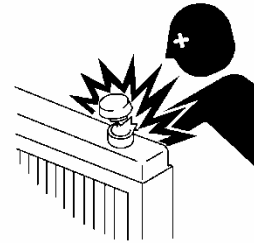
Whilst working with a hammer, keep protective equipment such as protective glasses and a helmet on, and insert a copper bar or similar object between the hammer and the target when hitting. Giving impact to a hard metal part such as a pin or a bearing may cause the broken chip to enter an eye and inflict injury.



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CAUTIONS WHEN COOLANT TEMPERATURE IS HIGH

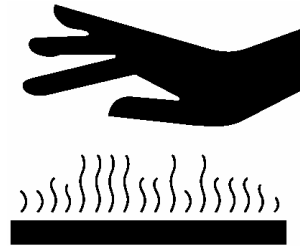
To prevent burns from hot water or steam spurting out when checking or draining the coolant, wait for the water to cool to a temperature where it is possible to touch the radiator cap by hand before starting the operation. Even when the coolant has cooled down, loosen the cap slowly to relieve the pressure inside the radiator before removing the cap.



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CAUTIONS WHEN OIL TEMPERATURE IS HIGH

To prevent burns from hot oil spurting out when checking or draining the oil, wait for the oil to cool to a temperature where it is possible to touch the cap or plug by hand before starting the operation. Even when the oil has cooled down, loosen the cap or plug slowly to relieve the internal pressure before removing the cap or plug.



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CAUTIONS FOR HIGH PRESSURE OIL

The hydraulic system is always under internal pressure. When inspecting or replacing piping or hoses, always check that the pressure in the hydraulic circuit has been released. If the circuit is still under pressure, it will lead to serious injury, so always do as follows.

- Release the pressure in the hydraulic circuit. Do not carry out any inspection or replacement work when the hydraulic system is under pressure.

★ Refer to "Maintenance 2. Basic Maintenance (Hydraulic Equipment Handling)".

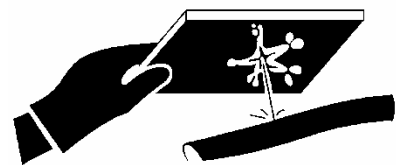
- If there is any leakage from the piping or hoses, the surrounding area will be wet, so check for cracks in the piping and hoses and for swelling in the hoses.

When carrying out an inspection, wear safety glasses and leather gloves.

- There is a hazard that high-pressure oil leaking from small holes may penetrate your skin or cause blindness if it contacts your eyes directly. If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the place with clean water, and consult a doctor immediately for medical attention.



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CAUTIONS FOR HIGH PRESSURE FUEL

High pressure is generated inside the engine fuel piping when the engine is running. When carrying out inspection or maintenance of the fuel piping system, wait for at least 30 seconds after stopping the engine to let the internal pressure go down before starting inspection or maintenance.

SAFETY HANDLING HIGH-PRESSURE HOSES

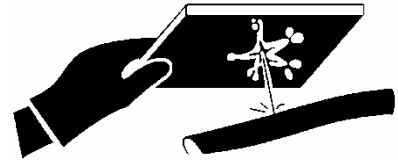
If oil or fuel leaks from high-pressure hoses, it may cause fire or defective operation, which may lead to serious injury. If any loose bolts are found, stop work and tighten to the specified torque. If any damaged hoses are found, stop operations immediately and contact us or our sales service agency.

Replace the hoses if any of the following problems are found.

- Damaged or leaking hydraulic fitting.
- Frayed or cut covering or exposed reinforcement wire layer.
- Covering swollen in places.
- Twisted or crushed movable portion.
- Foreign material embedded in covering.



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XAM18280

PRECAUTION FOR HIGH VOLTAGE

When the engine is running or immediately after it has stopped, high voltage is generated at the injector terminal and inside the engine controller, so there is danger of electrocution. Never touch the injector terminal or the inside of the engine controller.

If it is necessary, please contact us or our sales service agency.



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NOISE CAUTION

When carrying out maintenance of the engine and you are exposed to noise for long periods of time, wear ear covers or ear plugs while working.

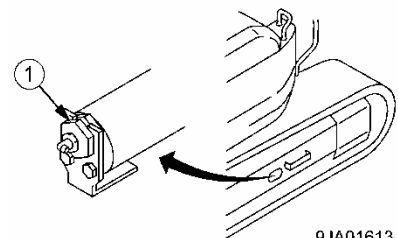
If the noise from the machine is too loud, it may cause temporary or permanent hearing problems.

SAFETY FIRST WHEN USING HIGH-PRESSURE GREASE TO ADJUST TRACK TENSION

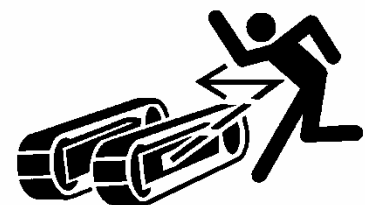
- Grease is pumped into the track tension adjustment system under high pressure.

If the specified procedure for maintenance is not followed when making adjustment, grease drain plug (1) may fly out and cause serious injury or property damage.

- When loosening grease drain plug (1) to loosen the track tension, never loosen it more than one turn. Loosen the grease drain plug slowly.
- Never put your face, hands, feet, or any other part of your body close to grease drain plug (1).



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DO NOT DISASSEMBLE RECOIL SPRING

Never attempt to disassemble the recoil spring assembly. It contains a spring under high pressure which serves as a shock absorber for the idler. If it is disassembled by mistake, the spring will fly out and cause serious injury. When it becomes necessary to disassemble it, ask us or our agent.

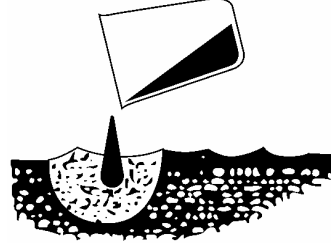
CAUTION FOR COMPRESSED AIR

- When carrying out cleaning with compressed air, there is a hazard of serious injury caused by flying particles.
- When using compressed air to clean elements or the radiator, always wear safety glasses, dust mask, gloves, and other protective equipment.

CAUTIONS WHEN TREATING WASTE

Always observe the following to prevent environmental pollution of a district inhabited with humans or animals.

- Do not dispose the waste oil down a water system such as sewage or river.
- Observe the applicable legal regulations and rules when disposing harmful substance such as the machine oil, fuel, solvent, filter or battery.



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PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

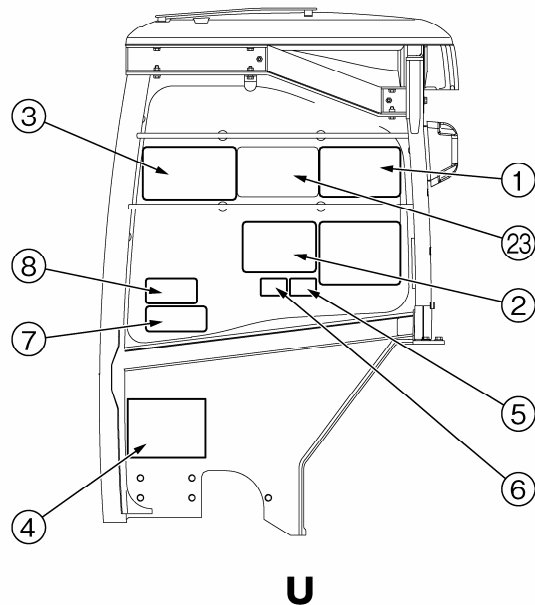
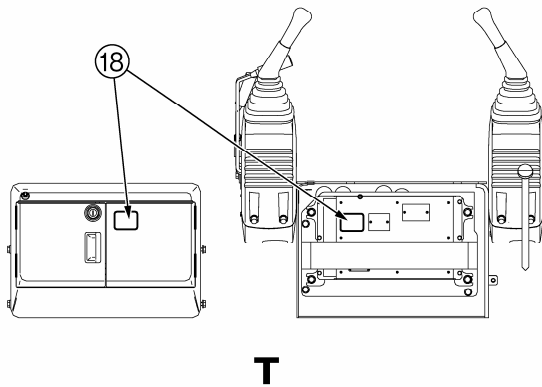
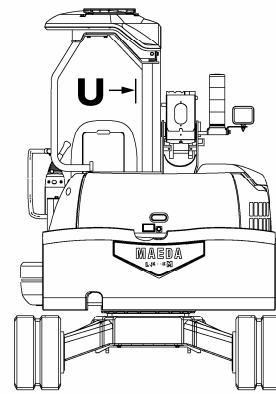
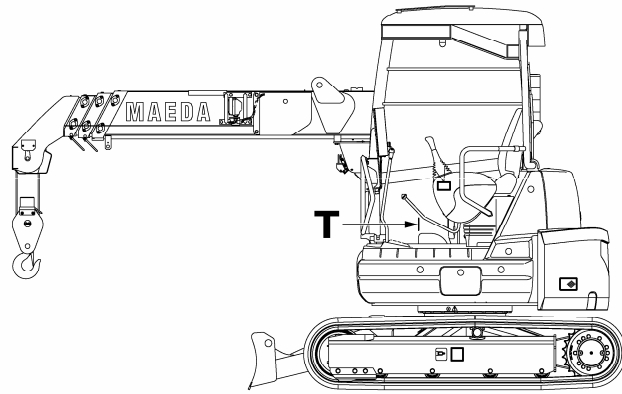
- For using the machine safely for an extended period of time, replace safety-critical parts like hoses and seat belts periodically.
 - ★For details, see "Inspection and Maintenance 4. Safety Critical Parts."
- The material of those components naturally changes over time, and repeated use causes deterioration, wear, and fatigue. As a result, there is a hazard that these components may fail and cause serious injury or death. It is difficult to judge the remaining life of these components from external inspection or the feeling when operating, so always replace them at the specified interval.
- Replace or repair safety-critical parts if any defect is found, even when they have not reached the time specified interval.

6. SAFETY LABEL LOCATIONS

Keep these labels clean all the time. If lost, apply again or replace with new one.

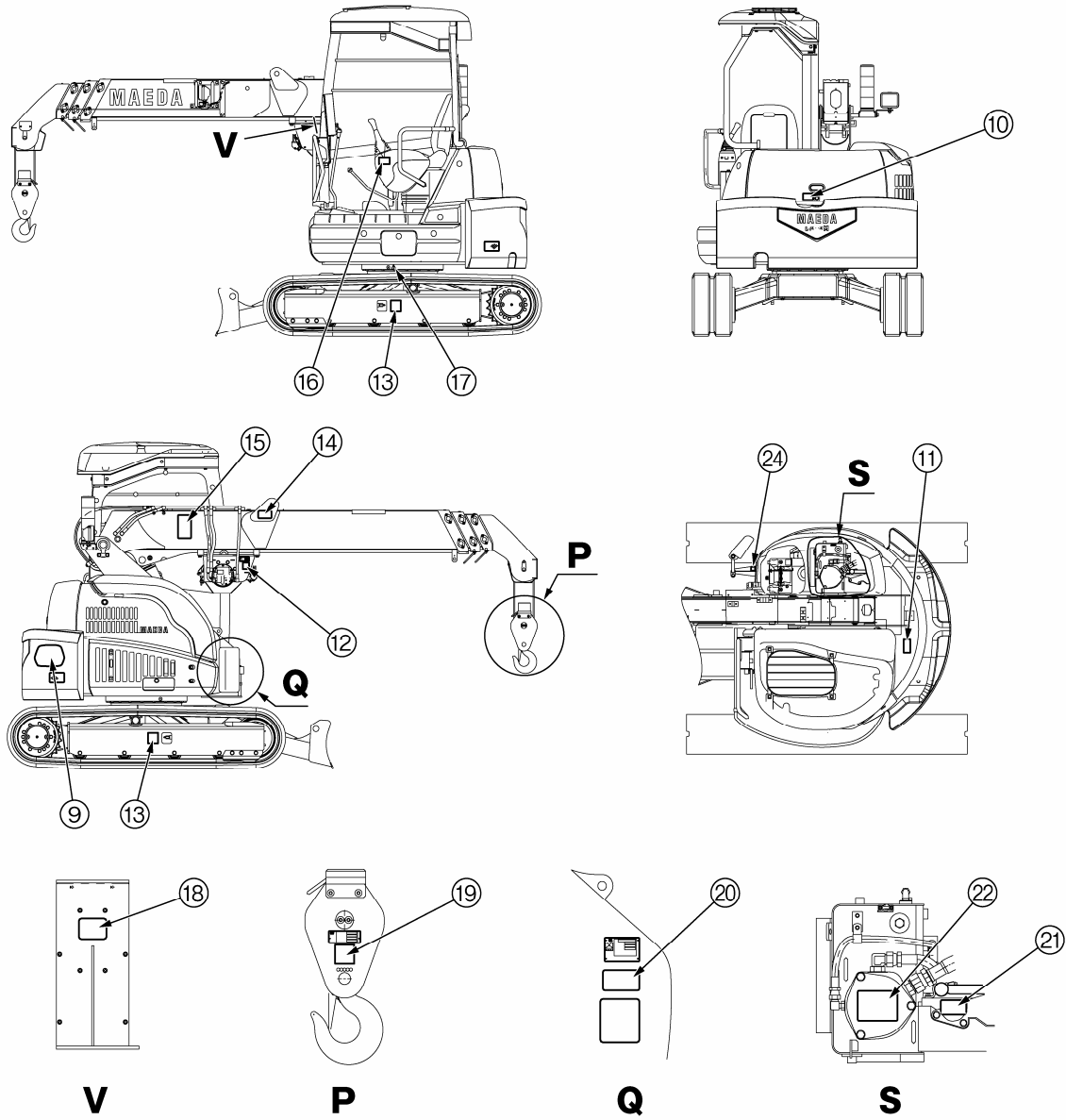
Labels other than the following safety labels exist, treat them the same.

[SAFETY LABEL LOCATIONS IN CAB]



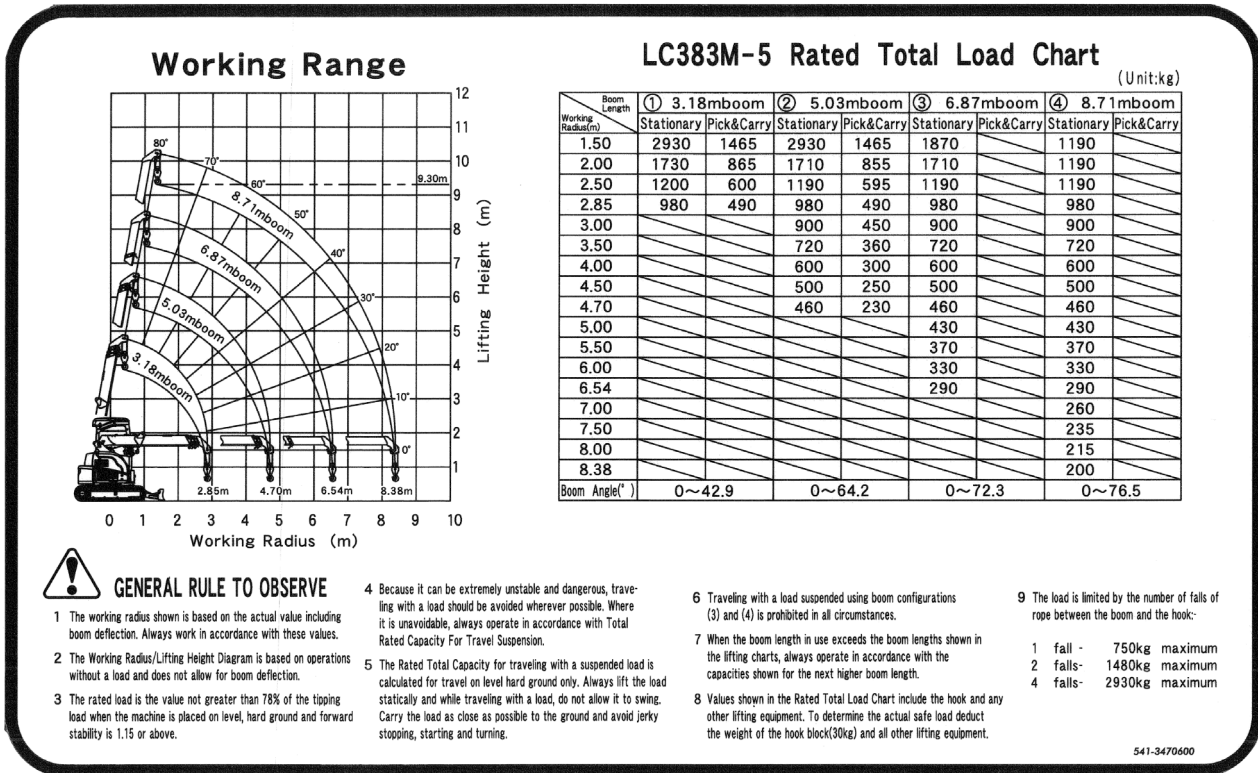
SAM01110E

[SAFETY LABEL LOCATIONS ON CHASSIS]



SAM01100E

(1) Working range and rated total load chart (541-3470600)



(2) For your safe operation (556-3367900-2)

FOR YOUR SAFE OPERATION

Be sure to operate your crane after reading Instruction Manual.

- Be sure to observe local laws and ordinances for crane operation.
- Before and after work, be sure to conduct daily inspection, lubrication and other required services.
- Crane should be operated on level, hard ground.
- Do not lift any load in excess of rated load.
- Make sure that there is no person or obstacle around the machine during work.
- Do not allow any person enter underneath the lifted load.
- Whenever leaving your operator seat, be sure to ground the load and shut down the engine.
- Never pull or drag any load horizontally.
- Never operate your crane with safety system function disabled.

CAUTION (Operation)

- Definitely avoid composite operation of 3 or more actions. It is too dangerous.
- Carry out swing operation smoothly, avoiding load to sway.
- Hoisting loads that produce vibrations is in principle prohibited. Attachments that produce vibrations can cause damage to the winch or other components of the machinery.

CAUTION (Work on slope)

- Working on slope is prohibited. If inevitable, limit the load to 50% of rated load. Never work on slope that is in excess of 3%. Crane may tip over.
- Swinging from higher to lower position on slope will be unstable with the load swaying out. Increase boom angle to reduce working radius and lower the swing speed.
- Never perform travel suspension on slope.

CAUTION (Traveling on slope)

- When traveling on slope, travel backward on up-hill and forward on down-hill.
- When traveling in reverse or in lateral position inevitably, be sure inclination is not in excess of 10 degrees.

3. Never perform swinging travel on slope as it may cause crane to tip over.

CAUTION (Travel suspension)

- Travel suspension is in principle prohibited as it is extremely unstable and hazardous. If inevitable, perform your work in accordance with Rated Load for Travel Suspension.
- Travel suspension is dangerous because load is likely to sway. Travel speed should be set at LO with engine running at low speed.
- Avoid jerky start, stop and spin turn.
- While in travel suspension, do not perform any crane function other than travel.
- Swing travel on slope is dangerous as it may cause the crane to tip over.

CAUTION (Hook stowage prior to traveling)

- Always level the boom and stow the hook prior to travel. When stowing the hook, never use the emergency switch. Never attempt to travel with the hook stowed and the boom raised.

CAUTION (Loading to and unloading from truck)

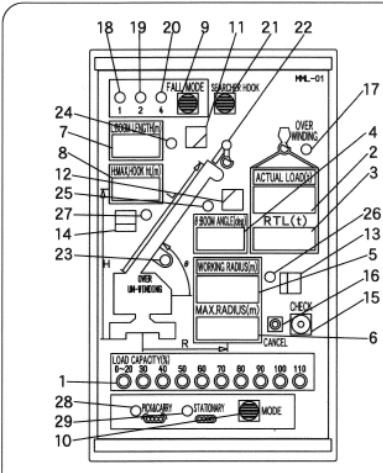
- Travel backward for loading and forward for unloading.
- Be sure to engage parking brake of truck and apply wheel blocks.
- Ramp board angle should be less than 15 degrees. Engage the board securely to truck bed and eliminate any difference of height between each board.
- Never perform any crane operation other than traveling on truck bed or ramp board as it may cause the crane to tip over.

Maximum inclination : 10 degrees

556-3367900-2

(3) Moment limiter operation (541-2214000)

MOMENT LIMITER OPERATION



- 1 Load capacity display
- 2 Actual load display
- 3 Rated load display
- 4 Boom angle display
- 5 Working radius display
- 6 Rated radius display
- 7 Boom length display
- 8 Lifting height display

- 9 Fall mode select button
- 10 Pick&Carry/Stationary mode select button
- 11 Boom angle upper limit setting button
- 12 Boom angle lower limit setting button
- 13 Working Radius upper limit setting button
- 14 Lift above ground level upper limit setting button
- 15 Set up check button
- 16 Set up cancel button
- 17 Overwind detect display LED(red)
- 18 1 fall display LED(green)
- 19 2 falls display LED(green)
- 20 4 falls display LED(green)
- 21 Searcher hook select button
- 22 Searcher hook display LED(orange)
- 23 Over Un-Winding detect display LED(red)
- 24 Boom angle upper limit display LED(orange)
- 25 Boom angle lower limit display LED(orange)
- 26 Working radius upper limit display LED(orange)
- 27 Lift above ground level upper limit display LED(orange)
- 28 Pick & carry mode select display LED(red)
- 29 Stationary mode select display LED(orange)

Configuration and how to use its function

Moment limiter is a safety system installed for preventing accident such as damaging or tipping over of crane due to over-loading.
For safer operation of your crane, be sure to fully utilize this system.

- 1) In addition to showing the lifting load and ratio of rated total load, it causes pre-warning (intermittent sound) to go off at 90% of rated total load, warning (continuous sound) to go off at 100%, causing actions of boom lowering, boom extending and hook hoisting to automatically stop, while actions on safe side such as boom hoisting, boom retracting and hook lowering remain to function.
- 2) Detects lifting load by means of pressure transmitter. Reads out rated total load with the signal of boom angle and length. Compares lifting load and rated total load for pre-warning, warning and stopping.


CAUTION

- 1 Swing mechanism does not stop automatically even when over-loaded. Be careful.
- 2 Before starting to operate your crane, be sure to conduct a start up check.
- 3 Set the moment limiter so that LED's on it go on at proper working conditions.
- 4 Pay attention to display of moment limiter to avoid over-loading the crane at any time.
- 5 If any action on non-safe side (boom extend, boom lower or hook hoisting) automatically comes to stop, reset the operation at safe side (boom retract, boom hoist or hook lowering).
- 6 For lifting a load off the ground, first hoist the hook until the load leaves ground and stop it momentarily to check for safety. Never lift your load off ground by hoisting boom.
- 7 While in pick & carry mode, if boom is extended to 3 or 4 stages, functions of extend, lower and hoisting will stop and E07 will be displayed. But this does not mean to be abnormal. In pick & carry mode, use of 3 or 4 stage boom is prohibited. Be sure to work with 2 or fewer stages.

541-2214000

(4) Warning for operation, inspection and maintenance (584-3469700)



CAUTION

When opening, closing, removing or replacing the windows, in order to avoid accidents caused by inadvertent movement of the controls, before leaving the operator's seat ALWAYS-

- ground any load
- move the safety lock (to the left of the operator's seat) to the LOCK position.

If the machine suddenly starts moving or acts in any unexpected way, serious injury or death may result.



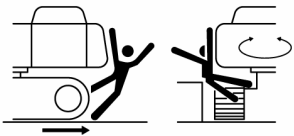
CAUTION

Whenever you operate the machine, check the operation pattern shown with your intended action.
When beginning any operation, start slowly, paying careful attention to all your surroundings.






WARNING



To prevent SERIOUS INJURY or DEATH before moving the machine ALWAYS

- sound the horn to alert anybody nearby
- ensure nobody is on or near the machine, or in the swing area
- safety permitting, position cab to maximize view of travel path
- if your view is obstructed, obtain assistance.



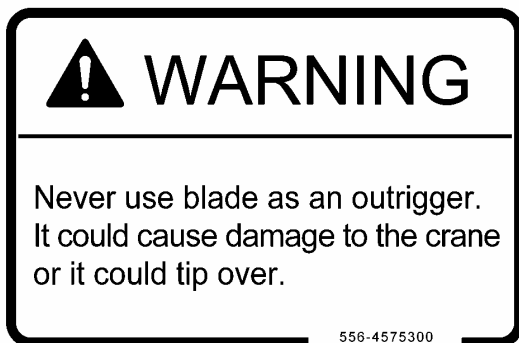
WARNING

To prepare for fires, decide the fire extinguisher storage location and install one, fully read the attached label for the usage and be prepared for fighting against the emergencies.

584-3469700

2-36

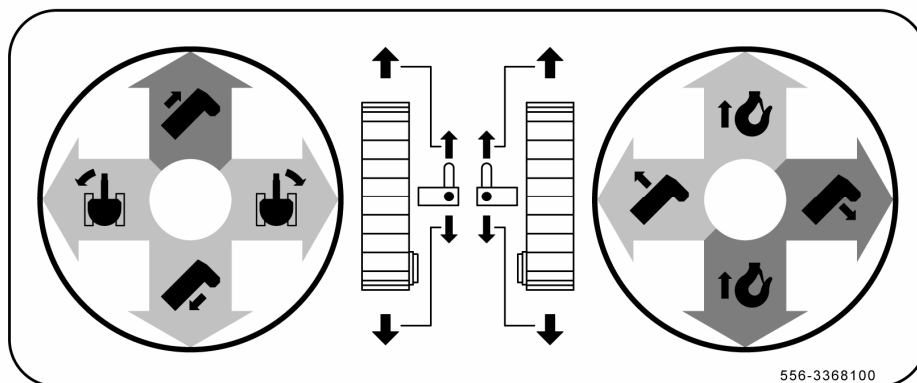
(5) Warning for blade operation (556-4575300)



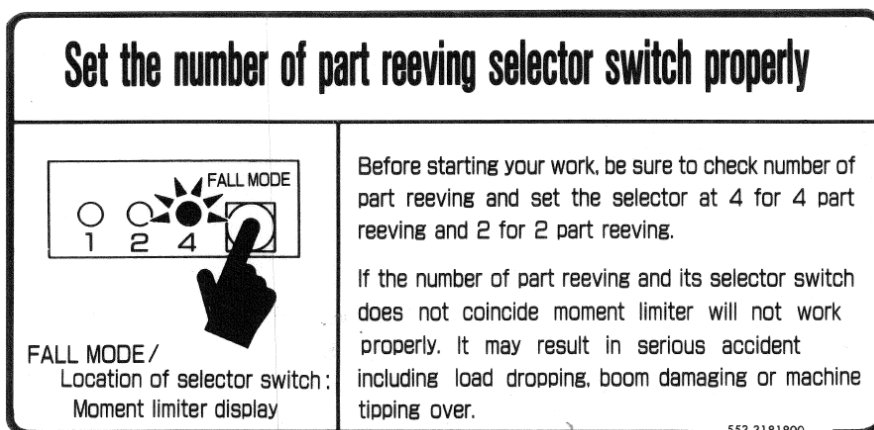
(6) Caution for emergency switch
(553-4266400)



(7) Control pattern (556-3368100)



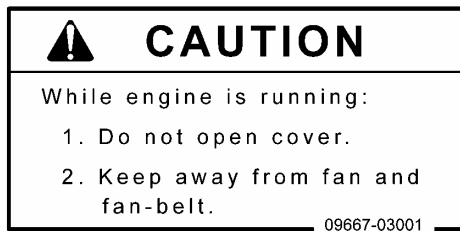
(8) Caution for number of parts reeving selector switch (553-3181800)



(9) Keep off swing area (09133-23000)



(10) Caution for rotating portion (09667-03001)



(11) Caution for engine hood (09805-13000)



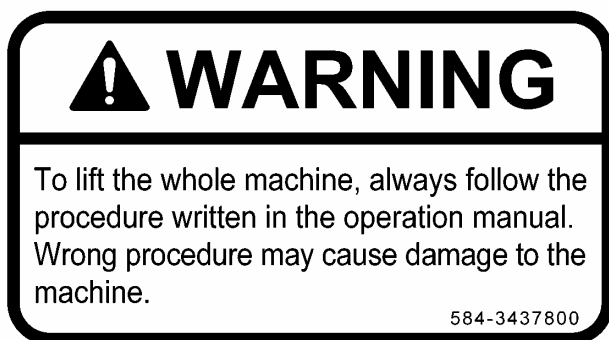
(12) Warning for winch (553-4267500)



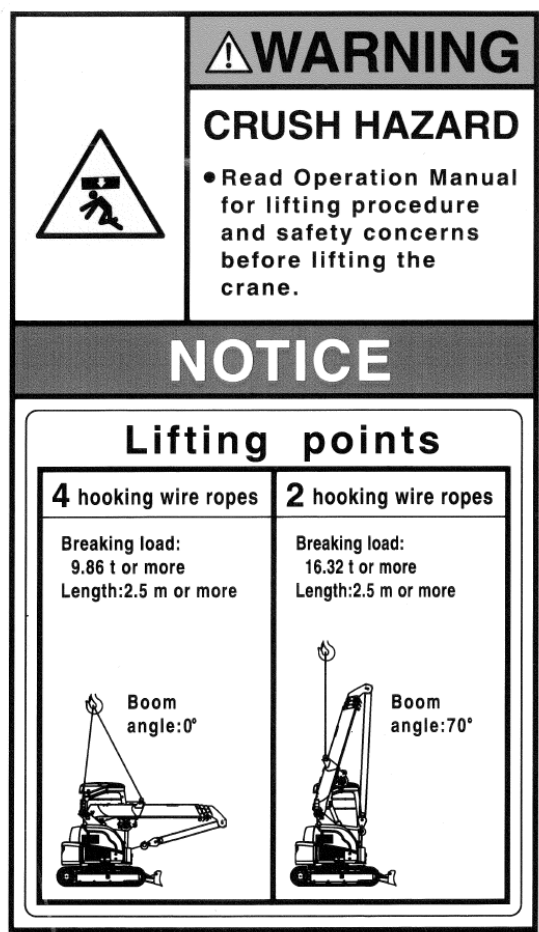
(13) Warning for track tension adjusting (584-4588200) (2 places)



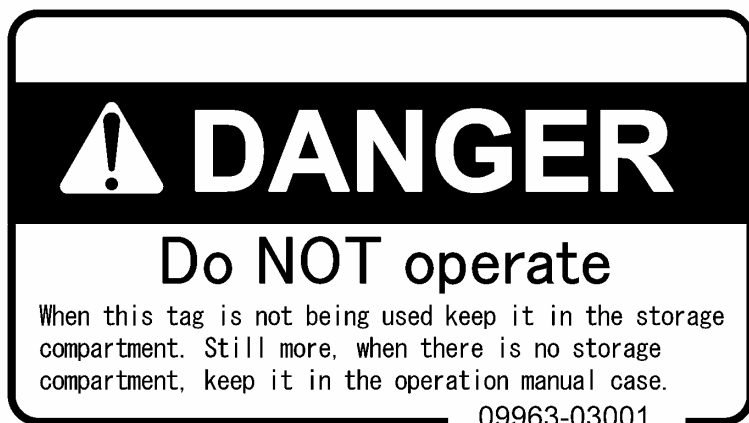
(14) Warning for lifting position (584-3437800)



(15) Caution for lifting machine (541-3472400)



(16) Warning tag (09963-03001)



(17) Warning (541-4614900)



(18) Caution for wash (300-4213900) (3 places)



(19) Warning for hook block (553-4267400) (2 places)



(20) Machine weight (541-4614800)

LC383M-5 MACHINE WEIGHT	
Model	Weight
LC383M-5	4400kg

541-4614800

(21) Warning for radiator cap (09653-A0361)



09653-A0361

(22) Warning for hydraulic oil (09653-03001)

 **WARNING**

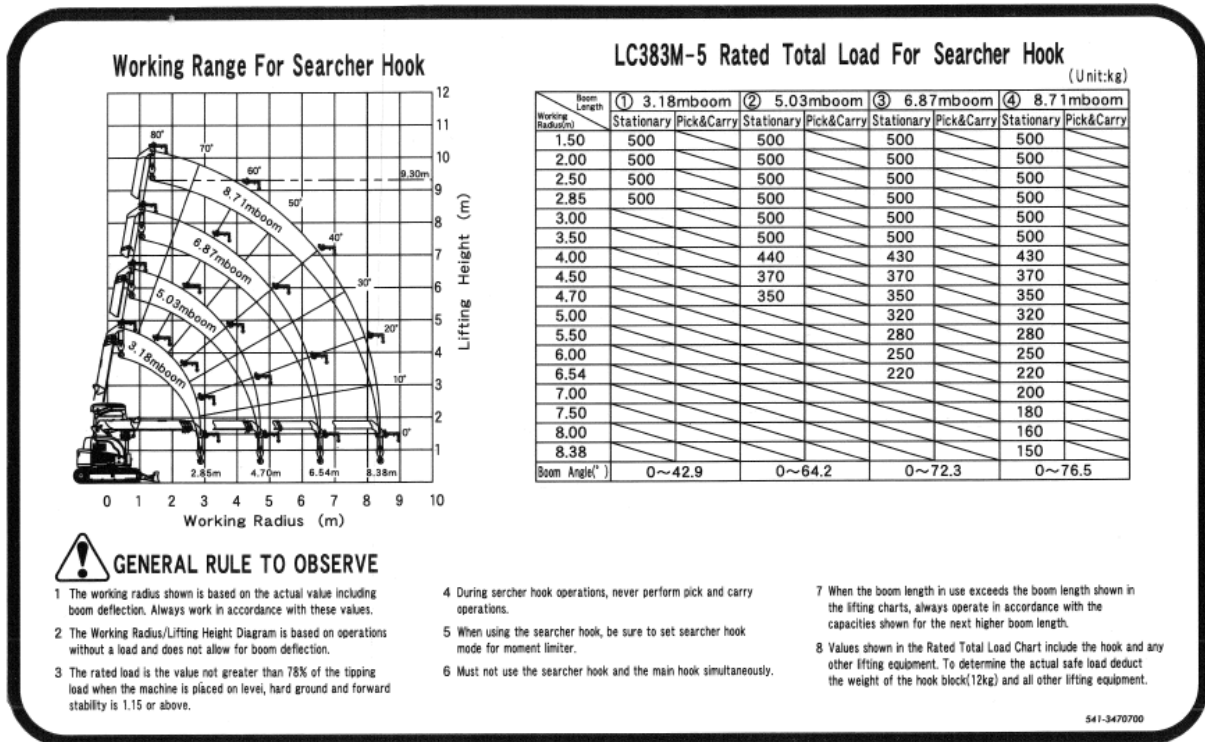
Hot oil hazard.

To prevent hot oil from spurting out:

- Turn engine off.
- Allow oil to cool.
- Slowly loosen cap to relieve pressure before removing.

09653-03001

(23) Working range and rated total load chart for searcher hook (541-3470700) (Optional)



(24) Do not stand on here (584-4581700)

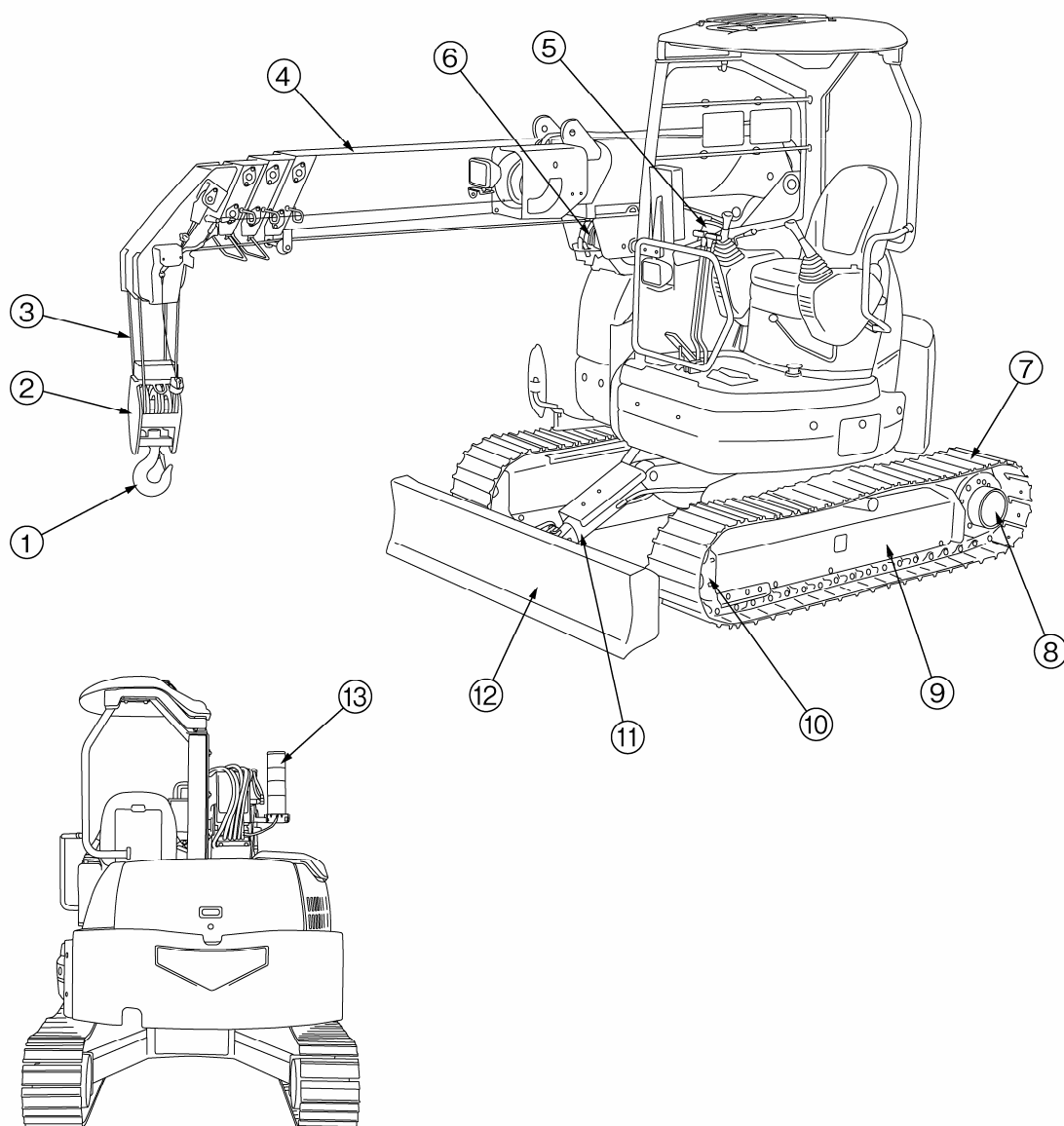


OPERATION

1. MACHINE EACH SECTION	3- 2
2. EXPLANATION OF DEVICES	3- 5
3. MACHINE OPERATIONS AND CONTROLS	3- 46
4. HANDLING WIRE CABLES	3-104
5. TRANSPORTATION	3-110
6. HANDLING IN COLD WEATHER	3-120
7. LONG TERM STORAGE	3-123
8. TROUBLES AND ACTIONS	3-124

1. MACHINE EACH SECTION

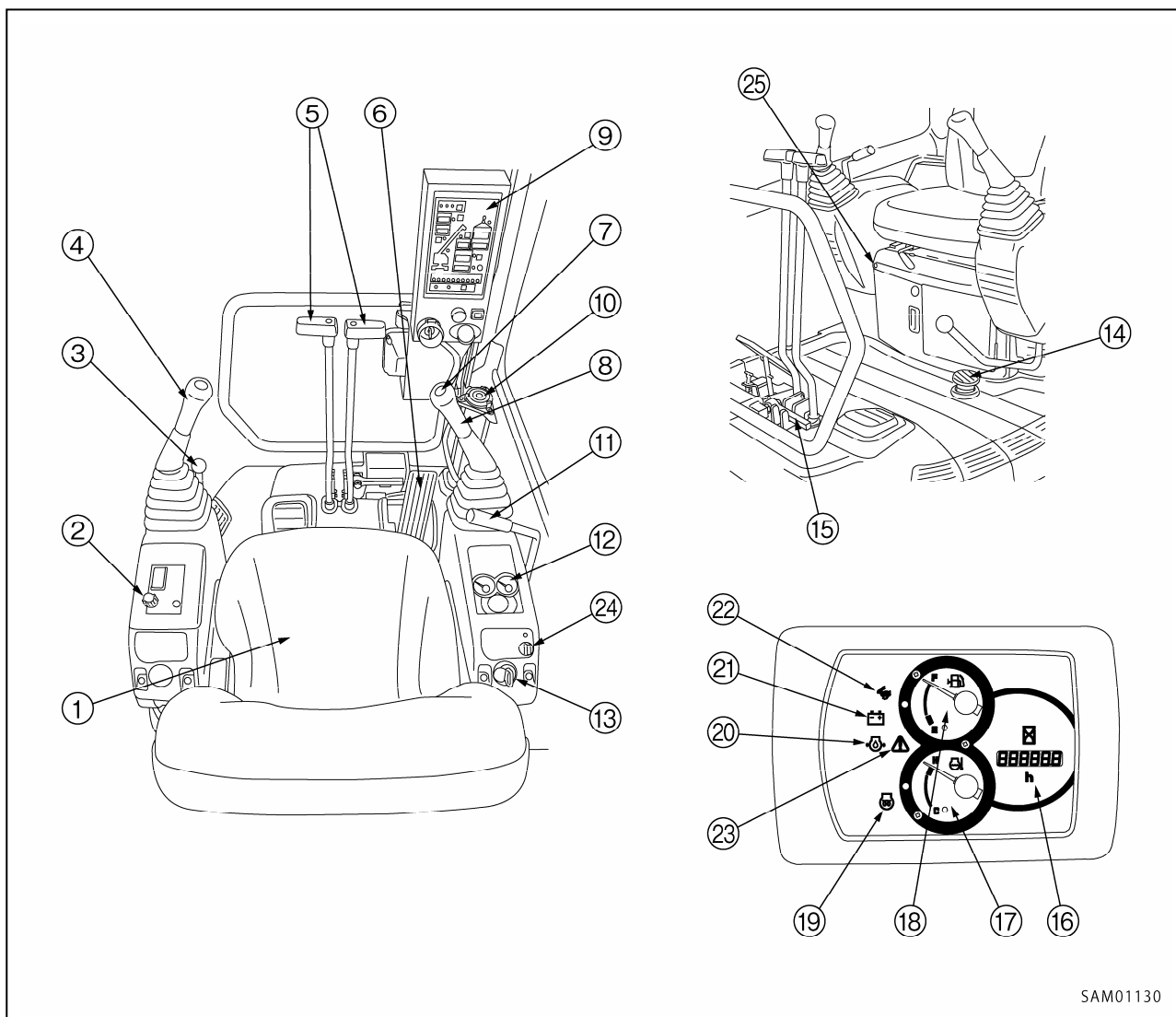
1.1 MACHINE EACH UNIT



SAM01120E

- | | |
|-------------------------|--------------------------|
| (1) Hook | (8) Sprocket |
| (2) Hook block | (9) Track frame |
| (3) Wire cable | (10) Idler |
| (4) Boom | (11) Blade cylinder |
| (5) Derricking cylinder | (12) Blade |
| (6) Winch | (13) Working status lamp |
| (7) Track | |

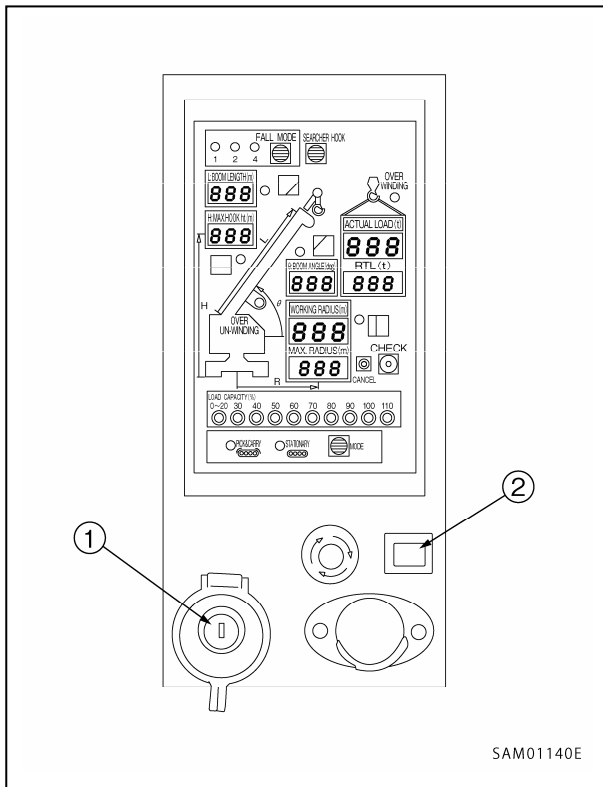
1.2 OPERATOR'S COMPARTMENT EQUIPMENT



SAM01130

- | | |
|---|--|
| (1) Operator's seat | (14) Speed-up pedal |
| (2) Lamp switch | (15) Travel lock lever |
| (3) Lock lever | (16) Service meter |
| (4) Left-hand work equipment control lever | (17) Engine coolant temperature gauge |
| (5) Travel lever | (18) Fuel gauge |
| (6) Accelerator pedal | (19) Engine pre-heating monitor |
| (7) Horn switch | (20) Engine oil pressure monitor |
| (8) Right-hand work equipment control lever | (21) Charge level monitor |
| (9) Moment limiter | (22) Travel speed-up monitor
(Does not function for this machine) |
| (10) Level | (23) Electrical system warning monitor
(Does not function for this machine) |
| (11) Blade lever | (24) Not available for this machine |
| (12) Monitor panel | (25) Not available for this machine |
| (13) Starter switch | |

1.3 MOMENT LIMITER RELATED SWITCH BOX



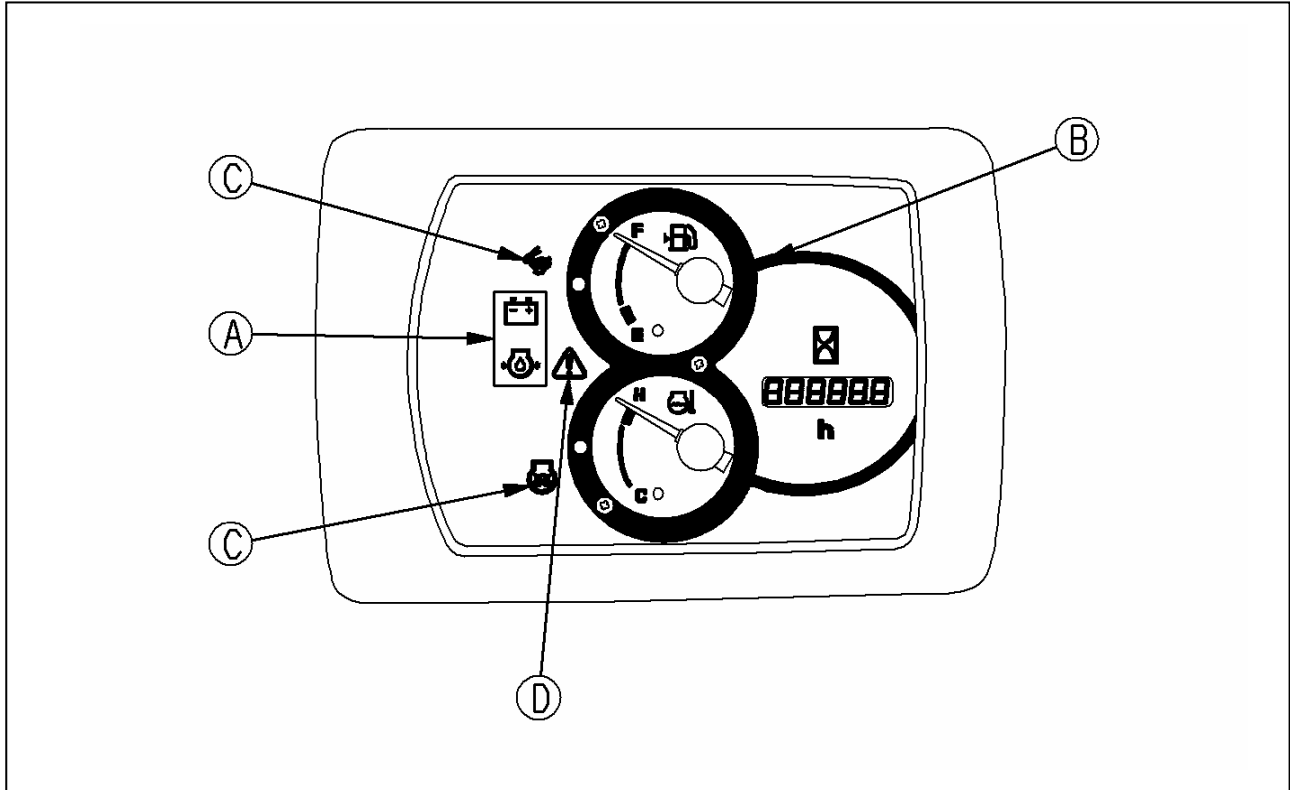
- (1) Moment limiter emergency stop cancel switch
- (2) Hook stowage switch

2. EXPLANATION OF DEVICES

The following is an explanation of devices that are required to operate the machine.

To perform suitable operations correctly and safety, it is important to have a complete understanding of equipment operating methods, and the displays.

2.1 MACHINE MONITOR



A: Emergency stop items

B: Gauge and meter

C: Pilot display

D: Electrical system

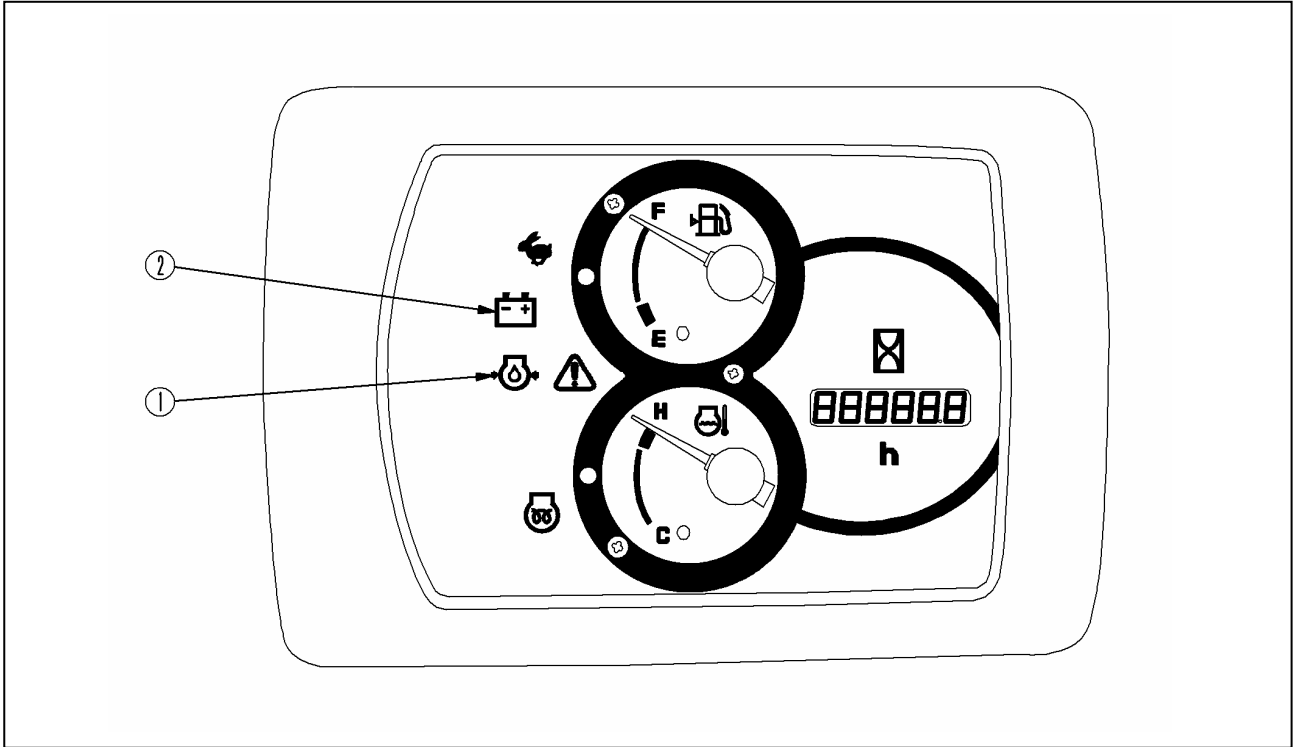
(Does not function for this machine)

2.1.1 EMERGENCY STOP ITEMS

⚠ CAUTION

If the monitor flashes or the buzzer sounds, stop the engine immediately or run at a low idle, check applicable location, then perform necessary actions.

These are items that should be observed while the engine is running. If any abnormality occurs, the abnormal section monitor flashes and the buzzer sounds. In this case, take the necessary actions immediately.



(1) Engine oil pressure monitor

(2) Charge level monitor

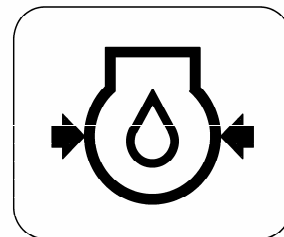
ENGINE OIL PRESSURE MONITOR

If the engine lubricating oil pressure falls below the normal value, this engine oil pressure monitor (1) flashes and the buzzer sounds.

If this monitor flashes, stop the engine and carry out an inspection according to "Operation 8.5 Other Trouble".

NOTES

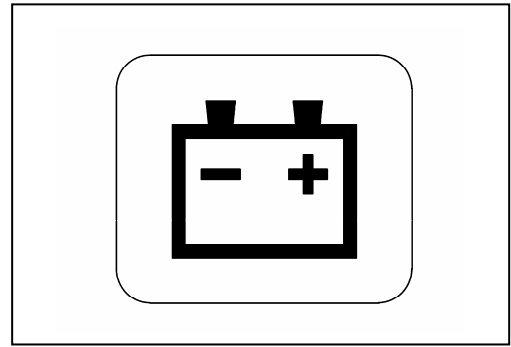
This monitor lights up while the starter switch is set in the ON position before the engine is started, and goes out after the engine is started.



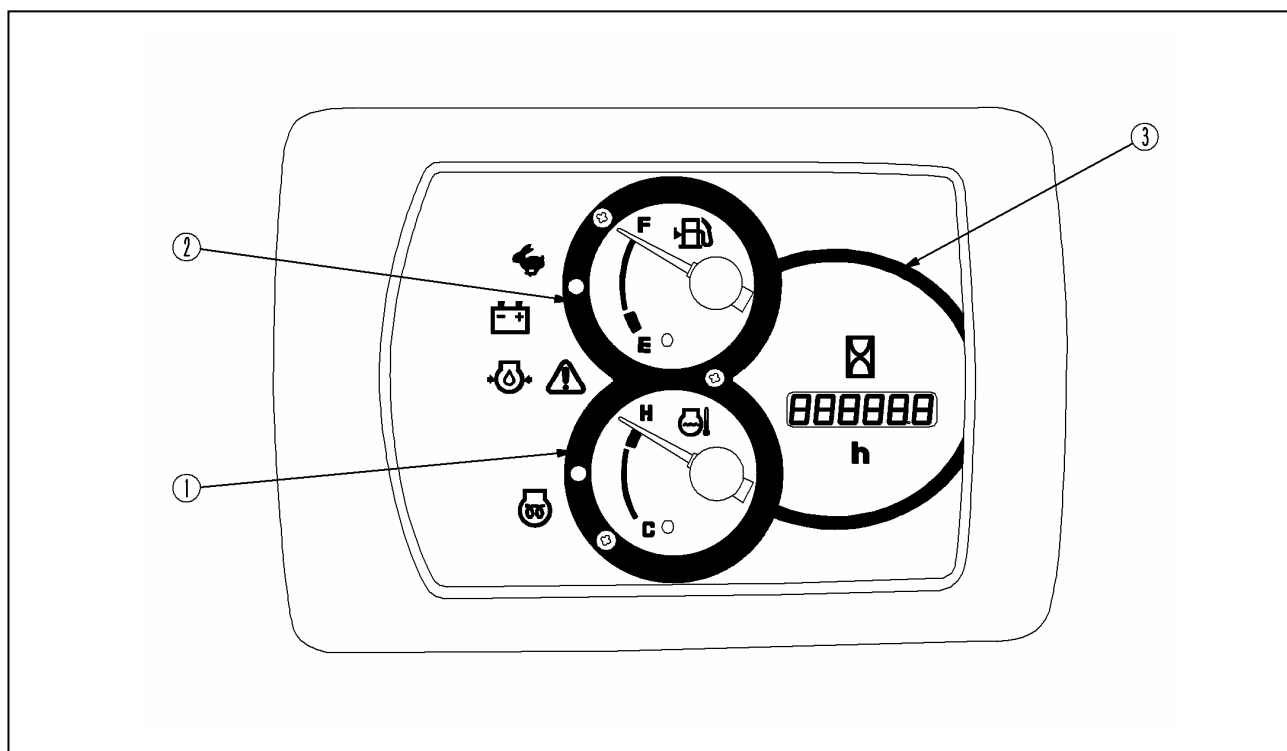
CHARGE LEVEL MONITOR

If the battery is not charged normally while the engine is running, this monitor (2) flashes and the buzzer sounds. If this monitor flashes, stop the engine and check the V-belt tension. If the V-belt is abnormal, see "Operation 8.5 Other Trouble".

NOTES
This monitor lights up while the starter switch is set in the ON position before the engine is started, and goes out after the engine is started.



2.1.2 GAUGE AND METER

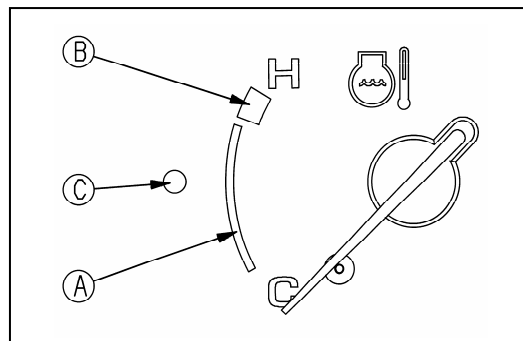


- (1) Engine coolant temperature gauge
- (2) Fuel gauge
- (3) Service meter

ENGINE COOLANT TEMPERATURE GAUGE

This meter (1) shows the engine coolant temperature. If the pointer is in range (A) while the machine is operating, the coolant temperature is normal.

If the pointer enters red range (B) while the machine is operating, pilot lamp (C) flashes and the buzzer sounds. In this case, run the engine at a low idle until pilot lamp (C) goes out and pointer enters range (A).

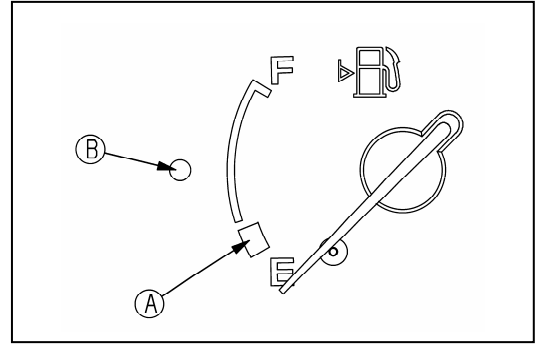


FUEL LEVEL GAUGE

This gauge (2) shows the amount of fuel remaining in the fuel tank.

The letter F indicates that the tank is Full.

The letter E indicates that only a small amount of fuel remains. If the amount of remaining oil drops below 6 liters, the pointer enters red range (A) and pilot lamp (B) flashes. If the pointer is in red range (A) or pilot lamp (B) flashes, check the fuel level and add fuel if necessary.



This gauge may not indicate the fuel level correctly for a while after the starter switch is turned to the ON position, but this is not an abnormality.

NOTES

After the starter switch is turned to the ON position, the pointer moves to between E and F, and then indicates the correct level.

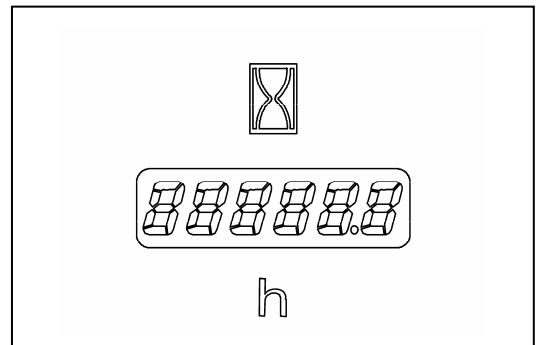
SERVICE METER

This meter (3) shows the total hours of operation of the machine.

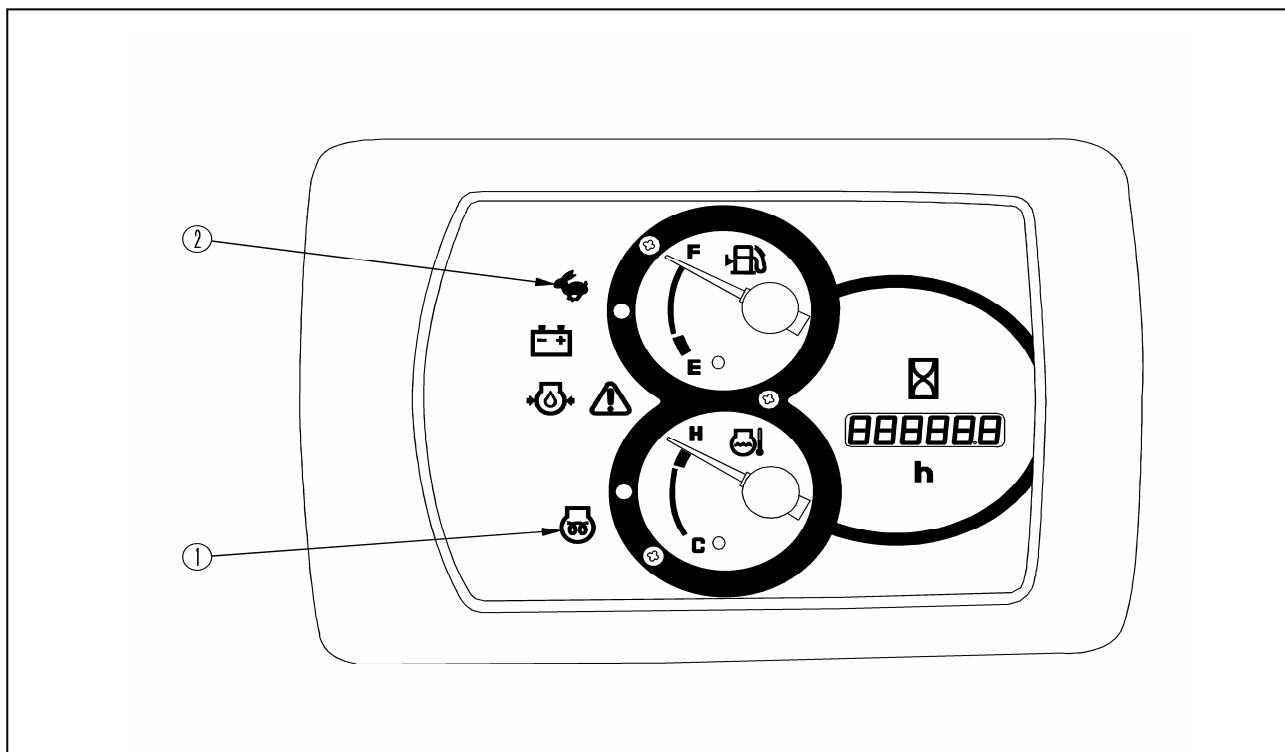
Check the periodic maintenance intervals according to the indicated hours.

When the engine is running, the service meter advances even if the machine is not moving.

The service meter advances 0.1 for every 1/10 hour that the machine is working, regardless of the engine speed.



2.1.3 PILOT DISPLAY

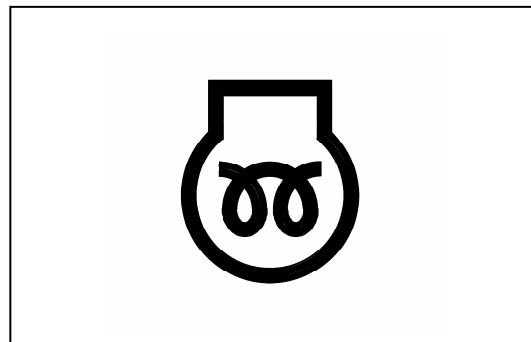


(1) Engine pre-heating monitor

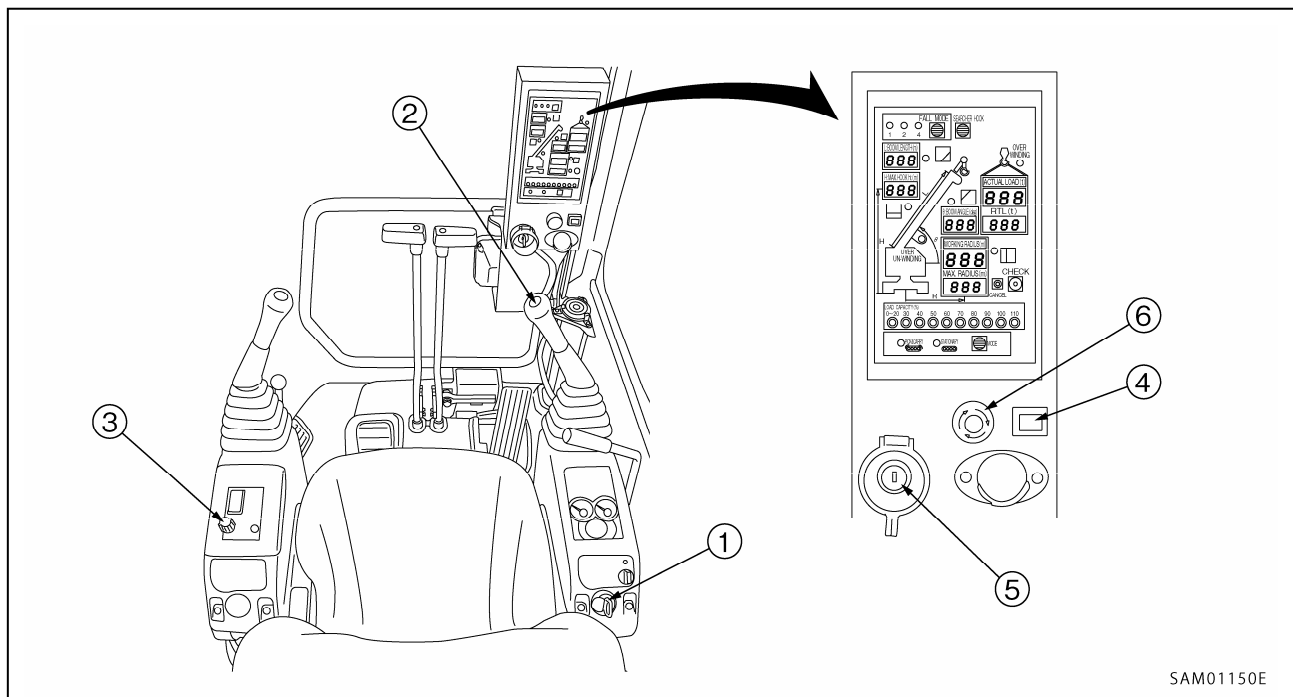
(2) Travel speed-up monitor
(Does not function for this machine)

ENGINE PRE-HEATING MONITOR

This monitor (1) flashes when the starter switch is turned to the HEAT position. After approximately 18 seconds, the buzzer sounds and this monitor goes out.



2.2 SWITCHES



- | | |
|--------------------|---|
| (1) Starter switch | (4) Hook stowage switch |
| (2) Horn switch | (5) Moment limiter emergency stop cancel switch |
| (3) Lamp switch | (6) Engine emergency stop switch |

STARTER SWITCH

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

(A): OFF position

The starter key can be inserted or withdrawn. All switches for the electrical system are turned off and the engine is not running.

(B): ON position

Electrical current flows through the charging and lamp circuit. Keep the starter key in the ON position while the engine is running.

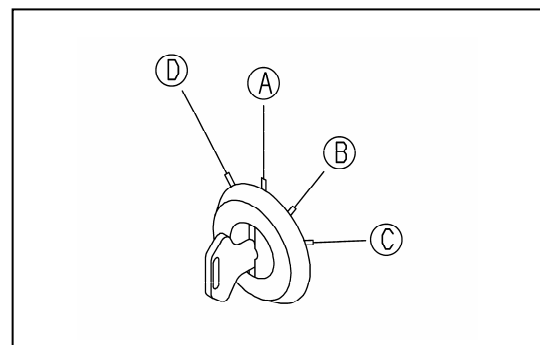
(C): START position

This is the engine start position. Keep the starter key in this position while cranking the engine (running the starter) and release it immediately after the engine starts. The key will return to the ON position.

(D): HEAT position

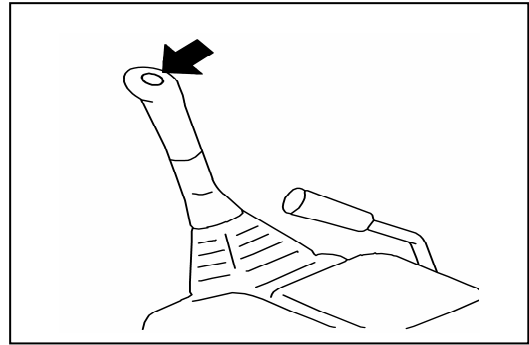
Set the starter key to this position when starting the engine in cold weather.

When the starter key is turned to the HEAT position, the pre-heating monitor lights up. Keep the key in this position until the pre-heating monitor goes out. When the pre-heating monitor goes out, release the key immediately. If the key is released, it returns to the OFF position. Then, start the engine by setting the key to the START position.



HORN SWITCH

Press this switch (2) at the center of the right-hand work control lever to sound the horn.



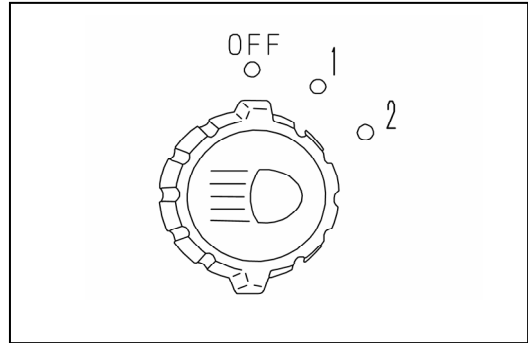
LAMP SWITCH

Use this switch (3) to light up the working lamps and the lamp inside the instruments.

Position 1: The lamp inside the instruments lights up.

Position 2: The lamp inside the instruments and the working lamps light up.

OFF position: The lights go out.



HOOK STOWAGE SWITCH

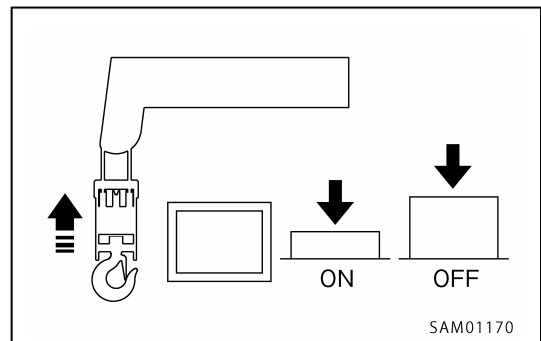
⚠ WARNING

- The hook stowage switch cancels the auto-stop function of the over hoist detector and reduces the hook raising power.
Operate the right-hand work equipment control lever carefully (do this very slowly without moving to the stroke end) when stowing the hook block. Pay sufficient attention not to let the hook block collide with the boom.
- Use the hook stowage switch only when stowing the hook block.

The purpose of the switch (4) is to stow the hook block into its stowage position at the boom tip.

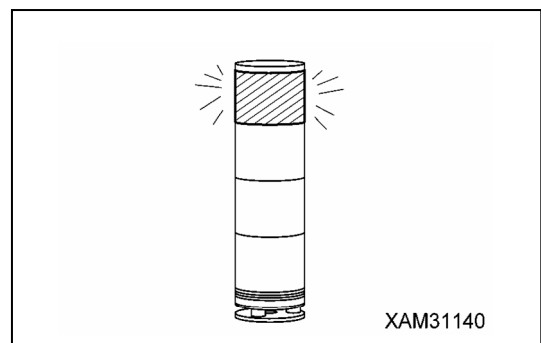
The pilot lamp inside the switch button lights when it is pushed to the ON position and is off when positioned OFF.

- ON: Keep the switch pushed and operate the control lever very slowly to raise the HOOK. The hook block will raise to the stowage position at the boom tip.
- OFF: Release the finger from the switch. It returns to the previous position and the auto-stop function of over hoist detector will be enabled. The hook raising power is increased to the normal level.



NOTES

- When turning this switch to the ON position, the red working status lamp will light up.
- To fix the hook block securely, keep the right-hand work equipment control lever in the HOOK RAISING position for about one second after the hook block is stowed at the boom tip.



MOMENT LIMITER EMERGENCY STOP CANCEL SWITCH

⚠ DANGER

The moment limiter emergency stop cancel switch will temporarily disable the moment limiter function.

While this switch is turned to the ON position (i.e. released), the moment limiter calculation of the rated total load is disabled, and the machine will be in a very risky condition. When lifting operations are continued under these conditions, it may cause the hoisted load to fall, damage to the boom, or a serious accident such as the machine rolling over, which may result in death or serious injury.

Use of this switch must be limited to specific inspection and maintenance purposes, where each sensor that detects the crane's condition is checked. Otherwise, keep the key of the switch extracted during ordinary operations.

In particular, operations as described below must be strictly avoided:

- To hoist a load, never raise the hook while this switch is set to ON (released).
The moment limiter is disabled from detecting a condition where the hoisted load exceeds the rated load, which can cause the wire cable to break and the hoisted load to drop, boom damage, or the machine to overturn.
- After the moment limiter detects a condition in which the actual load exceeds the rated load while the crane is operating and interrupts it, winding up, boom lowering and/or boom extension operation that are usually carried out by turning this switch to the ON (released) position must be strictly avoided. Otherwise the boom may be damaged or the machine may roll over.
- When stowing the hook, be sure to only use the hook stowage switch. If this moment limiter emergency stop cancel switch is used to hoist the hook, the winch will not automatically stop in an over-winding condition.

Use this switch (5) only for the limited purpose of inspecting and maintaining the boom length detector, angle detector or the pressure sensor.

- ON (Clear): Insert the key into the switch. Turn the key clockwise and keep it in that position. The activation stop function is cleared while the key is kept in the ON position. When the key is released, it will return automatically to the OFF (Auto) position.
- OFF (Auto): This activates stop functions. The key can be removed or inserted at this position.

NOTES

When turning this switch to the ON (released) position, the red working status lamp will light up.

ENGINE EMERGENCY STOP SWITCH

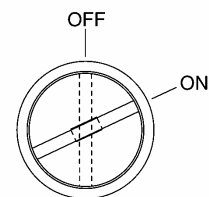
This switch (6) is used to stop the engine immediately if the machine is experiencing any abnormalities.

- ON: Press the switch. The engine stops.
- OFF: Turn the switch to the right (in the arrow direction in the figure at right).

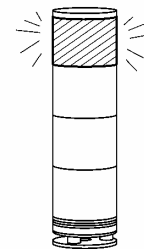
The switch returns to its original position.

NOTES

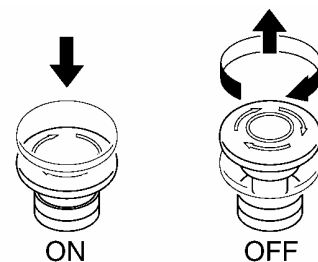
Before starting the engine again after stopping it in an emergency, be sure to return the engine emergency stop switch to the OFF position.



XAM15110



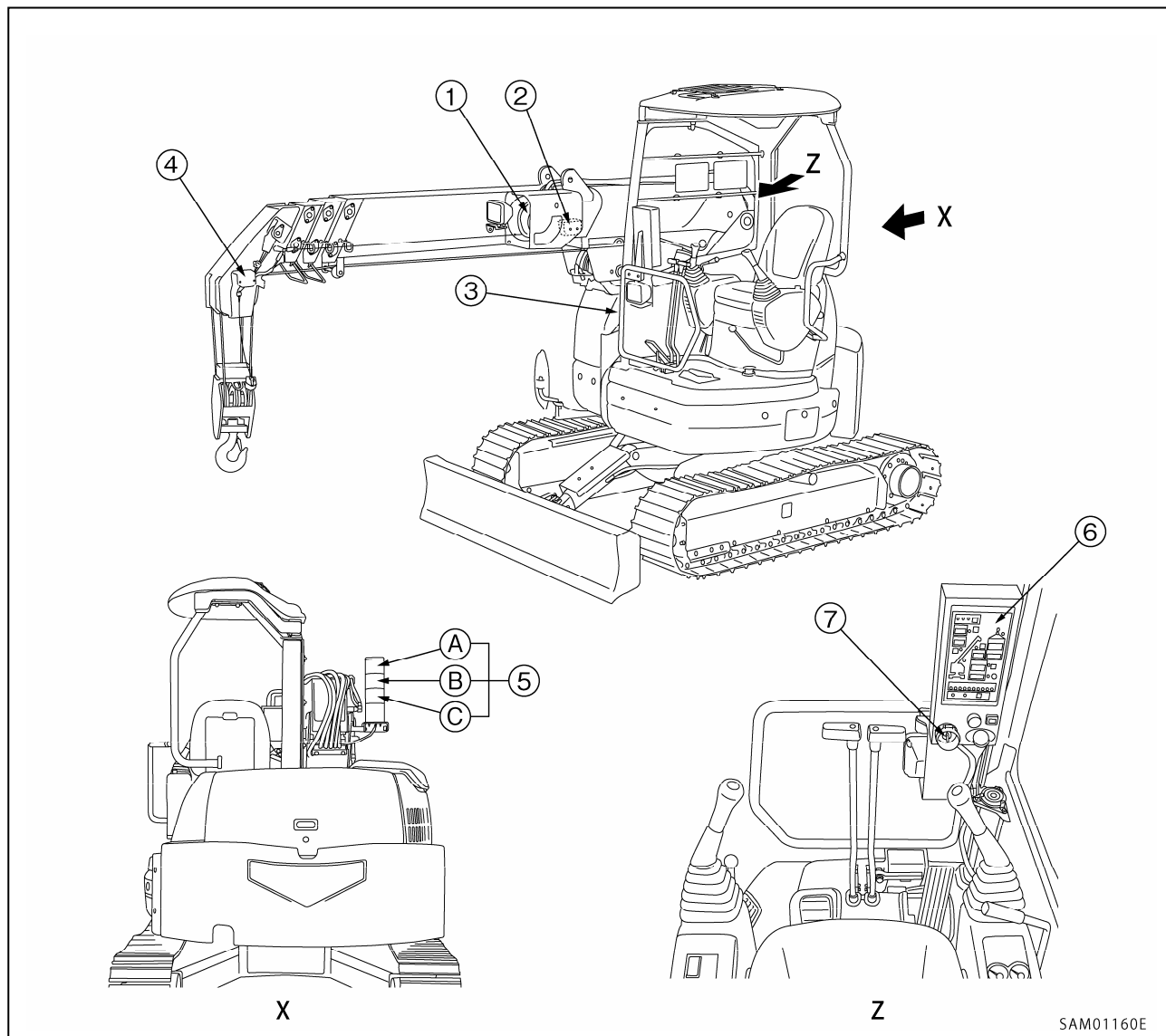
XAM31140



XAM21450

2.3 MOMENT LIMITER (OVERLOAD DETECTOR)

2.3.1 MOMENT LIMITER CONFIGURATION



SAM01160E

- (1) Boom length sensor (Boom left side)
- (2) Boom angle sensor (Boom left side)
- (3) Pressure sensor (Derrick cylinder) (2 places)
- (4) Over hoist detector (Boon tip side)
- (5) Working status lamp
 - (A) Red lamp (Warning lamp for load factor of 100% or more)
 - (B) Yellow (ON with load factor of 90 to less than 100%)
 - (C) Green (On with load factor of less than 90%)
- (6) Moment limiter display unit
- (7) Moment limiter emergency stop cancel switch

2.3.2 FUNCTION OF MOMENT LIMITER

⚠ DANGER

- Do not remove, disassemble, or repair detectors. Do not move the detectors to another location from original position.
- Should an object hit a detector or you find any damage on a detector, be sure to verify the actuation status of the auto stop.

If you find any abnormality with the actuation of the auto stop, do not fail to fix it.

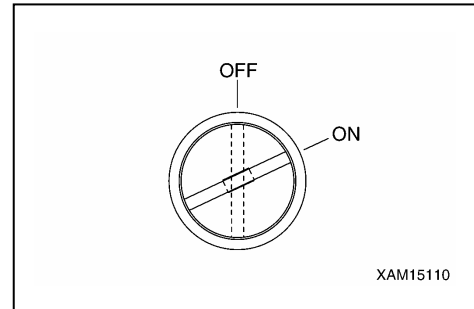
- The machine will not stop automatically even if the crane is overloaded during the swing operation. Do not swing the crane whilst overloaded.
- When the boom approaches the stop position during operation, be sure to change the operation speed of the boom to low.

With high-speed boom operation, the boom may overrun the specified stop position, which may result in serious accident such as the machine rolling over, leading to death or serious injury.

- The moment limiter emergency stop cancel switch will temporarily disable the moment limiter function.

While this switch is turned to the ON position (i.e. released), calculation of the rated total load is disabled, thus the machine is in a very risky condition.

When lifting operations are continued under these conditions, it may cause the hoisted load to fall, damage the boom or a serious accident such as the machine rolling over, which may result in death or serious injury. Use of this switch must be limited to the specific inspection and maintenance purposes, where each sensor that detects the crane's condition is checked. Otherwise, keep the key of the switch extracted during ordinary operations.



The moment limiter is a device that has been installed to prevent the hoisted load from falling, the boom from breaking, or the machine from overturning due to overloading. Always check the operation of the moment limiter before crane operation to verify no abnormality.

MECHANISM OF MOMENT LIMITER

The moment limiter computes the current "rated total load (RTL)" by calculating the current boom position from boom angle and the boom length gauges, and from the number of wire rope falls (entered by the driver).

Then by actually hoisting a load, the "actual load reading" (hoist load) is sent from the pressure sensor of the derrick cylinder to the moment limiter. The moment limiter comparatively calculates between the "rated total load" computed out of the current posture and the "actual load" (hoisted load), and issues an alarm if the result indicates the rated total load/actual load = 90 to 100%.

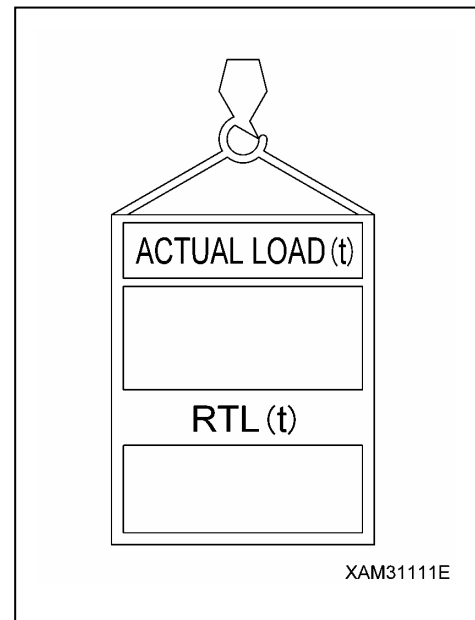
If the calculation result indicates the rated total load/actual load = above 100%, an alarm is issued and the causes the boom operation to automatically stop.

And the accuracy of the overload stop meets the accuracy calculated as below, when the boom is slowly lowered:

$$\text{Accuracy of the overload stop} = \frac{A - B}{B} \times 100 < +10\%$$

Where, A: Total weight of the hoisted load, hook block and sling instruments

B: Rated total load at the working radius (measured radius) of the overload error.



DISPLAY OF THE MOMENT LIMITER ERROR MESSAGES

The moment limiter performs self-diagnosis on the moment limiter display unit when an error is issued from the boom angle, boom length, or pressure sensors, when a circuit is opened or a connector is disconnected.

The result is displayed on the “Rated total load Display” of the moment limiter display unit by an error code to notify the operator of the error.

Stop using the crane if an error code is displayed.

For details about error codes, causes of errors and actions to be taken, see “Operation 2.3.10 Moment Limiter Causes of Errors and Actions to be Taken”.

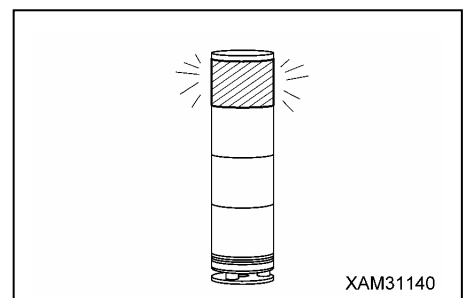
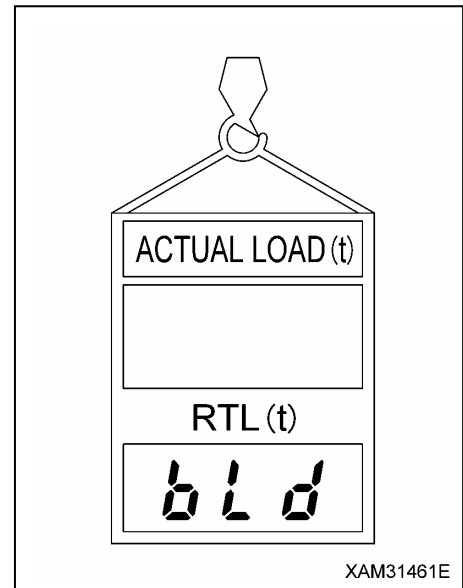
LIMITATION OF OPERATION DUE TO THE BLADE POSITION

Indications and warning are issued against a load hoisting operation in a condition where the Blade is lowered and a load is imposed. At the same time, crane functions below are interrupted:

- Indications and warnings:
 - Rated total load display in the Moment limiter will flash and indicate “bld”.
 - Buzzer sounds intermittently.
 - The red lamp of the working status lamp will light up.
- Functions to be interrupted:
 - Winch hoisting
 - Boom derricking
 - Boom telescoping

When a load is imposed on the Blade and in addition to that a load is hoisted, the above conditions continue.

Either clearing the Blade from the ground or to lower the hoisted load to the ground will release these indications and warnings, and then the crane resumes these functions.



2.3.3 MOMENT LIMITER OPERATIONS

The moment limiter is a device for emergency situations. Operations relying on the device may involve danger.

Pay sufficient attention during operations not to cause the crane to auto-stop.

PROHIBITED ACTIONS AFTER AUTO STOP

⚠ DANGER

- The following crane operations are prohibited after the crane has stopped automatically due to overloading.
These operations are very dangerous and may cause the machine to roll over or the boom to break.
 - Boom lowering operation
 - Boom extension operation
 - Hook raising operation
 - Crane slewing operation
- If the searcher hook (optional) is installed, the following crane operations are prohibited after the crane has stopped automatically due to overloading.
 - Boom raising operation
 - Boom lowering operation
 - Boom extension operation
 - Crane slewing operation

RECOVERY OPERATION FROM AUTO STOP

⚠ DANGER

Be sure to switch the engine speed to low speed and carry out crane operations carefully if the moment limiter load factor is 90% or higher.
Carrying out crane operations with the engine running at high speed is very dangerous, will cause the hoisted load to swing, and may result in overloading or the boom to break.

With load factor of “less than 90%”

When the hoisting load is less than 90% of the rated total load, the working status lamp lights up in green, indicating normal operation status.

With load factor of “90 to less than 100%”

When the hoisting load reaches 90% of the rated total load (pre-warning), the working status lamp changes from green to yellow and the alarm sounds intermittently, notifying the operator and those in close proximity that the hoisting load is close to the rated total load.

With load factor of “100% or higher”

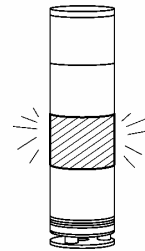
When the hoisting load reaches 100% of the rated total load after exceeding 90% of the rated total load (pre-warning), the working status lamp changes from yellow to red and the alarm now sounds continuously. The following crane operations will stop automatically.

- Hook raising operation
- Boom extension operation
- Boom lowering operation

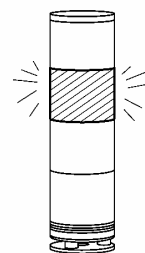
If the searcher hook (optional) is installed, the following crane operations will stop automatically.

- Boom raising operation
- Boom extension operation
- Boom lowering operation

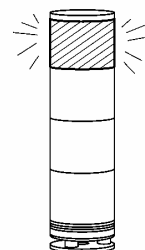
An audible sound of “beeping, indicating overloading” will be issued. Furthermore, the LED sign showing “100%” will light up on the moment limiter load factor display.



XAM31120



XAM31130

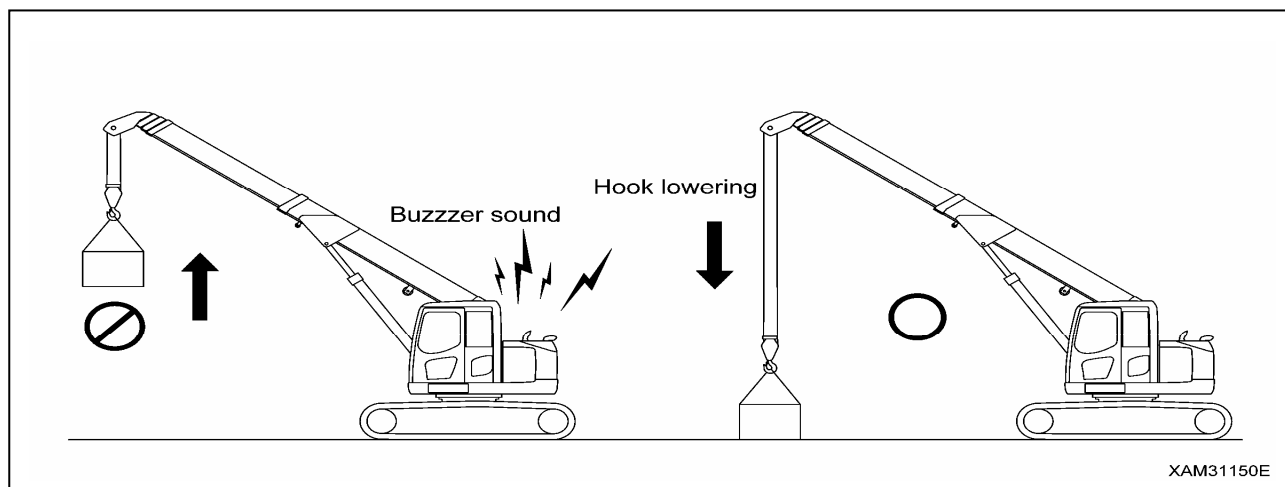


XAM31140

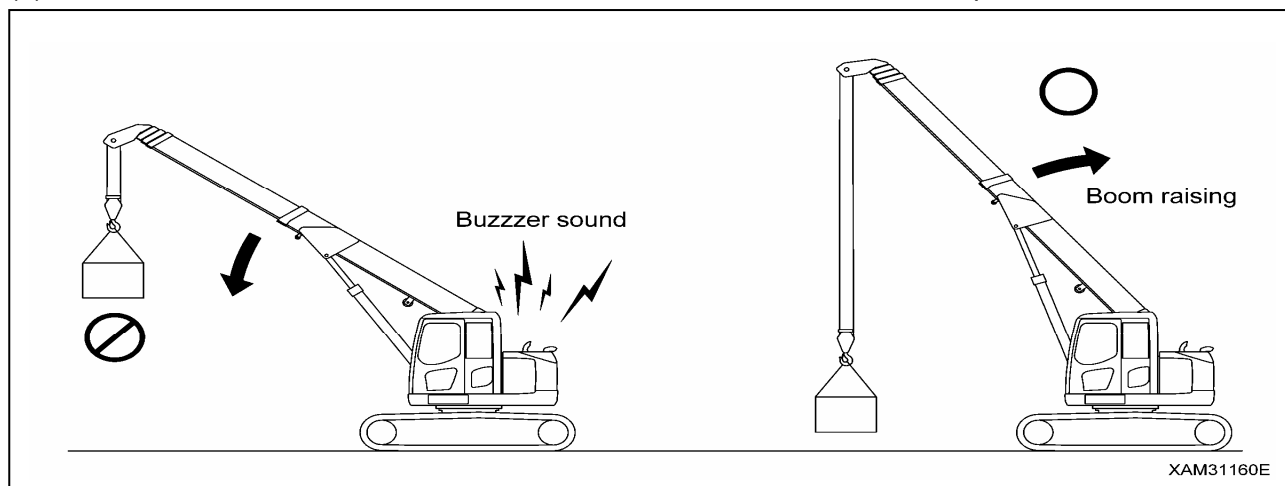
RECOVERY OPERATION FROM AUTO STOP

The recovery operation from overloading should be the reverse operation of the crane operation that caused the auto stop. Perform one of the following.

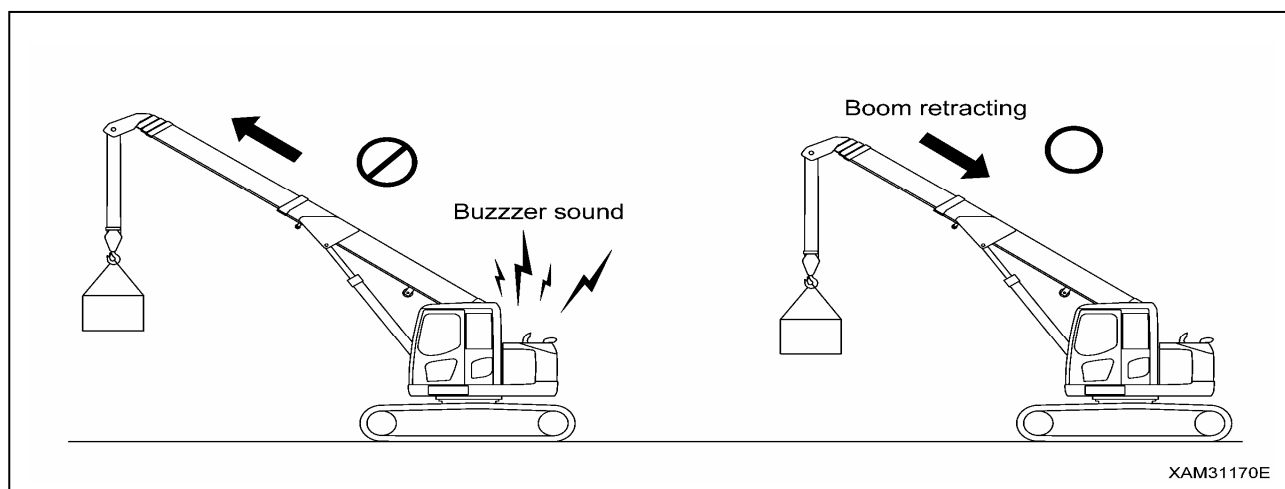
- (1) Lower the hook and put down the hoisted load on the ground.



- (2) Raise the boom. Lower the hook so that the hoisted load will be as low as possible.



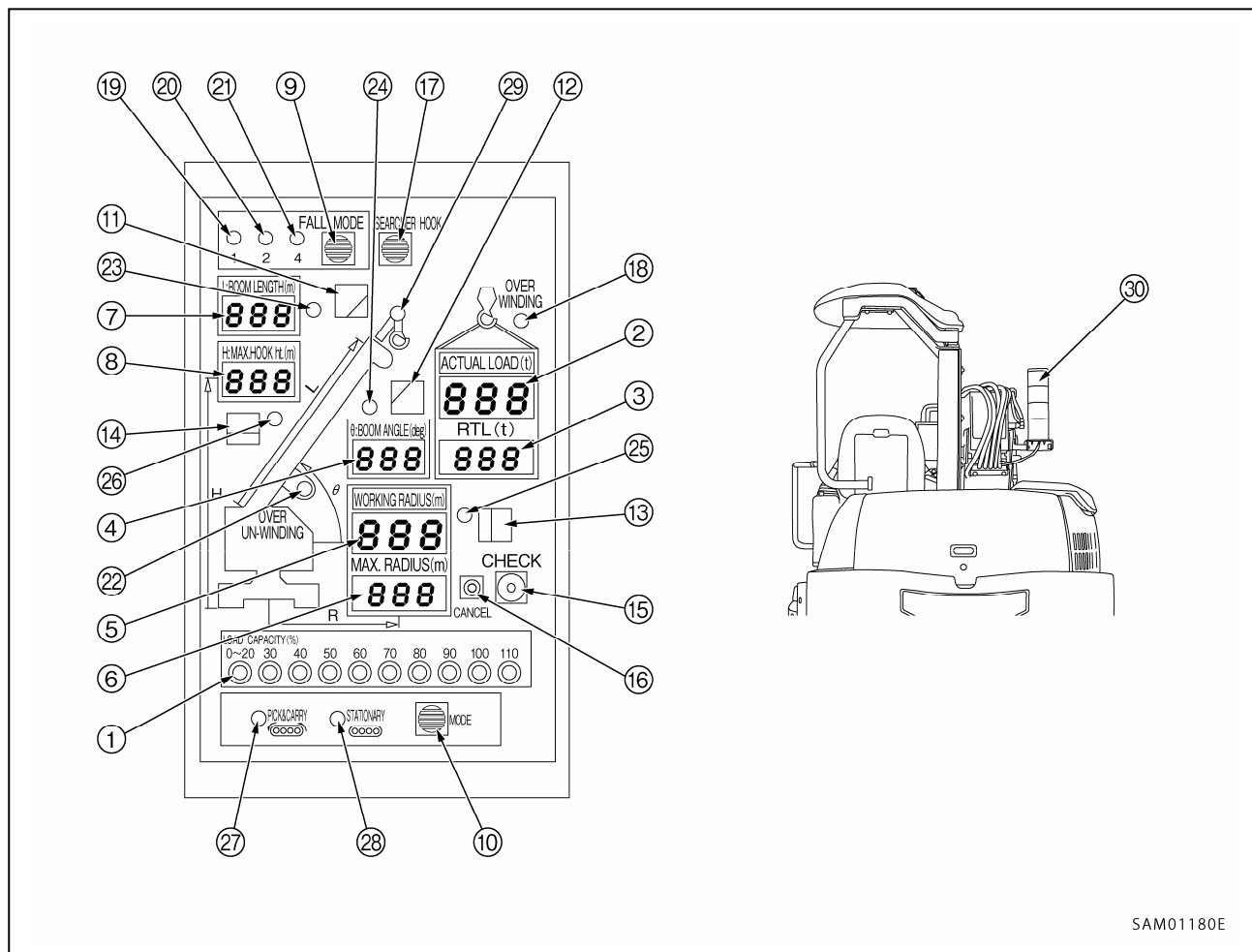
- (3) Retract the boom.



NOTES

If the searcher hook (optional) is installed, recover by performing the operation in (3). The boom raising operation is disabled.

2.3.4 NAMES OF MOMENT LIMITER DISPLAY UNIT



- | | |
|---|---|
| (1) Load factor display | (16) Cancel switch |
| (2) Actual load display | (17) Searcher hook mode selector switch |
| (3) Rated total load display | (18) Over winding detection LED (Red) |
| (4) Boom angle display | (19) 1-fall LED (Green) |
| (5) Actual working radius display | (20) 2-fall LED (Green) |
| (6) Rated working radius display | (21) 4-fall LED (Green) |
| (7) Boom length display | (22) Over un-winding LED (Red) |
| (8) Lifting height display | (23) Boom angle upper limit LED (Green) |
| (9) Fall mode selector switch | (24) Boom angle lower limit LED (Green) |
| (10) Pick & Carry/Stationary mode select switch | (25) Working radius upper limit LED (Green) |
| (11) Boom angle upper limit switch (SETUP/CANCEL) | (26) Lifting height upper limit LED (Green) |
| (12) Boom angle lower limit switch (SETUP/CANCEL) | (27) Pick & carry mode selection LED (Red) |
| (13) Working radius upper limit switch (SETUP/CANCEL) | (28) Stationary mode selection LED (Orange) |
| (14) Lifting height upper limit switch (SETUP/CANCEL) | (29) Searcher hook LED (Orange) |
| (15) Check switch | (30) Working status lamp
(Changes to green, yellow, and red) |

For the operation of the searcher hook, see "SEARCHER HOOK".

DESCRIPTIONS OF SWITCHES ON MOMENT LIMITER DISPLAY UNIT

FALL MODE SELECTOR SWITCH AND WIRE ROPE DISPLAY LED (GREEN)

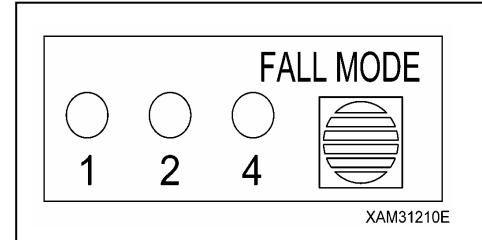
DANGER

When entering the number of wire rope falls, verify the actual number of wires and make sure you set them up correctly.

Failure to set the correct wire rope fall(s) may cause the winch wire rope to break and lead to a serious accident.

Use this switch to change the number of wire rope falls.

- Keep pressing the switch for one or more seconds.
The setting changes from "4 falls" to "1 fall".
At the same time, the wire fall display LED changes from "4 falls" to "1 fall", indicating that the setting has changed.
- After that, keep pressing the switch for three or more seconds, then the setting changes from "1 fall" to "2 falls", and "2 falls" to "4 falls" once every one second.



NOTES

When changing the setting, right after doing so, release your hand from the switch, and then press the switch again.

BOOM ANGLE UPPER LIMIT SWITCH AND LED (GREEN)

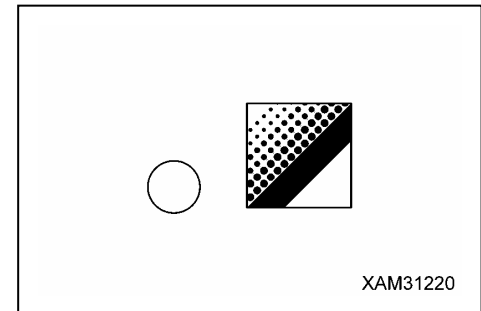
Use this switch to set or cancel the boom angle upper limit.

[SETUP]

With no upper limit value set, position the boom to the angle you would like, and press the switch for three or more seconds.

The boom angle at this point is set as the upper limit.

At the same time, the LED flashes indicating that the upper limit value has been set.



NOTES

- Be sure to verify that the boom automatically stops at the set angle before performing the actual operation. If the boom does not stop automatically, re-set the boom angle using the procedure above.
- While the boom is within the pre-warning zone or at the upper limit, the warning buzzer sounds intermittently only when the boom derricking operation is attempted.
- The limit value being set is retained in the memory even when the starter switch is turned to OFF position.

When the boom reaches the pre-warning zone or stops at the upper limit with the boom angle upper limit set, the boom angle upper limit LED flashes.

[CANCEL]

With the upper limit value being set (LED ON), press the switch for three or more seconds.

The current upper limit value setting will be cleared. At the same time, the LED goes off indicating that the upper limit value setting is cleared.

NOTES

The setting and canceling will not repeat even if you keep the switch pressed for more than three seconds. Remove your hand from the switch and press the switch again.

BOOM ANGLE LOWER LIMIT SWITCH AND LED (GREEN)

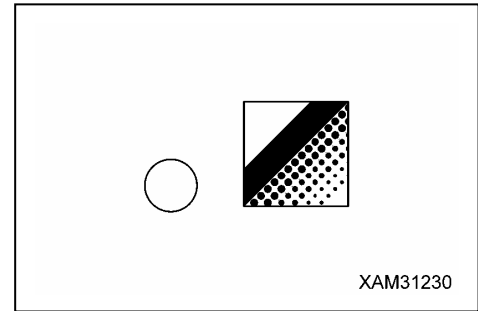
Use this switch to set or cancel the boom angle lower limit.

[SETUP]

With no lower limit value set, position the boom to the angle you would like, and press the switch for three or more seconds.

The boom angle at this point is set as the lower limit.

At the same time, the LED flashes indicating that the lower limit value has been set.



NOTES

- Be sure to verify that the boom automatically stops at the set angle before performing the actual operation. If the boom does not stop automatically, re-set the boom angle using the procedure above.
- While the boom is within the pre-warning zone or at the lower limit, the warning buzzer sounds intermittently only when the boom lowering operation is attempted.
- The limit value being set is retained in the memory even when the starter switch is turned to OFF position.

When the boom reaches the pre-warning zone or stops at the lower limit with the boom angle lower limit set, the boom angle lower limit LED flashes.

[CANCEL]

With the lower limit value being set (LED ON), press the switch for three or more seconds.

The current lower limit value setting will be cleared. At the same time, the LED goes off indicating that the lower limit value setting is cleared.

NOTES

The setting and canceling will not repeat even if you keep the switch pressed for more than three seconds. Remove your hand from the switch and press the switch again.

WORKING RADIUS UPPER LIMIT SWITCH AND LED (ORANGE)

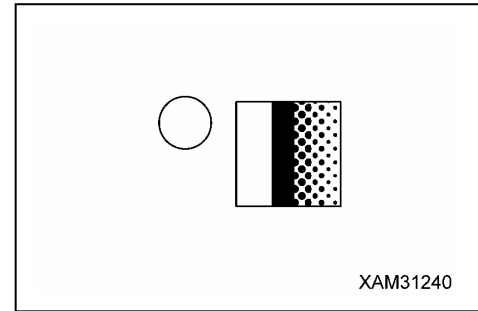
Use this switch to set or cancel the working radius upper limit.

[SETUP]

With no upper limit value set, set the boom to the working radius you would like, and press the switch for three or more seconds.

The working radius at this point is set as the upper limit.

At the same time, the LED flashes indicating that the upper limit value has been set.



NOTES

- Be sure to verify that the boom automatically stops at the set working radius before performing the actual operation. If the boom does not stop automatically, re-set the working radius using the procedure above.
- While the boom is within the pre-warning zone or at the lower limit, the warning buzzer sounds intermittently only when the boom lowering operation is attempted.
- The limit value being set is retained in the memory even when the starter switch is turned to OFF position.

When the boom reaches the pre-warning zone or stops at the upper limit with the working radius upper limit set, the working radius upper limit LED flashes.

[CANCEL]

With the upper limit value being set (LED ON), press the switch for three or more seconds.

The current upper limit value setting will be cleared. At the same time, the LED goes off indicating that the upper limit value setting is cleared.

NOTES

The setting and canceling will not repeat even if you keep the switch pressed for more than three seconds. Remove your hand from the switch and press the switch again.

LIFTING HEIGHT UPPER LIMIT SWITCH AND LED (GREEN)

Use this switch to set or cancel the lifting height upper limit.

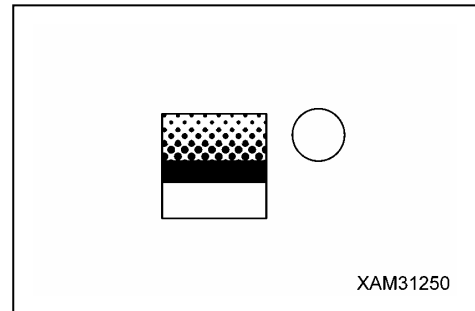
While the lifting height is restricted by detecting the height of the tip of the boom, the lifting height on the display panel shows the lifting height when the hook was raised to the over hoist detection status.

[SETUP]

With no upper limit value set, set the boom to the lifting height you would like, and press the switch for three or more seconds.

The lifting height at this point is set as the upper limit.

At the same time, the LED flashes indicating that the upper limit value has been set.



NOTES

- Be sure to verify that the boom automatically stops at the set lifting height before performing the actual operation. If the boom does not stop automatically, re-set the lifting height using the procedure above.
- While the boom is within the pre-warning zone or at the lower limit, the warning buzzer sounds intermittently only when the boom lowering operation is attempted.
- The limit value being set is retained in the memory even when the starter switch is turned to OFF position.

When the boom reaches the pre-warning zone or stops at the upper limit with the lifting height upper limit set, the lifting height upper limit LED flashes.

[CANCEL]

With the upper limit value being set (LED ON), press the switch for three or more seconds.

The current upper limit value setting will be cleared. At the same time, the LED goes off indicating that the upper limit value setting is cleared.

NOTES

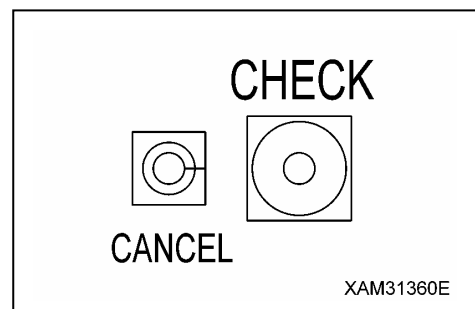
The setting and canceling will not repeat even if you keep the switch pressed for more than three seconds. Remove your hand from the switch and press the switch again.

CANCEL SWITCH

Use this switch to cancel all the set values.

- Press this switch and "CHECK" switch at the same time for five or more seconds.

All the set values are canceled.



CHECK SWITCH

Use this switch to check the set values.

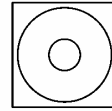
Keep pressing the switch for three or more seconds. Each set value flashes for approximately five seconds in the display section.

- (1) "Boom angle upper limit value" is displayed at the boom length display section.
- (2) "Boom angle lower limit value" is displayed at the boom angle display section.
- (3) "Working radius upper limit value" is displayed at the working radius display section.
- (4) "Lifting height upper limit value" is displayed at the lifting height display section.

NOTES

- When a set value is displayed, the LED for its setting switch section flashes at the same time.
- After five seconds of flashing the set value, displays will return to the original indication.
- "0.0" is shown in a display for which a specific value is not given.
- Displays other than those being set will not change.

CHECK



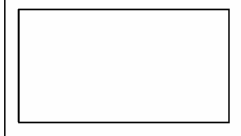
XAM31270E

L:BOOM LENGTH(m)



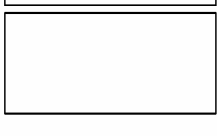
XAM31310E

H:LIFTING HEIGHT (m)



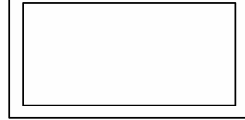
XAM31300E

WORKING RADIUS (m)



XAM31470E

θ:BOOM ANGLE(deg)



XAM31281E

PICK & CARRY/STATIONARY MODE SELECT SWITCH AND PICK & CARRY LED (RED), STATIONARY LED (ORANGE)

⚠ DANGER

Pick and carry operations can be unstable and dangerous.

Where such an operation is unavoidable, see "Operation 3.19 Pick & Carry Operation" and strictly observe rated total load for pick and carry operations, correct practices and travelling posture.

Not observing these cautions during pick and carry operations will result in serious accidents.

This switch is used to switch to travelling mode from stationary mode for pick and carry operations.

- Keep pressing the switch for three or more seconds. The setting of the rated load changes to "Pick and Carry Mode" and "PICK & CARRY" LED lights up. At the same time, red working status lamp will light up.
- Keep pressing the switch again for three or more seconds. The setting of the rated load changes to "Stationary Mode" and "STATIONARY" LED lights up.

PICK&CARRY

STATIONARY



MODE

XAM31180E

DESCRIPTIONS OF MOMENT LIMITER DISPLAY UNIT

For LED's not described in this section, see "Operation 2.3.4 Names of Moment Limiter Display Unit".

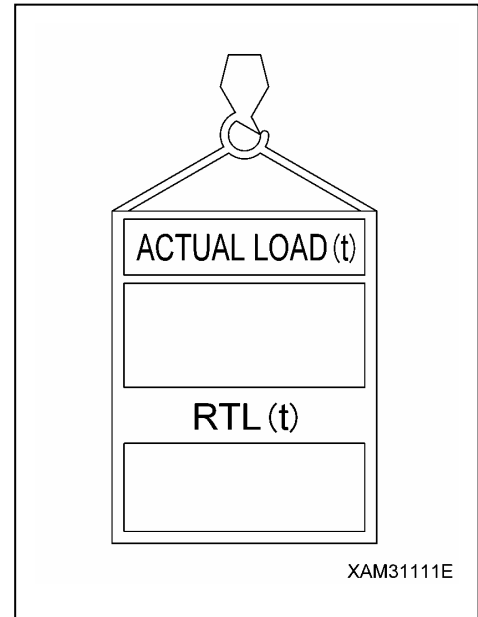
ACTUAL LOAD DISPLAY SECTION

This section constantly displays the actual load of the hoisted load while the crane is operating.

The actual load indicates the total weight of the hoisted load and lifting accessories increasing the hook weight. If "0.0" to "0.1" is displayed when nothing is being hoisted, the system is normal. If the value displayed is out of this range, contact us or our sales service agency.

NOTES

- Due to the mechanism of the load detector, the actual load value changes in the display during boom derricking operation. When the boom is raised, the actual load value increases, however this does not indicate a device failure.
- Even when the hoisting operation is paused, a swinging load will make changes in the actual load value display.



RATED TOTAL LOAD (RTL) DISPLAY SECTION

The rated total load (i.e. hook block + sling instruments + hoisted load) applicable to the current configuration is computed based on conditions including number of wire falls, boom length, boom angle, or working radius, and is displayed accordingly.

WORKING RADIUS DISPLAY SECTION

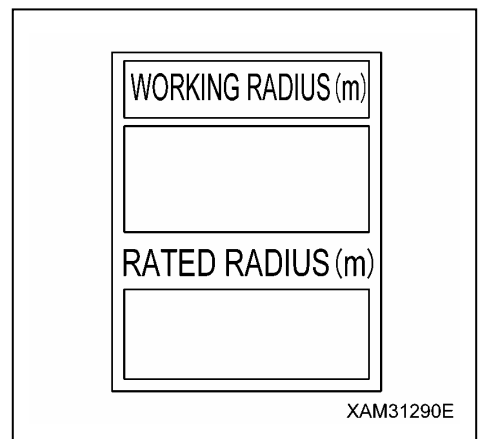
This section constantly displays the current working radius while the crane is operating.

Current working radius is the distance between the center of the crane rotation and axis of the hook. The effect of boom deflection is not computed.

RATED RADIUS DISPLAY SECTION

This section constantly displays the rated working radius while the crane is operating.

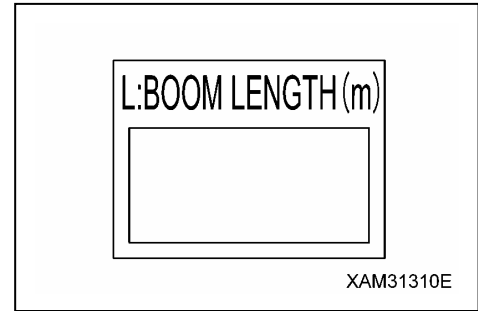
Rated working radius is the maximum working radius computed based on the boom length and actual load.



BOOM LENGTH DISPLAY SECTION

This section constantly displays the current boom length while the crane is operating.

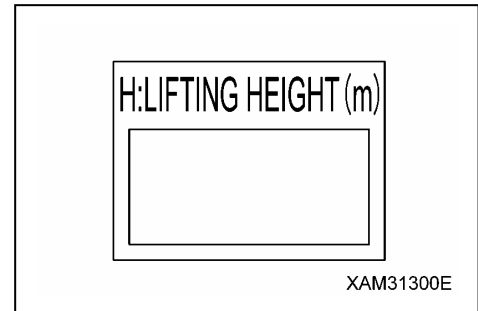
The boom length is the distance from the boom foot pin to the sheave pin at the end of the boom.



LIFTING HEIGHT DISPLAY SECTION

This section constantly displays the current lifting height while the crane is operating.

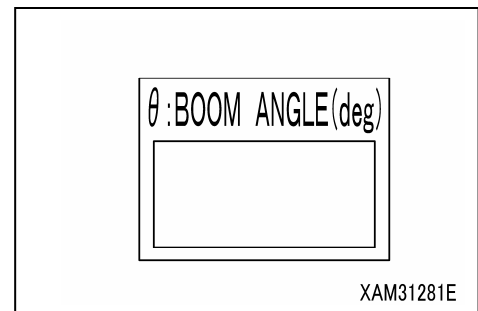
The lifting height is the vertical distance from the ground to the bottom of the hook with the hook raised to the upper limit.



BOOM ANGLE DISPLAY SECTION

This section constantly displays the current boom angle while the crane is operating.

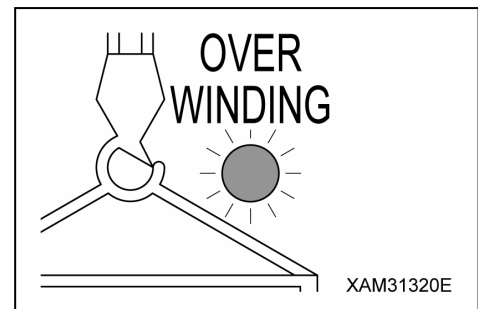
The boom angle is the angle formed between the boom and the horizontal line.



OVER WINDING LED (RED)

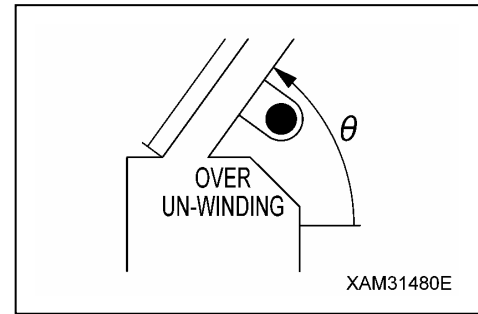
When the hook reaches over-winding condition while the crane is operating, the over winding LED flashes a warning. The hook winding and/or boom extending is automatically interrupted.

This LED also flashes when the hook is stowed during the hook stowing operation. This is normal.



OVER UN-WINDING LED (RED)

When the hook reaches over un-winding condition while the crane is operating, the over un-winding LED flashes for warning and hook un-winding is automatically interrupted.

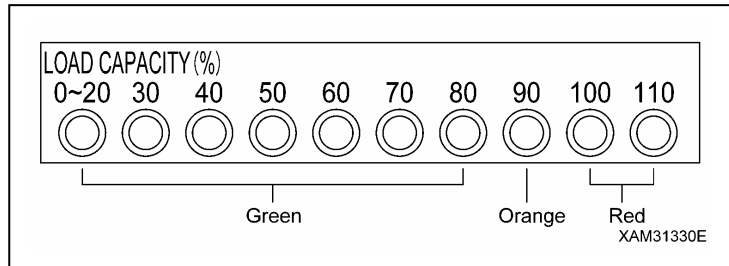


LOAD FACTOR DISPLAY

This display indicates the status of the moment limiter load factor by its illumination.

The load factor is the ratio between the actual load and the rated total load.

- According to the change in the load capacity, particular "LEDs" are turned on or off to show the present load factor.
- All the "LEDs" light up when the load factor is 100% or more.



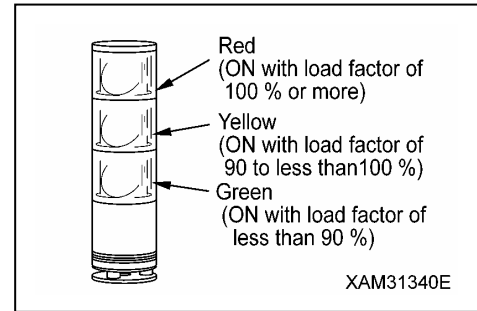
NOTES

Where the load factor is near 50%, all the "LEDs" marked with "50" or below light up.
All the "LEDs" marked over 50 go out.

2.3.5 MOMENT LIMITER FUNCTIONS

OVERLOAD WARNING

1. SAFETY ZONE ("Actual load" is less than 90% of the "rated total load") (Load factor is less than 90%)
 - The green working status lamp lights up.
 - The LEDs lights up in green if the load factor is less than 80%.
2. PRE-WARNING ("Actual load" is 90 to less than 100% of the "rated total load") (Load factor is 90 to less than 100%)
 - The yellow working status lamp lights up.
 - The LEDs lights up in orange and green if the load factor is 90 to less than 100%.
 - The alarm bleeps intermittently.
3. LIMIT WARNING ("Actual load" is 100% or higher than the "rated total load") (Load factor is 100% or higher)
 - The red working status lamp lights up.
 - The alarm bleeps continuously.
 - The hazardous operation of the boom stops automatically.
 - "Load factor 100% or more" LED (Red) lights up.
 - The "Load factor 110% or more" LED (red) lights up when the load factor is 110% or more.
4. CLEARING LIMIT WARNING AUTO STOP



If the system stops automatically, promptly perform the recovery operation caused by overloading.

See "Operation 2.3.3 Moment Limiter Operations (Recovery Operation from Auto Stop)" for recovery operations.

WORKING ENVELOPE RESTRICTION WARNING

When the working envelope gets close to the set restriction value, a warning is issued to notify the operator and those around.

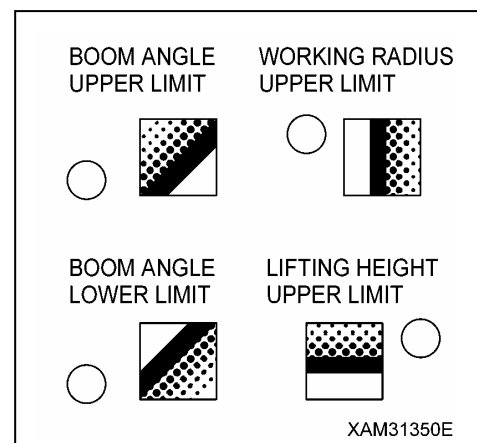
The last status of the set value for the working envelope restriction is memorized even if the starter switch is turned to the OFF position.

NOTES

- For how to set the value for working envelope restriction, see "Operation 2.3.4 Names of Moment Limiter Display Unit (Descriptions of Switches on Moment Limiter Display Unit)".
- The warning buzzer sounds only when the working envelope gets close to the set restriction value.

When the working envelope has been set, the restriction will be as follows.

1. SAFETY ZONE
 - The appropriate working envelope restriction LED (green) lights up.
 - The green working status lamp lights up.
2. PRE-WARNING
 - The appropriate working envelope restriction LED (green) flashes.
 - The alarm bleeps intermittently.
 - The green working status lamp lights up.
3. LIMIT WARNING
 - The appropriate working envelope restriction LED (green) flashes.
 - The yellow working status lamp lights up.
 - The alarm bleeps continuously.
 - The hazardous operation of the boom stops automatically.



OVER HOIST DETECTOR

CAUTION

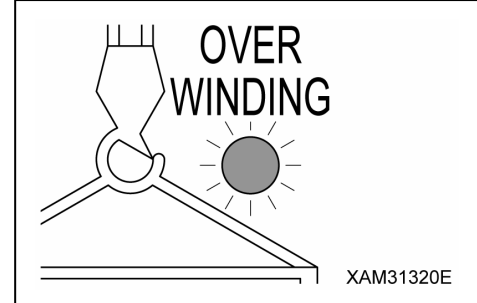
Pay attention to the distance between the hook and boom when raising the hook.
Extending the boom also raises the hook.
Always check the hook height when extending the boom.

When you overwind the hook when raising the hook or extending the boom,

- The "Over winding" LED (red) flashes.
- If hook raising or boom extension operations are attempted, the warning beep sounds intermittently.
- The hook raising and boom extension operations stop automatically.

In the case of auto stop, immediately perform the recovery operation.

Perform hook lowering and boom retracting operations as recovery operations.



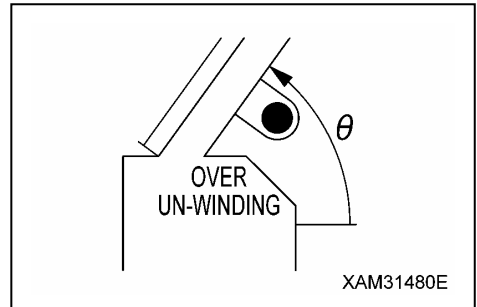
THREE-WINDING STOP DEVICE

If you unwind the hook excessively to cause the wire cable on the winch drum to run out,

- The "Over un-winding" LED (red) flashes.
- If the hook lowering operation is attempted, the warning beep sounds intermittently.
- The hook lowering operation stops automatically.

In case of auto stop, immediately perform the recovery operation.

Perform hook raising motion as the recovery operation.



NUMBER OF WIRES ROPE FALL(S) SELECTOR SWITCH

WARNING

- **Stop operating the crane when changing the number of wires by using the fall mode selector switch.**
Changing the number of wires while the crane is operating can cause unexpected accidents.
- **Always perform the crane operation after matching the number of wires displayed on the moment limiter with the actual number of wires. Mistaking the number of wires could lead to serious accidents.**

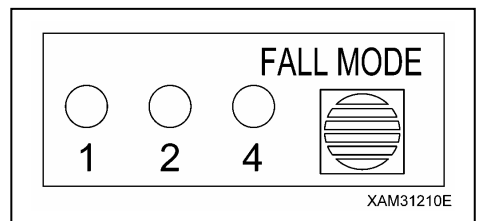
The wire cable has a determined safe working load per fall.

Determine the number of wires according to the maximum load to be hoisted.

The actual number of wires used and the number of wires displayed on the moment limiter must match.

With this machine, the hook for four/two wire cables is referred to as the standard specification.

The last status of the set number of wires is memorized even if the starter switch is turned to the OFF position.



BOOM LOWER LIMIT DETECTION

Where the boom length is 3.3 meters or more, boom lowering operations are automatically stopped to prevent the boom angle going below horizontal.

2.3.6 MOMENT LIMITER STARTING STATUS

The moment limiter checks its function for approximately three seconds when the starter switch is turned to the ON position.

Meanwhile,

- All the working status lamps light up.
- All the LED's light up.

Then, if the moment limiter and the sensors are normal upon the completion of the functional check of the moment limiter, the red and yellow working status lamps turn off and the green working status lamp lights up indicating that the machine is ready for use.

CAUTION

If the red working status lamp does not turn off after completing the functional check of the moment limiter, be sure to contact us or our sales service agency.

2.3.7 MOMENT LIMITER WORKING ENVELOPE SETTING

WARNING

- The boom may go beyond the set value when operated at high speed even if the working envelope was restricted by the moment limiter. Be sure to set the working envelope with a safe distance from obstacles. Operate the crane at low speed.
- Be sure to verify that the boom stops at the set position after setting the boom working envelope.

If the boom working envelope is limited due to working space issues, you can set the boom working envelope to the desired value.

SETTING WORKING ENVELOPE

Operate the boom to the limit of the working envelope you would like to restrict, and press the appropriate SETUP/CANCEL switch for three or more seconds.

You can set that limit value.

At the same time, the LED above the appropriate switch will light up.

NOTES

The last status of the set value has been held in memory even if the starter switch is turned to the OFF position.

BOOM ANGLE
UPPER LIMIT



WORKING RADIUS
UPPER LIMIT



BOOM ANGLE
LOWER LIMIT



LIFTING HEIGHT
UPPER LIMIT



XAM31350E

CANCELING WORKING ENVELOPE SETTING

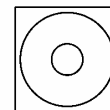
- Press and hold the CANCEL switch and CHECK switch at the same time for five or more seconds. All the set working envelope restrictions are canceled.

At the same time, the LED above all the working envelope limit switches goes off to complete the cancellation of the settings.

CHECK



CANCEL



XAM31360E

- Press the SETUP/CANCEL switch of the motion for which restriction you would like to cancel for three or more seconds. The set value of only the selected item can be canceled.
At the same time, the LED above the switch goes off to complete the cancellation of the setting.

NOTES

See "Operation 2.3.4 Names of Moment Limiter Display Unit (Descriptions of Switches on Moment Limiter Display Unit)" for how to set the value for working envelope restriction.

2.3.8 PICK & CARRY/STATIONARY MODE SELECT SWITCH

⚠ DANGER

Pick and carry operations can be unstable and dangerous.

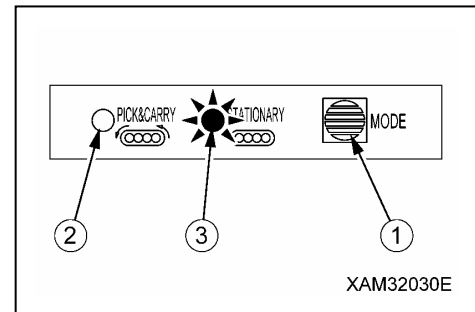
Where such an operation is unavoidable, see "Operation 3.19 Pick and Carry Operation" and strictly observe rated total load for pick and carry operations, correct practices and travelling posture.

Not observing these cautions in pick and carry operations will result in serious accidents.

Use this Pick & Carry/Stationary mode select switch for the condition of operations.

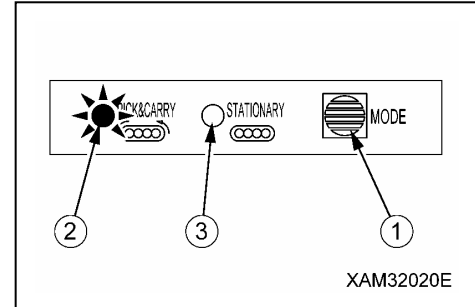
- When a pick and carry operation is not required, press this mode switch (1) and keep pressing for three or more seconds.

The operation mode is set to "Stationary Mode" and "STATIONARY" LED (3) lights up.



- When a pick and carry operation is required, press this mode switch (1) and keep pressing for three or more seconds.

The operation mode is set to "Pick and Carry Mode" and "PICK & CARRY" LED (2) lights up.

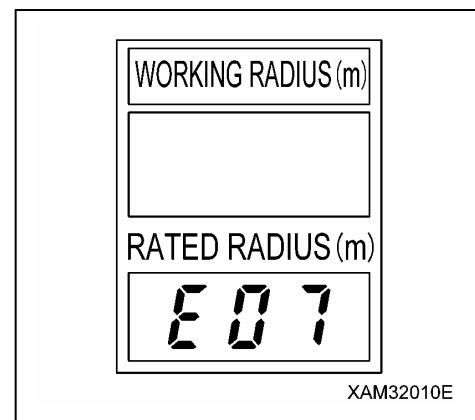


NOTES

- If the boom length exceeds "5 meters" and the Searcher hook mode is activated and where the Pick & Carry/Stationary mode select switch is set to Pick and Carry mode or the travel levers are actuated, the buzzer sounds and the rated radius display is turned to an error code "E07".

To select the Pick and Carry mode, the boom length must be "5.0 meters" (i.e. second section of the boom) or less.

- When the travel levers are actuated forward or backward, the Pick and Carry mode is automatically activated, over which, however, the Pick & Carry/Stationary mode select switch setting takes precedence.



2.3.9 MOMENT LIMITER EMERGENCY STOP CANCEL SWITCH

⚠ DANGER

The moment limiter emergency stop cancel switch will temporarily disable the moment limiter function.

While this switch is turned to the ON position (i.e. activated), calculation of the rated total load is disabled, thus the machine is in a very risky situation. When lifting operations are continued under these conditions, it may cause the hoisted load to fall, damage to the boom, or cause a serious accident such as the machine rolling over, which could result in death or serious injury.

Use of this switch must be limited to specific inspection and maintenance purposes, where each sensor that detects the crane's condition is checked. Otherwise, keep the key of the switch extracted during ordinary operations.

In particular, operations as described below must be strictly avoided:

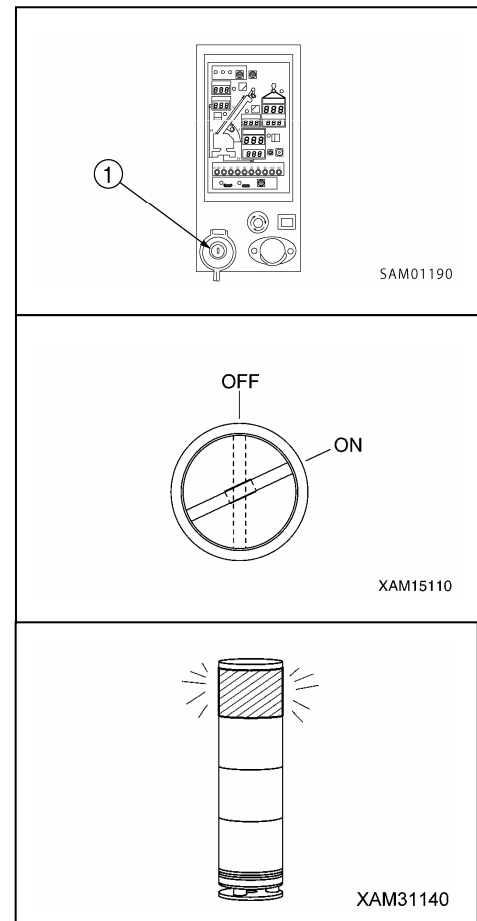
- To hoist a load, never raise the hook while this switch is set to ON (activated).
The moment limiter is disabled from detecting a condition where the hoisted load exceeds the rated load, which can cause the wire cable to break and the hoisted load to drop, damage to the boom, or the machine to roll over.
- After the moment limiter detects a condition in which the actual load exceeds the rated load while the crane is operating and interrupts it, winding up, boom lowering and/or boom extension operations that could be carried out by turning this switch to the ON (activated) position must be strictly avoided. Otherwise, the boom may be damaged or the machine may roll over.
- When stowing the hook, be sure to only use the hook stowage switch. If this moment limiter emergency stop cancel switch is used for hook raising, the winch will not automatically stop in an over-winding condition which may allow the hook to strike the boom tip or cause the wire cable to break.

Use this switch (1) only when the moment limiter failed to operate or when the load of the crane is checked.

- ON (Clear): Insert the key into the switch. Turn the key clockwise and keep it in that position. The activation stop function is cleared while the key is kept in the ON position. When the key is released, it will return automatically to the OFF (Auto) position.
- OFF (Auto): This activates stop functions. The key can be removed or inserted at this position.

NOTES

When turning this switch to the ON (activated) position, the red working status lamp will light up.



2.3.10 MOMENT LIMITER CAUSES OF ERRORS AND ACTIONS TO BE TAKEN

The moment limiter displays an error code at the “rated total load” display section on the display panel to notify the error.

If an error code shown in the table below was displayed, contact us or our sales service agency.

Error Code	Error Details	Actions to Be Taken
E1L 	The input to pressure sensor 1 is lower than the specified value.	Check the installation of the pressure sensor 1.
E1H 	The input to pressure sensor 1 is higher than the specified value.	
E2L 	The input to pressure sensor 2 is lower than the specified value.	Check the installation of the pressure sensor 2.
E2H 	The input to pressure sensor 2 is higher than the specified value.	
E3L 	The input to the boom angle gauge is lower than the specified value.	Check the installation of the boom angle gauge.
E3H 	The input to the boom angle gauge is higher than the specified value.	
E4L 	The input to the boom length gauge is lower than the specified value.	Check the installation of the boom length gauge.
E4H 	The input to the boom length gauge is higher than the specified value.	
E04 	Calibration memory error.	Turn the starter switch to OFF once, then to ON again.
E05 	A/D Converter is not working. Pressure, angle and length data are not available to read.	Where an error comes again, replace the computing unit.
E07 	Pick and Carry mode is selected in a disallowed condition.	Cancel Pick and Carry mode, or retract the boom so that it returns to an allowed condition.

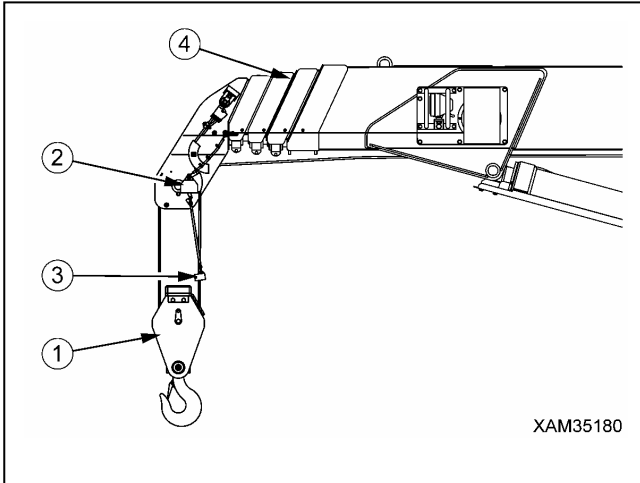
2.4 OVER HOIST DETECTOR

CAUTION

Pay attention to the distance between the hook block and the boom when raising the hook block.

The hook block also raises when the boom is extended.

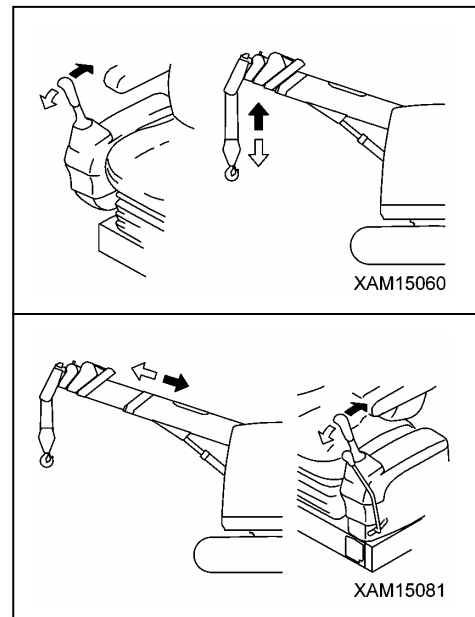
Always check the height of the hook block when performing boom extension operations.



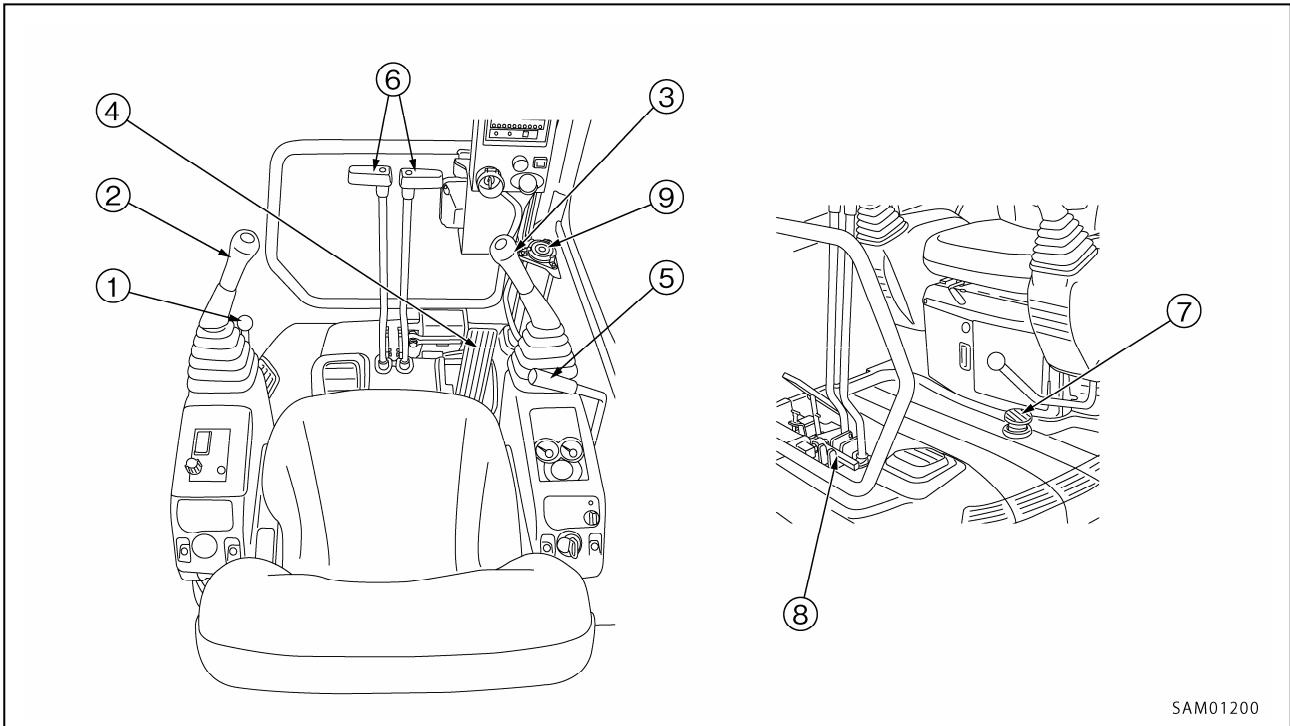
- (1) Hook block
- (2) Over hoist detector
- (3) Weight
- (4) Boom

The over hoist detector automatically stops the hook block (1) raising up or the boom (4) extending and disables further operations, in a condition where the hook block (1) is raised up or the boom (4) is extended until the hook block (1) comes close to the boom (4) tip and lifts the weight (3) up. In such a condition, the buzzer intermittently sounds to warn of over-raising only when hook raising or boom extension operations are attempted.

When this warning buzzer sounds, immediately operate the right-hand work equipment control lever to the HOOK LOWERING position (push forward) or left-hand work equipment control lever to the RETRACT position (pull backward), so that the hook block (1) is lowered down.



2.5 CONTROL LEVERS AND PEDALS



SAM01200

- | | |
|---|---------------------------|
| (1) Lock lever | (6) Travel lever |
| (2) Left-hand work equipment control lever | (7) Travel speed-up pedal |
| (3) Right-hand work equipment control lever | (8) Travel lock bar |
| (4) Accelerator pedal | (9) Level |
| (5) Blade lever | |

LOCK LEVER (FOR LEFT-HAND AND RIGHT-HAND WORK EQUIPMENT CONTROL LEVERS)

⚠ WARNING

- When standing up from or leaving the operator's seat, set the lock lever to the LOCK position. If the lock lever is not at the LOCK position and the control levers or control pedals are touched by mistake, serious personal injury may result. Check that the lock lever is securely in the LOCK position.
- Even if the lock lever is set to the LOCK position, the travel and blade operations are not locked.
- When pulling the lock lever up or down, be careful not to touch the work equipment control lever.

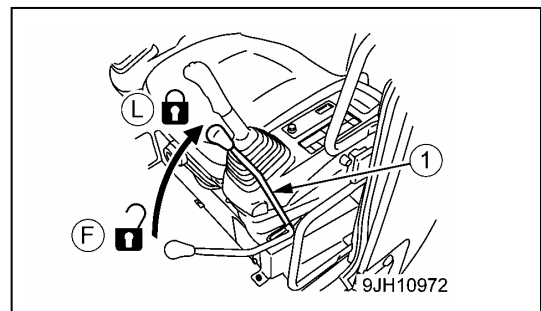
The lever (1) is a device to lock the crane operation and swing control.

If this lever is pulled up, the lever stand swings up to the LOCK position (L).

This lock lever is a hydraulic lock type. Accordingly, when it is in the LOCK position (L), the control levers move but the crane and the swing motor do not.

NOTES

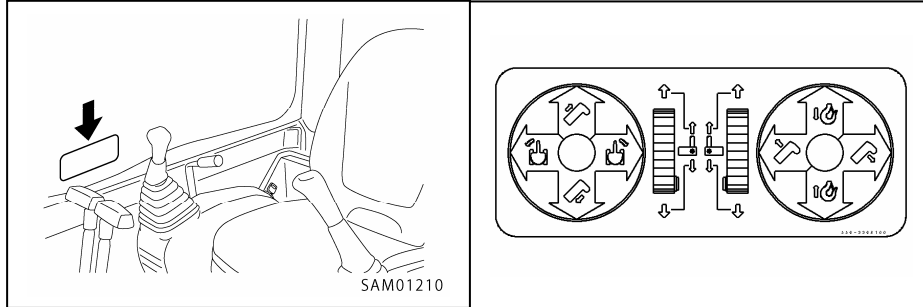
First make sure that the lock lever is in the LOCK position (L), and then turn the engine starter switch.
If the engine was stopped with the lock lever in the FREE position (F), set the lock lever to the LOCK position (L) before starting the engine.



WORK EQUIPMENT CONTROL LEVER

WARNING

- The control pattern of this machine is as indicated in the **CONTROL PATTERN** label, shown below. When any user desires to change to any other pattern, please contact us or our sales and service agency.
- If the control pattern is changed, the **CONTROL PATTERN** label must also be replaced.



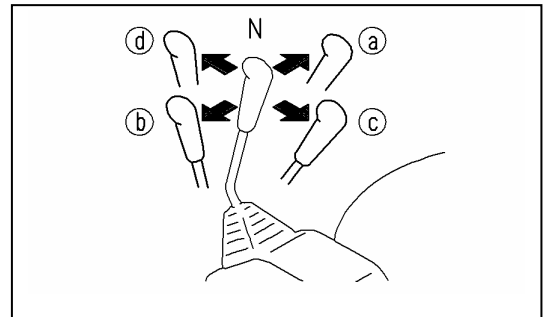
The left-hand work equipment control lever (2) is used to swing the upper structure and telescope the boom.

Swing operation

- (a) Swing to right: Pull the lever to the right.
- (b) Swing to left: Push the lever to the left.

Boom telescoping operation

- (c) Boom retracting: Pull the lever toward you.
- (d) Boom extending: Push the lever forward.
- (N) Neutral: Release the lever.



The upper structure and boom are held in that position when the control lever is returned to neutral

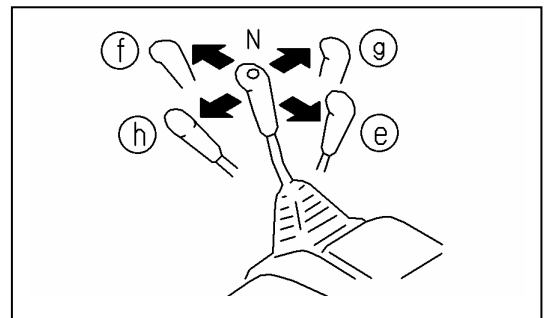
The right-hand work equipment control lever (3) is used to operate the winch and derrick the boom.

Winch operation

- (e) Hook raising: Pull the lever toward you.
- (f) Hook lowering: Push the lever forward.

Boom derricking operation

- (g) Boom lowering: Push the lever to the right.
- (h) Boom raising: Pull the lever to the left.
- (N) Neutral: Release the lever.

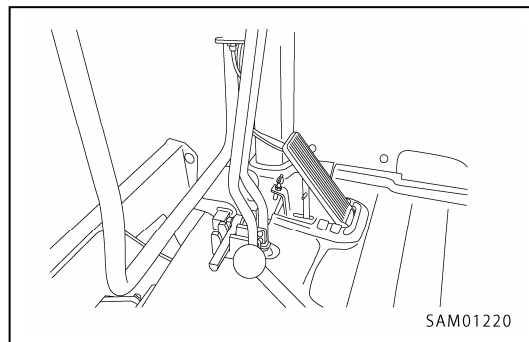


The hook and boom are held in that position when the control lever is returned to neutral.

ACCELERATOR PEDAL

Use this pedal (4) to control the engine rotating speed and output.

You can control the engine speed freely from low idle to full speed.



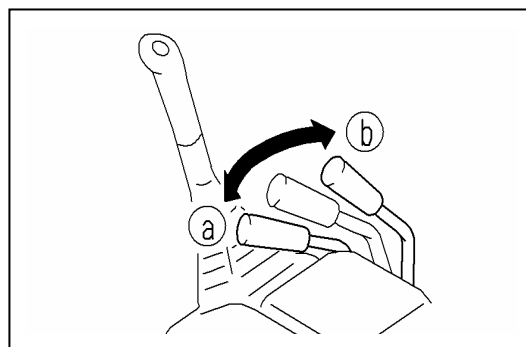
BLADE CONTROL LEVER

CAUTION

- This operation lever is not locked even if the lock lever is set to the LOCK position. Accordingly, do not touch this lever while you are not operating the blade.
- When continuing the blade operation for more than one hour, check for rise of the coolant temperature.

Use this lever (5) to operate the blade.

- (a): Down
- (b): Up



TRAVEL LEVERS

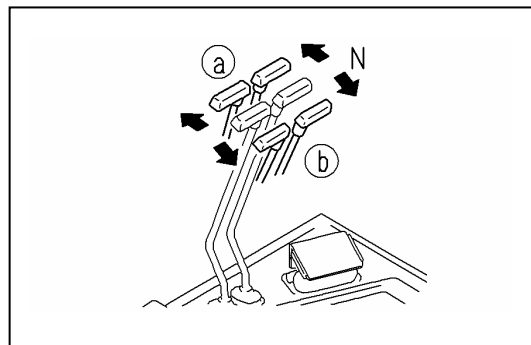
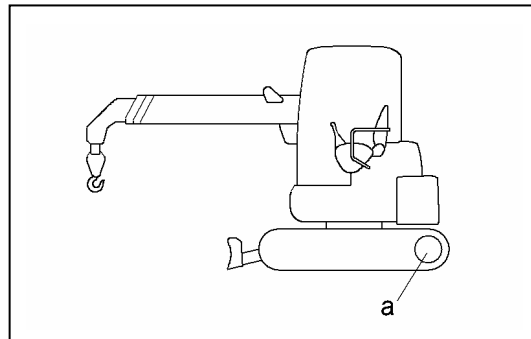
WARNING

When the track frame is facing the rear, the direction of operation is opposite to the direction of movement of the machine.

**When operating the travel lever, check if the track frame is facing the front or the rear.
(When the sprocket (a) is at the rear, the track frame is facing the front.)**

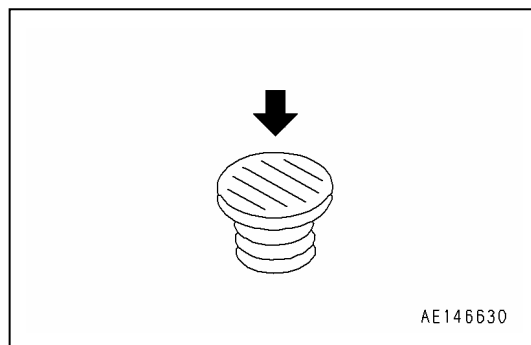
Use these levers (6) to travel the machine.

- (a) FORWARD: The lever is pushed forward.
- (b) REVERSE: The lever is pulled back.
- N (Neutral): The machine stops.



TRAVEL SPEED-UP PEDAL

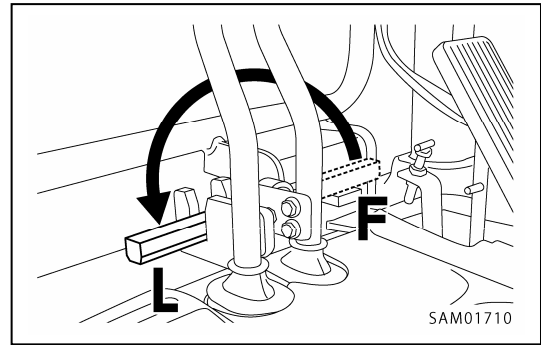
If this pedal (7) is pressed, the travel speed increases.



TRAVEL LOCK BAR

This bar (8) is used to "LOCK" the travel lever to prevent the machine from moving.

- LOCK (L): Turn the bar to the left to engage it in the groove.
- TRAVEL (F): Turn the bar to the right.



LEVEL

WARNING

Operating the crane on a slope may cause the machine to roll over.

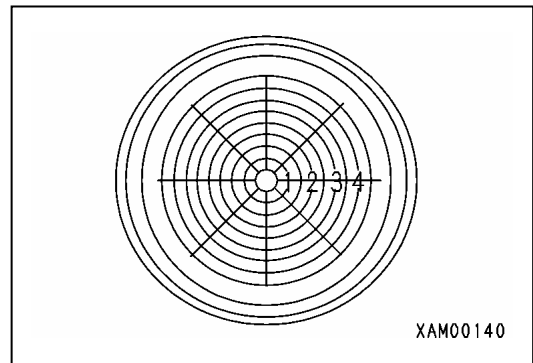
Prior to starting operations, check the gradient of the ground and try to find a level location.

When it is not possible to avoid operating on a slope, use supporting timber or build up the ground with soil so that the machine is level.

This device (9) indicates the degree the machine body is tilted.

The position of the bubble indicates how much the machine is tilted and in which direction.

Use this device to verify that the machine is level before operating the machine in a work area.



2.6 COVERS WITH LOCK

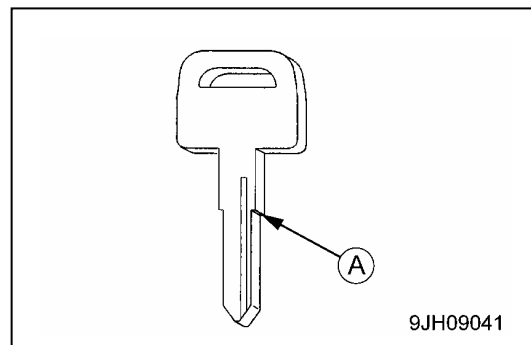
The dust cover, engine hood, and tool box cover are equipped with locks.

Open or close the covers using the starter key.

OPENING AND CLOSING COVERS WITH LOCK

Insert the key as far as it will go to the shoulder (A).

If the key is turned before it is inserted all the way, it may break.



Opening

1. Insert the starter key.
2. Turn the key clockwise to open the cover.

Locking

1. Close the cover.
2. Turn the key counter-clockwise and pull it out.

2.7 ENGINE HOOD

CAUTION

When carrying out inspection and maintenance of the engine compartment, fully open the engine hood and be sure to keep it open using the stopper.

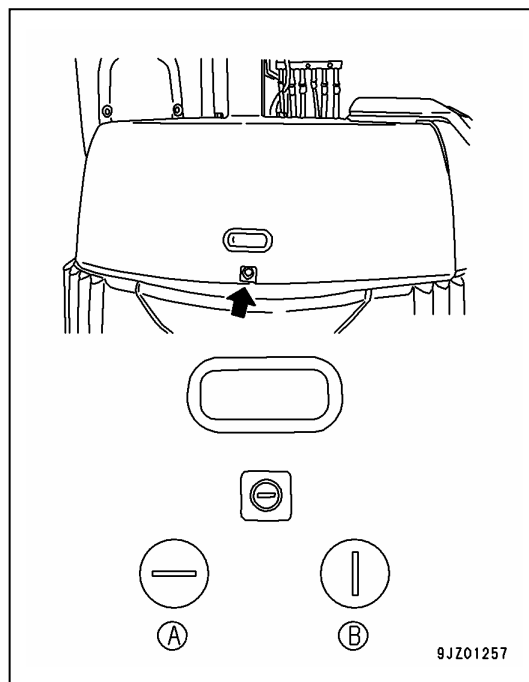
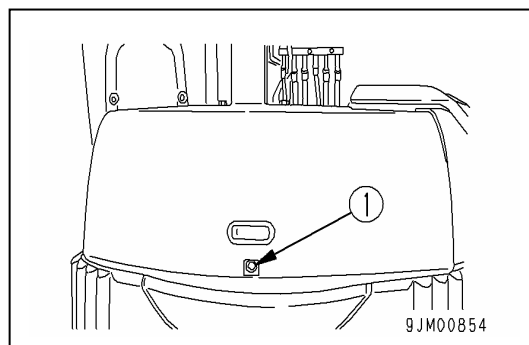
CAUTION

Always keep the engine hood locked except when opening it.

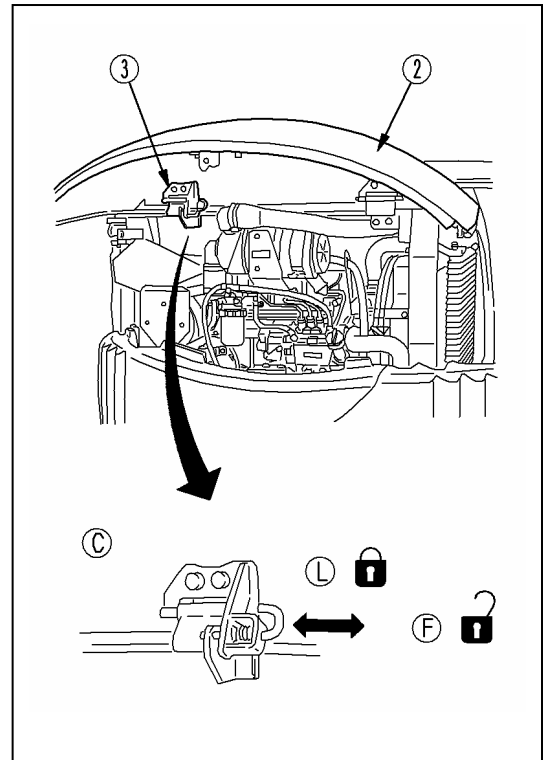
You can check whether the engine hood is locked by checking the direction of the key slot of the opening knob.

1. Press engine hood opening knob (1) to unlock the hood.

- (A): OPEN
- (B): LOCK



2. Push up hood (2) fully. Stopper (3) operates to fix hood (2).
3. When closing engine hood (2), pull stopper (3) to the free position (F) and lower the hood slowly, and then press it to the lock position (L).



2.8 FUSES

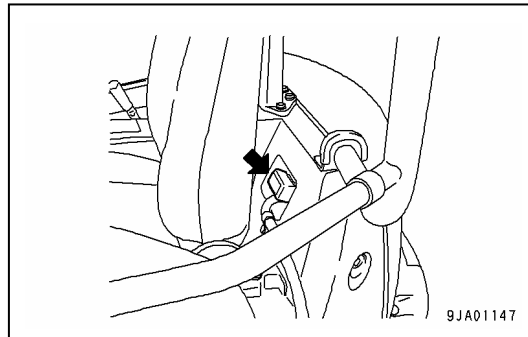
CAUTION

Be sure to turn the starter switch to the OFF position when replacing a fuse.

Fuses protect electrical components and wires from burning out.

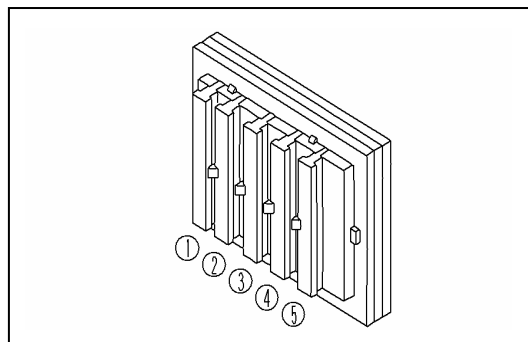
If a fuse has corroded and is surrounded by white powder or there is play between it and its holder, be sure to change the fuse.

When replacing a fuse, always use one of the same capacity.



FUSE CAPACITY AND CIRCUIT NAMES

No.	Capacity	Circuit name
(1)	30 A	Stop solenoid, stop relay, timer, feed pump
(2)	20 A	Buzzer, horn, lamp, Crane control
(3)	20 A	PPC lock, governor motor, working status lamp
(4)	25 A	Options, alternator, safety relay
(5)	20 A	Machine monitor, controller

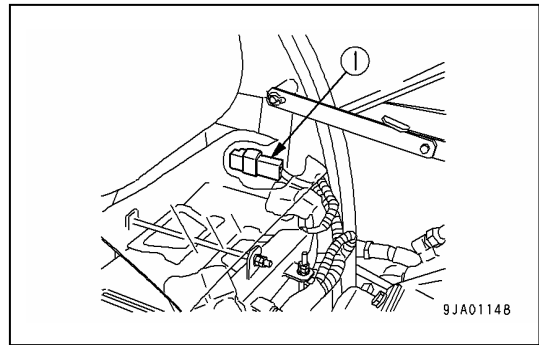


2.9 FUSIBLE LINK

If the starter motor does not turn even when the starter switch is turned to the START position, there is probably a disconnection in the fusible link (1). Open the cover on the right side of the machine and check and replace the fusible link.

NOTES

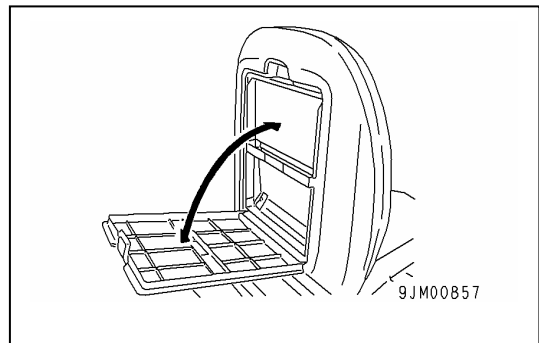
A fusible link refers to the large-sized fuse wiring installed in the high current flow portion of the circuit to protect electrical components and wiring from burning out, in the same way as an ordinary fuse does.



2.10 OPERATION MANUAL STORAGE

A magazine box is provided on the reverse side of the operator's seat for the safekeeping of the Operation Manual.

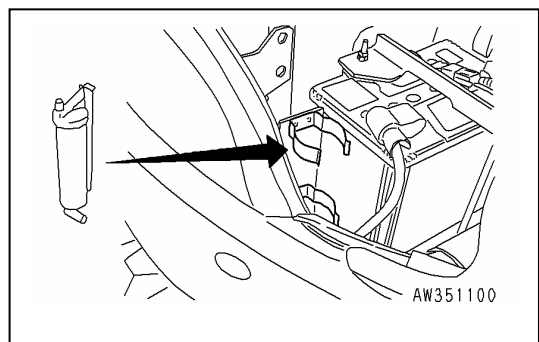
Always keep the Operation Manual in this box so that it can be read at any time.



2.11 GREASE GUN HOLDER

The grease gun holder is on the side of the battery. Hook the grease gun in this holder while it is not used.

Close the handle of the grease gun and store the grease gun with the handle directed at the front of the machine.



2.12 POWER SUPPLY FOR OPTIONS

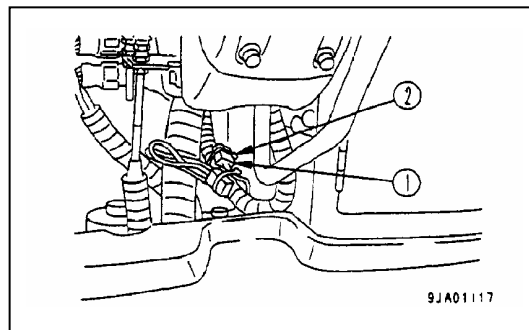
CAUTION

When using an electrical component that has not been manufactured by us, confirm that it is of 12 V specification and that it has a capacity less than 240 W (equivalent to 20 A). When using a large capacity electrical component, contact us or our sales service agency.

There is power supply connector (1) (Connector No. M20A) for optional components at the bottom of the box for the right-hand work equipment control lever.

NOTES

- Connector (1) is fixed using band (2). When using the connector, remove it from band (2), and fix it again after use.
- Cover connector (1) with nylon or other material to keep it away from water.



For removable connectors, contact us or our sales service agency.

3. MACHINE OPERATIONS AND CONTROLS

3.1 CHECKING/ADJUSTING BEFORE STARTING ENGINE

3.1.1 VISIBLE CHECKS

Look around and below the machine before starting the engine, and check the status of working equipment and the hydraulic system such as tightness of nuts and bolts, and leakage of oil, fuel and coolant.

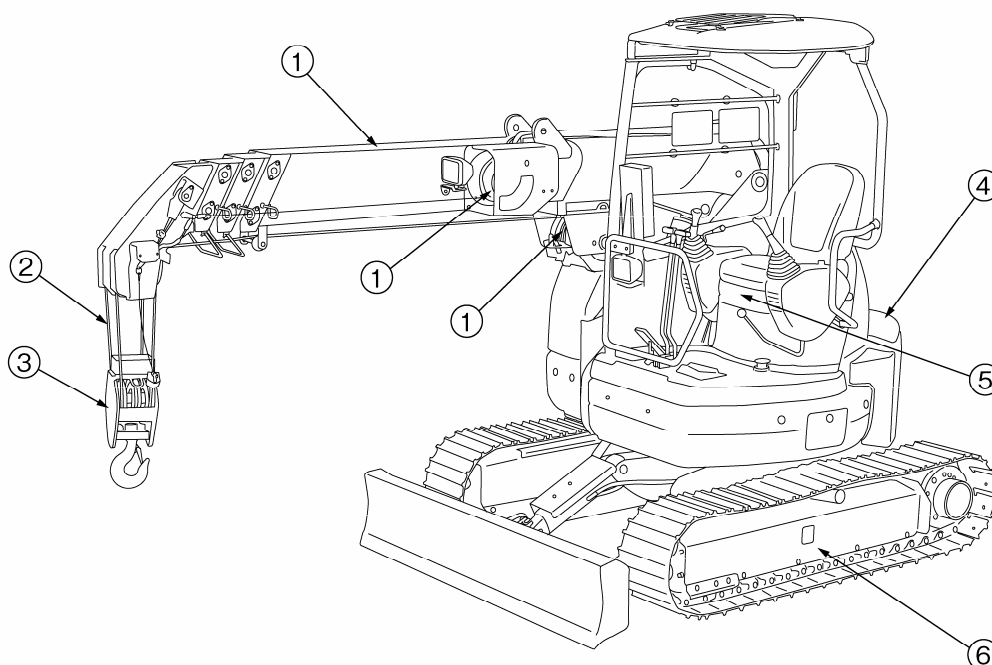
Also, check the electrical wiring for looseness and play. Also check for excessive temperature of components covered in dust.

⚠ WARNING

- When carrying out inspection and maintenance in the engine compartment, fully open the engine hood and be sure to secure it using the stopper.
- Remove any accumulated flammable materials immediately from around the battery, engine, muffler, or other high temperature engine parts. Leaking fuel or oil may cause the machine to catch fire. Carry out checks carefully, be sure to repair any problems, and contact us or our sales service agency if necessary.

If the machine is on an angle, place it on a level surface and begin the inspection.

Checking and cleaning of the items shown in this section is required to be completed prior to starting the engine for the first time every day.



SAM01230

1. CHECKING AROUND CRANE

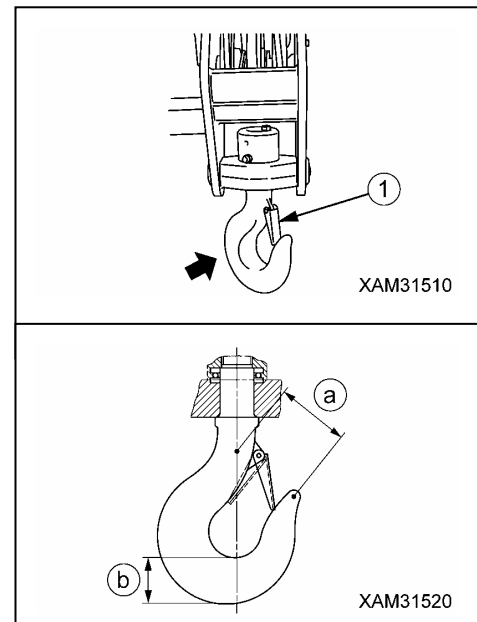
- Look around and below the boom, boom mounting and look for any leaking oil or other substances. Be especially careful to check the derrick cylinder and lower part of the winch motor. If you find any abnormalities, repair them.
- Check each part of the mounting portion for cracks, excessive deformation, contamination, etc. In addition, check bolts, nuts, pins and piping joints for looseness, damage, etc. If you find any abnormalities, repair them.
- Check each part of the boom for cracks, excessive deformation and contamination etc. In addition, check bolts, nuts, pins and piping joints for any looseness, drop and damage etc. Be especially careful to check for excessive abrasion and damage of the boom support pin or derrick support pin. If you find any abnormalities, repair them.
- Check for excessive damage and deformity of the over hoist weight wire cable of the over hoisting alarm device at the tip of the boom. If you find any abnormalities, repair them.
- Check working lamp for cracks, excessive deformation and contamination, etc. If you find any abnormalities, repair them. If dirty, clean it.
- Check for sagging electrical wiring, loose connections and burn traces. If you find any abnormalities, repair them.

2. CHECKING WIRE CABLES

- ★ See "Operation 4. Handling Wire Cables" for wire cables.
- Check the wire cables for damage, deformation, wear, twists, kinks, corrosion etc. If you find any abnormalities, repair them.
- Check the bound condition of the wire cable ends. If you find any loose wire cable ends, replace them.
- Check for irregular winding of the wire cables (winch drum). If you find any instances of irregular winding, correct them.

3. CHECKING HOOK BLOCK

- Verify that hook latch (1) functions normally. If you find any abnormalities, repair them.
- Rotate the hook and verify that the hook rotates smoothly and that trunnion does not emit any abnormal sounds. If you find any abnormalities, repair them.
- Check the hook for any crack or excessive deformation. If you find any abnormalities, repair them.
- If dimension (a) between the punch marks punched on the hook has become 105 mm or more, or hook lower part dimension (b) has become 49.5 mm or less, replace the hook.



4. CHECKING AROUND UPPER STRUCTURE

- Check for any fuel, oil or water leaks from the engine, and check for damages hoses and tubes. If you find any abnormalities, repair them.
- Check the hot engine sections such as the engine muffler and around the battery for the buildup and deposit of combustibles such as dead leaves, paper wastes, dust, oil, and grease. Remove any that you find.
- Check the starter, alternator, around the battery and similar parts for sagging electrical wiring, piping joints, and burn traces. If you find any abnormalities, repair them.
- Check the hydraulic equipment, hydraulic tank, hoses and joints for oil leaks. If you find any abnormalities, repair them.
- Check the handrails and steps for cracks, excessive deformation, contamination etc. If you find any abnormalities, repair them. In addition, check bolts and nuts for looseness, damage, etc. If you find any abnormalities, repair them.
- Check the working status lamp for cracks, excessive deformation and contamination, etc. If you find any abnormalities, repair them. If dirty, clean it.

5. CHECKING CANOPY

- Check windshields for dislocation or damage, and cracks or impairments in window panes. If you find any abnormalities, repair them. If the windshields are broken, stop your work and repair them immediately.
- Check the seat belt and mounting bracket for abnormalities. If any damage is discovered, replace them with new ones.
- Verify that all operation levers, travel levers, the lock lever and access pedals operate smoothly. If you find any abnormalities, repair them.
- Check the moment limiter display and the monitor panel on the instrument panel for damage and dirt. If you find any abnormalities, repair them. If dirty, clean it.
- Check for sagging electrical wiring, loose connections and burn traces. If you find any abnormalities, repair them.
- Check the headlight for cracks, excessive deformation and contamination, etc. If you find any abnormalities, repair them.

6. CHECKING AROUND UNDERCARRIAGE

- Check each of the frames, tracks, rollers, idlers and sprockets for cracks, excessive deformation, contamination, etc. In addition, check bolts, nuts and pins for looseness or damage etc. If you find any abnormalities, repair them.
- Look around and below the undercarriage for any leaking oil or other substances, check bolts, nuts, pins and piping joints for looseness, damage etc. If you find any abnormalities, repair them.

3.1.2 CHECKING BEFORE STARTING (CHECKING BEFORE OPERATION)

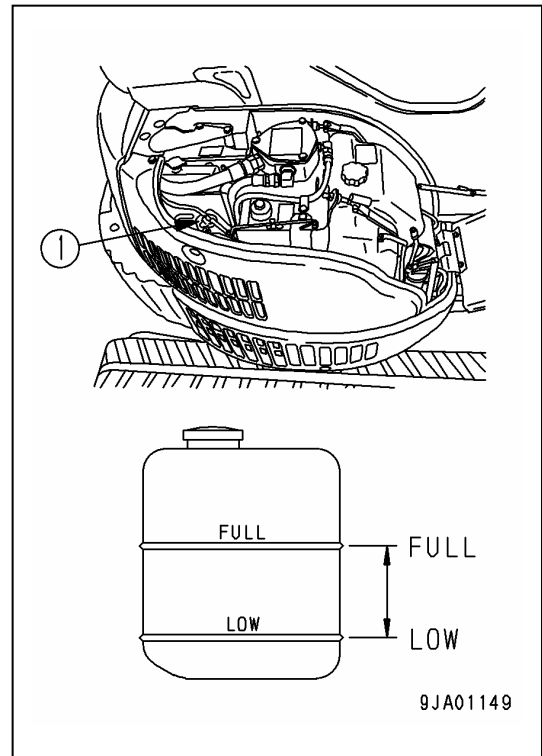
Checks specified in this section are required to be completed once prior to starting the engine for the first time every day.

CHECKING/REFILLING ENGINE COOLANT

WARNING

- Do not open the radiator cap unless necessary. When checking the coolant, always wait for the engine to cool down and check the sub tank.
- Immediately after the engine is stopped, the coolant will still be very hot and the radiator will be under high internal pressure. If the cap is removed under these conditions, there is a risk you may be burnt. Wait for the temperature to drop, then turn the cap slowly and carefully to release the pressure.

1. Open the dust cover, and check that the coolant of sub tank (1) is between the FULL and LOW levels. If low, add the water to sub tank (1) until the coolant reaches the FULL level.
2. After refilling, close the cap securely.
3. If the sub tank is empty, check for a coolant leakage and then check the coolant level in the radiator. If the water level is low, add coolant to the radiator, and then fill the sub tank.



CHECKING/REFILLING OIL LEVEL IN ENGINE OIL PAN

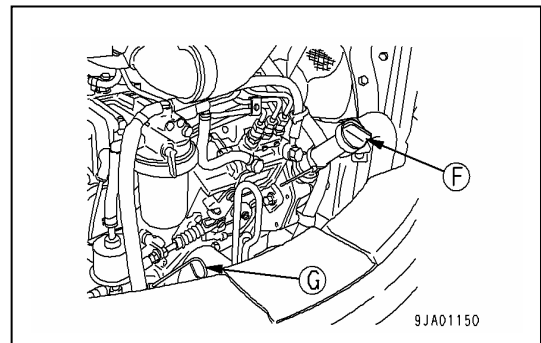
WARNING

Parts and oil will still be very hot immediately after the engine is stopped, and may cause burns. Wait for the temperature of these components to drop before performing this operation.

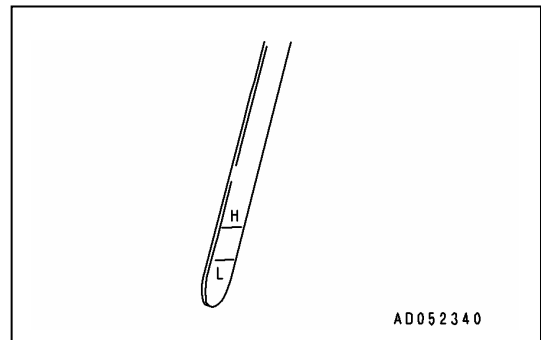
CAUTION

- If the machine is on an angle, place the machine on a level surface and start the inspection.
- Check the oil level before starting the engine or after 15 minutes (or longer) after the engine has stopped.
- Be careful not to let dust enter from the filler port when refilling with oil.
- Keep the engine oil at the appropriate level.
Use of an excessive amount of oil will result in excessive oil consumption and this tends to increase the oil temperature, making the oil deteriorate faster. A very low level of oil may cause the engine to burn out.
- Be careful not to let dust enter from the filler port when refilling with oil.

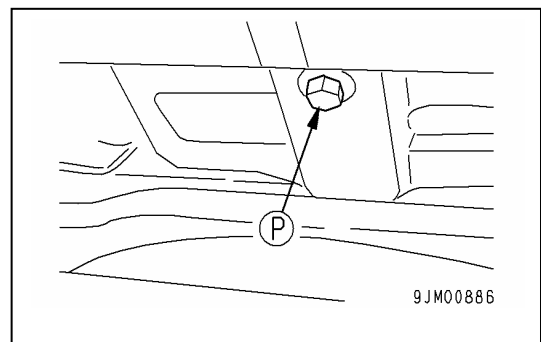
1. Open the engine hood.
2. Remove dipstick (G) and wipe the oil off with a cloth.
3. Fully insert dipstick (G) into the gauge guide, then remove it.



4. If the oil level is between the H and L marks on dipstick (G), the oil level is normal.
If the oil level is lower than the L mark, add oil through the filler port (F).



5. If the oil level is above the H mark, drain the excess engine oil from drain plug (P), and then check the oil level again.
6. If the amount of oil is sufficient, secure the oil filler cap and close the engine hood.

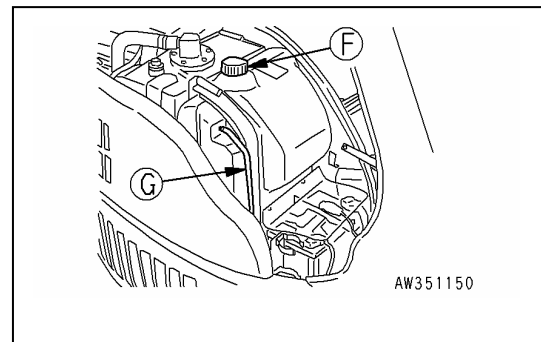
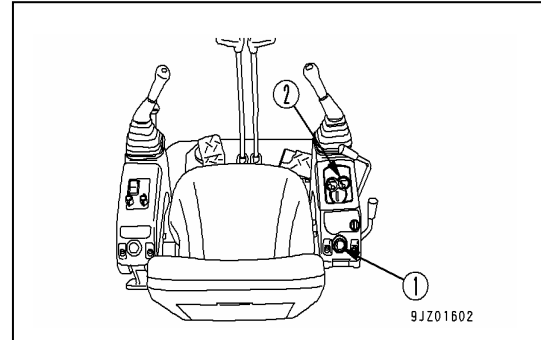


CHECKING FUEL LEVEL

WARNING

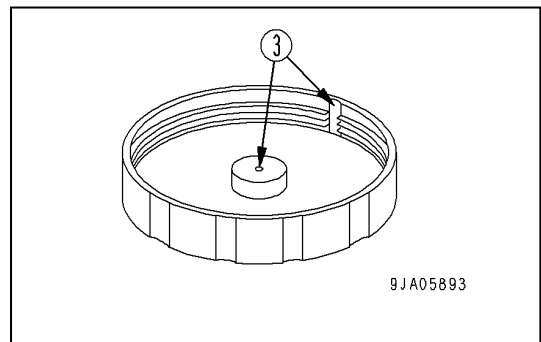
- Be extremely careful with fire, such as that from cigarettes.
- Be sure to stop the engine when refueling. If refueling is carried out while the engine is operating, any fuel that spills on a section that gets hot such as a muffler may catch fire.
- Be careful not to allow the fuel to overflow when refueling. Fuel that overflows may cause a fire.
- Wipe and clean any spilled fuel. If any fuel spills onto sand, remove the sand, too.
- Fuel is highly flammable and dangerous. Do not bring any flame near to fuel.

1. Insert the key in starter switch (1) and rotate it to the ON position. The monitor will light up.
2. Check the fuel level by reading fuel gauge (2). If low, open the cover at right and refuel through filler port (F) by observing the sight tube (G).
Fuel tank capacity: 42 liters
3. After refueling, close the filler cap securely.



CAUTION

If breather hole (3) on the cap is clogged, the pressure in the tank will drop and fuel will not flow. Clean breather hole (3) from time to time.



CHECKING/REFILLING OIL LEVEL IN WINCH MOTOR REDUCTION GEAR CASE

WARNING

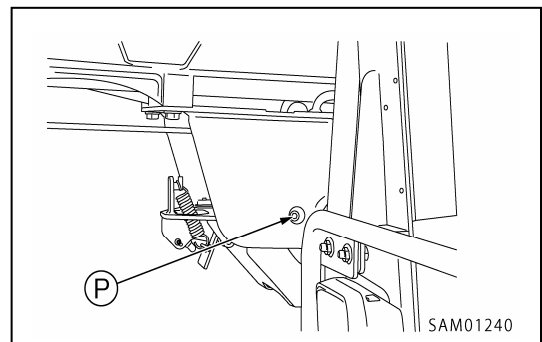
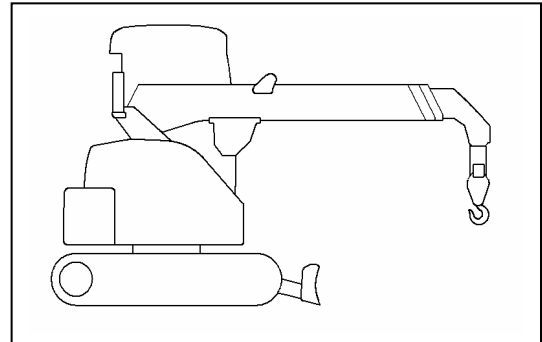
The parts and oil will still be very hot immediately after the engine is stopped.
Wait for the oil temperature to drop; do not try to remove the plug of the port immediately.

CAUTION

- For information about the type of oil used, see "Inspection and Maintenance 7.1 Use of Fuel, Coolant and Lubricants According to Ambient Temperature".
- Use seal tape, etc. on the thread of the filler plug to stop any oil from leaking, and securely tighten the plug after refilling the oil.

- Prepare a container with a capacity of one liter or more to catch drain oil.
- A hexagon wrench for removing plug: 8 mm
- Refilled oil capacity in swing reduction gear case: 0.75 liters

1. Stop the machine on a level surface.
2. As shown in the figure to the right, retract the boom to the minimum length, lower it fully and set it horizontally.
3. Turn the winch slowly until plug (P) can be seen through the opening.
4. Set a container under drain plug (P) to catch the oil.
5. Remove plug (P) using a hexagon wrench and check that the oil level is near the bottom end of the plug hole.
6. If the oil level is low, add the gear oil until it overflows from plug hole (P).
7. After draining oil, install and tighten drain plug (P) securely.



NOTES

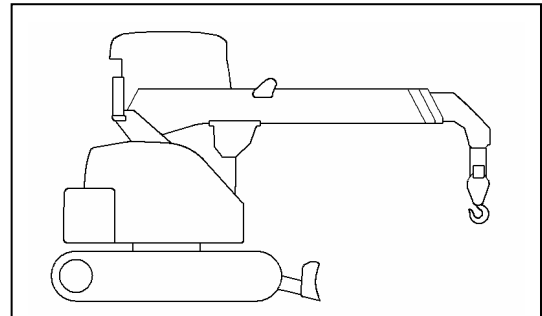
If any oil spills, wipe it off completely.

CHECKING/REFILLING OIL LEVEL IN HYDRAULIC TANK

WARNING

When removing the cap of oil filter port, turn it slowly to release the internal pressure. Otherwise, it may gush out.

1. If the machine is not in the condition as shown on the right, start the engine and run it at low speed. Retract the boom to the minimum length, lower it fully, set it horizontal, and stop the engine.

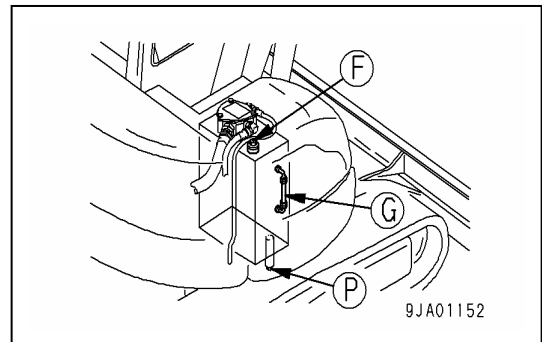


2. Check dipstick (G). The oil level should be between the H and L marks.

CAUTION

Do not add the oil above the H mark level. This will damage the hydraulic circuit or cause the oil to spurt out.

If oil has been added above the H level, drain the oil as follows: Swing the upper structure so that drain plug (P) under the hydraulic tank will be between the left and right tracks. Stop the engine, wait until the oil cools down, and remove the excess oil from drain plug (P).

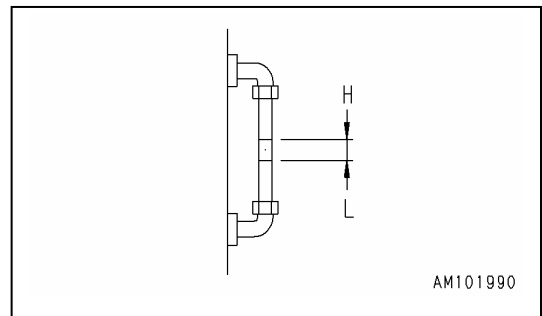


3. If the oil is below the L level, remove the cover at the top of the hydraulic tank, and add oil through filler port (F).

NOTES

The oil level will vary depending upon the oil temperature. Accordingly, use the following as a guide.

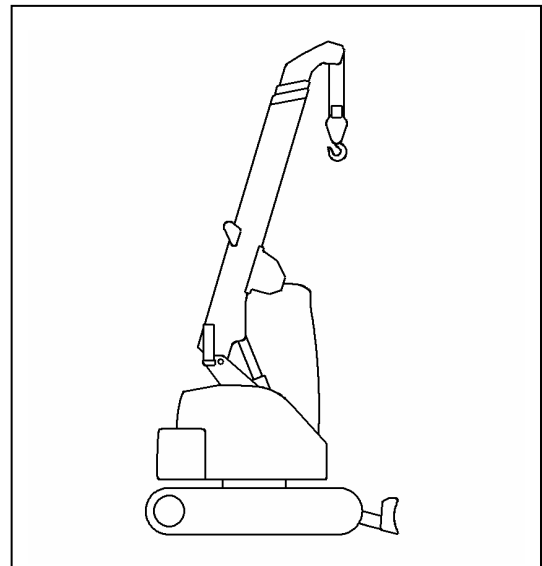
- Before starting operation: Around L level (Oil temperature: 10 to 30°C)
- Normal operation: Around H level (Oil temperature: 50 to 80°C)



4. As shown in the figure to the right, retract the boom to the minimum length and raise it fully, lower the blade to the ground, attach the oil filler cap and then pressurize inside of the tank.

CAUTION

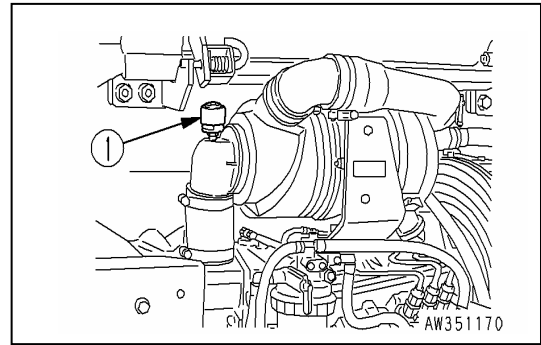
If you do not pressurize the hydraulic tank, equipment will be affected adversely due to suction of air by the pump.



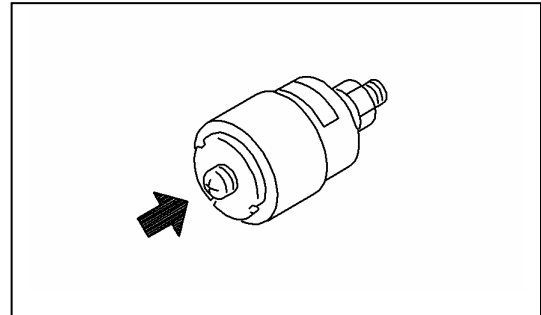
CHECKING DUST INDICATOR

1. Open the engine hood and check that the red piston is not showing in the transparent part of dust indicator (1).
2. If the red piston has appeared, clean or replace the air cleaner element immediately.

See "Inspection and Maintenance 10.3 Irregular Maintenance (Checking/Cleaning/Replacement Air Cleaner Element)" for cleaning of element.



3. After checking, cleaning, or replacing the air cleaner element, press the knob of dust indicator (1) to return the red piston to its original position.

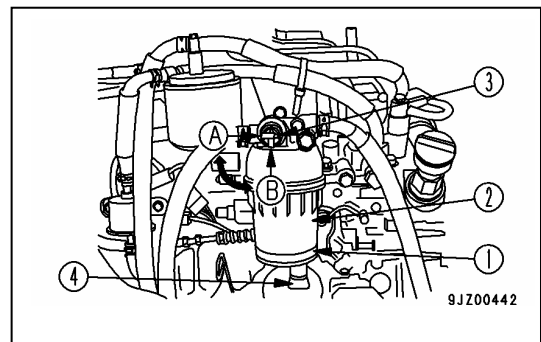
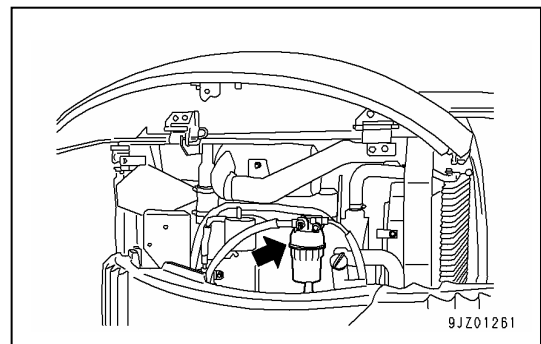


CHECKING WATER SEPARATOR

If red ring (1) of the water separator is located at the bottom of case (2), no water has entered.

If red ring (1) is floating, water has entered under the ring. Remove the water in the following procedure.

1. Open the engine hood.
2. Set handle (3) to Close position (A).
3. Loosen drain plug (4), drain off water until red ring (1) contacts the bottom, then close plug (4).
4. Set handle (3) to Open position (B).
5. Eliminate water and dust mixed into the fuel tank by referring to "Inspection and Maintenance 10.3 Irregular Maintenance (Draining Water and Sediment from Fuel Tank)".



CHECKING ELECTRICAL WIRING

CAUTION

- If fuses frequently blow or if there are traces of short-circuiting on the electrical wiring, promptly ask us or our sales service agency to locate the cause and carry out repairs.
- Keep the top surface of the battery clean and check the breather hole in the battery cap. If it is clogged with dirt or dust, wash the battery cap to clear the breather hole.

Check that there is no damage to the fuses; that fuses of the specified capacity are used; that there is no disconnection or trace of short-circuiting in the electrical wiring. Check also that there are no loosened terminals. If any are discovered, tighten them.

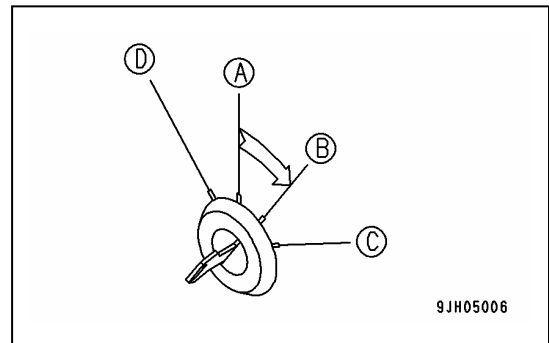
In particular, pay attention and check the electrical wiring of the battery, engine starter and alternator.

Be sure to check that no inflammable materials have accumulated around the battery. If any are found, remove them immediately.

Contact us or our sales service agency for cause, detection and repair.

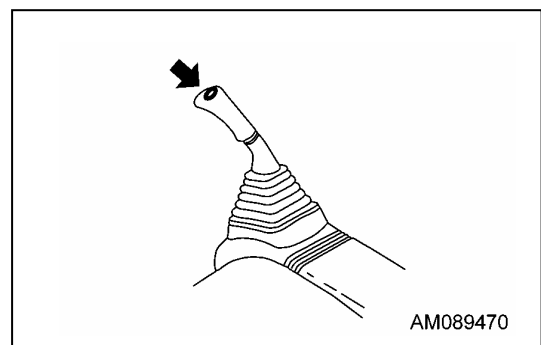
CHECKING FUNCTION OF HORN

1. Set the starter switch to ON position (B).



2. Confirm that the horn sounds immediately when the horn switch is pressed.

If the horn does not sound, contact us or our sales service agency.



ADJUSTING

WARNING

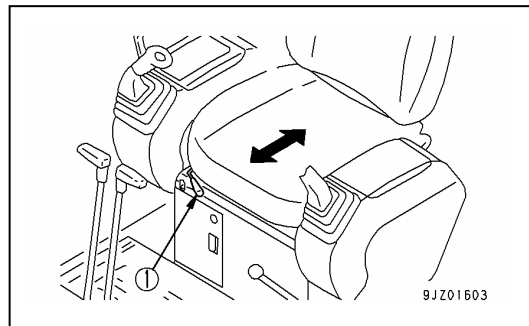
When adjusting the operator's seat position, always set the lock lever to the LOCK position. This will prevent an operation error if the control lever is touched accidentally.

ADJUSTING OPERATOR'S SEAT

The seat can slide in the forward or backward direction.
Pull up lever (1) to set the seat to the desired position,
then release the lever.

Extent of adjustment: 100 mm

Adjust the operator's seat position according to the current
type of machine operation.



HANDLING SEAT BELT

WARNING

- Before fitting the seat belt, check that there are no problems with the belt mounting brackets. If the seat belt is worn or damaged, replace it.
- Even if the seat belt does not appear to have any abnormalities, replace it every three years. The date of manufacture of the belt is shown on the back of the belt.
- Always wear the seat belt while operating the machine.
- Fit the seat belt so that it is not twisted.

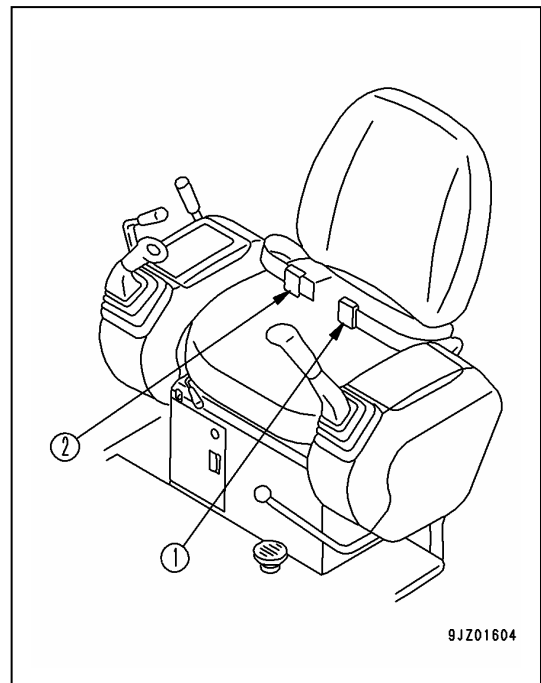
Check that the seat belt mounting bolts are not coming out of the fixing points. If loose, tighten them.

Tightening torque: 24.5 ± 4.9 Nm $\{2.5 \pm 0.5$ Kgm}

If the belt surface is scratched or ragged or if the metal of the seat belt is deformed or damaged, replace the seat belt with a new one.

WEARING OR RELEASING SEAT BELT

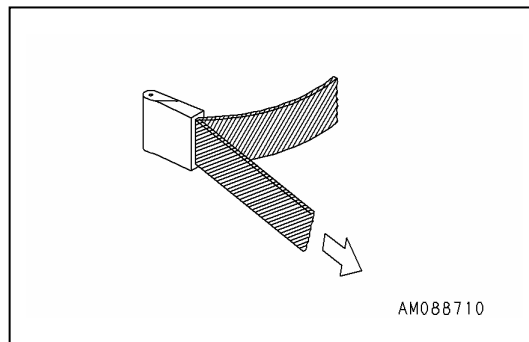
1. Sit down on the operator's seat, and adjust the seat position so that your back touches the seat back and so that you can easily operate the machine.
2. To fasten the seat belt, insert flap (2) into buckle (1). Pull the belt slightly to check it is locked.
3. To release the belt, pull up the lever end of buckle (1). Be careful not to twist the seat belt, and adjust the length of the belt with the flap.



ADJUSTING THE SEAT BELT LENGTH

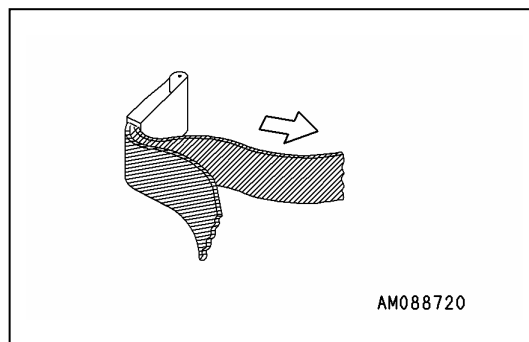
To shorten the belt:

Pull the belt end from the flap.



To lengthen the belt:

Pull the belt toward the buckle at a right angle.

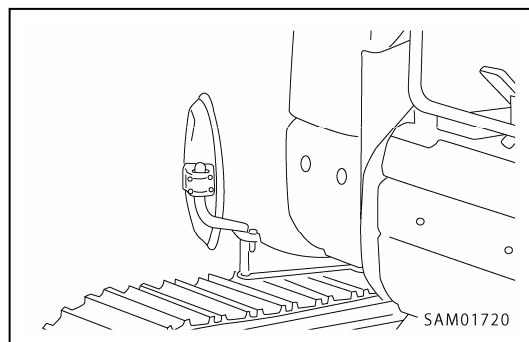


ADJUSTING MIRRORS

WARNING

Always adjust the mirrors before starting operations. If mirrors are not adjusted correctly, you will not be able to obtain a sufficient view of your surroundings, which may result in damage to the machine, or serious injury.

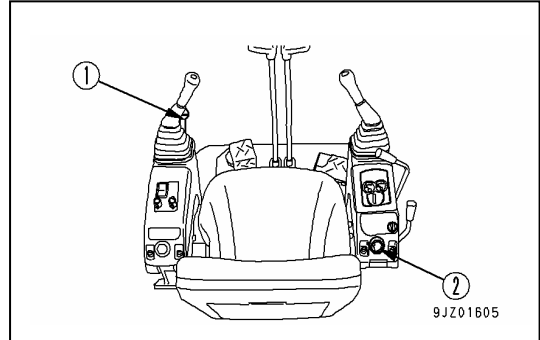
The position of this mirror should be adjusted so that a person standing at the right-front end of the machine is visible.



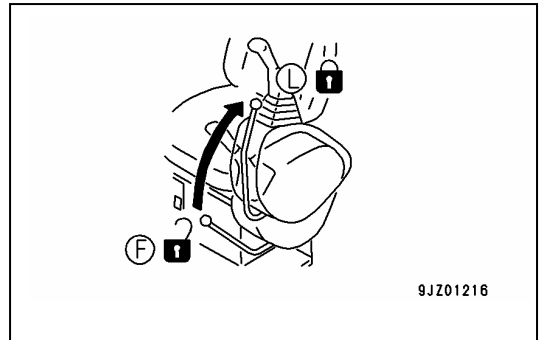
3.1.3 OPERATIONS/CHECKING BEFORE STARTING ENGINE

⚠ WARNING

When starting the engine, check that the lock lever is securely in the LOCK position. If the lock lever is not locked securely and the control levers or control pedals are touched when the engine is started, the machine may move unexpectedly, which may lead to serious personal injury.

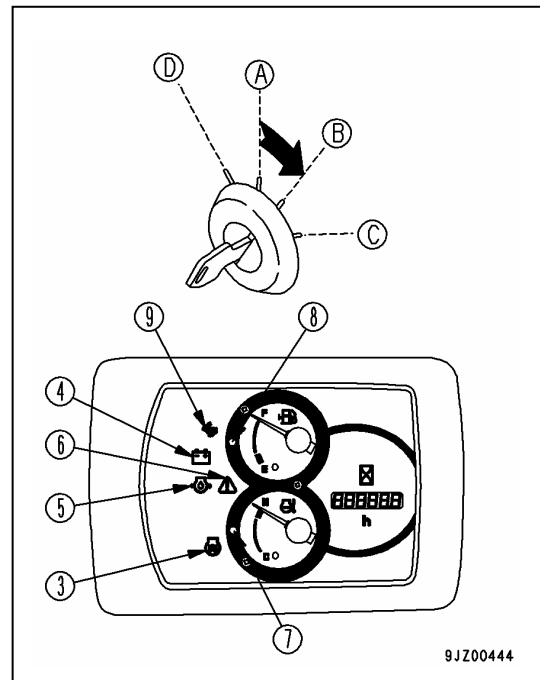


1. Check that lock lever (1) is in LOCK position (L).
2. Check that all control levers are set in the correct positions.



3. Insert the ignition key into starter switch (2), rotate the key to ON position (B), and check the following points.
 - 1) The buzzer sounds for approximately one second, and then the gauge lights light up for approximately three seconds.
 - Engine pre-heating monitor (3)
 - Charging level monitor (4)
 - Engine oil pressure monitor (5)
 - Electrical system warning monitor (6)
 - Engine coolant temperature caution lamp (7)
 - Fuel level caution lamp (8)
 - Travel speed-up monitor (9)

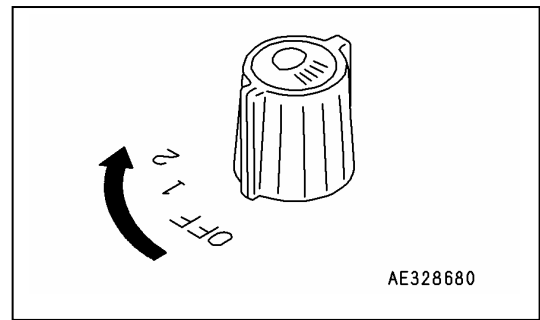
If any monitor does not light up or any buzzer does not sound, the monitor bulb may have blown or the circuit may have shorted. In this case, contact us or our sales service agency.



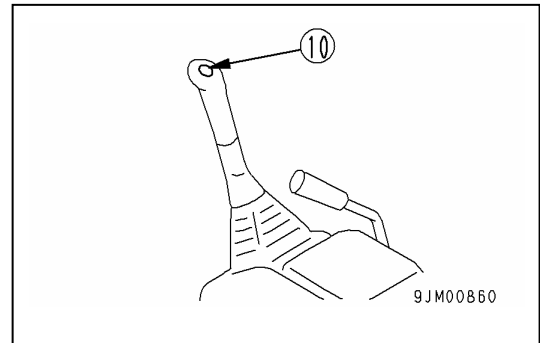
After approximately three seconds, the following monitors will light up but the others will go out.

- Charging level monitor (4)
- Engine oil pressure monitor (5)
- Electrical system warning monitor (6)

- 2) Operate lamp switch and check that working lamps light up. If any lamp does not light up, the bulb has likely blown or there may be a disconnection. In such a case, ask us or our sales service agency for repair services.



- 3) Press horn switch (10) to check that the horn sounds.



3.1.4 CHECKING AFTER STARTING ENGINE

Check the followings in this section after starting the engine and before starting work for the first time every day.

CAUTION

The checkups described in this section should be carried out after starting the machine. See "Operation 3.1.3 Operations Before Starting Engine" and later to execute the engine startup, travelling operations, and crane operations.

CHECKING OF ENGINE STARTING ABILITY AND NOISE

When starting the engine, check that there are no abnormal engine noises and that the engine starts up easily and smoothly.

Also check that there are no abnormal noises when the engine is idling or when engine revolutions increase slightly.

- If there is an abnormal noise at the time of engine startup and if that condition continues, the engine may be damaged.

In that case, ask us or our sales service agency to check the engine as soon as possible.

CHECKING OF ENGINE ACCELERATION AND DECELERATION

When stopping the machine while it is operating, check that there are no engine speed irregularities and that the engine does not stop suddenly.

After carrying out warm-up operations, check that the engine speed increases smoothly when the accelerator pedal is pressed to speed up the engine from low idling speed to full speed.

- Carry out these checks in a safe place, watching out for any potential surrounding dangers.
- If the engine performs very badly at low idling speed or during acceleration, and if this condition continues, the engine may be damaged or may not be able to recognize the operator's driving style, and as a result may lead to an unexpected accident.

In that case, ask us or our sales service agency to check the engine as soon as possible.

CHECKING ENGINE EXHAUST GAS COLOR, NOISE AND VIBRATION

Keep the engine idling and continue the operation without a load for about five minutes.

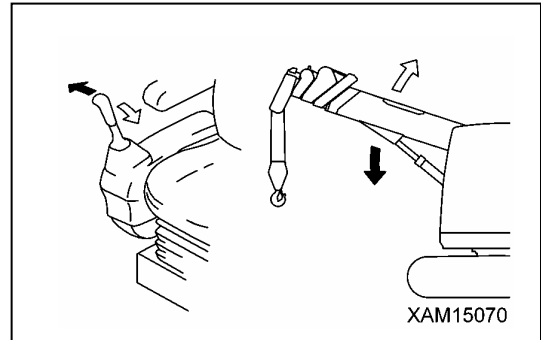
Verify that the engine exhaust gas color is either transparent or slightly blue. Also, check for abnormal noises and vibrations. If you find any abnormalities, repair them.

CHECKING CRANE OPERATIONS

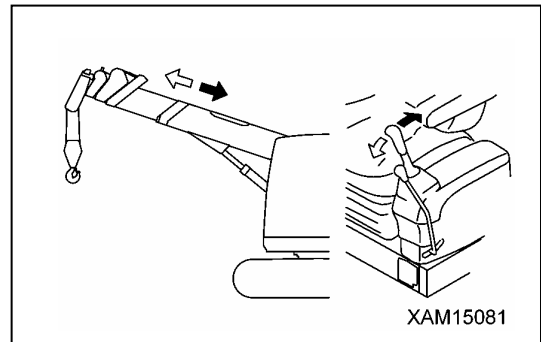
WARNING

Be sure to refer to the Operation sections between "3.10 Cautions before Operating the Crane" and "3.17 Stowage Operation of Crane", and strictly observe the methods described and cautions given when checking crane operations.

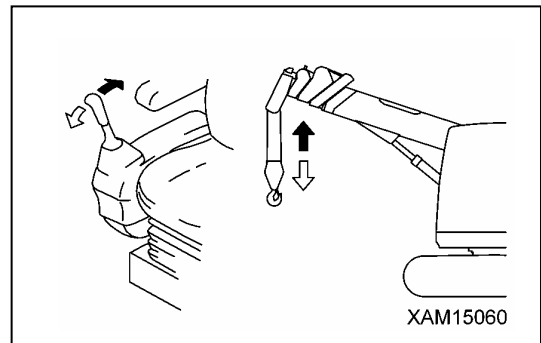
1. Verify that the boom rises smoothly when the right-hand work equipment control lever is moved to the RAISE position (pull toward you). Also, verify that the boom lowers smoothly when the right-hand work equipment control lever is moved to the LOWER position (push away from you). When doing the above, check for any abnormal sounds coming from any part of the boom or from the boom derricking cylinder. If you discover any abnormalities, repair them.



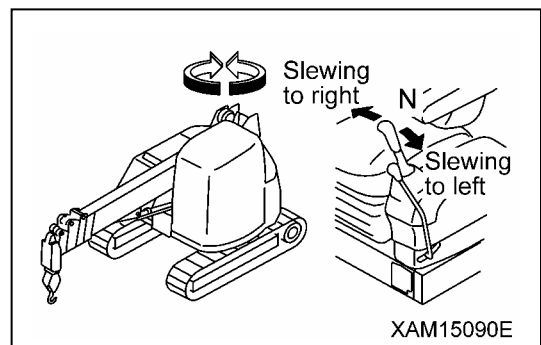
2. Verify that the boom extends smoothly when the left-hand work equipment control lever is moved to the EXTEND position (push forward). Also, verify that the boom retracts smoothly when the left-hand work equipment control lever is moved to the RETRACT position (pull backward). When doing the above, check for any abnormal sound emitted by part of the boom or from the boom telescoping cylinder. If you find any abnormalities, repair them.



3. Verify that the hook is wound down smoothly when the right-hand work equipment control lever is moved to the HOOK LOWERING position (push forward). Also, verify that the hook is wound up smoothly when the right-hand work equipment control lever is moved to the HOOK RAISING position (pull backward). When doing the above, check for any abnormal sound emitted by part of the boom or from the winch motor. If you find any abnormalities, repair them.



4. Verify that the crane swings smoothly counterclockwise when the left-hand work equipment control lever is moved to the LEFT position (push toward outside). Also, verify that the crane swings smoothly clockwise when the left-hand work equipment control lever is moved to the RIGHT position (pull toward you). When doing the above, check for any abnormal sound coming from the swing post. If you find any abnormalities, repair them.



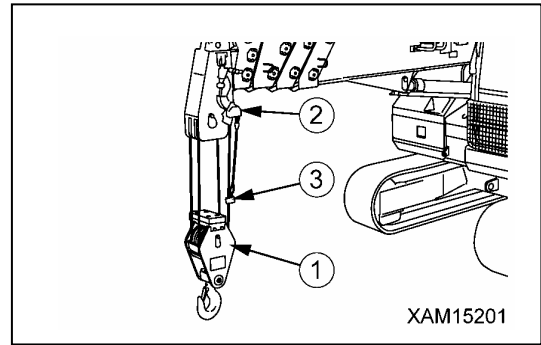
CHECKING OPERATION OF OVER HOIST DETECTOR

Over hoist hook block (1), and raise the hook using the winch and extend the boom, and verify that the buzzer sounds intermittently, and that the hook raising and boom extension operations stop.

If these operations do not stop, the over hoist detector (2) may be faulty.

If the alarm does not stop, the over hoist detector (2) may be faulty or the circuit may be open.

Ask us or our sales service agency for repair services.



CHECKING OPERATION OF MOMENT LIMITER

WARNING

If you find any abnormality with the moment limiter, immediately contact us or our sales service agency.

1. Set the starter switch to the ON position.
2. Check the working status lamp. All three colors light up for approximately three seconds at first, then only the green light remains lit.
3. Check the moment limiter display unit.
Verify that no error code is displayed at the "RATED TOTAL LOAD" display on the display panel.
4. Start the engine and operate the crane as follows to verify whether the moment limiter correctly displays the value.

Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed "boom length" with the boom length at minimum	3.2 m
Displayed "boom length" with the boom length at maximum	8.7 m
Displayed "working radius" with the boom length of "3.2 m" (first section of the boom) and boom angle of "50.0 degrees"	1.9 ± 0.2 m

5. Prepare a standard weight of known actual mass. Hoist it to ensure that the displayed "actual load" value is identical to the total masses of the standard weight and the slinging equipment. Take note, however, that there may be a slight error due to the condition of the boom.
6. Operate the crane until the moment limiter display values indicate the boom length is "3.2 meters" (3.2 m boom) and boom angle is "50 degrees", and then measure the "boom angle" and "working radius". If the measured value(s) differ from the moment limiter display value, contact us or our sales service agency.

3.2 STARTING ENGINE

3.2.1 NORMAL STARTING ENGINE

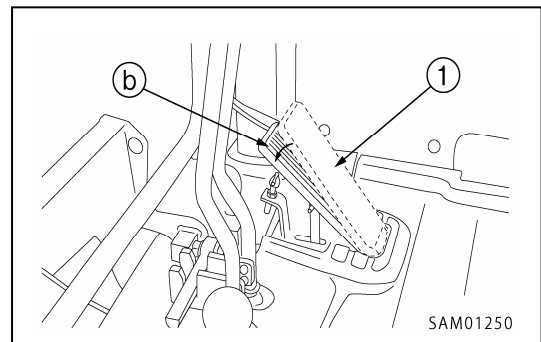
WARNING

- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no people or obstacles in the surrounding area and sound the horn before starting the engine.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure there is sufficient ventilation.

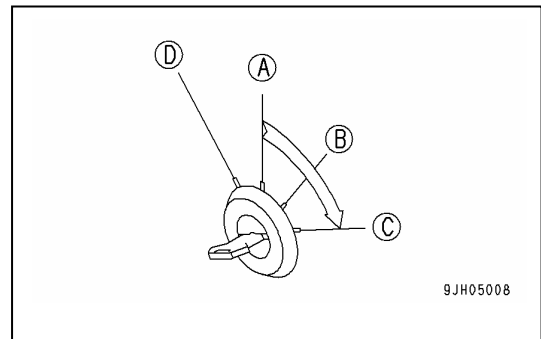
CAUTION

Do not keep the starter motor rotating continuously for more than 20 seconds.
If the engine will not start, wait for least two minutes before trying to start the engine again.

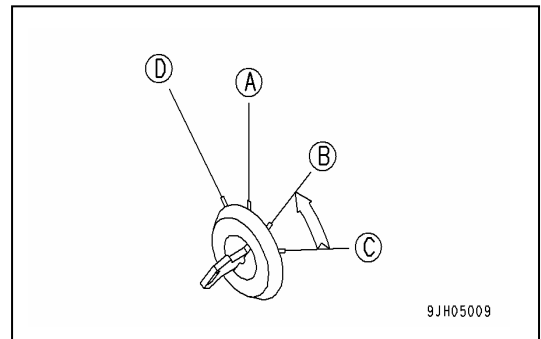
1. Press accelerator pedal (1) to midway point (b) between the low idling status and full speed status.



2. Turn the key of starter switch (2) to START position (C). The engine starts.



3. Release the key of starter switch (2) when engine has started. The key returns to ON position (B) automatically.



3.2.2 STARTING ENGINE IN COLD WEATHER

⚠ WARNING

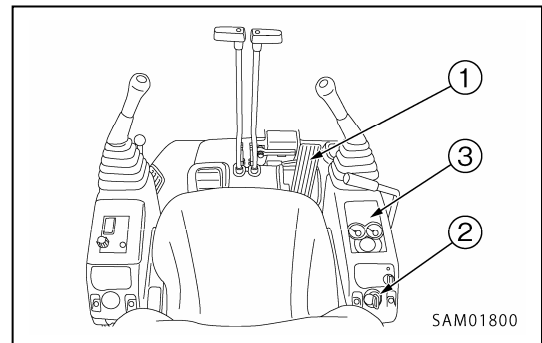
- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by short-circuiting the engine starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no people or obstacles in the surrounding area and sound the horn before starting the engine.
- Never use starting aid fluids as they may cause explosions.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure good ventilation.

CAUTION

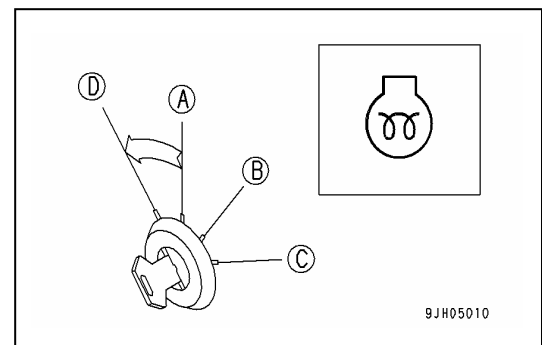
Do not keep the starter motor rotating continuously for more than 20 seconds.
If the engine will not start, wait for least two minutes before trying to start the engine again from Step 2.

When starting engine in low temperatures, do the following.

1. Press accelerator pedal (1) fully to rotate the engine at full speed.



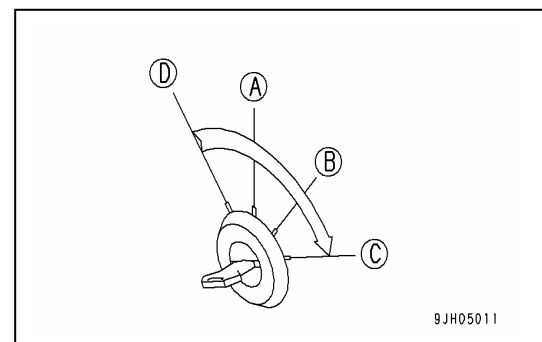
2. Keep the key of starter switch (2) at the HEAT (pre-heat) position (D). Make sure that the buzzer sounds and engine pre-heating monitor (3) lights up first and then begins flashing.
After approximately 18 seconds, engine pre-heating monitor (3) will go out to indicate that the engine has warmed up.



NOTES

Although the monitor and gauge lamps also light up when the starter key is set to the HEAT position, this is normal.

3. When engine pre-heating monitor (3) goes out, set the key of starter switch (2) to START position (C) to start the engine.

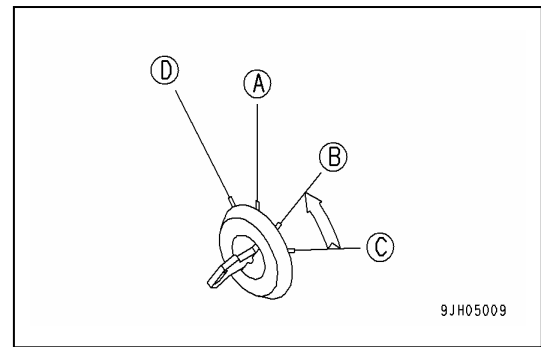


4. Release the key of starter switch (2) when engine has started.

The key returns to ON position (B) automatically.

NOTES

If the ambient temperature is below 0°C, press the accelerator pedal for one fourth of its stroke and warm up the engine.



3.3 OPERATIONS AFTER STARTING ENGINE

⚠ WARNING

- If you experience any problems such as an emergency stop or an abnormal machine operation, return the starter switch key to the OFF position.
- If the warm-up operation for the hydraulic equipment is not carried out thoroughly, and the machine is operated, the response to the movement of the control levers will be slow and the machine's movement may not be what the operator expects. In particular, in cold areas, always warm up the engine thoroughly.

3.3.1 ENGINE WARM-UP OPERATION

CAUTION

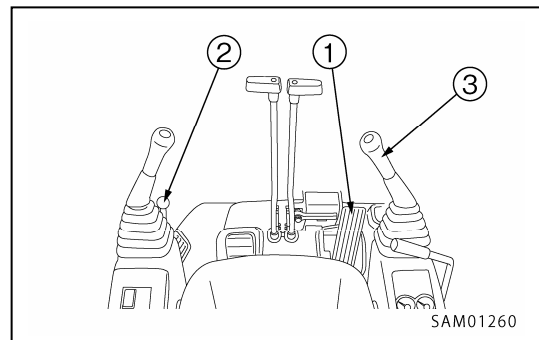
- Do not carry out operations or operate the control levers suddenly while the hydraulic oil is at low temperature. Always warm up the engine. This can increase the machine service life.
- Do not accelerate the engine suddenly until the warm-up operation has finished.
Do not run the engine at low idling or high idling without a load for more than 20 minutes. If it is necessary to run the engine at idling (with low oil level), apply a load from time to time or run the engine at a mid-range speed.

After the engine starts, do not start operating the machine immediately. First, carry out the following operations and checks.

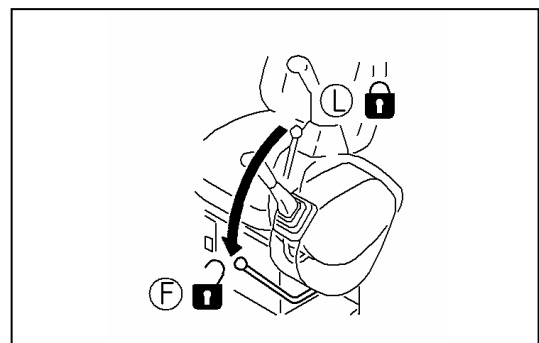
1. Press accelerator pedal (1) to the midway position between the low idling status and full speed status, then rotate the engine at an intermediate speed without a load for approximately five minutes.

NOTES

If the ambient temperature is below 0°C, press the accelerator pedal a quarter of its stroke and warm up the engine.



2. Set lock lever (2) to FREE position (F).

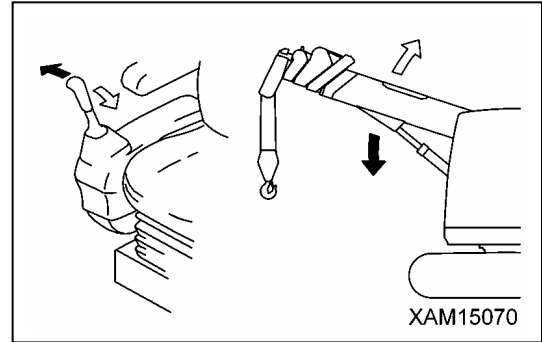


3. Using right-hand work equipment control lever (3) carefully, lower the boom to its stop position and hold it there for five minutes.

While carrying out this task, move the right-hand work equipment control lever (3) to the HOOK RAISING position (pull backward) and raise the hook adequately so that it does not touch the ground.

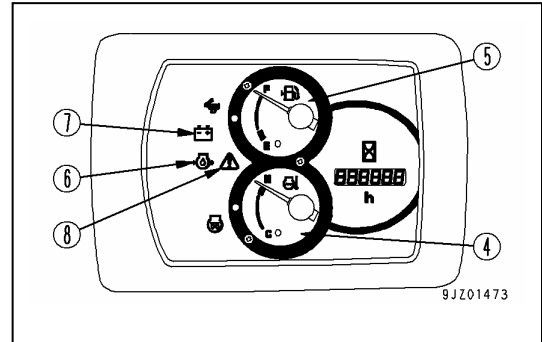
Push outside: The boom is lowered.

Pull inside: The boom is raised.



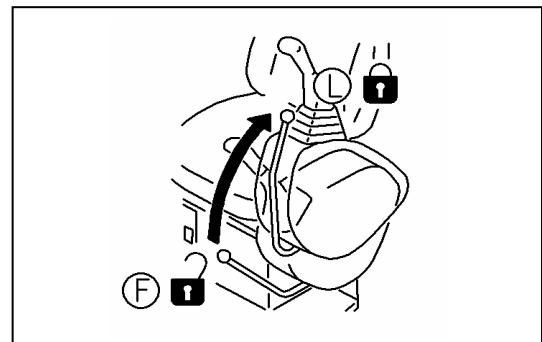
4. After carrying out the engine warm-up operation, check that all the gauges and monitors have the following status. If there are any abnormalities, service or repair them.

- Engine coolant temperature gauge (4): The pointer indicates the normal range.
- Fuel gauge (5): The pointer indicates the normal range.
- Engine oil pressure monitor (6): OFF
- Charging level monitor (7): OFF
- Electrical system warning monitor (8): OFF



5. Check for abnormal exhaust gas color, noise, or vibration. If there are any abnormalities, contact us or our sales service agency.

6. Set lock lever (2) to LOCK position (L), and make sure that the work equipment does not operate or swing when you move the left-hand and right-hand work equipment control levers.



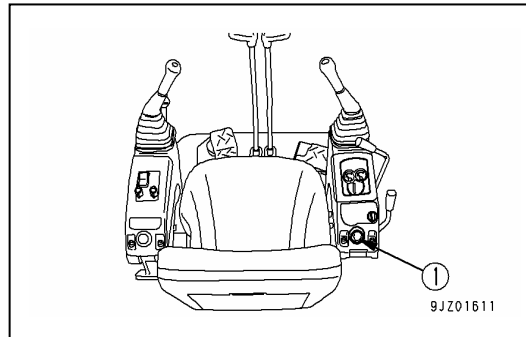
3.4 STOPPING ENGINE

CAUTION

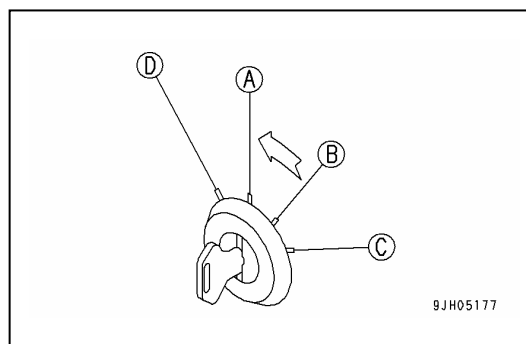
Do not stop the engine quickly except in an emergency, as it can reduce the service life of engine and the engine parts.

If the engine has overheated, do not stop it quickly but cool down the engine by rotating it at an intermediate speed. Then, stop the engine.

1. Run the engine at a low idle for about five minutes to gradually cool down the engine.



2. Return the key of starter switch (1) to OFF position (A) to stop the engine.
3. Pull out the key from starter switch (1).



3.5 BREAKING-IN MACHINE

CAUTION

Perform breaking-in for the period of about the first 100 hours (hours displayed on the service meter).

The life of the machine shortens if overloaded operation or task is performed before the various sections of the machine are used to the operation.

While this machine is shipped after undergoing a thorough adjustment and inspection process, forcing the machine from the beginning will quickly degrade the functions of the engine and crane, shortening their life.

Perform the breaking-in for the first 100 hours (time displayed on the service meter).

Pay attention particularly to the following during the breaking-in period.

- Be sure to carry out the engine and hydraulic equipment warm-up operations after the engine has started. See "Operation 3.3 Operations after Starting Engine".
- Start the engine at low speed and perform warm-up operation for five minutes.
- Avoid overloading operations or tasks that require high-speed operation.
- Avoid sudden starting, sudden acceleration, sudden steering and unnecessary sudden stops.

3.6 MACHINE TRAVELLING POSTURE

⚠ WARNING

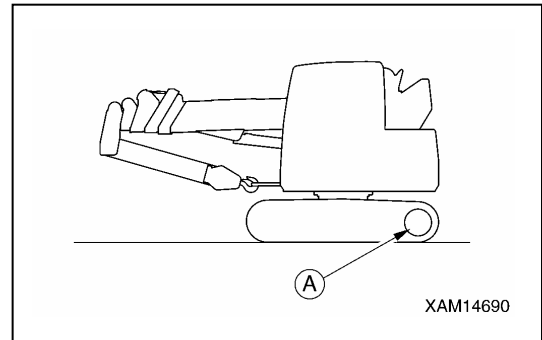
- When moving this machine under its own power, take the "travelling posture" with which the boom and hook block are stowed.
- Travelling or performing pick and carry operations with the boom extended is essentially prohibited. Doing so will cause the machine to roll over, and may result in a serious accident.
- Follow the local laws and regulations if driving the machine on public roads.

Adopt the travelling posture shown on the right when moving the machine.

TRAVELLING BEFORE AND AFTER THE OPERATION, OR FOR TRANSPORTATION

Keep the machine in the travelling posture as shown in the figure on the right, when travelling to and from an operation site or a transportation depot.

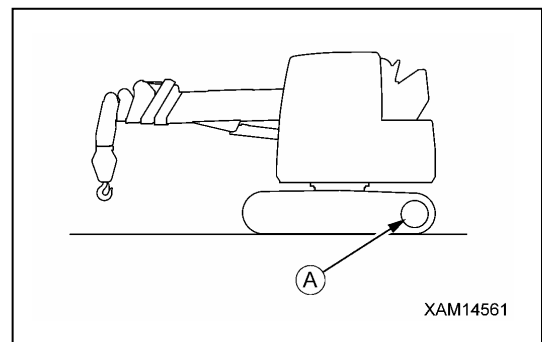
- Retract the boom fully.
- Lower the boom fully.
- Stow the hook block to its designated stowage position (regular stowage position).
- Always direct sprocket (A) backward.



TRAVELLING IN THE COURSE OF OPERATIONS

Keep the machine in the travelling posture as shown in the figure on the right, when travelling in the course of operations.

- Retract the boom fully.
- Lower the boom fully.
- Stow the hook block to its temporary stowage position below the boom tip.
- Always direct sprocket (A) backward.



NOTES

For details about the hook stowing operation, see "Operation 3.17 Stowage Operation of Crane".

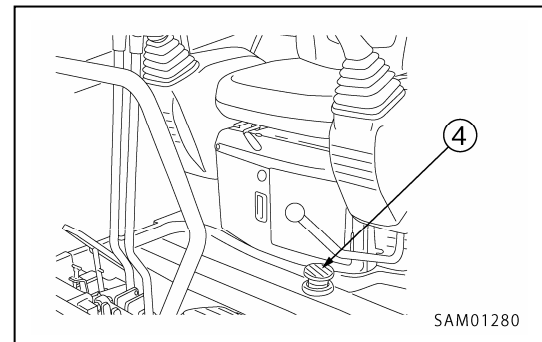
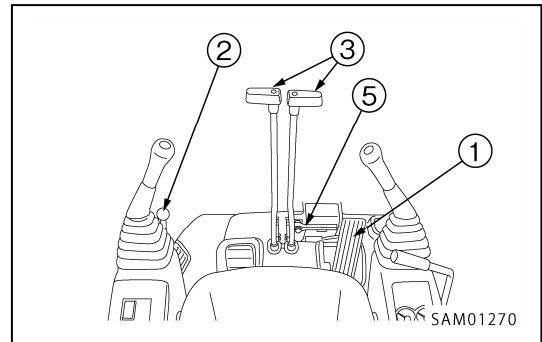
3.7 STARTING/MOVING/STOPPING MACHINE

⚠ WARNING

- Before operating the travel lever or travel pedal, check the direction that the track frame is facing.
When the sprocket is at the front, the operation direction of the travel lever is opposite to the direction of movement of the machine.
- Prior to beginning travelling, check around the machine to ensure conditions are safe and sound the horn.
- Do not allow anyone to enter the area around the machine.
- Remove any obstacles from the travel path.
- When travelling, check that the travel alarm sounds correctly.
- While travelling, it is possible to carry out crane operations such as swinging or boom retraction, however, always avoid such operations. For a crane operation such as swinging, always stop travelling beforehand.

PREPARATIONS FOR MOVING THE MACHINE

1. Keep accelerator pedal (1) at a low idle. When the machine starts, press the accelerator pedal gradually to increase the engine speed and to speed up the machine.



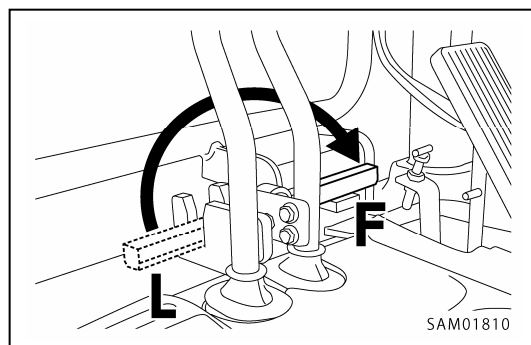
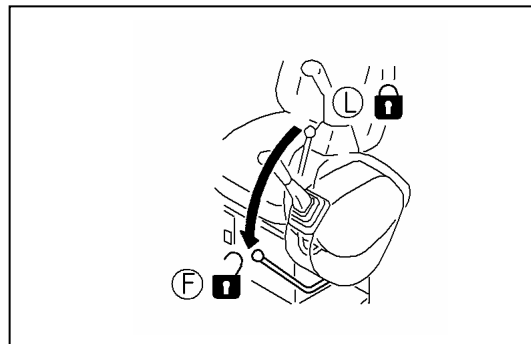
MOVING MACHINE FORWARD

1. Set lock lever (2) to FREE position (F) and keep the machine in the travelling posture.

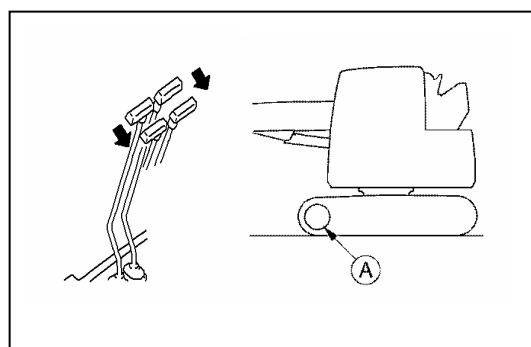
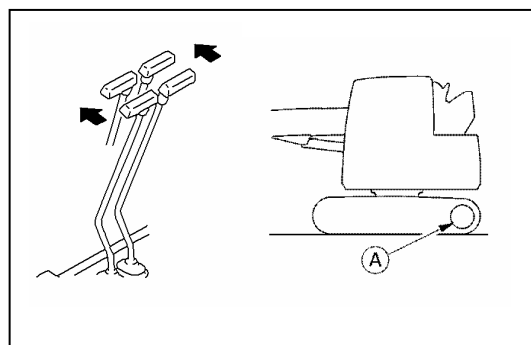
NOTES

See "Operation 3.6 Machine Travelling Posture" for details.

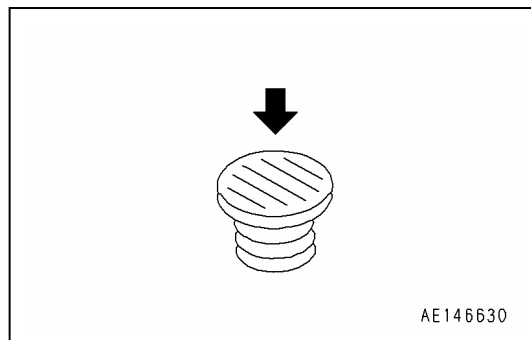
2. Raise the blade.
3. Push travel lock lever (5) to travel position (F).



4. Operate left and right travel levers (3) as follows.
 - When the sprocket is at the rear of the machine
Start the machine by pushing left and right travel levers (3) slowly.
 - When the sprocket is at the front of the machine
Start the machine by pulling left and right travel levers (3) slowly.



5. Press speed-up pedal (4) to increase the travel speed.



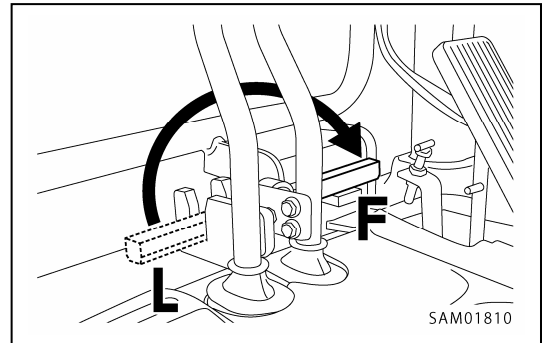
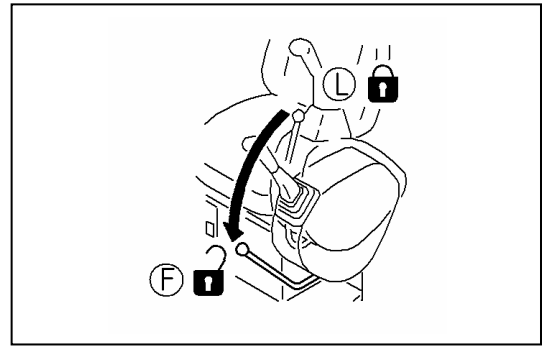
MOVING MACHINE BACKWARD

1. Set lock lever (2) to FREE position (F) and keep the machine in the travelling posture.

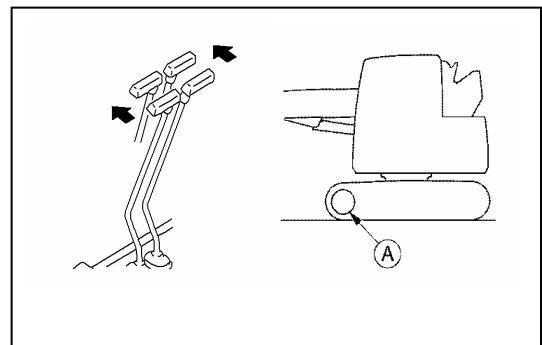
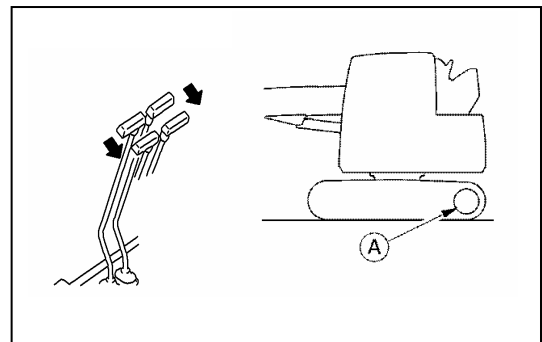
NOTES

See "Operation 3.6 Machine Travelling Posture" for details.

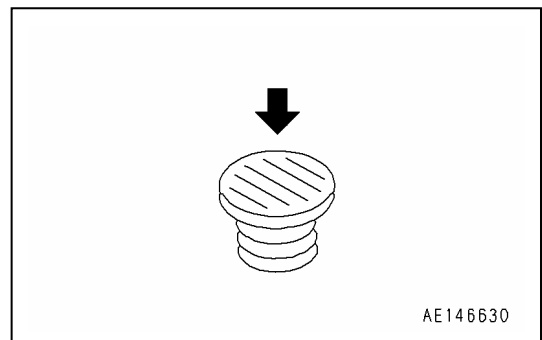
2. Raise the blade.
3. Push travel lock bar (5) to travel position (F).



4. Operate left and right travel levers (3) as follows.
 - When the sprocket is at the rear of the machine
Start the machine by pulling left and right travel levers (3) slowly.
 - When the sprocket is at the front of the machine
Start the machine by pushing left and right travel levers (3) slowly.



5. Press speed-up pedal (4) to increase the travel speed.



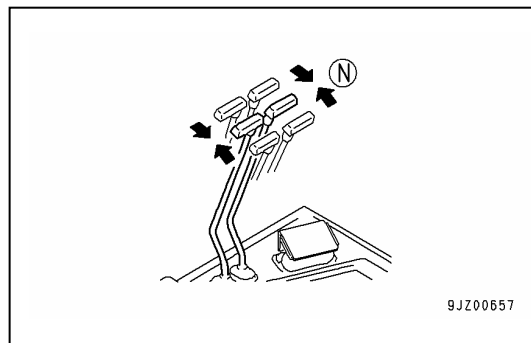
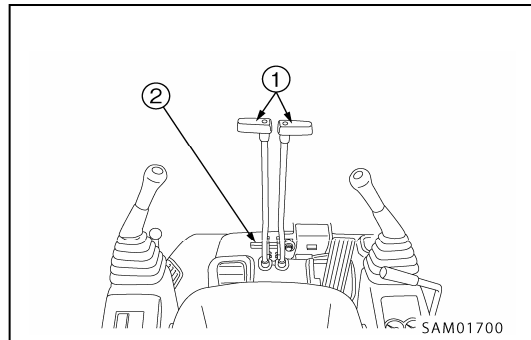
STOPPING MACHINE

WARNING

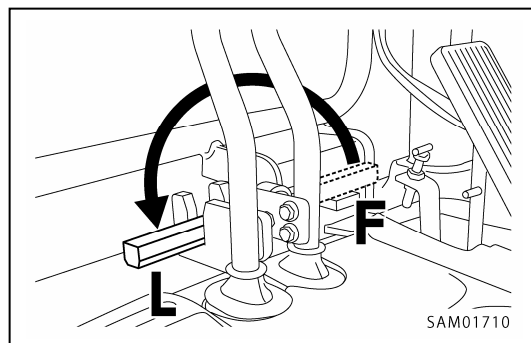
Avoid stopping suddenly. Give yourself ample room when stopping.

1. Set left and right travel levers (1) to the Neutral position (N).

The machine is braked and stopped.



2. Push travel lock bar (2) to the LOCK position (L) and locate it in the groove.



3.8 STEERING MACHINE

WARNING

Before operating the travel levers, check the sprocket position.

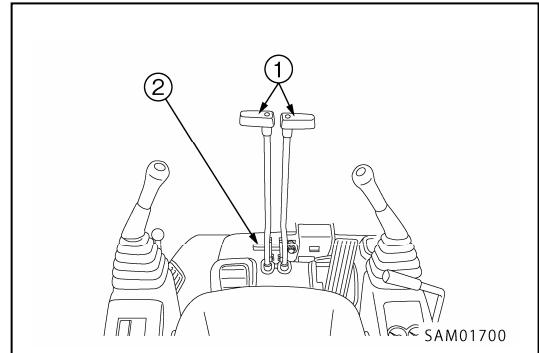
When the sprocket is at the front, the operation direction of travel lever is opposite to the direction of movement of the machine.

Use the travel levers to change direction.

Avoid sudden changes of direction as much as possible.

Especially when performing counter-rotation (spin turn), stop the machine before turning.

Operate two travel levers (1) as follows.

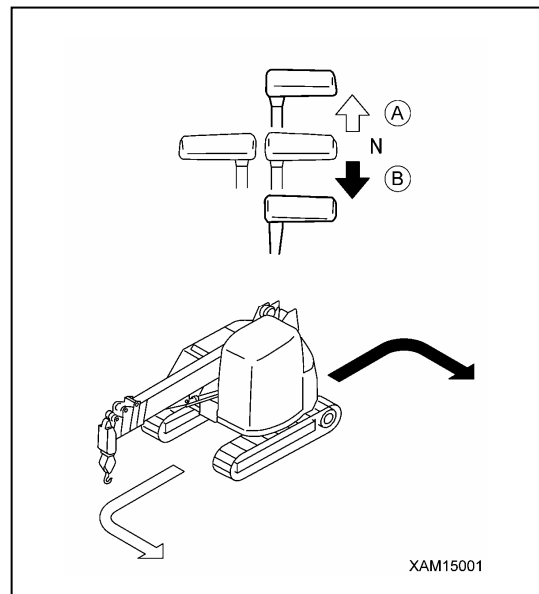


STEERING THE MACHINE WHEN STOPPING

When turning to the left, push the right travel lever forward. The machine turns to the left when travelling forward. Pull the lever backward, and the machine turns to the left when travelling backward.

(A): Forward left turn

(B): Reverse left turn



NOTES

When turning to the right, move the left travel lever in the same way.

WHEN OPERATING LEVERS DURING TRAVELLING (WITH THE LEFT AND RIGHT TRAVEL LEVERS SHIFTED TO THE SAME DIRECTION)

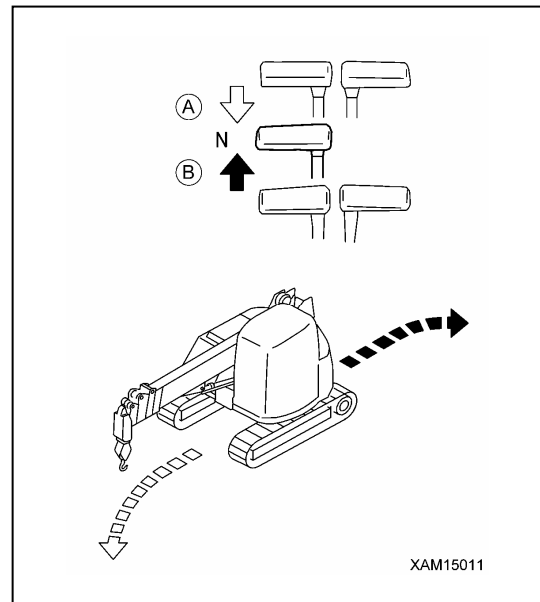
When turning to the left, return the left travel lever to the neutral position. The machine turns to the left.

(A): Forward left turn

(B): Reverse left turn

NOTES

When turning to the right, move the right travel lever in the same way.

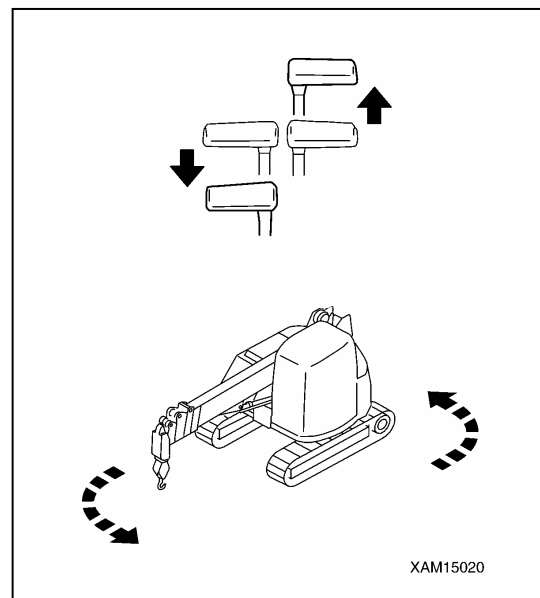


WHEN PERFORMING COUNTER-ROTATION TURN (SPIN TURN)

When using counter-rotation (spin turn) to turn left, pull the left travel lever back and push the right travel lever forward.

NOTES

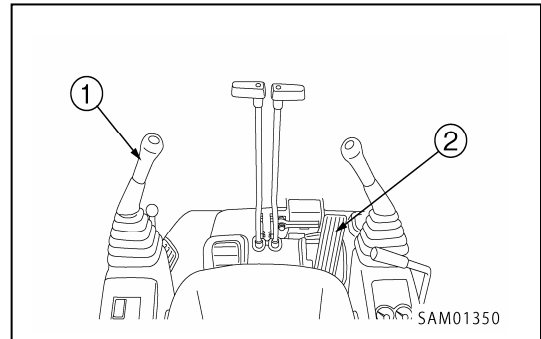
When using counter-rotation (spin turn) to turn right, pull the right travel lever back and push the left travel lever forward.



3.9 SWINGING

WARNING

- The rear of the machine extends outside the track width. Before swinging, check with the mirror, and also check visually that the surrounding area is safe.
- Before swinging the machine, check that the area around the machine is safe, and sound the horn

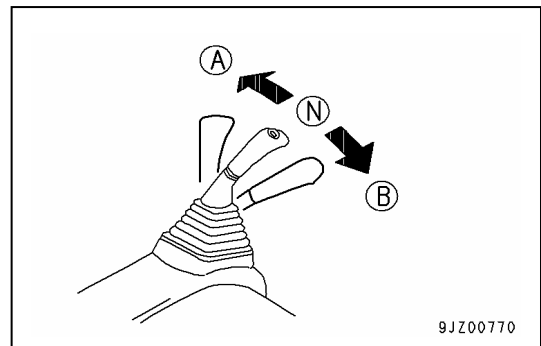


1. Operate left work equipment control lever (1) to swing the upper structure.

(A): Left swing

(B): Right swing

When not swinging, place the left work equipment control lever (1) to N (neutral) position, and the swing brake comes into effect.

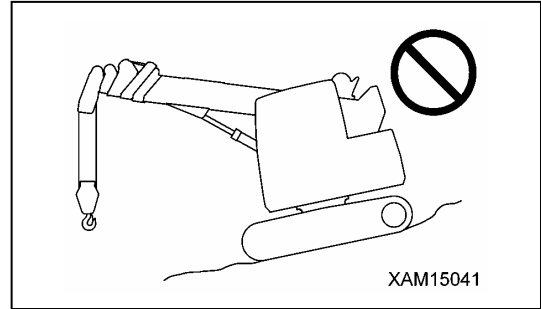


3.10 CAUTIONS BEFORE OPERATING THE CRANE

⚠ WARNING

Not observing these cautions before operation may result in serious accidents.

- Always position the machine on level ground before operating the crane.
Once the machine is stationed, check it is level.
The moment limiter computes the moment subject to the machine being correctly leveled. Otherwise, it will not provide a pre-warning or warning when an operation enters a pre-warning zone. All operations must be carried out when the machine is level.

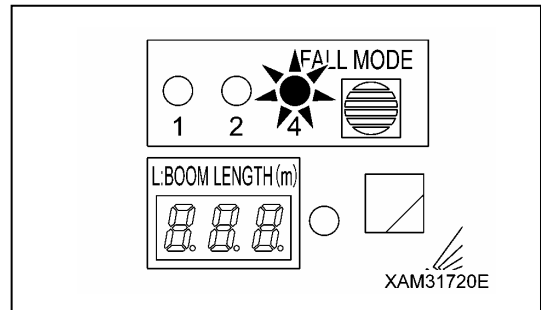


- Set the moment limiter correctly to the crane operation. The moment limiter computes the moment based on the setting. Unless the setting represents the actual condition, damage may occur to the wire cables or boom, which may result in serious injury.

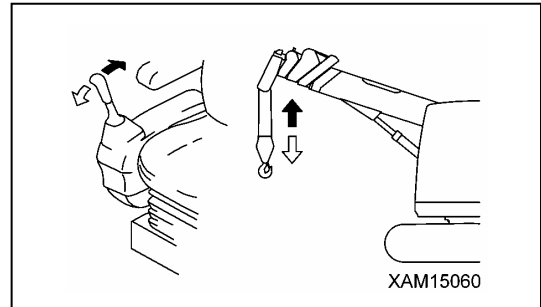
Examples:

- Actual number of the wire cable falls: 2
- The fall mode switch setting in the moment limiter: 4

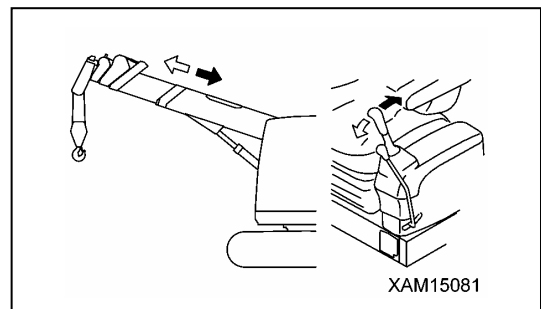
In such a condition as above, the moment limiter computes the load using the value of "4 falls", thus even though the actual load reaches pre-warning zone, no pre-warning or warning is provided. Consequently, when the rated total load exceeds the allowance of the "2 falls", the wire cable may break.



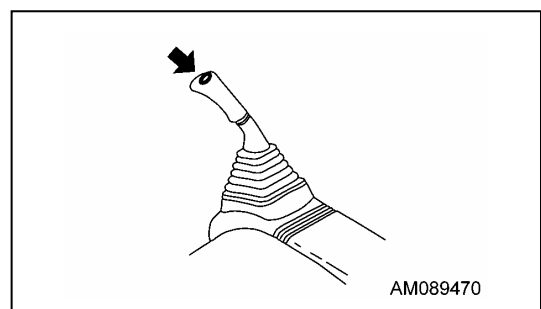
- When you over hoist the hook, the over hoist detector actuates to sound the buzzer and stop hook raising. When the warning buzzer sounds, immediately release the right-hand work equipment control lever and return it to the neutral position to stop hook raising.
Next, move the right-hand work equipment control lever to the HOOK LOWERING position (push forward) so that the hook block is lowered.



- If you extend the boom too far, the hook block is also hoisted, thus the over hoist detector activates to sound the buzzer and stop the extension process. When the warning buzzer sounds, immediately release the left-hand work equipment control lever and return it to the neutral position to stop extending the boom.
Next, move the left-hand work equipment control lever to the RETRACT position (pull back) so that the boom is retracted.



- Use the horn switch and sound the horn to warn danger to persons nearby, when necessary, during crane operations.



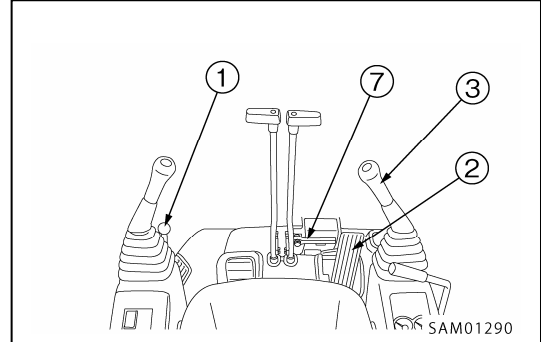
3.11 OPERATIONS BEFORE OPERATING THE CRANE

⚠ CAUTION

Boom extending or raising while the hook block is secured to the wire cable for stowage may damage the wire cable or the regular hook block stowage section in the front of the upper structure. Always lower the hook block at the same time, to avoid excessive tension on the stowage wire cable.

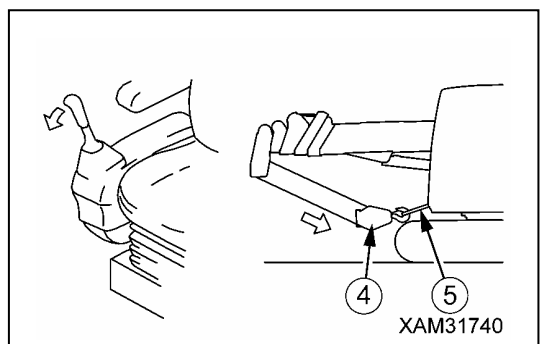
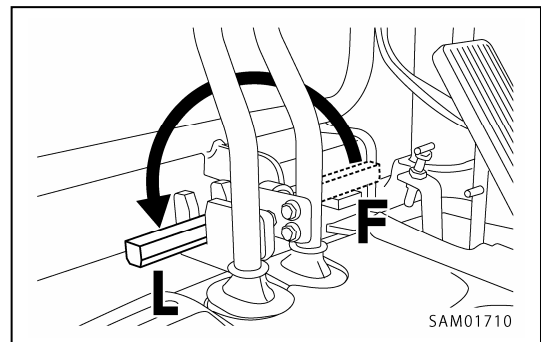
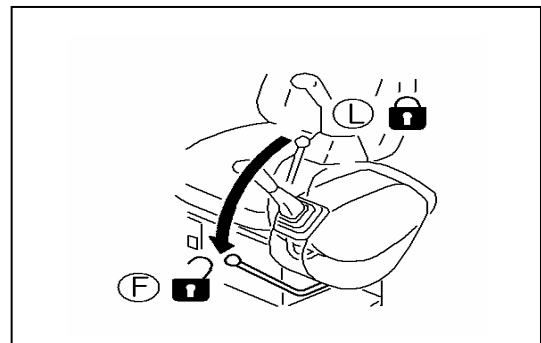
CAUTION

- Be careful not to over lower the hook block, an action that will result in it laying on the ground. That may result in irregular winding of the wire cable onto the drum.
- When the hook block is released from the regular stowage position, the hook block may swing wildly and damage other components around it. Pay sufficient attention to maintaining safe conditions around the hook block.



Perform the following operations before operating the crane.

1. Set lock lever (1) to the FREE position (F).
2. Keep accelerator pedal (2) at low idling speed.
3. Push travel lock bar (7) to the LOCK position (L) and locate it in the groove.
4. Move right-hand work equipment control lever (3) to the HOOK LOWERING position (push forward) so that hook block (4) is lowered and the stowage wire cable (5) (of the regular stowage position) is loosened.



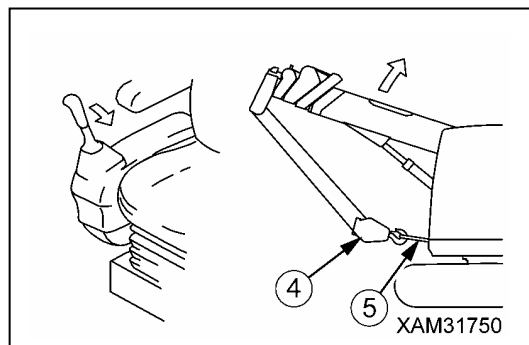
NOTES

During this operation, over lowering hook block (4) should be avoided. Otherwise, loosened hook block (4) may damage other components around it.

5. Move right working control lever (3) to the RAISE position (pull toward you) to raise the boom.

NOTES

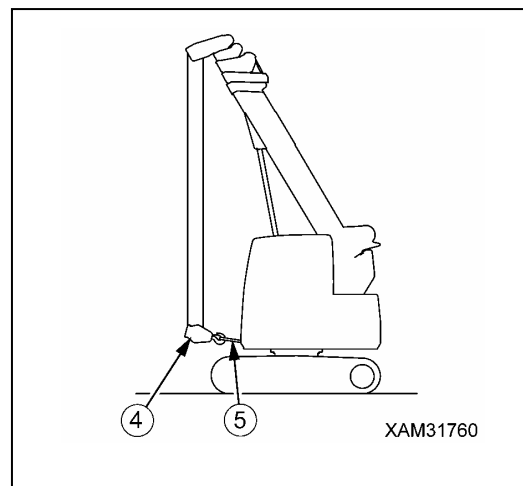
During this operation, excessive tension between hook block (4) and stowage wire cable (5) should be avoided. If storage wire cable (5) is under excessive tension, lower hook block (4).



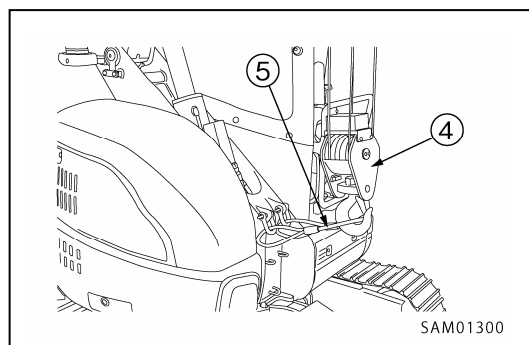
6. Repeat Steps 4 and 5 above alternately, so that the boom is slowly raised to the position where hook block (4) moves perpendicular to the stowage position in the front of the upper structure of the crane.

⚠ WARNING

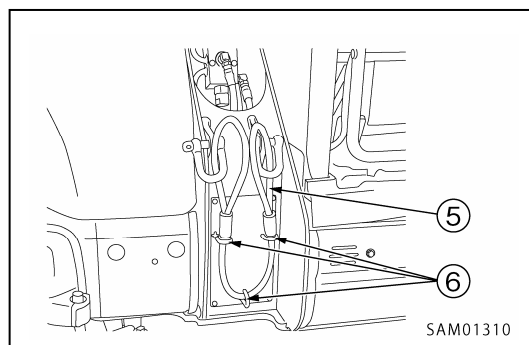
When hook block (4) is released from stowage rope (5) before the boom is sufficiently raised to the correct position, hook block (4) may swing wildly and cause damage to the machine or serious injuries to people.



7. Remove hook block (4) from storage rope (5).

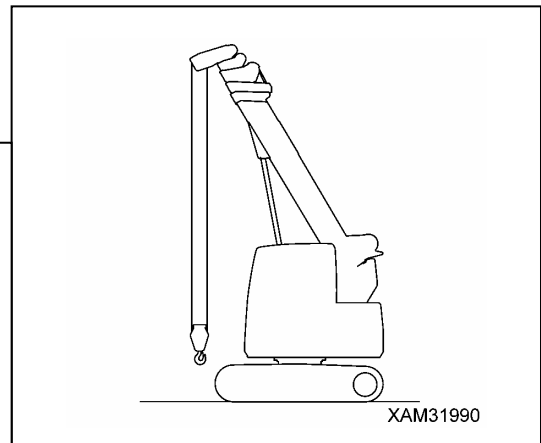
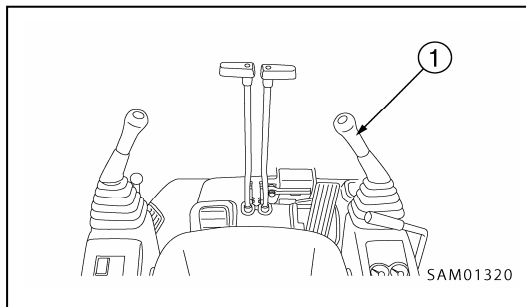


8. Secure hook block stowage wire cable (5) firmly to rope hanger (6).



3.12 CRANE OPERATION POSTURE

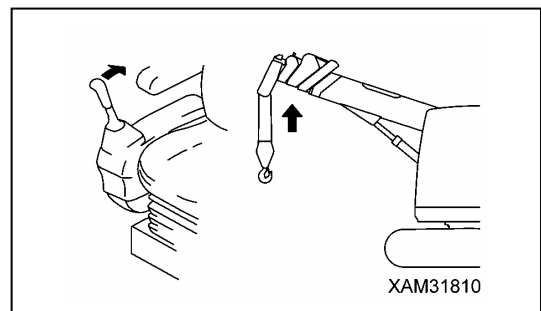
To start the crane operation, following "Operation 3.11 Operations before Operating the Crane", set to the crane operation posture as below:



1. Move right-hand work equipment control lever (1) to the HOOK RAISING position (pull backward) so that the hook block is hoisted.

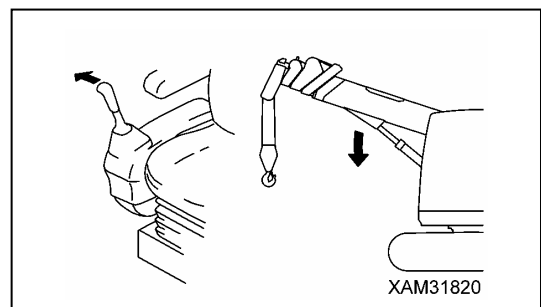
Here, exercise care not to over-hoist the hook block.

Over-hoisting will create an over-hoisting warning situation.

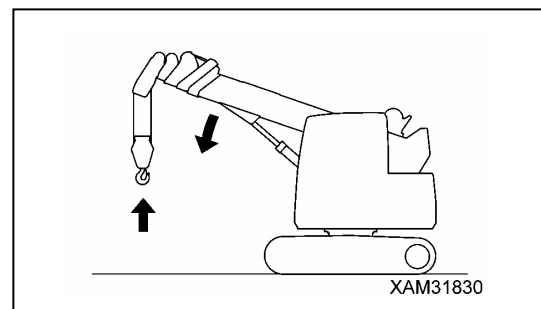


2. Move right-hand work equipment control lever (1) to the LOWER position (push right) so that the boom is lowered.

Be careful not to over lower the hook block, an action that will result in it laying on the ground.



3. Repeat the practices of Steps 1 and 2 above alternately, so that the crane posture is as shown in the figure at right.



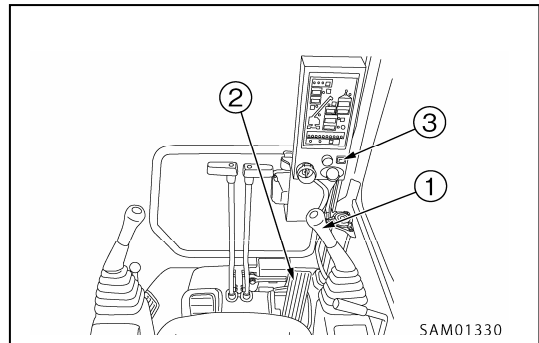
3.13 HOOK RAISING /LOWERING OPERATION

⚠ WARNING

- With the boom deflection, the hoisted load slightly shifts forward. Notify workers around you such as slinging operators.
- If the hook block was hoisted too far, over hoisting will be detected. The alarm buzzer sounds intermittently. If the alarm buzzer is heard, move the right-hand work equipment control lever immediately to the **NEUTRAL** position and stop raising the hook.
- When lowering the hook a long distance such as for underground work, be sure to leave more than three turns of the wire cable on the winch drum.

CAUTION

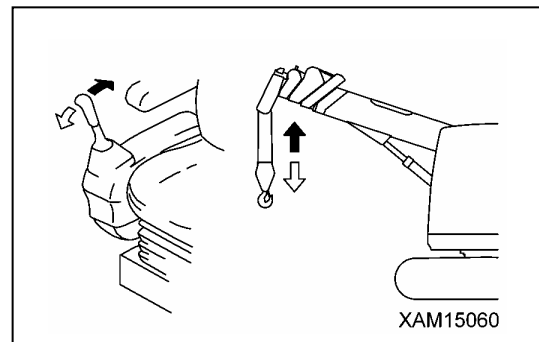
- Be careful not to over lower the hook block, an action that will result in it laying on the ground. That may result in irregular winding of the wire cable to the drum.
- During the winch operation, always avoid returning the lever to the neutral position abruptly which loosens the wire cable and may result in irregular winding of the wire cable to the drum.



3.13.1 NORMAL HOOK RAISING/LOWERING OPERATION

Move right-hand work equipment control lever (1) as follows.

- Hook Lowering: Push the lever forward.
- Neutral: Release the lever.
The lever will return to the **NEUTRAL** position and the raising/lowering of the hook block stops.
- Hook Raising: Pull the lever toward you.



NOTES

Adjust the winch raising/lowering speed with right-hand work equipment control lever (1) and stroke of acceleration pedal (2).

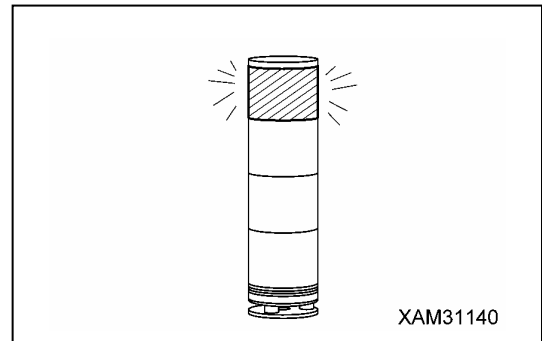
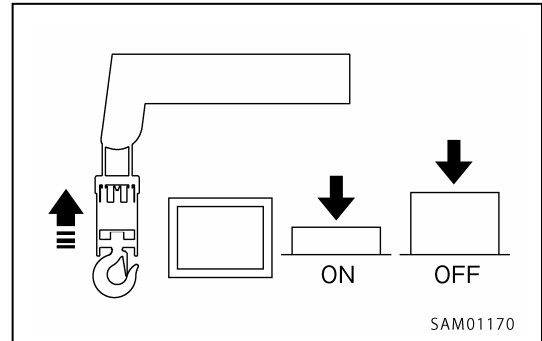
3.13.2 HOOK RAISING OPERATION BY HOOK STOWAGE SWITCH

⚠ WARNING

- The hook stowage switch cancels the auto-stop function of the over hoist detector and reduces the hook raising ability.
Move the right-hand work equipment control lever carefully (very slowly without moving to the stroke end) when stowing the hook block. Pay sufficient attention not to let the hook block collide with the boom.
- Use the hook stowage switch only when stowing the hook block.

Keep the normal winding operation and use hook stowage switch (3) in the switch box as follows:

- ON: Keep the button pushed and move the right-hand work equipment control lever to the HOOK RAISING (pull backward) position. The hook block will be winched for stowage to the boom tip.
The pilot lamp inside the switch lights, at this time.
- OFF: Release the finger from the switch. It returns to the previous position and the auto-stop function of over hoist detector will be enabled. The hook raising ability is increased to the normal level.



NOTES

- When turning hook stowage switch (3) to the "ON" position, the red lamp of the working status lamp will light up.
- To fix the hook block securely, keep the right-hand work equipment control lever in the HOOK RAISING position for about one second after the hook block is stowed in the boom tip.

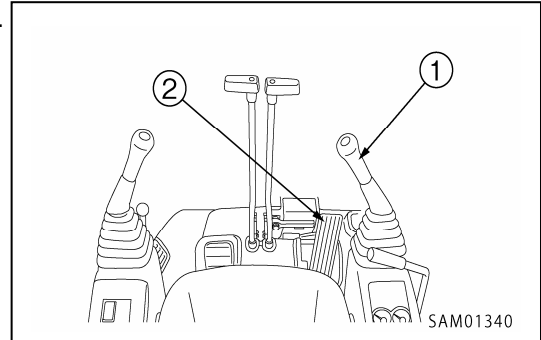
3.14 BOOM DERRICKING OPERATION

⚠ WARNING

- Move the right-hand work equipment control lever as slowly as possible. Sudden operation of the lever especially while hoisting a load will cause the load to swing, which may adversely impact the machine and result in damage or the machine rolling over.
- Never attempt to draw a load forward or set a lying load upright by boom derricking. Such practices must be carried out with hook raising operations.
- Lowering the boom increases the working radius and the rated total load that can be hoisted decreases. Be extremely careful so that the load weight will not be exceeded with the boom in the lowest position when working by derricking the boom.

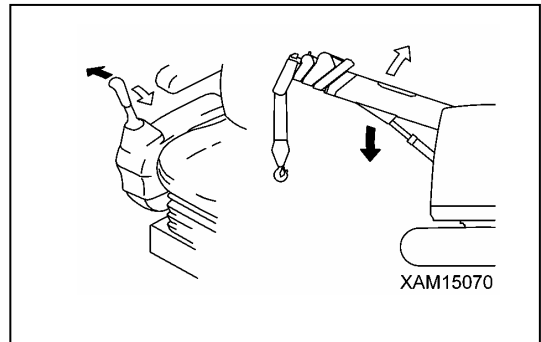
Move right-hand work equipment control lever (1) as follows.

- Lower: Push the lever toward outside (right).
- Neutral: Release the lever.
The lever goes back to the NEUTRAL position and the boom derricking stops.
- Raise: Pull the lever toward you (left).



NOTES

- Adjust the boom derricking speed with right-hand work equipment control lever (1) and the stroke of acceleration pedal (2).
- Where the boom length display in the moment limiter indicates "3.3 meters" or more, the boom lowering movement will be stopped automatically to prevent it from being lowered below horizontal.



3.15 BOOM TELESCOPING OPERATION

⚠ WARNING

- Move the left-hand working equipment control lever as slowly as possible. Sudden operation of the lever, in particular when hoisting a load, will cause the load to swing, which may adversely impact the machine and result in damage or the machine rolling over.
- Never attempt to draw a load forward or set a laying load upright by boom telescoping. Such practices must be carried out with hook raising operations.
- Extending the boom increases the working radius and the rated total load that can be hoisted decreases. Be extremely careful so that the load weight will not be exceeded with the boom extended to the maximum extent when working with a telescoped boom.
- When the boom is extended, the hook block is raised.
If the alarm buzzer of the over hoist detector is heard during boom extension operations, return the left-hand working equipment control lever immediately to the NEUTRAL position and stop the boom extension operations.

CAUTION

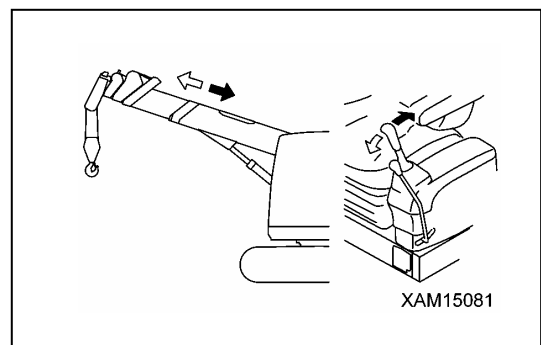
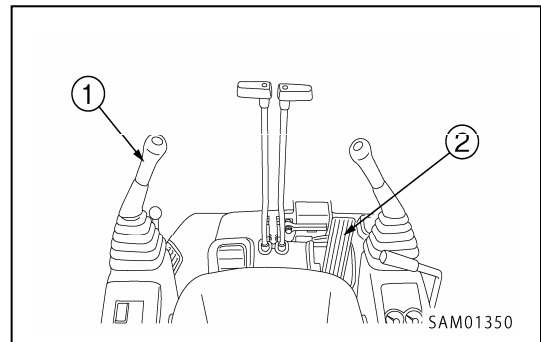
- The hook block is raised or lowered while telescoping the boom. Perform the winch operation at the same time to adjust the hook block height.
- When the boom is maintained extended for long periods, the boom slightly retracts due to the temperature change in the hydraulic oil. In this case, extend the boom as needed.

Move left-hand work equipment control lever (1) as follows.

- Extend: Push the lever forward.
- Neutral: Release the lever.
The lever returns to the NEUTRAL position and the boom telescoping stops.
- Retract: Pull the lever toward you.

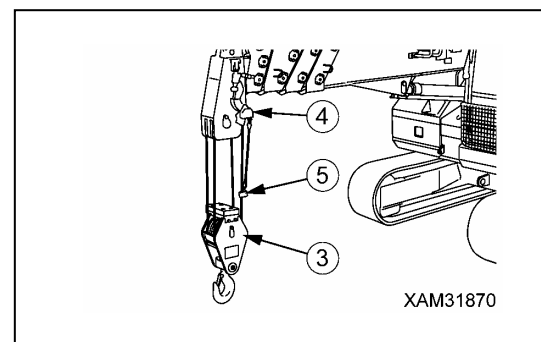
NOTES

- Adjust the boom telescoping speed with left-hand work equipment control lever (1) and the stroke of acceleration pedal (2).
- When the boom extends, the second boom extends first, and then the third and fourth booms extend at the same time.
When the boom retracts, it retracts in the reverse order of boom extension.



CAUTION

As the boom extends and hook block (3) hoists weight (5) of over hoist protector (4), boom extension stops. When this occurs, the boom will not extend even if you try to extend it. In this case, lower the hook block by retracting boom or lowering the hook block.



3.16 SWING OPERATION

⚠ WARNING

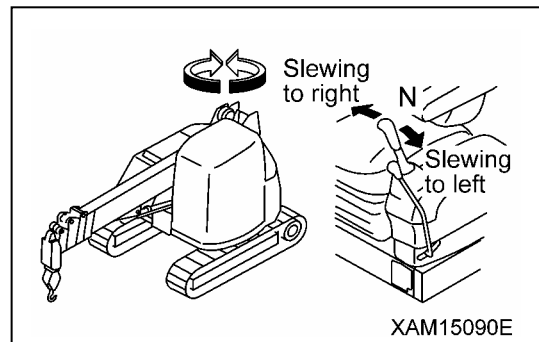
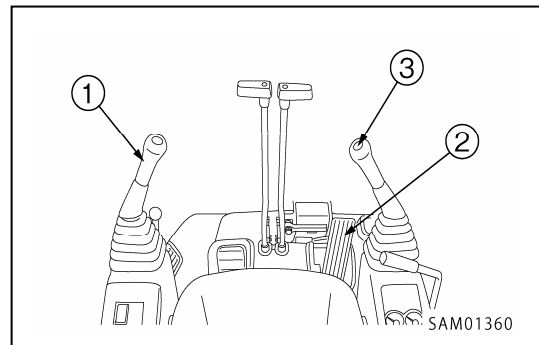
- Check the safety of the surrounding area and sound the horn before swinging.
- Swing the crane as slowly as possible. Start smoothly, swing at a low speed, and stop gently. Sudden operation of the lever, in particular when hoisting a load, will cause the load to swing, causing the machine to lose stability, and thus may break the crane or overturn the machine.
- Never attempt to draw a load forward or sideways, or set a laying load upright by swing maneuver. Such practices must be carried out with hook raising operations.

Operate left-hand work equipment control lever (1) as follows.

- Left: Push the lever toward outside (left).
- Neutral: Release the lever.
The lever returns to the NEUTRAL position and the swing stops.
- Right: Pull the lever toward inside (right).

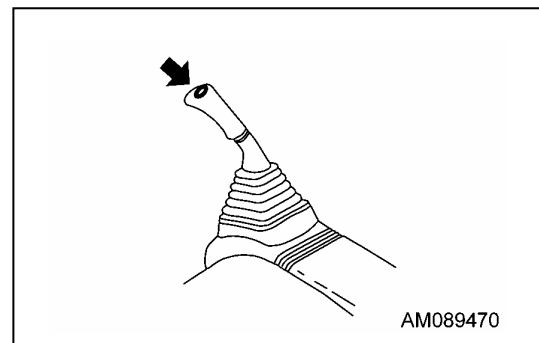
NOTES

- Adjust the crane swing speed with left-hand work equipment control lever (1) and the stroke of acceleration pedal (2).
- Use horn switch (3) in the knob of the right-hand work equipment control lever to warn of swing operation to the surrounding area.



CAUTION

The rated total load is the same throughout 360 degrees, regardless of the position in which the swinging is stopped.



3.17 STOWAGE OPERATION OF CRANE

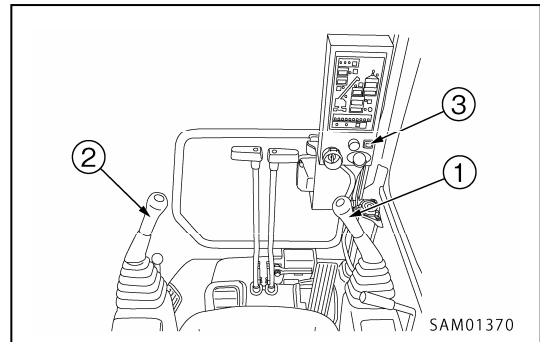
3.17.1 CRANE OPERATION FOR TEMPORARY HOOK BLOCK STOWAGE

⚠ CAUTION

- The hook stowage switch cancels the auto-stop function of the over hoist detector and reduces the hook raising ability.
Move the right-hand work equipment control lever carefully (very slowly without moving to the stroke end) when stowing the hook block. Pay sufficient attention not to let the hook block collide with the stowage position at the boom end.
- Use the hook block temporary stowage position in the boom only for travel within the site in during crane operations. For a distant travel such as to-and-from a working site or transportation, always secure the hook block to the regular hook block stowage section in the front of the upper structure.
- Prior to the hook stowage, always set the boom to an angle below five degrees or above 70 degrees. If the hook is stored at any other angle, the top of the hook block may be damaged.
- Never attempt hook block stowage while the moment limiter emergency stop cancel switch is in the ON position. In that condition, it does not enter the hook block stowage mode and may result in damage being caused to the top of the hook block, the boom, or wire cables.

CAUTION

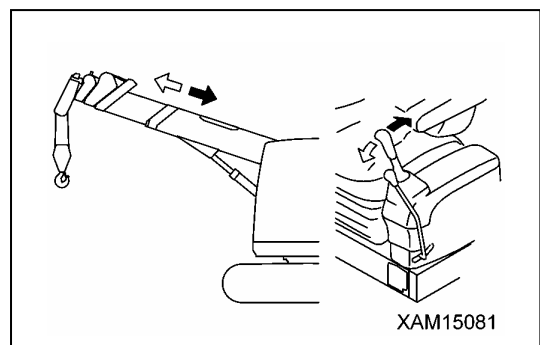
- Prior to stowing the hook block, stop the hook block swinging.
- Be careful not to over lower the hook block, an action that will result in it laying on the ground. Doing so may result in irregular winding of the wire cable to the drum.
- The boom retraction operation also leads to hook block lowering condition. Also, boom lowering results in the hook block being lowered. To avoid it laying on the ground, raise the hook block at the same time.



1. Operate left-hand work equipment control lever (2) to the RETRACT (pull backward) position and retract the boom to the minimum length.

NOTES

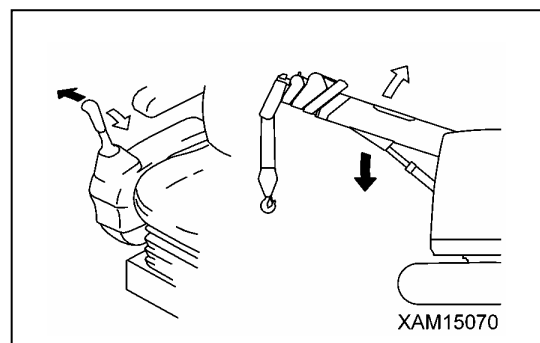
The boom retraction operation also lowers the hook block. Use the hook raising operation to raise the hook block as applicable.



2. Move right-hand work equipment control lever (1) to the LOWER (push outside) position and lower the boom until it stops.

NOTES

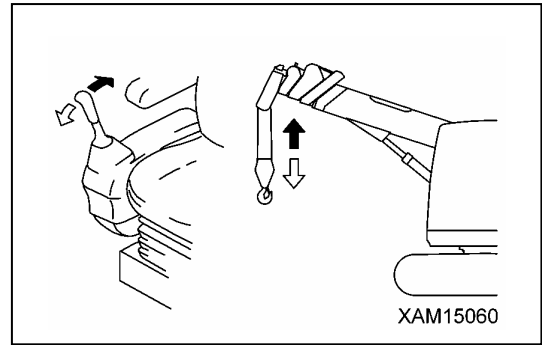
The boom lowering operation also lowers the hook block. Use the hook raising operation to raise the hook block as applicable.



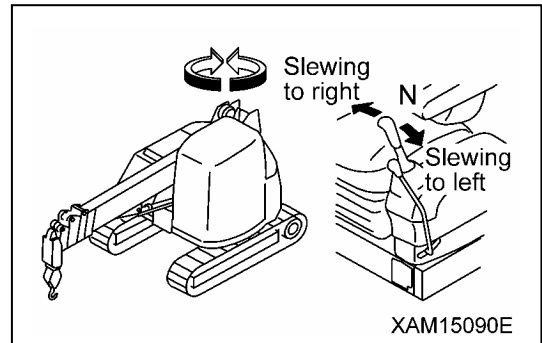
3. On each occasion that the hook block nearly reaches the ground as a result of practice in Steps 1 and 2 above, move right-hand work equipment control lever (1) to the HOOK RISING (pull backward) position and raise the hook block within an extent that over winding can be avoided.

NOTES

In the condition where the hook block is over wound, the over hoist detector triggers warning buzzer and the winch will automatically stop.

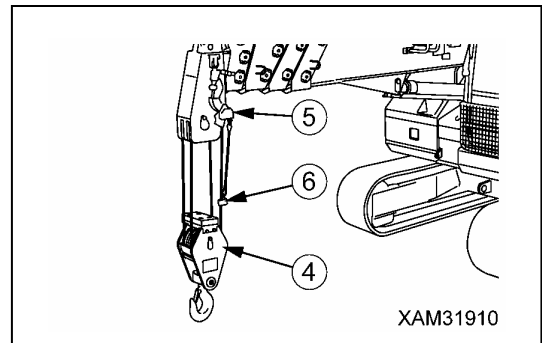


4. Operate left-hand work equipment control lever (2) to the LEFT (push outside) position or the RIGHT (pull toward you) position so that the boom comes to the center of the machine.



NOTES

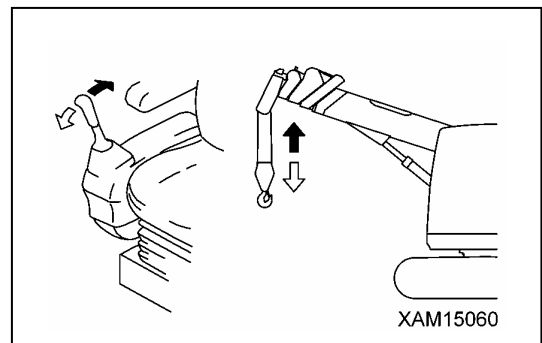
By carrying out Steps 1 to 4, the boom stowage process will be complete.
Next, hook block (4) will be stowed as follows:



5. Move right-hand work equipment control lever (1) to the HOOK RAISING (pull backward) position and continue raising hook block (4) until it lifts weight (6) then the winding automatically stops (i.e. over-winding condition).

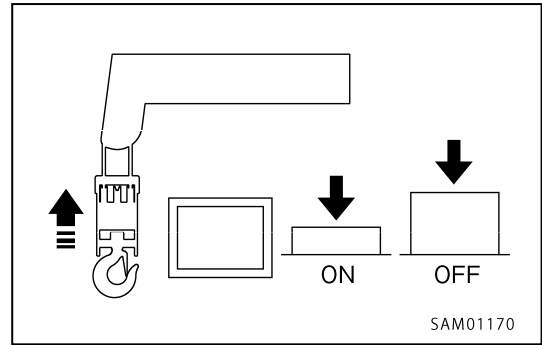
NOTES

When hook block (4) is over wound, the warning buzzer sounds and the winching operation will automatically stop.



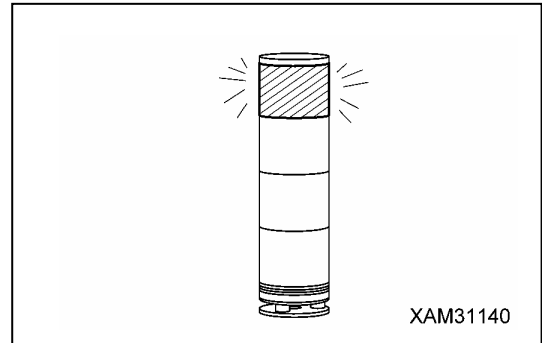
6. Keep pressing hook block stowage switch (3) (at the ON position) and move right-hand work equipment control lever (1) to the HOOK RAISING (pull backward) position again to raise hook block (4) up slowly and precisely to stow the hook block below the tip of the boom.

Keep the right-hand work equipment control lever in the HOOK RAISING position for about one second after the hook block is stowed in the boom tip.



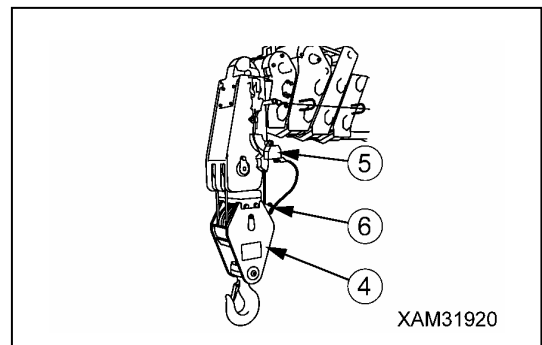
NOTES

When turning this switch to the ON position, the red lamp of the working status lamp will light up.



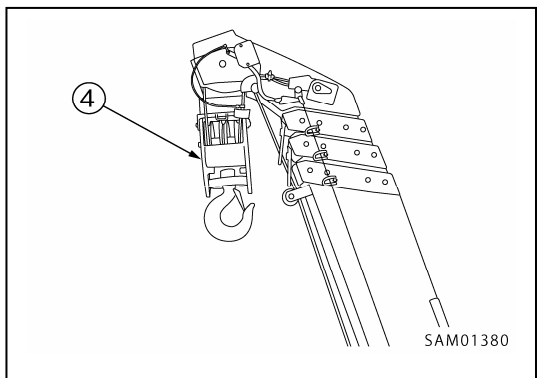
NOTES

The figure at right shows the correct condition where hook block (4) is properly stowed below the boom tip.



NOTES

- The figure at right shows the correct condition where hook block (4) is properly stowed below the boom tip while the boom is set to an angle above 70 degrees.
- If you stow the hook block with the boom set at an angle above 70 degrees, fully retract the boom as explained in Step 1. Then, raise the boom above 70 degrees, see "Operation 3.14 Boom Derricking Operation". Then, proceed to Step 4.



3.17.2 CRANE OPERATION FOR REGULAR HOOK BLOCK STOWAGE

⚠ WARNING

- For hook block stowage operation, use both the left and right-hand work equipment control levers most carefully (slowly without moving at full stroke). Otherwise, the hook block may shake badly and damage objects around or cause serious accidents resulting in death or serious injury.
- Raise the boom to the correct position close to the hook block stowage section. Never attempt to attach the hook block to the stowage wire cable when the hook block is still distant from it, otherwise, the hook block may detach and damage objects around, as well as cause serious accidents resulting in death or serious injury.

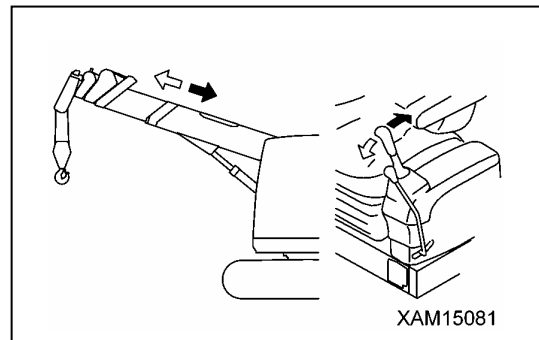
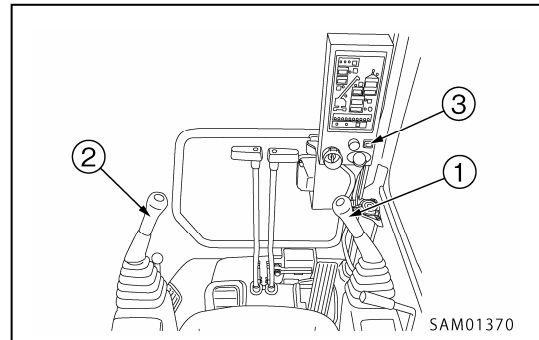
CAUTION

- Prior to stowing the hook block, stop the hook block swinging.
- Be careful not to over lower the hook block, an action that will result in it laying on the ground. That may result in irregular winding of the wire cable to the drum.
- The boom retraction operation also leads to hook block lowering condition. Also boom lowering results in the hook block being lowered. To avoid it laying on the ground, raise the hook block at the same time.

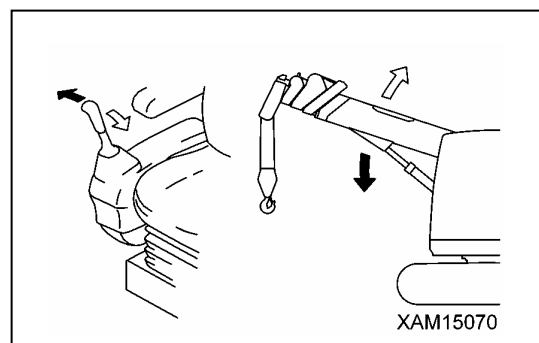
1. Operate left-hand work equipment control lever (2) to the RETRACT (pull backward) position to retract the boom to the minimum length.

NOTES

The boom retraction operation also lowers the hook block. Use the hook raising operation to raise the hook block as applicable.



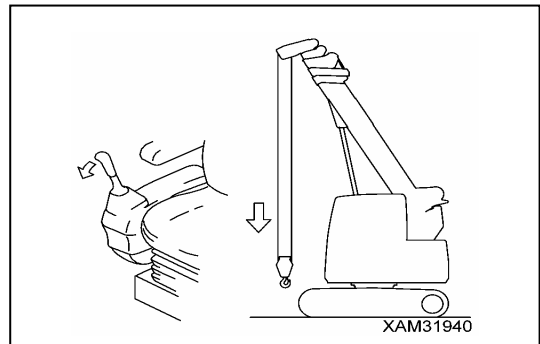
2. Move right-hand work equipment control lever (1) to the RAISE (pull inside) position and raise the boom until the hook block reaches close to the regular stowage position.



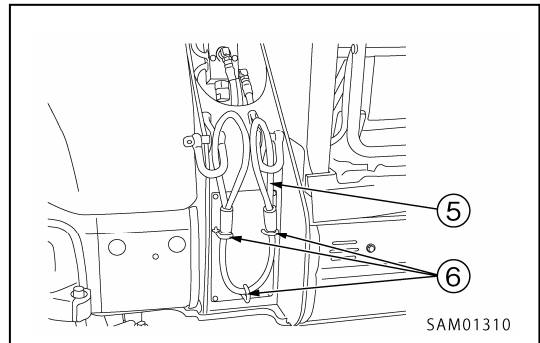
3. Move right-hand work equipment control lever (1) to the HOOK LOWERING (push forward) position and lower the hook block until it reaches close to the regular stowage position.

NOTES

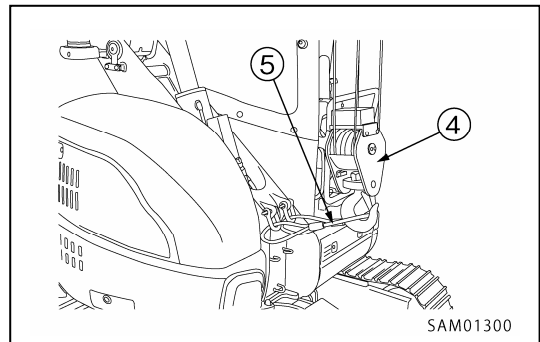
During this operation, over lowering hook block (4) should be avoided. Otherwise, loosened hook block (4) may damage other components around.



4. Remove wire cable (5) for the hook block stowage from hanger (6).



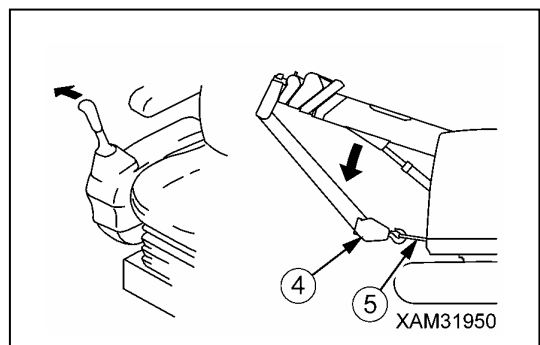
5. Fasten hook block (4) to wire cable (5) for the hook block stowage.



6. Move right-hand work equipment control lever (1) to the LOWER (push outside) position and lower the boom until it stops.

NOTES

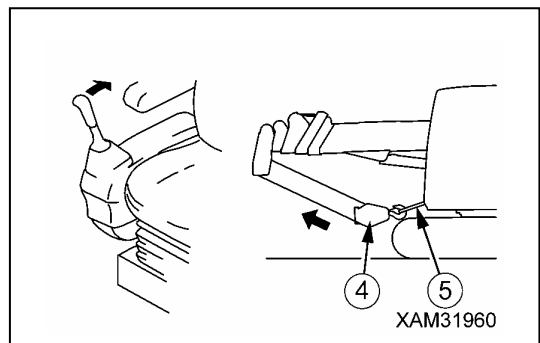
During this operation, raise up hook block (4) occasionally to take up the wire cable slack. Be careful so that hook block (4) will not give an excessive tension to stowage wire cable (5).



7. Keep pressing hook block stowage switch (3) (at the ON position) and move right-hand work equipment control lever (1) to the HOOK RAISING (pull backward) position to raise hook block (4) up slowly and precisely to tension wire cable (5).

NOTES

During this operation, avoid over raising hook block (4). Otherwise, stowage wire cable (5) may damage the regular stowage position and around it in the front of the upper structure of the crane, when over wound.



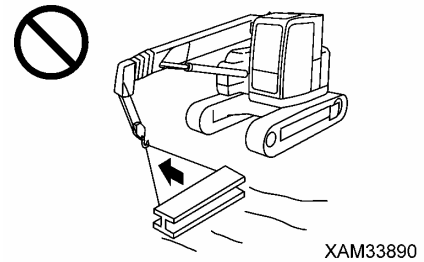
3.18 DO'S AND DON'TS DURING OPERATION

WARNING

- Prior to operating the crane, always place the machine on level and solid ground. Use the level to ensure this.
- In the event that operating the crane while travelling is unavoidable, always stop travelling first, then carry out the crane operation. Use of both the left and right-hand work equipment control levers while travelling is not possible on this machine, however swinging and boom retraction is.
- See the cautions given in "Safety" besides the dos and don'ts in this section.

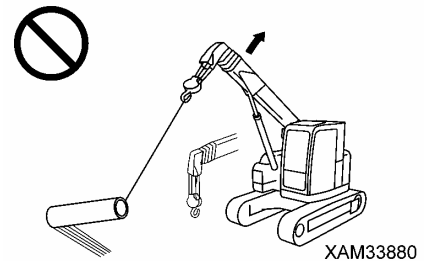
DON'T OPERATIONS WITH SWING FORCE

Do not draw in or lift the load with a swing operation.



DON'T OPERATIONS WITH DERRICKING FORCE

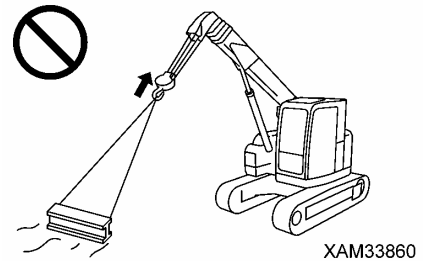
Do not draw in or lift the load with a boom derricking operation.



DON'T PULL SIDEWAYS, DRAW IN, OR HOIST DIAGONALLY

Pulling sideward, drawing in, or hoisting diagonally applies unreasonable force on the machine. It not only damages the machine body, but is also dangerous. Never operate it in these ways.

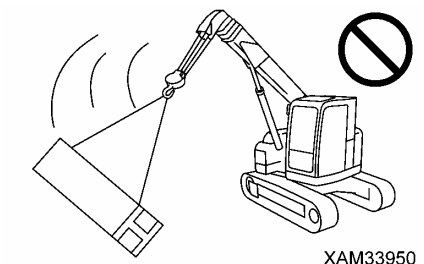
The hook must come right above the center of gravity of the hoisted load.



DON'T CARRY OUT ABRUPT OPERATIONS

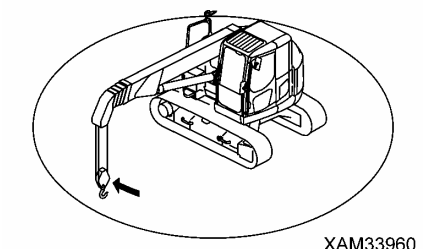
Do not operate the lever abruptly.

Especially, the "swing", "boom lowering", and "hook lowering" must be operated at low speed.



DO NOT ALLOW ACCESS INTO WORKING RADIUS

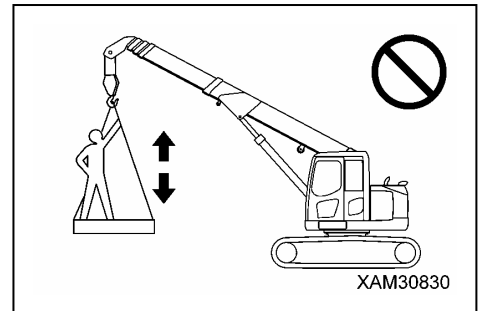
Do not let people enter the working radius area such as permitting an operator to go under the hoisted load.



DON'T USE FOR OTHER THAN MAIN APPLICATIONS

Do not lift people up/down with the crane, unless using a safety cage designed for this purpose.

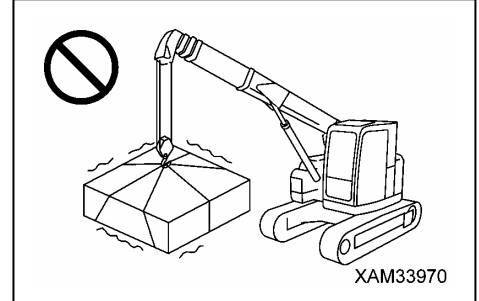
For details, follow laws and regulations applicable to the place of use machine.



DON'T PERFORM UNREASONABLE OPERATIONS

Operations requiring more than the machine's level of performance can cause accidents.

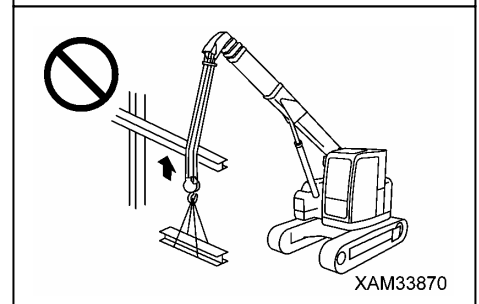
In particular, crane operations must be carried out according to the rated total load chart.



DON'T WIND WIRE BY FORCE

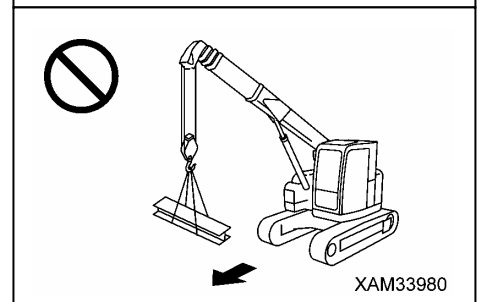
Be careful not to hook the wire cable over a tree or steel beam while working.

If it gets stuck on something, do not force by winding the wire. Untangle and then wind the wire.



PICK AND CARRY OPERATION

Pick and carry operations are very dangerous and may cause shaking of the hoisted load or the machine to roll over. Extreme care must be taken during this operation. Where such an operation is unavoidable, see "Operation 3.19 Pick and Carry Operation" and strictly observe the safety precautions in it.

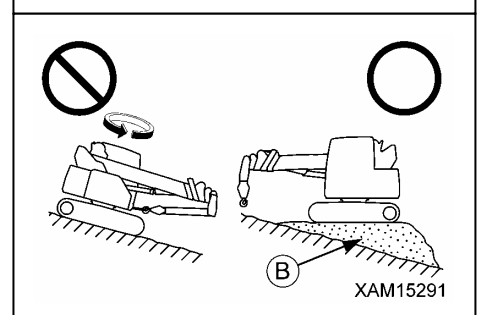


NO OPERATIONS ON SLOPE

Crane operation on a slope may cause the machine to turn over. Basically, do not carry out crane operations on a slope.

If you absolutely have to do so, place some earth fill (B) on the slope to make the ground level and hard and to prevent the machine from turning over, then place the machine on the ground.

Always check that the machine is level using the level gauge on the left side of operator's seat.



3.19 PICK AND CARRY OPERATION

3.19.1 SAFETY PRECAUTIONS FOR PICK AND CARRY OPERATION

DANGER

- Pick and carry operation is a very unstable and dangerous practice and extreme care must be taken during this operation.
Where such an operation is unavoidable, strictly adhere the limits in the "Rated total load table for pick and carry operation" and the specified pick and carry travelling posture.
- Note that the "Rated total load table for pick and carry operation" only presents the load applicable to travelling on a level and solid surface after the load is lifted in a stationary state. Do not pick and carry the load on a slope or a soft ground.
- Never operate the crane while travelling with the load hoisted.
- Move the machine only after you have checked the ground conditions, the surroundings, and the work situation.
- Do not accelerate the machine while travelling.
- Rotate the engine at a slow speed, and keep that hoisted load close to the surface to prevent shaking.
- Avoid sudden acceleration, sudden stops, and sudden changes in direction as they may swing the load and create a dangerous situation.
- Not observing these cautions during pick and carry operations may result in serious accidents.
- Never use searcher hook during pick and carry operations.

NOTICE FOR THE RATED TOTAL LOAD FOR PICK AND CARRY OPERATION AND WORKING RANGE

Strictly observe the rated total load as shown in the table below:

Item	Description
Boom length	5.0 meters (second section) or less
Rated total load	See the "Rated Total Load Table for Pick and Carry Operation"

NOTICE FOR THE OPERATING LOCATION

In ground conditions or locations such as those shown below, the machine must not enter or perform pick and carry operations, as they create a risk of the machine overturning.

Always survey the road surface or the ground prior to operations and arrange a person to direct an appropriate path to take in dangerous or low visibility areas.

- Slopes, soft surfaces such as damp ground, ground with many barriers, rough surfaces such as riverbeds, or ground with many bumps that need to be navigated over.
- Near a deep gutter or a shoulder of a road.
- In water or fords, snowy surfaces, or frozen roads.

NOTICE FOR OPERATIONS

Operations such as those listed below shall be strictly avoided, otherwise the machine may roll over.

Always remain seated in the operator's compartment and carry out pick and carry operations with the utmost care.

- Operating the crane while travelling is strictly prohibited. Always maintain the recommended pick and carry posture.
- The load to hoist cannot be kept in an elevated position. Keep the hoisted load close to the surface to avoid shaking.
- Sudden start and stop, and sudden changes of direction must be strictly avoided. They make the hoisted load shake and cause a dangerous condition.

Always set the travel speed selector switch to the Low position and keep the engine speed low to provide slow travelling.

- Strictly avoided travelling over bumps. Such practices may cause the machine to roll over. Always make a detour to stay away from such bumps.

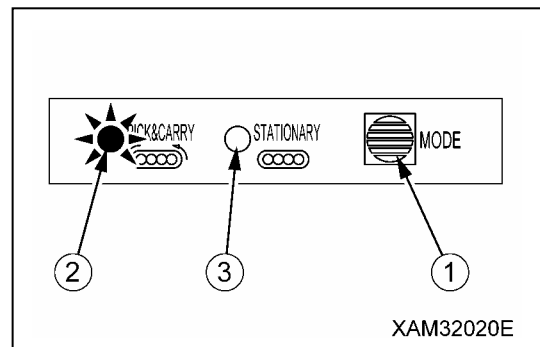
3.19.2 POSTURE FOR PICK AND CARRY OPERATION

⚠ DANGER

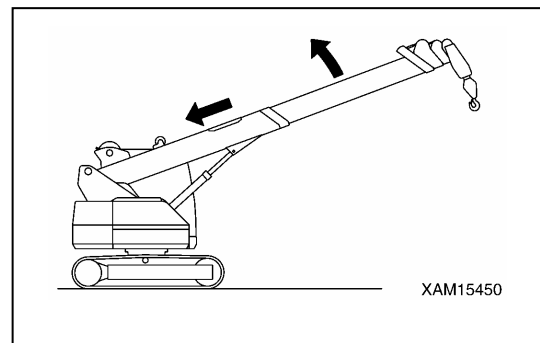
During pick and carry operation, retract the boom to "5.0 meters" (second section) or less, and carry out operations within the range of "Rated total load table for pick and carry operation" and the specified pick and carry travelling posture. If the operation posture is changed during travelling, this will overturn the machine, causing serious injury accidents.

During pick and carry operations, keep the machine in the posture for pick and carry operation as shown in the figure.

1. Press travel mode switch (1) of the moment limiter and keep pressing for three or more seconds.
The operation mode is set to "Pick and Carry Mode" and "PICK & CARRY" LED (2) lights up.

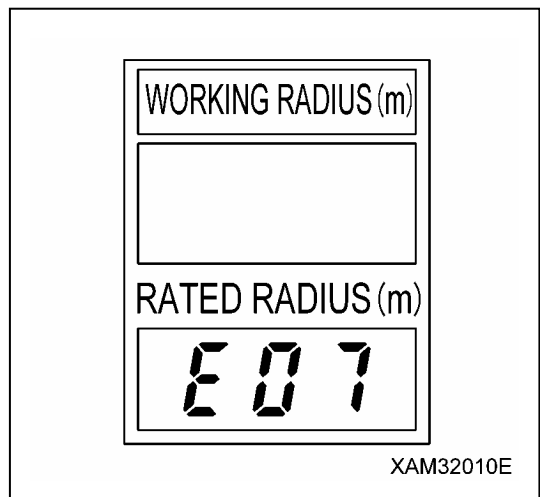


2. See "Operation 3.15 Boom Telescoping Operation" and retract the boom to "5.0 meters" (second section) or less, accordingly.
3. See "Operation 3.13 Hook Raising/Lowering Operation" and lower the hoisted load until it nearly touches the ground.



NOTES

- If the boom length exceeds "5 meters" and the Searcher hook mode is activated and where the Pick & Carry/Stationary mode select switch is set to the Pick and Carry mode or the travel levers are actuated, the buzzer sounds and the rated radius display is turned to an error code "E07".
To select the Pick and Carry mode, the boom length must be "5.0 meters" (i.e. second section of the boom) or less.
- When the travel levers are actuated forward or backward, the Pick and Carry mode is automatically activated, over which, however, the Pick & Carry/Stationary mode select switch setting takes precedence.



3.19.3 OPERATIONS DURING PICK AND CARRY OPERATION

⚠ DANGER

- See "Operation 3.19.1 Safety Precautions for Pick and Carry Operation" and always observe safe operation procedures as required.
- Do not operate the crane during the pick and carry operation. The machine may overturn.
- Always remain seated in the operator's compartment and carry out pick and carry operations with utmost care.
- Prior to beginning travelling, check around the machine to ensure conditions are safe and sound the horn.
- Before shifting the direction to forward or backward, or changing direction, check around the machine to ensure conditions are safe and sound the horn.
- Always keep the engine speed low to provide slow and cautious travelling.
Always keep sufficient distance away from other machines or structures to avoid collisions.

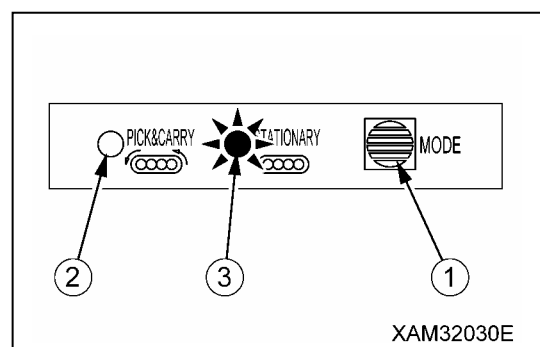
1. See "Operation 3.7 Starting/Moving/Stopping Machine" and "Operation 3.8 Steering Machine" for travelling the machine.
2. See "Operation 3.13 "Hook Raising/Lowering Operation" and "Operation 3.14 Boom Derricking Operation" for crane operation. In this operation, keep the hoisted load at a height where it is almost touching the ground to prevent it shaking.

NOTES

When the moment limiter auto-stop is triggered, see "Operation 2.3.3 Moment Limiter Operations".

3.19.4 RELEASING PICK AND CARRY OPERATION POSTURE

1. See "Operation 3.7 Starting/Moving/Stopping Machine" and "Operation 3.21 Parking Machine" and park the machine accordingly.
2. Press Pick and Carry/Stationary Mode Select switch (1) in the moment limiter.
The operation mode is set to "Stationary Mode" and "STATIONARY" LED (3) lights up.
3. See "Operation 3.6 Machine Travelling Posture" and set the machine to the travelling posture.



3.20 OPERATION OF BLADE

3.20.1 PRECAUTION OF BLADE OPERATION

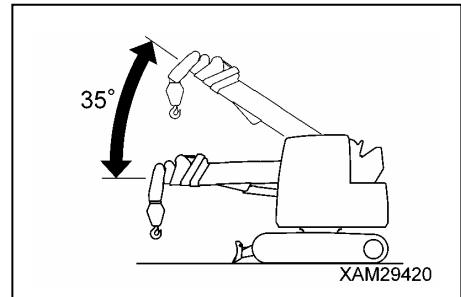
WARNING

[BASIC POSTURE OF THE BLADE]

- Always clear the Blade from the ground during the hoisting operation. Failure to do so may result a serious hazard including damaging the machine or tipping it over.
- Avoid ground leveling operations at the same time as hoisting operations. Otherwise, it may cause a serious hazard including damaging the machine or tipping it over.
- A basic posture as below shall be observed for ground leveling operations using the Blade.
 - Keep the Blade ahead.
 - Retract the boom to the minimum and stow the hook.
 - Lower the boom to the range between "fully lowered to 35 degrees".

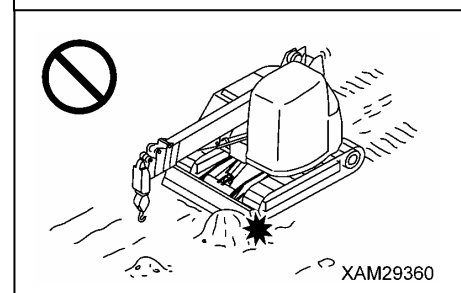
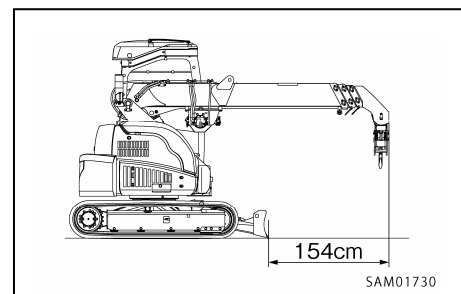
Where the boom is raised in excess, the machine may tip over and result a serious hazard.

- Any leveling operations other than in the basic posture may cause the machine to tip over or damage to the wire rope which triggers a serious accident.



[SAFETY PRECAUTIONS FOR GROUND LEVELING]

- In the condition that the boom is "full lowered", its end exceeds the Blade end by "154 cm". It is essential to ensure that no obstacles lie ahead. Else, the boom may hit an obstacle and cause a critical accident.
- After leveling operations finish or during transportation, position the Blade to touch the ground. The Blade may lower down causing a critical accident due to a slack Blade cylinder or hydraulic system error.
- Do not attempt to travel backwards while the Blade is touching the ground. This can damage the hydraulic hose. The Blade may become inoperable.
- Avoid the Blade hitting obstacles such as stones and rocks. Immediate damage of the Blade or cylinder may follow such an event.

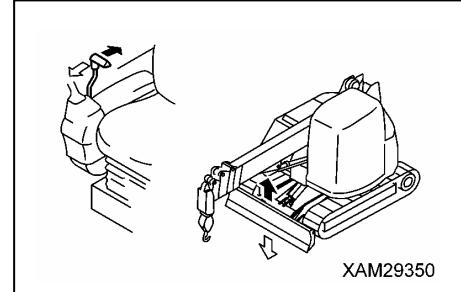


3.20.2 OPERATION OF BLADE

! WARNING

- Always clear the Blade from the ground during the hoisting operation. Failure to do so may result in a serious hazard including damaging the machine or tipping it over.
- Avoid ground leveling operations at the same time as hoisting operations. Otherwise, it may cause a serious hazard including damaging the machine or tipping it over.

Shift the Blade control lever back and forth located at the right side of the operator's seat to actuate the Blade.



CAUTION

- Indications and warning are issued against a load hoisting operation in a condition where the Blade is lowered and a certain load is imposed. At the same time, crane functions below are interrupted:

Indications and warnings:

- Rated total load display in the Moment limiter will blink and indicate "bld".
- Buzzer sounds intermittently.
- The red lamp of the rotary lamp lights.

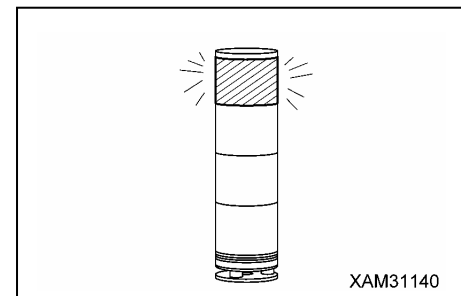
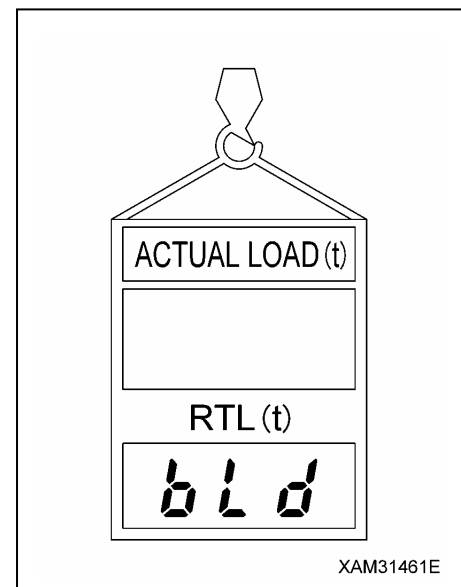
Functions to be interrupted:

- Winch hoisting
- Boom derricking
- Boom extending

When a certain loading is applied to the Blade in addition to that of a load that is hoisted, the above conditions continue.

Either clear the Blade from the ground or lowering the hoisted load on the ground will release these indications and warnings, then the crane resumes these functions.

- During travelling that is not for ground leveling operations, keep the Blade clear from the ground. Road surfaces may be damaged in such a condition.



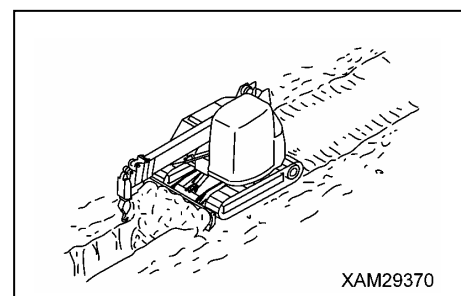
3.20.3 WORKING WITH A BLADE

GROUND LEVELING

! WARNING

Secure the safety of surroundings, first. Accident to other persons, the machine tipping over due going off-track, or the Main boom crashing may happen, resulting in a serious hazard, including injury or death.

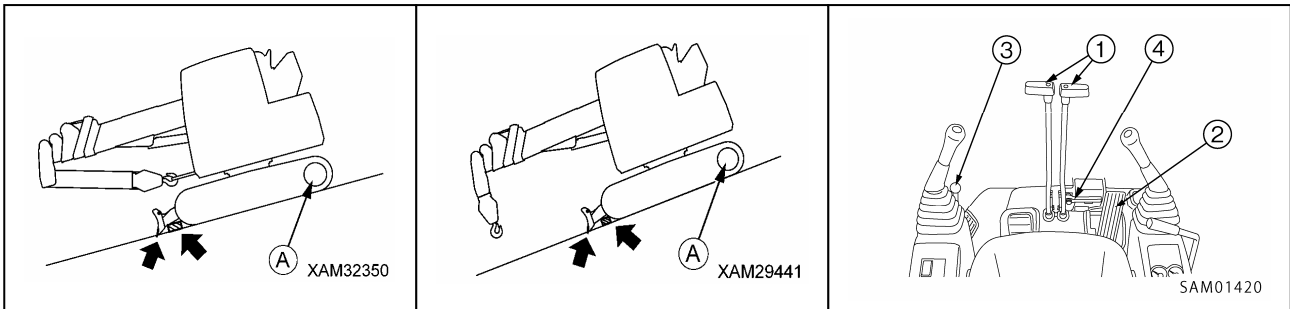
The Blade is employed for ground leveling operations.



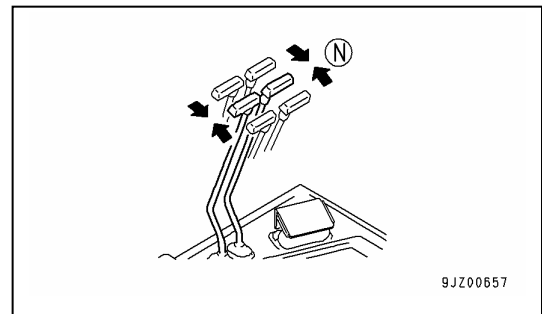
3.21 PARKING MACHINE

⚠ WARNING

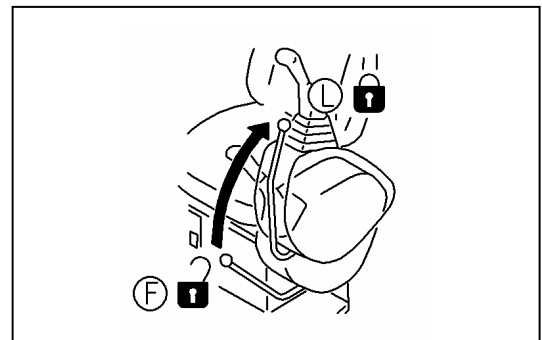
- Parking the machine on the firm, level ground. If it is unavoidably necessary to park the machine on a slope, put blocks under the tracks and dig the blade into the ground surface to stop the machine from moving.
 - If the control levers are touched by mistake, the machine may suddenly move, which may cause a serious accident.
- Before standing up from the operator's seat, always set the lock lever securely to the LOCK position.



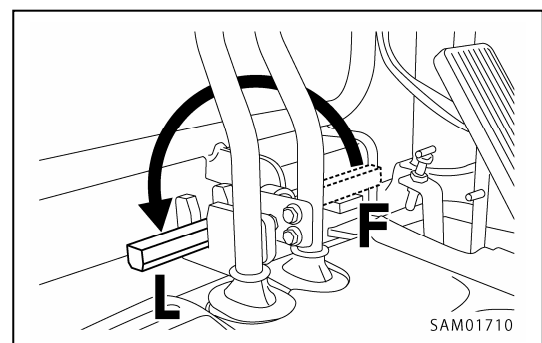
1. Set left and right travel levers (1) to the Neutral position (N). The machine stops.
2. Release accelerator pedal (2) to rotate the engine at low idling speed.



3. Lower down the blade onto the ground.
4. Set lock lever (3) securely to the LOCK position (L).



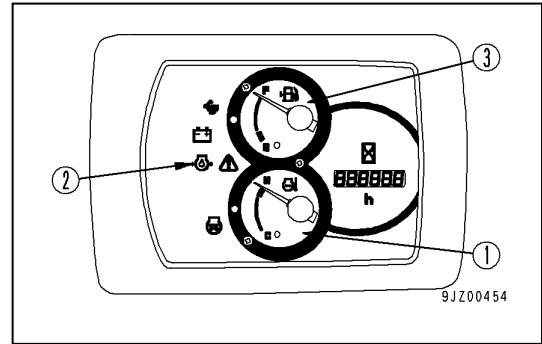
5. Push travel lock bar(4) to the LOCK position (L) and locate it in the groove.



3.22 MACHINE INSPECTION AFTER DAILY WORK

3.22.1 BEFORE STOPPING ENGINE

Use the machine monitor to check engine coolant temperature (1), engine oil pressure (2), and fuel level (3).



3.22.2 AFTER STOPPING ENGINE

1. Walk around the machine and check the crane, machine exterior, and undercarriage, also check for any leakage of oil or coolant.
If a leakage or an abnormality is found, repair it.
2. Refill the fuel tank.
3. Check around the engine compartment and battery for paper and debris. Clean out any paper and debris to avoid a fire hazard.
4. Remove all the mud and water from the undercarriage of the machine.

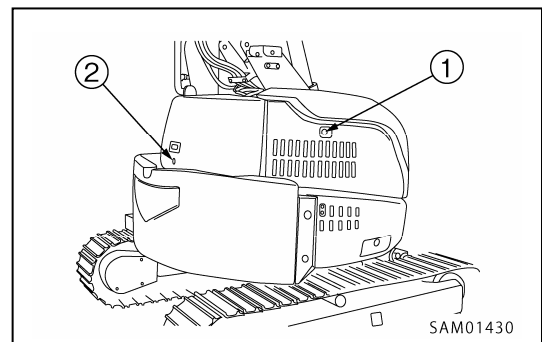
3.22.3 LOCKING

Always lock the following places.

- (1) Cover on the right side of the machine
- (2) Engine hood

NOTES

Use the starter switch key to lock and unlock all these places.



3.23 CAUTIONS IN TRAVELLING

WARNING

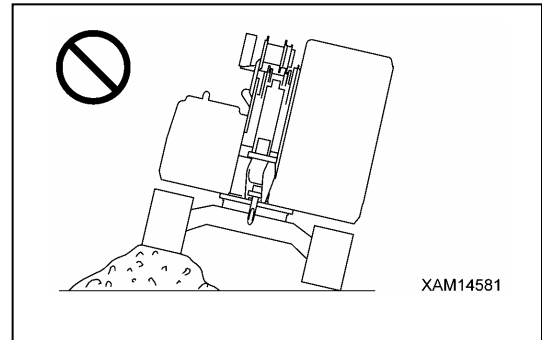
Not observing these cautions before operating the crane will result in a serious accident.

CAUTIONS IN TRAVELLING

Travelling over boulders, tree stumps, or other obstacles will cause a significant amount of shock to the chassis (and in particular to the tracks), and this will cause damage to the machine.

For this reason, always remove any obstacles or travel around them, or take other steps to avoid travelling over such obstacles as far as possible.

If you have to travel over the obstacles, be sure to take the "travelling posture" to lower the center of gravity, and reduce the travelling speed as much as possible so that the machine will go over the obstacles at the center of the crawlers.



NOTES

See "Operation 3.6 Machine Travelling Posture" for the machine travelling posture.

CAUTIONS IN HIGH SPEED TRAVELLING

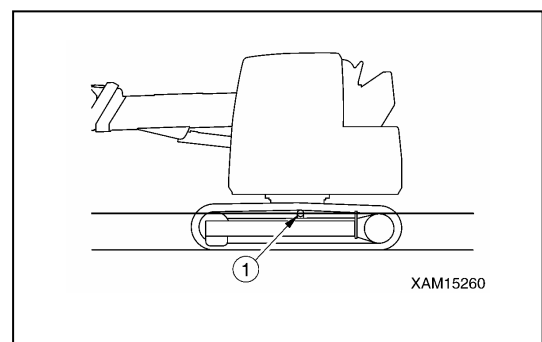
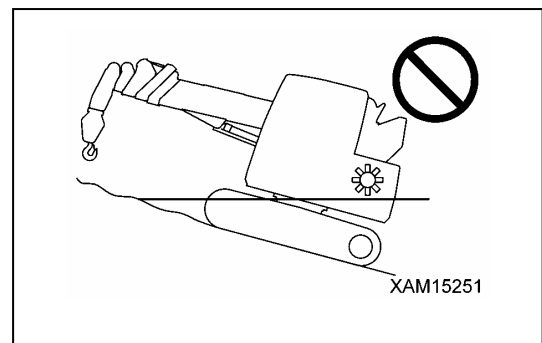
On uneven roadbeds such as rock beds or uneven roads with large rocks, travel at low speed. When traveling at high speed, set the idler in the forward direction.

PERMISSIBLE WATER DEPTH

CAUTION

When driving the machine out of water, if the angle of the machine exceeds 15 degrees, the rear of the upper structure will go under water, and water will be thrown up by the radiator fan. This may cause the fan to break. Be extremely careful when driving the machine out of water.

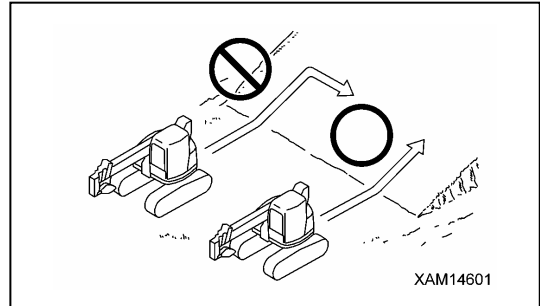
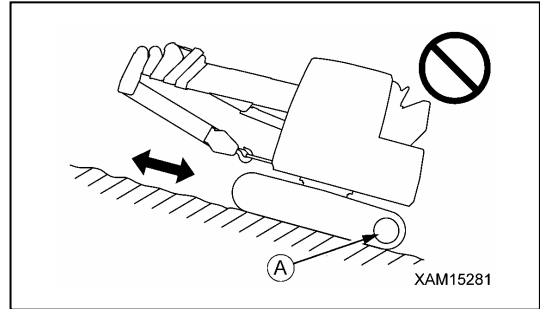
Do not drive the machine in water deeper than center of carrier roller (1). Supply grease to the parts which have been under water for long periods until the used grease is projected out of the bearings.



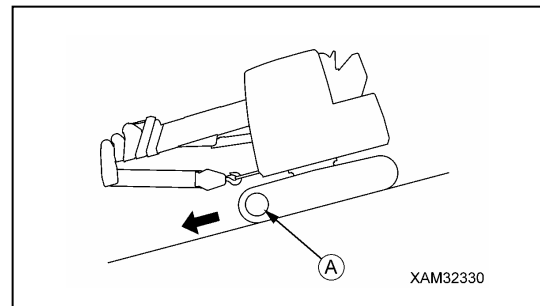
CAUTIONS FOR SLOPE TRAVELING

⚠ WARNING

- For slope travelling, take care of overturning or drifting.
- At the angle of 15 degrees or more, when the machine is on a slope, the incline detector actuates and it triggers a buzzer. When the buzzer sounds, stop travelling and change to a safer path.
- For travelling on a slope, always keep the travelling posture, where the hook block is positioned to its regular stowage. Otherwise, if it is fixed to the temporary stowage position at the boom tip, it may become loose. See "Operation 3.6 Machine Travelling Posture" for the machine travelling posture.
- On a slope of 10 degrees or more, use reverse travelling to climb it and forward travel to climb down it. Always direct the front of the machine down the slope. Where forward travelling to climb up and reverse travelling for climbing down are used, the machine may become unstable and risk rolling over or drifting.
- When travelling along slopes, always keep the machine facing straight forward along the slope and never attempt to turn around it or traverse it. When possible, use a level route and make a detour to avoid the slope, to increase safety.
- Keep travelling in a manner so that the machine can be stopped whenever it slips or becomes unstable.

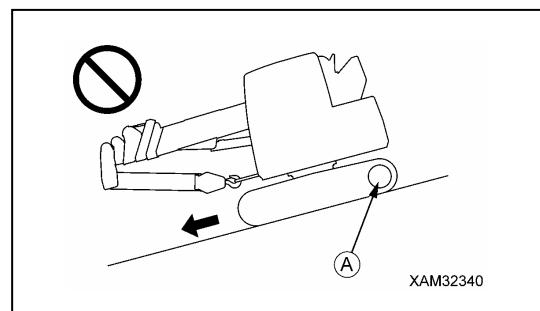


- When travelling down steep hills, use the travel lever and accelerator pedal to keep the travel speed low. When travelling down a steep hill of more than 10 degrees, with sprocket (A) side down, set the machine to the posture shown in the figure at right, and lower the engine speed.



NOTES

Travel down slopes with sprocket (A) side down. If the machine travels down with sprocket (A) side up, the track tends to become loose, and that can cause skipping pitches.



TRAVELLING DOWNHILL

Put the travel lever in the NEUTRAL position. This will cause the brake to be automatically applied.

ENGINE STOPPED ON SLOPE

If the engine stops when travelling uphill, move the travel levers to the NEUTRAL position, lower the blade to the ground, stop the machine, then start the engine again.

CAUTIONS ON SLOPE

If the engine stops when the machine is on a slope, never use the left-hand work equipment control lever to swing operations. The upper structure will swing under its own weight.

4. HANDLING WIRE CABLES

4.1 BENCHMARK FOR REPLACING WIRE CABLES

CAUTION

- The benchmark for replacing wire cables is common to all the wire cables for winching, telescoping the boom, and slinging.
- Measure the diameter of the wire cable at the section where the wire cable repeatedly passes through the sheave. Measure the diameter from three directions and calculate their mean value.
- Do not use old wire cables even if they have not been used.
- See "Inspection and Maintenance 10.3 Replacement Wire Cable in Irregular Maintenance" for information about how to replace the wire cable.
- Contact us or our sales service agency for replacing/repairing the wire cables.

WIRE CABLE NOMINAL DIMENSION

- Wire cable for winching: IWRC 6 × Ws (26) 0/0 dia. 8 × 73 m
- No. 4 boom extending wire cable: IWRC 6 × Fi (29) 0/0 dia. 9
- No. 4 boom retracting wire cable: IWRC 6 × Fi (29) 0/0 dia. 6

BENCHMARK FOR REPLACING WIRE CABLES

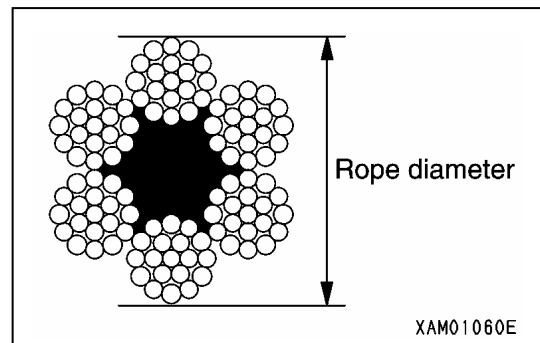
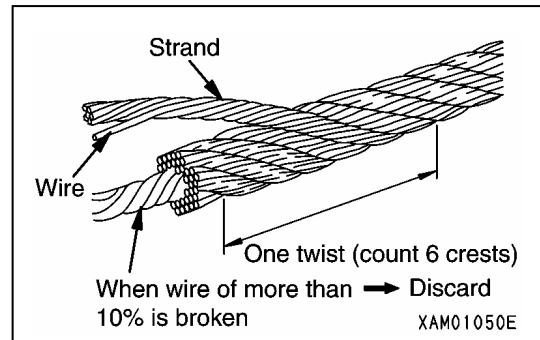
A wire cable undergoes wear and tear over time.

Prompt replacement is required if any of the following have occurred to the wire cable.

1. Percentage of snapped wires to total wires (except filler wires) in outer strands exceeds the ratio below:
 - (1) 10% or more of the wires in one twist of the wire cable, or 5% or more when such snapped wires are in one single strand.
 - (2) 20% or more of the wires in five twists of the wire cable.
2. The diameter of the wire cable is worn for 7% or more of the nominal diameter

NOTES

- A wire cable with a diameter of 9 mm must be replaced if its diameter has worn to 8.4 mm.
- A wire cable with a diameter of 8 mm, it must be replaced when its diameter is worn to 7.5 mm.
- A wire cable with a diameter of 6 mm must be replaced if its diameter has worn to 5.6 mm.



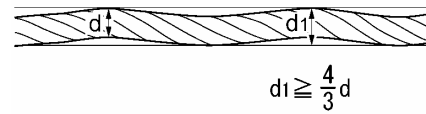
3. The wire cable, corroded as below:
 - (1) Wire surface has pitted or pitted.
 - (2) Wires become slack due to internal corrosion.

4. Excessively deformed as below:

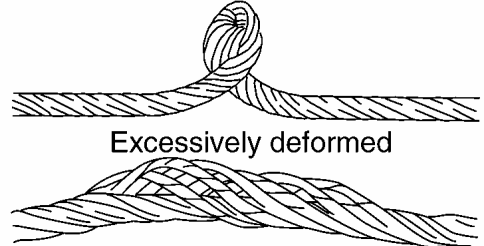
- (1) The cable is twisted and has some kinks.
- (2) Waviness width is $\frac{4}{3}d$ or more in a distance within 25 times of nominal diameter d .
- (3) The minimum diameter is $\frac{2}{3}$ or less of the maximum diameter due to local pressure and being flattened.
- (4) Core wire or wire core projects.
- (5) Excessively curved.
- (6) Basket-like deformation.
- (7) A strand sinks inside.
- (8) One strand or more is slack.
- (9) Wires project excessively.

5. The cable shows some abnormality at the terminals.

Waviness width



Kinked



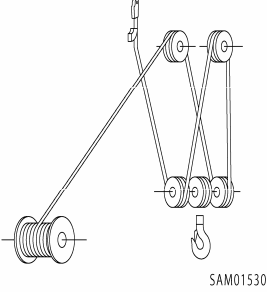
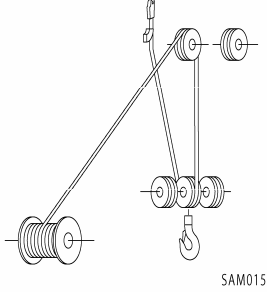
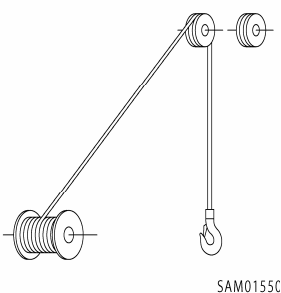
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4.2 WINCH WIRE CABLE FALL MODE AND RATED TOTAL LOAD

Number of wire cable falls of the hook block shall be determined based on the load to be hoisted, boom length and winching speed.

The load to one wire cable fall must be within "750 kg".

The table below shows the hook block types, wire cable falls and the rated total load in each condition:

Type of Hook Blocks	For 2 or 4 falls (Common)	For 2 or 4 falls (Common)	For 1 fall (Exclusive)
Number of Wire Falls	4 cable	2 cable	1 cable
Wire Cable Configuration			
Rated total load	2930 kg	1480 kg	750 kg
Hook weight	30 kg	30 kg	20 kg

4.3 WHAT TO DO WITH TWISTED WINCH WIRE CABLE

⚠ WARNING

Always wear thick leather working gloves when handling wire cables.

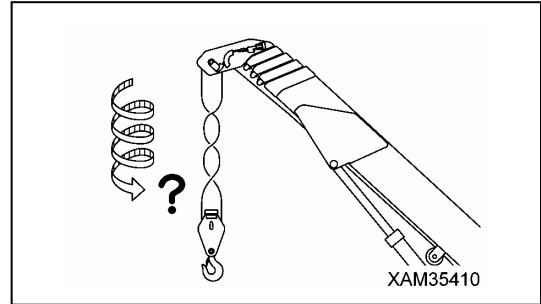
CAUTION

Change the hooking direction of the wire cable (reverse the hook block side and winch drum side) from time to time.

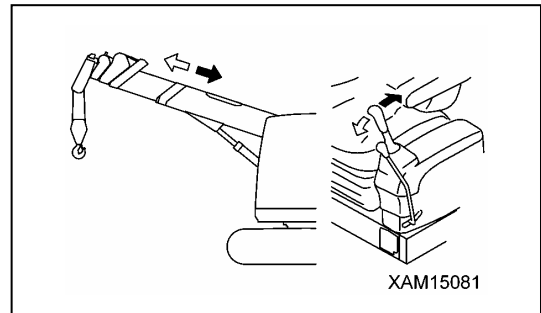
Doing so can extend the service life of the wire cable.

When the wire cable gets twisted, straighten the twist with the following procedure.

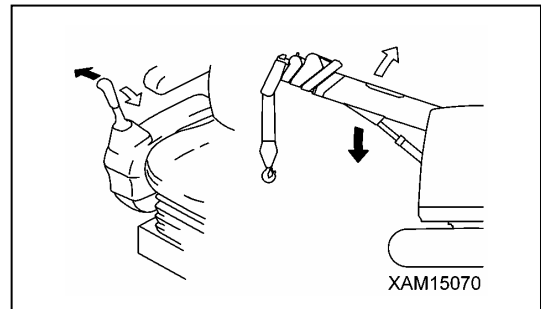
1. With the hook in normal condition, check the direction of the twist and how many times the cable is twisted.



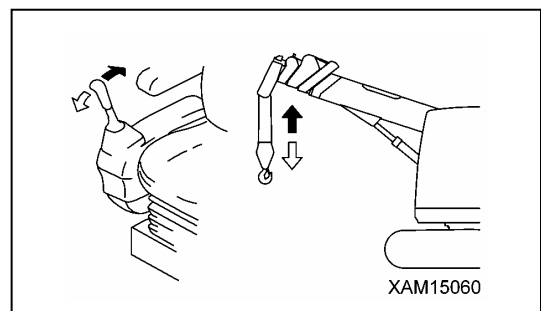
2. Operate the left-hand work equipment control lever to the RETRACT position (pull backward) to retract the boom to lower the boom fully.



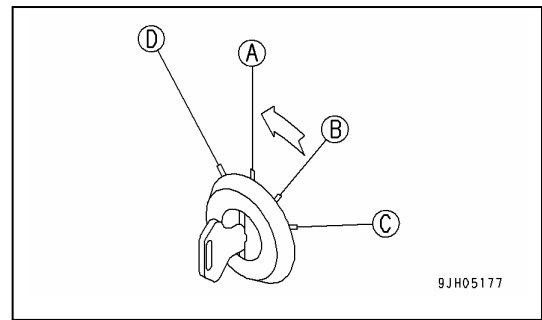
3. Move the right-hand work equipment control lever to the LOWER position (push outside) to lower the boom to approximately 20 degrees.



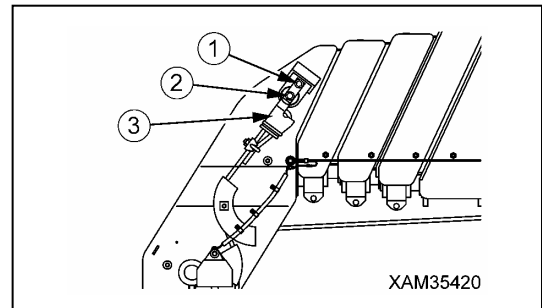
4. Move the right-hand work equipment control lever to the HOOK LOWERING position (push forward) to un-hoist the hook block until it nearly touches the ground, then move the right-hand work equipment control lever to the LOWER position (push outside) to lower the boom so that the hook block reaches the ground, then lower the boom to the end.



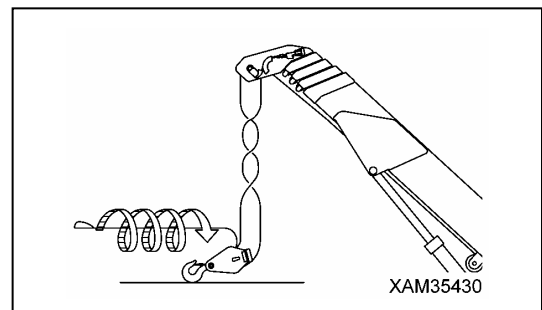
5. Turn the starter switch to the (A) (OFF) position to stop the engine. Then, set the lock lever to the LOCK position.



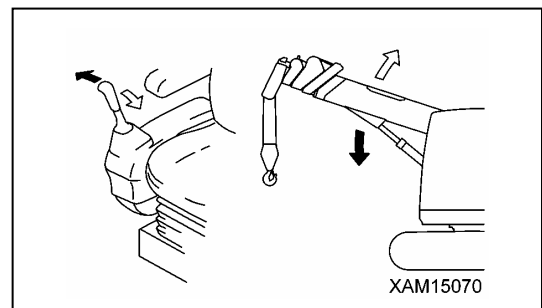
6. Remove securing bolt (1) to remove wedge socket pin (2), and then remove wedge socket (3).



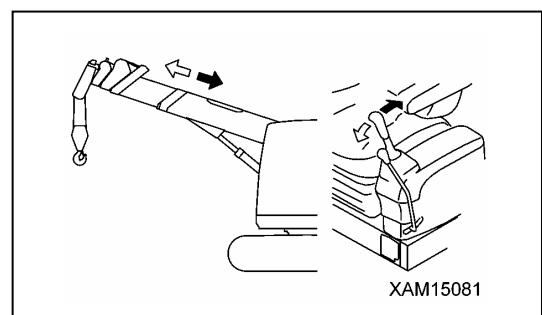
7. Twist the end of the wire for "n" (number of wire falls) times the number the hook is twisted, in the opposite direction from the direction the hook block is twisted to and which you checked in the step 1 (opposite direction from the one the wire cable tries to go back to naturally when you release your hand from the wedge socket) and install the wire cable.



8. Start the engine and move the right-hand work equipment control lever to the RAISE position (pull toward you) to increase the boom angle to its maximum.

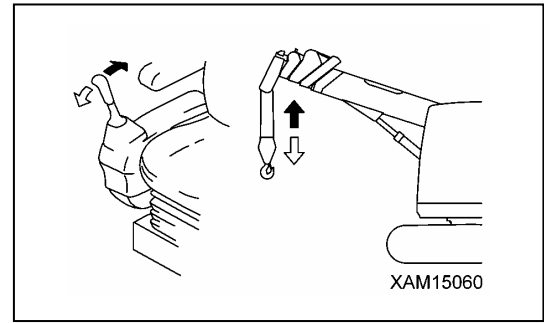


9. Operate the left-hand work equipment control lever to the EXTEND position (push forward) to extend the boom to its maximum.



10. Move the right-hand work equipment control lever to repeat RAISING/LOWERING (forward/backward) the hook block for several times.
11. Tidily spool up the wire cable into the winch drum with some tension applied to the cable.
12. Repeat the above procedure until the hook is no longer twisted.

If the wire cable is still twisted after performing the procedure above, change with a new wire cable.



5. TRANSPORTATION

When transporting the machine, observe all related laws and regulations, and be careful to ensure safety.

OBSERVATION OF ROAD TRANSPORTATION ACTS

If there are applicable local laws and regulations, observe these laws and regulations for safe transportation.

If not, contact us or our sales service agency.

TRANSPORTATION MEASURE

WARNING

Take road width, height, and weight into consideration in determining the transportation route.

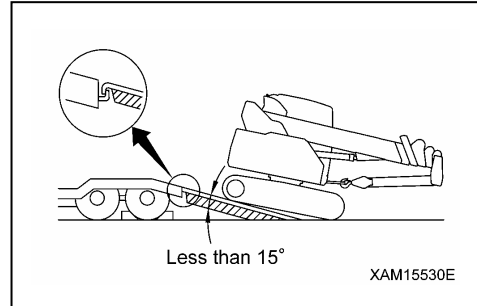
To determine the transportation measure, see the weights and dimensions shown in "Specifications 1. Main Specification Table".

5.1 LOADING/UNLOADING

⚠ WARNING

- See "Specifications 1. Main Specification Table" for dimensions and weights related to this machine.
- Select and use the ramp boards that satisfy the following conditions.
 - Has a length that when placed, the angle from the track is 15 degrees or less.
 - Has a width no narrower than the rubber tracks.
 - Has a thickness and strength that can fully withstand the weight of the machine.
- Be sure to place the ramp boards perpendicular to the truck box.

Also, match the center of the each of the tracks with the center of corresponding ramp board. Misplaced ramp boards and unmatched tracks may cause the machine to slip off of the ramp boards and cause serious accidents.



- Always put the machine in the "travelling posture" when loading/unloading the machine. See "Operation 3.6 Machine Travelling Posture" for information about the travelling posture.
- Always run the engine at low idling speed, and operate the machine slowly when loading and unloading.
- Always load the machine by moving backward. Moving forward involves overturning hazard. The operator must be on the back side of the truck.
- Always unload the machine by moving forward. Moving forward involves overturning hazard. The operator must be on the back side of the truck.
- Loading/Unloading the machine involves danger. Be extremely careful.
- Select flat and solid ground for loading/unloading the machine. Maintain a safe distance from the edge of the road.
- Remove dirt around the crawlers to prevent the machine from slipping sideways on the ramp boards. Remove any substance on the loading ramps such as snow, ice, grease, and oil.
- Never change direction on the ramp boards. Go down from the ramp board, and then change direction.
- The center of gravity of the machine will change suddenly at the point between the ramps and the trailer, and there is a danger that the machine will go off balance. Travel slowly over this point.

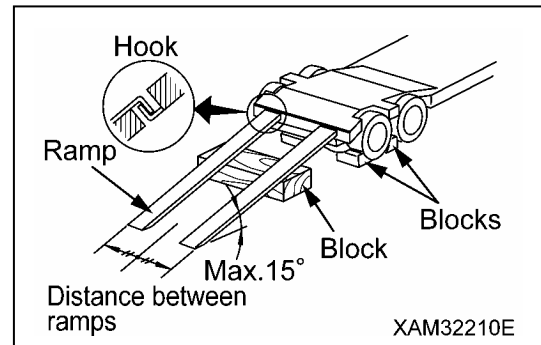
Always put the machine in the "travelling posture" when loading/unloading the machine. Always use ramp boards or forwarding blocks when loading/unloading the machine and use the following procedure.

5.1.1 LOADING

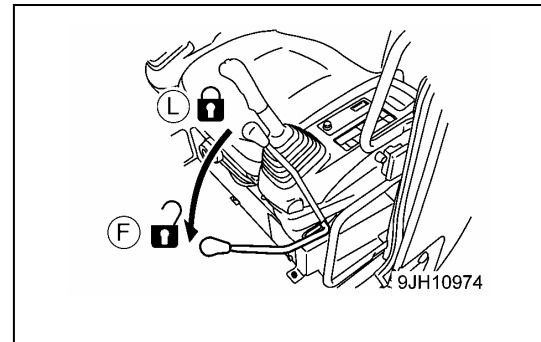
1. Load and unload on firm level ground only. Maintain a safe distance from the edge of a road.
2. Apply the trailer brakes securely, then put blocks under the tires to prevent the trailer from moving.
3. Secure the ramp boards in a way that the center of the trailer and the machine match.

NOTES

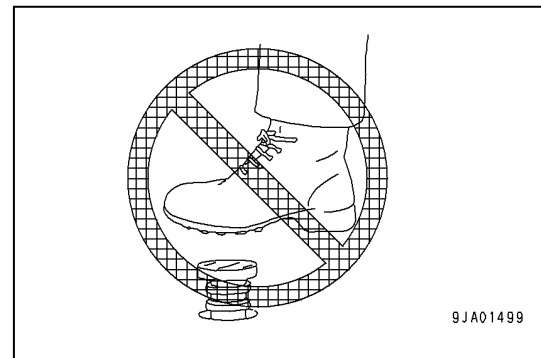
- Set left and right ramps parallel to each other and equally spaced to the left and right of center of the trailer.
- Make angle of installation a maximum of 15 degrees.
- Hang the hook of the ramp securely to hook the holder of the trailer.
- If the ramps bend by a large extent due to the weight of the machine, put blocks under the ramps to prevent them from bending.



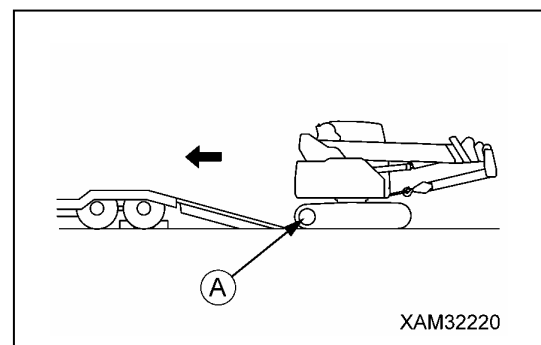
4. Start the engine.
Warm the engine up fully.
5. Set the lock lever to FREE position (F).



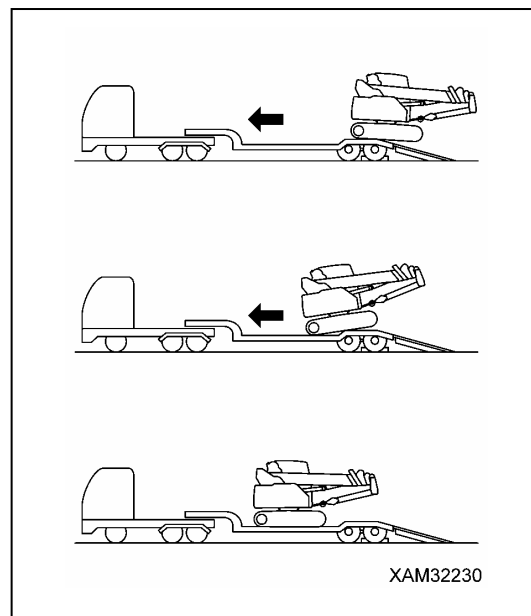
6. Keep the engine speed at a low idle.
7. Do not operate the travel speed-up pedal.



8. Before moving onto the ramps, make sure that the machine is positioned in a straight line with the ramps and that the center line of the machine matches that of the trailer.
Align the direction of travel with the ramps and travel slowly.
Only operate the travel lever while on the ramps. Do not operate any other lever.



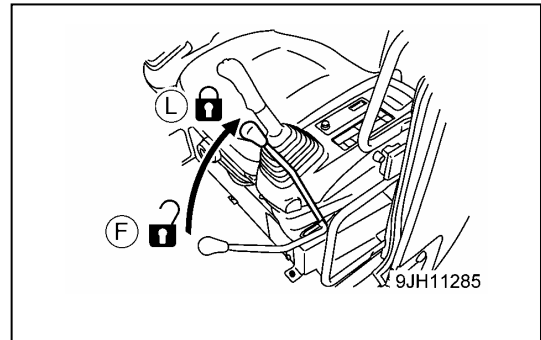
9. Align the direction of travel with the ramps and travel slowly. When on the ramps, operate only the travel.
10. When the machine travels over the rear wheels of the trailer, it becomes unstable, so drive slowly and carefully. Never operate the steering.
11. At the moment the machine passes the rear wheels, it tilts backward, so be careful not to let the crane hit the trailer body, drive the machine backward to the specified position, then stop the machine.



5.1.2 SECURING MACHINE

After placing the machine on the specified position of the trailer, secure it according to the following procedure.

1. Lower the blade.
2. Stop the engine, and remove the key from the starter switch.
3. Set the lock lever securely to the LOCK position (L).

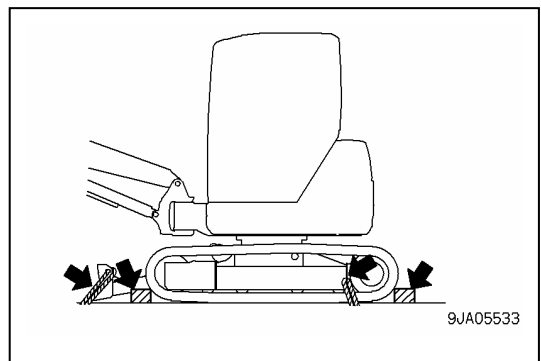


CAUTION

Do not use the fixing hole at the rear of the track frame for towing or lifting the machine.

4. Place blocks under both ends of the tracks to prevent the machine from moving during transportation, and secure the machine with chains or wire cables of suitable strength.

Be particularly careful to secure the machine in position so that it does not slip to the side.



NOTES

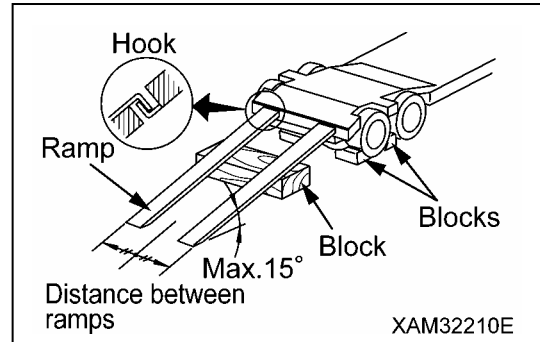
- When securing the machine, put blocks between the wire cable and the machine to prevent damage to the cable or machine.
- When using chains or wire cables to secure the machine, utilize the holes on the blade side plate and the fixing hole at the rear of the track frame.

5.1.3 UNLOADING

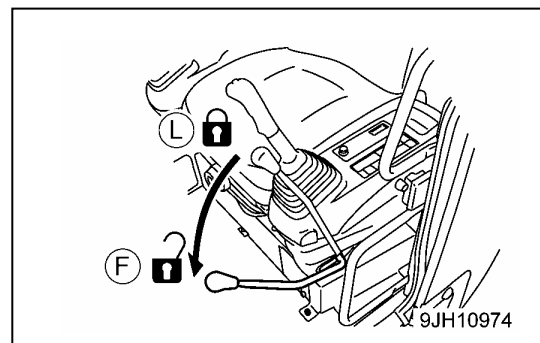
1. Unload on firm level ground only. Maintain a safe distance from the edge of a road.
2. Apply the trailer brakes securely, then put blocks under the tires to prevent the trailer from moving.
3. Secure the ramp boards in a way that the center of the trailer and the machine match.

NOTES

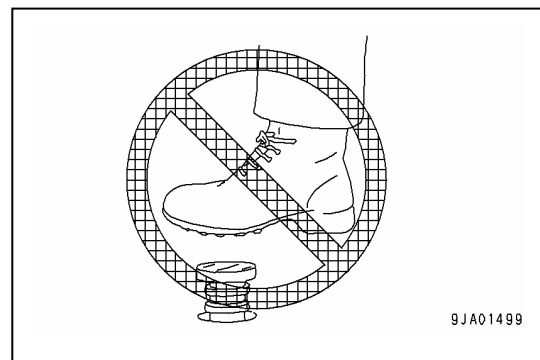
- Set the left and right ramps parallel to each other and equally spaced to the left and right of the center of the trailer.
- Set the angle of installation to a maximum of 15 degrees.
- Hang the hook of the ramp securely to the hook holder of the trailer.
- If the ramps bend a large amount under the weight of the machine, put blocks under the ramps to prevent them from bending.



4. Remove the chains and wire cables fastening the machine.
5. Start the engine.
Warm the engine up fully.
6. Set the lock lever to the FREE position (F).



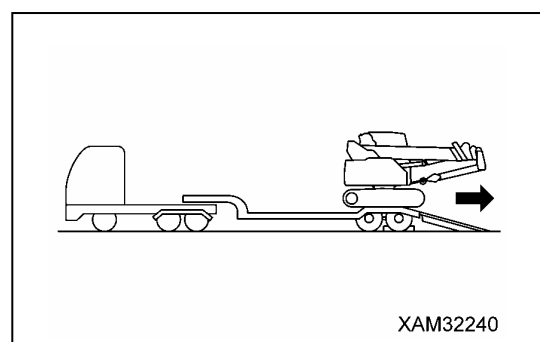
7. Keep the engine speed at a low idle.
8. Do not operate the travel speed-up pedal.



9. Before moving onto the ramps, make sure that the machine is positioned in a straight line with the ramps and that the center line of the machine matches that of the trailer.

Align the direction of travel with the ramps and travel slowly.

Only operate the travel lever while on the ramps. Do not operate any other lever.



5.2 LIFTING MACHINE

5.2.1 LIFTING THE MACHINE IN THE BOOM LOWERED POSTURE

DANGER

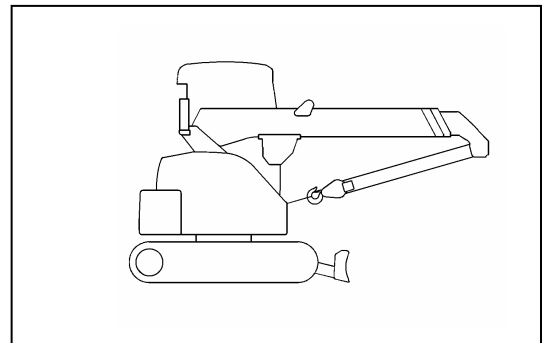
- See "Specifications 1. Main Specification Table" for dimension and weights related to this machine.
- The operator carrying out the lifting operation using a crane must be a properly qualified crane operator.
- Never raise the machine with any workers on it.
- Slings equipment such as wire cables and shackles for lifting operations must be sufficiently capable of sustaining loads associated with this machine.
- When lifting, keep the machine horizontal.
- When carrying out lifting operations, set the lock lever to the LOCK position to prevent the machine from moving unexpectedly.
- Never enter the area under or around the machine when it is raised.
- Do not lift the machine other than in the posture or as slung below. Otherwise, the machine may go out of balance.

CAUTION

- Use four wire cables and four shackles of the same specifications when lifting up the machine. Also avoid the slinging wire cables touching the machine body during the lift.
 - Wire cable: Breaking load: 96.7 KN or more (6 × 37 - dia. 14 × 2.5 m)
 - Shackle: Using load: 2.0 t or more, Nominal size 18 (excluding SD type)
- When the machine is lifted in its boom lowered posture, make sure that the hook block is in the regular stowage position. For details, see "Operation 3.17.2 Crane Operation for Regular Hook Block Stowage".

When lifting the machine, carry out the operation on firm level ground only as follows.

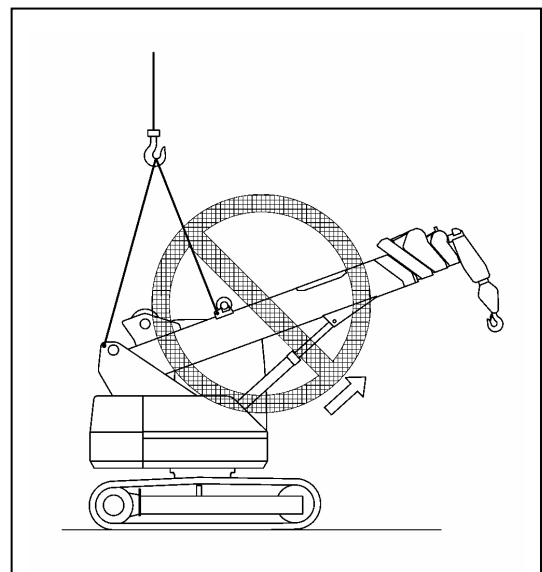
1. Hitch the hook on to the hook hitch wire cable and secure the hook and boom to the machine body as shown in the figure on the right.



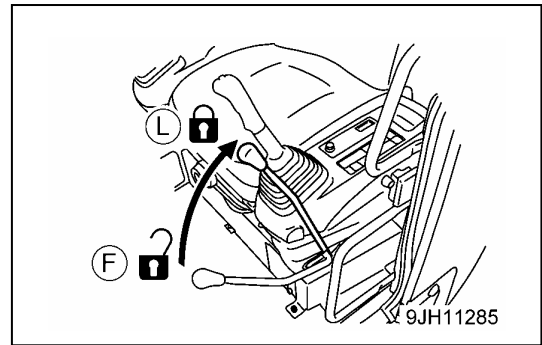
CAUTION

If the machine is lifted with the hook stowed at the boom tip, the boom will rise because of the weight of the machine, and the machine cannot be raised in the correct position.

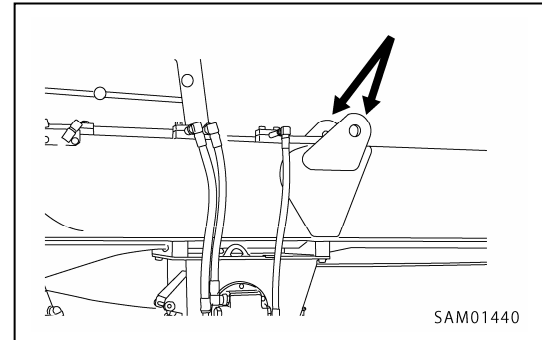
When lifting up? the machine with the boom lowered, be sure to secure the hook and boom to the machine body by using the hook hitch wire cable.



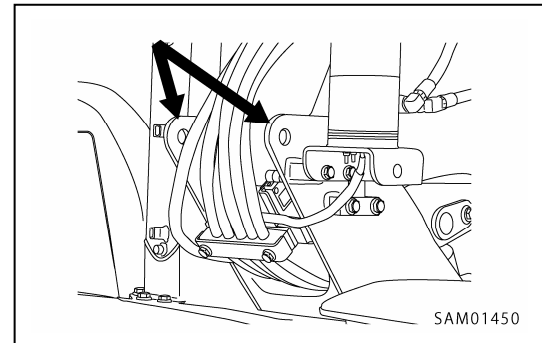
2. Set the lock lever securely to the LOCK position (L).
3. Stop the engine, and remove the key from the starter switch. Then check that there is nothing around the operator's compartment and get off the machine.
4. Lock the covers and caps fitted with locks.



5. Fix shackles to two brackets at the left and right sides of the boom, then attach the slinging wire cables.



6. Fix shackles to the two brackets on left and right sides of the crane frame, then attach the slinging wire cables.



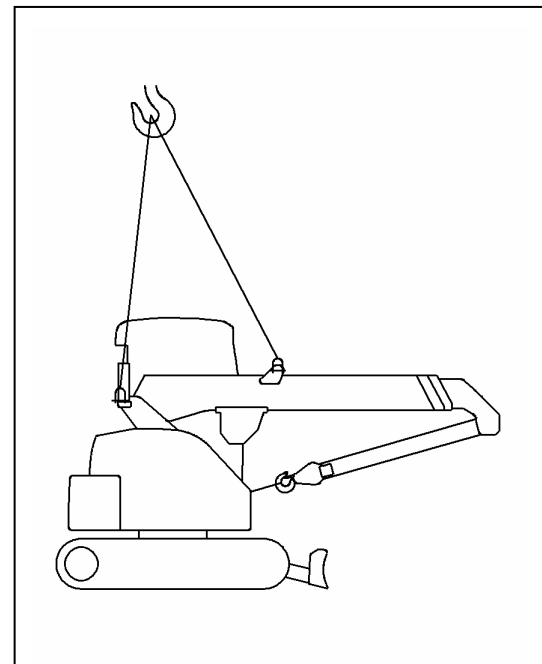
NOTES

Apply appropriate pads to the locations in which the slinging wire cable may touch the machine, prior to lifting up.

7. Keep the angle of sling wire cables within a range of 30 to 40 degrees and lift up slowly.

NOTES

- After lifting the machine just clear of the ground, check the condition of the hook and the lifting posture.
- Verify that there has been no change in posture caused by the leakage from the hydraulic circuit on the derricking cylinder head side when the machine is hoisted.
- When the machine in the standard configuration is lifted, it leans about one degree backward and about five degrees toward the operator's compartment side. This leaning angle may vary slightly in accordance with the boom angle and amount of fuel remaining.



5.2.2 LIFTING THE MACHINE IN THE BOOM RAISED POSTURE

DANGER

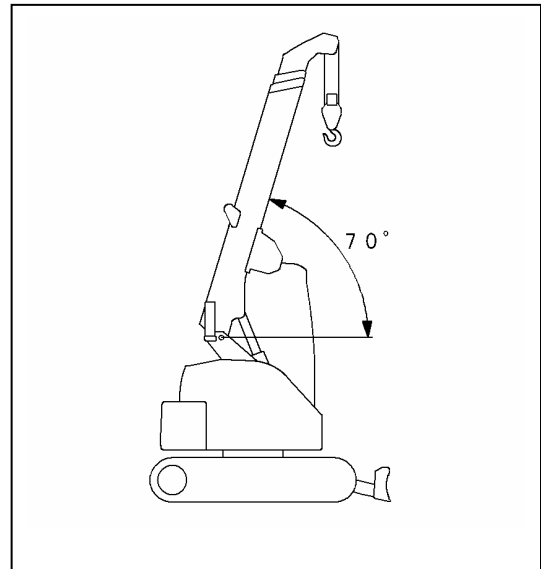
- See "Specifications 1. Main Specification Table" for dimension and weights related to this machine.
- The operator carrying out the lifting operation using a crane must be a properly qualified crane operator.
- Never raise the machine with any workers on it.
- Slings equipment such as wire cables and shackles for lifting operation must be sufficiently capable of sustaining loads associated with this machine.
- When lifting, keep the machine horizontal.
- When carrying out lifting operations, set the lock lever to the LOCK position to prevent the machine from moving unexpectedly.
- Never enter the area under or around the machine when it is raised.
- The procedure and the scheme for slinging (i.e. attaching shackles into the two brackets on both the left and right sides of the boom) other than as specified below must never be attempted for lifting the machine. If such a practice is unavoidable, please contact us or our sales service agency.

CAUTION

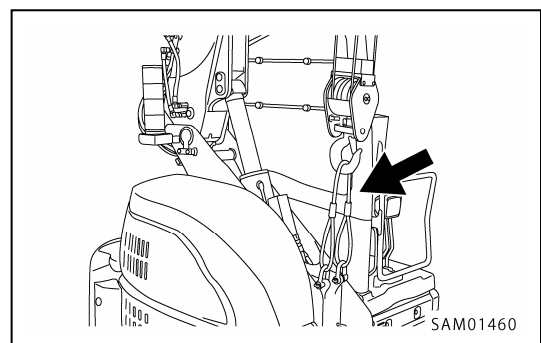
- Use two wire cables and two shackles of the same specifications when lifting up the machine.
 - Wire cable: Breaking load: 160 kN or more (6 × 37 - dia. 18 × 2.5 m)
 - Shackle: Using load: 2.5 t or more, Nominal size 20 (excluding SD type)
- When the machine is lifted in its boom raised posture, make sure that the hook block is in the regular stowage position.
See "Operation 3.17.2 Crane Operation for Regular Hook Block Stowage" for details.

When lifting the machine, carry out the operation on firm level ground as follows.

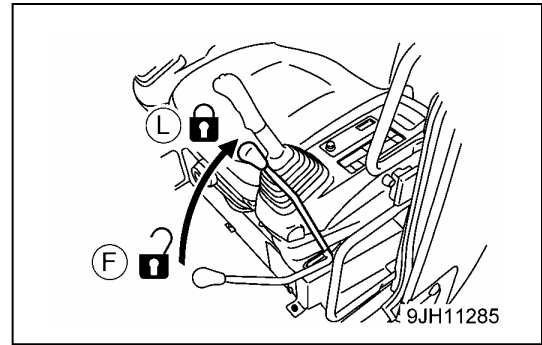
1. Retract the boom fully and raise it to an angle of 70 degrees.



2. See "Operation 3.17.2 Crane Operation for Regular Hook Block Stowage", and hitch the hook block to the stowage cable.



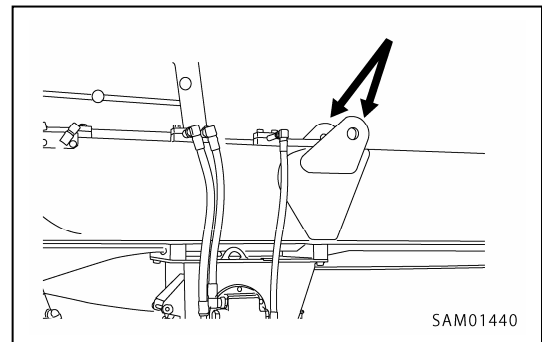
3. Stop the engine, and remove the key from the starter switch. Then check that there is nothing around the operator's compartment and get off the machine.
4. Set the lock lever securely to the LOCK position (L).
5. Lock the lock cover and cap.



6. Fix shackles to two brackets on the left and right sides of the boom, then attach the slinging wire cables.

NOTES

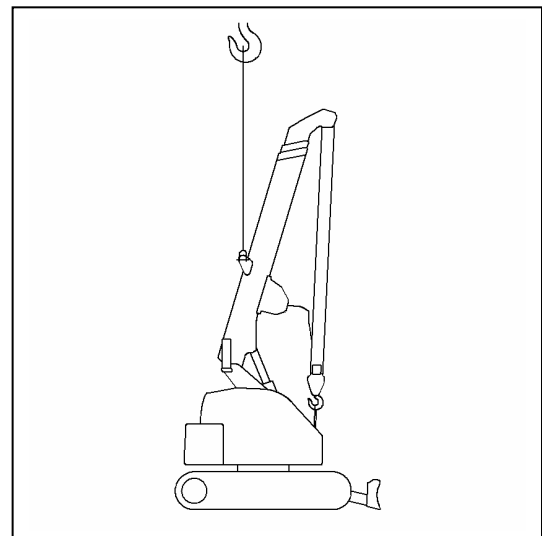
Apply appropriate pads to the locations in which the slinging wire cable may touch the machine, prior to lifting up.



7. Lift the machine slowly.

NOTES

- After lifting the machine just clear of the ground, check the condition of the hook and the lifting posture
- Verify that there has been no change in posture caused by the leakage from the hydraulic circuit on the derricking cylinder head side when the machine is hoisted.
- When the machine in the standard configuration is lifted, it leans about 0 degrees backward and about 3.5 degrees toward the operator's compartment side. This leaning angle may vary slightly in accordance with the boom angle and amount of fuel remaining.



6. HANDLING IN COLD WEATHER

6.1 PREPARING FOR LOW TEMPERATURE

In low temperatures, the machine may start to have some difficulty and the coolant may freeze. In this case, take the following actions.

FUEL AND LUBRICANTS

Change the fuel and oil to ones with low viscosity.

See "Inspection and Maintenance 7.1 Use of Fuel, Coolant and Lubricants According to Ambient Temperature" for the specified viscosity.

COOLING SYSTEM COOLANT

WARNING

- Antifreeze is toxic. Be careful not to get it in your eyes or on your skin. If it should get in your eyes or on your skin, wash it off with large amounts of fresh water and see a doctor at once.
- When changing the coolant or when handling coolant containing antifreeze that has been drained when replacing the coolant or repairing the radiator, you should employ a specialized contractor or contact us or our sales service agency. Antifreeze is toxic. Do not let it flow into drainage ditches or spray it onto the ground surface.
- Antifreeze is flammable. Do not bring any flame close. Do not smoke when handling antifreeze.

CAUTION

Never use antifreeze with ethanol or propanol-based antifreeze.

See "Inspection and Maintenance 10.3 Irregular Maintenance (Cleaning inside of cooling system)" for the cooling water replacement period and mixing rate of antifreeze.

BATTERY

WARNING

- The battery generates flammable gas. Do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is danger that the battery may explode.
- Battery electrolyte is toxic. Do not let it flow into drainage ditches or spray it on the ground surface.
- Battery electrolyte dissolves paint. If it sticks to the machine, wash it away with water immediately.

When the ambient temperature drops, the capacity of the battery will also drop.

If the battery charge ratio is low, the battery electrolyte may freeze. Maintain the battery charge as close as possible to 100%. Insulate it against cold temperature to ensure the machine can be started easily the next morning.

NOTES

Measure the specific gravity and calculate the charging rate from the following conversion table.

		Electrolyte temperature (°C)			
		20	0	–10	–20
Charging rate (%)	100	1.28	1.29	1.30	1.31
	90	1.26	1.27	1.28	1.29
	80	1.24	1.25	1.26	1.27
	75	1.23	1.24	1.25	1.26

AFTER THE DAYS WORK IS COMPLETED

To prevent mud, water, or the undercarriage from freezing and making it impossible for the machine to move on the following morning, observe the following precautions.

- Remove all the mud and water from the machine body.
In particular, wipe the hydraulic cylinder rods clean to prevent damage to the seal caused by mud, dirt, or drops of water from getting inside the seal.
- Park the machine on hard, dry ground.
If this is impossible, park the machine on boards. The boards prevent the tracks from freezing to the ground, and allow the machine to be moved the next morning.
- Open the drain valve and drain any water collected in the fuel system to prevent it from freezing.
- Completely fill the fuel tank. This minimizes moisture condensation in the tank when the temperature drops.
- The battery capacity drastically drops in low temperatures.
Cover the battery or remove it from the machine, store the battery in a warm place, and install it again the next morning.
- If the electrolyte level is low, add distilled water in the morning before beginning work.
Do not add water after the day's work to prevent diluted electrolyte in the battery from freezing during the night.

AFTER COLD WEATHER SEASON

When the season changes and the weather becomes warmer, do the following.

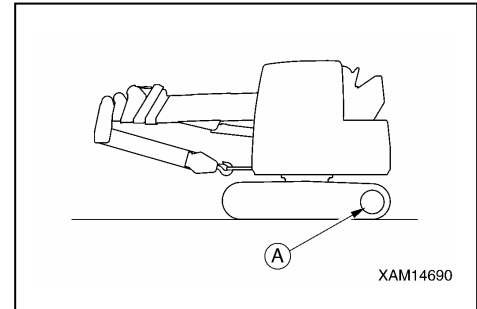
- Replace the fuel and oil for all parts with oil of the viscosity specified. For details, see "Inspection and Maintenance 7.1 Use of Fuel, Coolant and Lubricants According to Ambient Temperatures".

7. LONG TERM STORAGE

7.1 BEFORE STORING IT MACHINE

CAUTION

The machine should take the posture shown in the figure on the right during any long-term storage to protect the cylinder rod. See "Operation 3.6 Machine Travelling Posture" for travelling posture, (to prevent rust on the cylinder rod)



The correct practice for one month or longer, is as follows:

- Clean and wash all parts, then store the machine indoors.
If the machine has to be stored outdoors, select level ground and cover the machine with a sheet.
- Completely fill the fuel tank. This prevents moisture from collecting.
- Lubricate and change the oil before storing it.
- Coat the exposed portion of the hydraulic cylinder piston rod with grease.
- Disconnect the negative terminals of the battery and cover it or remove it from the machine and store it separately.
- If the temperature will go down to 0°C or below, add antifreeze. Contact us or our sales service agency for the mixing quantity of the antifreeze.

7.2 DURING STORAGE

⚠ WARNING

If it is necessary to perform rust-prevention operation whilst the machine is indoors, open the doors and windows to improve ventilation and prevent gas poisoning.

- During storage, operate and move the machine for a short distance once a month so that a new film of oil will coat moving parts. At the same time, also charge the battery.
- When operating the crane, wipe off all the grease from the hydraulic cylinder rods.

7.3 AFTER STORAGE

CAUTION

If the machine has been stored without carrying out the monthly rust-prevention operation, consult us or our sales service agency before using it.

When using the machine after long-term storage, do the following before using it.

- Remove the drain plug of the fuel tank, hydraulic oil tank, and engine oil pan to drain any water.
- Lubricate and change the oil before starting it.
- Wipe of the grease from the hydraulic cylinder piston rods.
- Remove the cover over the battery (install the battery to the machine if dismantled for storage). Check the electrolyte level and specific gravity, and then connect the battery cable from the negative side.
- Carefully perform the check before starting operation and warm-up operation. Carefully check the various parts of the machine.

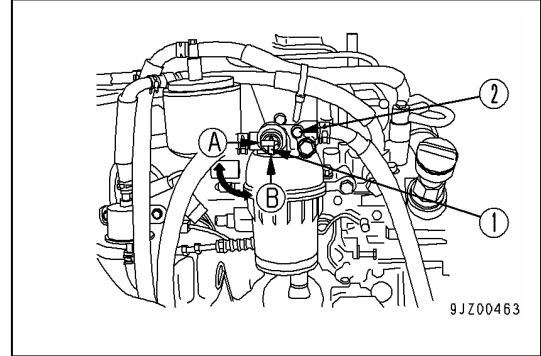
8. TROUBLES AND ACTIONS

8.1 RUNNING OUT FUEL

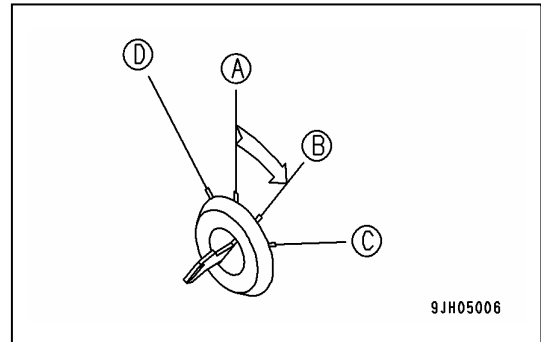
When starting the engine again after running out of fuel, fill with fuel, then bleed the air from the fuel system before starting the engine.

PROCEDURE FOR BLEEDING AIR

1. Completely fill the fuel tank with fuel.
2. Set handle (1) of the water separator to Open position (B).
3. Loosen air bleeding bolt (2) of the water separator by two to three turns.
4. Once the fuel flows without air bubbles from the air bleeding bolt (2), tighten air bleeding bolt (2).



5. Turn the starter switch to ON position (B) and return it to OFF position (A) after 10 to 15 seconds. The automatic air bleeding device allows bleeding air automatically.



8.2 PHENOMENA THAT ARE NOT FAILURES

Note that the following phenomena are not failures:

- When starting or stopping the swing, noise will be emitted from the brake valve.
- When going down a steep slope at low speed, a noise will be emitted from the travel motor.
- Some noise heard from around valves when boom is fully retracted and the boom telescoping cylinder is released at retracted position.
- Some noise heard from around valves when the boom derricking cylinder is relieved on the LOWER position.
- The over hoist alarm cancel switch sounds because of vibration during travelling. To stop the buzzer, press the "over hoist alarm cancel switch" of the moment limiter.

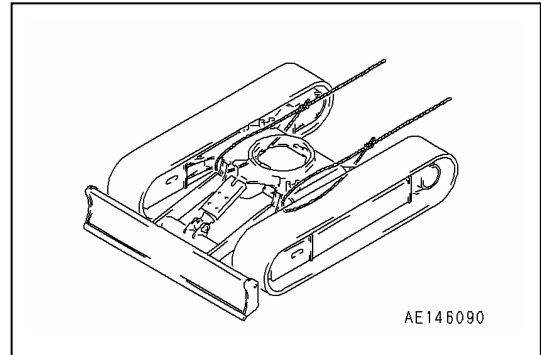
8.3 TOWING THE MACHINE

⚠ WARNING

- Wire cables used for towing the machine must be sufficiently durable for the towing weight of the machine.
- Do not apply any sudden load to the wire cable.

If pulling the machine out when it is stuck in mud or when towing a heavy object with the machine, pass wire cables for towing lengthwise through the track frame as shown in the figure on the right.

Put wooden blocks between the wire cables and the machine to prevent the cables causing damage to the machine.



8.4 DISCHARGED BATTERY

8.4.1 CAUTIONS IN BATTERY HANDLING

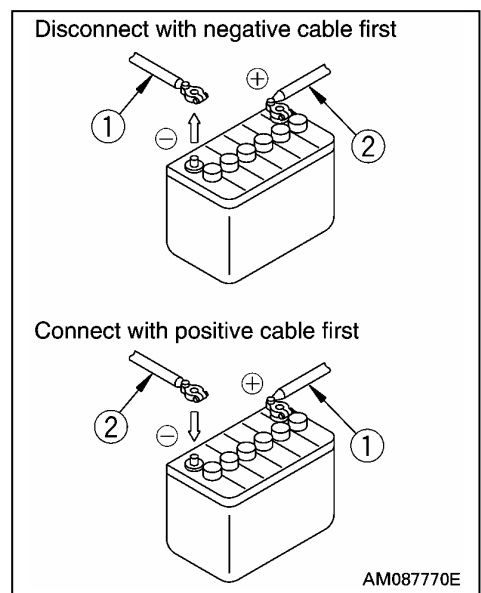
⚠ WARNING

- It is dangerous to charge a battery when it is mounted on a machine. Make sure that the battery is taken off of the machine before charging.
- When checking or handling the battery, stop the engine and turn the starter switch key to the OFF position.
- The battery generates hydrogen gas, so there is a hazard of explosion. Do not bring lit cigarettes near the battery, or do anything that will cause sparks.
- Battery electrolyte is diluted sulfuric acid, and it will eat away at your clothes and skin if it comes in contact.

If any battery electrolyte gets on your clothes or on your skin, immediately wash it off with a large amount of water.

If it gets in your eyes, wash it out with fresh water and consult a doctor.

- When handling batteries, always wear safety glasses and rubber gloves.
- When removing the battery, first disconnect the cable from the ground (normally the negative (-) terminal). When installing, install the positive (+) terminal first. If a tool touches the positive terminal and the chassis, there is a danger that it will cause a spark, so be extremely careful.
- If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion.
Install the terminals securely.
- When removing or installing the cables, check which is the positive (+) terminal and which is the negative (-) terminal.

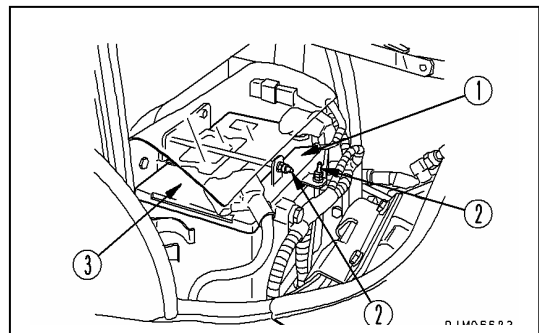


8.4.2 BATTERY REMOVAL AND INSTALLATION

CAUTION

**After securing the battery, check that it does not move.
If it moves, tighten it again securely.**

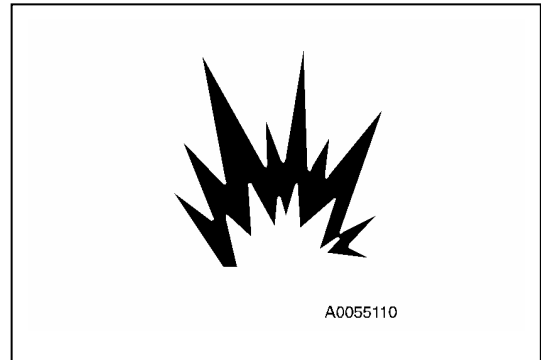
- When removing the battery, first disconnect the cable from the ground (normally the negative (-) terminal).
If a tool touches the positive terminal (+) and the chassis, there is danger that it will cause a spark, so be extremely careful.
- When installing the battery, connect the cable on the ground last.
- Securely fix the battery in the specified position. At this time, take care that the mounting holders will not touch the terminals.
- When replacing the battery, securely fix it with battery mounting holder (1).
Tightening torque of mounting nut (2)
3.92 to 5.88 Nm {0.5 to 0.6 Kgm}
- Place the battery top cover over battery (3) and secure it so that it will not roll up.
If the cover is damaged, replace it immediately.
- If chlorides are accumulated on the battery top or around the terminals, wash them away with water at about 40 degrees. Dry up and then install the wires.



8.4.3 CAUTIONS IN BATTERY CHARGING

When charging the battery, if the battery is not handled correctly, there is a hazard that the battery may explode. Always follow the instructions of "Operation 8.4.1 Cautions in Battery Handling" and the instruction manual accompanying the charger, and do the following.

- Flammable hydrogen gas is produced while the battery is charged. Accordingly, remove the battery from the machine, remove the battery caps, and charge in a well ventilated place.
- Tighten the battery caps securely. If any battery cap is damaged, replace it immediately.
- Set the voltage of the charger to match the voltage of the battery to be charged. If the correct voltage is not selected, the charger may overheat and cause an explosion.
- Connect the positive (+) charger clip of the charger to the positive (+) terminal of the battery, then connect the negative (-) charger clip of the charger to the negative (-) terminal of the battery. Be sure to attach the clips securely.
- Set the charging current to 1/10 of the value of the rated battery capacity; when carrying out rapid charging, set it to less than the rated battery.
If the charger current is too high, the electrolyte will leak or dry up, and this may cause the battery to catch fire and explode.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. The battery electrolyte may catch fire and explode.
- Do not use or charge the battery if the battery electrolyte level is below the LOWER LEVEL line. It can cause an explosion. Check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.



8.4.4 STARTING ENGINE WITH A BOOSTER CABLE

When starting the engine using a booster cable, do the following.

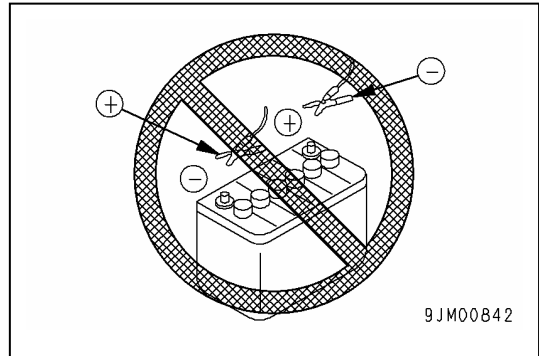
PRECAUTIONS FOR CONNECTING AND DISCONNECTING BOOSTER CABLE

⚠ WARNING

- When connecting the cables, never contact the positive (+) and negative (–) terminals.
- When starting the engine with a booster cable, always wear safety glasses and rubber gloves.
- Be careful not to let the normal machine and problem machine make contact with each other. The battery generates hydrogen gas, so an explosion may be caused by a spark near the battery.

Be careful not to make a mistake when connecting a booster cable. In the last connection (to the upper structure frame), a spark will be caused. Connect the cable to a spot as far away from the battery as possible. (However, do not connect the work equipment, since the current does not flow well through it.)

- When removing the booster cable, exercise good care so that the booster cable clips do not contact each other, or contact the chassis.



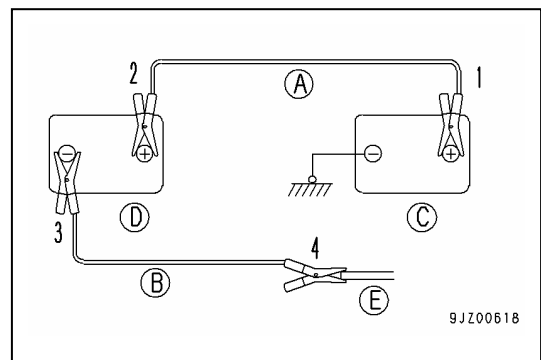
CAUTION

- The size of the booster cable and clip should be suitable for the battery size.
- The battery of the normal machine must be the same capacity as that of the engine to be started.
- Check the cables and clips for damage or corrosion.
- Connect the clips firmly.
- Check that the lock levers of both machines are set to the LOCK positions.
- Check that each lever is in the NEUTRAL position.

BOOSTER CABLE CONNECTION

Set both starter switches of the normal machine and problem machine to the OFF positions respectively and connect the booster cable in the numerical order shown in the following figure.

1. Connect the clip of booster cable (A) to the positive (+) terminal of battery (C) on the problem machine.
2. Connect the clip at the other end of booster cable (A) to the positive (+) terminal of battery (D) on the normal machine.
3. Connect the clip of booster cable (B) to the negative (–) terminal of battery (D) on the normal machine.
4. Connect the other clip of booster cable (B) to the upper structure frame (E) of the problem machine.



8.4.5 STARTING ENGINE

⚠ CAUTION

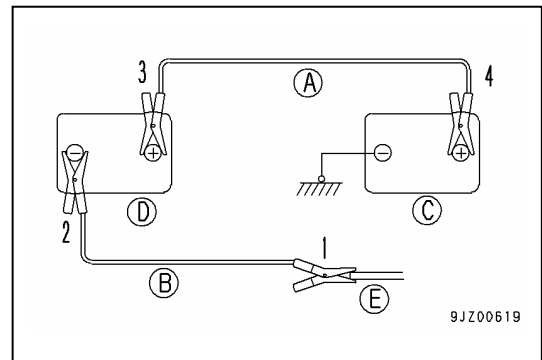
Check that the lock levers of the normal machine and problem machine are set to the LOCK positions. Also check that each control lever is in the NEUTRAL position.

1. Make sure the clips are firmly connected to the battery terminals.
2. Start the engine of the normal machine and run it at high idle speed.
3. Turn the starter switch of the problem machine to the START position and start the engine.
If the engine does not start at first, try again after two minutes or so.

BOOSTER CABLE DISCONNECTION

After the engine has started, disconnect the booster cables in the reverse of the order in which they were connected.

1. Remove one clip of booster cable (B) from the upper structure frame (E) of the problem machine.
2. Remove the clip of booster cable (B) from the negative (-) terminal of battery (D) on the normal machine.
3. Remove the clip of booster cable (A) from the positive (+) terminal of battery (D) on the normal machine.
4. Remove the clip of booster cable (A) from the positive (+) terminal of battery (C) on the problem machine.



8.5 OTHER TROUBLE

8.5.1 ELECTRICAL COMPONENTS

- Always contact us or our sales service agency when dealing with the items in parentheses in the "Actions to be Taken" column.
- For causes of problems or causes that are not listed below, contact us or our sales service agency for repair services.

Problem	Main Causes	Actions to be Taken
The lamp does not glow brightly even when the engine runs at high speed	• Defective wiring • Insufficient adjustment of fan belt tension • Broken fuse	• Check, repair loose terminal and disconnection • Adjust fan belt tension, see Maintenance for Every 500 Hours • Replace
Lamp flickers while engine is running		
Charge level monitor does not go out even when engine is running	• Defective alternator • Defective wiring	• Replace • Check, repair
Abnormal noise is generated from alternator	• Defective alternator	• Replace
Starter motor does not turn when starter switch is turned on	• Defective wiring • Insufficient battery charge • Broken fuse	• Check, repair • Charge • Replace
Pinion of starter motor keeps going in and out (chatters)	• Insufficient battery charge	• Charge
Starter motor cranks engine sluggishly	• Insufficient battery charge • Defective starter motor	• Charge • Replace
Starter motor disengages before engine starts	• Defective wiring • Insufficient battery charge	• Check, repair • Charge
Engine pre-heating monitor does not light up	• Defective wiring • Defective monitor	• Check, repair • Replace
Engine oil pressure monitor does not light up when engine is stopped (Starter switch at the ON position)	• Defective monitor • Defective oil pressure switch	• Replace • Replace

8.5.2 CHASSIS

- Always contact us or our sales service agency when dealing with the items in parentheses in the "Actions to be Taken" column.
- For causes of problems or causes that are not listed below, contact us or our sales service agency for repair services.

Problem	Main Causes	Actions to be Taken
Speed of travel, swing, boom, is slow	• Lack of hydraulic oil	• Add oil to reach the specified capacity, see Check Before Starting
Abnormal noise is generated by pump	• Clogged element in hydraulic tank strainer	• Clean, see Maintenance for 2000 Hours
Excessive rise in hydraulic oil temperature	• Lack of hydraulic oil • Loose fan belt	• Add oil to reach the specified capacity, see Check Before Starting • Adjust fan belt tension, see Maintenance for Every 500 Hours
Track comes off	• Track too loose	• Adjust track tension, see Irregular Maintenance
Abnormal wear of sprocket		

8.5.3 ENGINE

- Always contact us or our sales service agency when dealing with the items in parentheses in the "Actions to be Taken" column.
- For causes of problems or causes that are not listed blow, contact us or our sales service agency for repair services.

Problem	Main Causes	Actions to be Taken
Engine oil pressure monitor lights up	• Low oil level in oil pan (sucking air in) • Clogging oil filter cartridge • Oil leakage caused by defective tightening or breakage of oil pipe or pipe joint • Defective engine oil pressure sensor	• Add oil to reach the specified capacity, see Check Before Starting • Replace cartridge, see Maintenance for Every 500 Hours (• Check, repair) (• Replace sensor)
Steam spurts out from top of radiator (pressure valve)	• Lack or leakage of coolant • Loose fan belt • Dirt is accumulated in the cooling system	• Check and add coolant or repair, see Check Before Starting • Adjust fan belt tension, see Maintenance for Every 500 Hours • Change coolant, flush inside of cooling system, see Irregular Maintenance • Clean or repair, see Maintenance for Every 500 Hours (• Replace thermostat) • Tighten cap or replace packing (• Replace sensor)
Red range of engine water temperature gauge indicator lights up	• Clogged or bend of radiator fins • Defective thermostat • Loose radiator cap (When working at high altitude) • Defective coolant level sensor	(• Replace sensor) (• Replace thermostat)
White range of engine water temperature gauge indicator lights up after long operation	• Defective thermostat	(• Replace thermostat)
Engine does not start when starter motor is turned	• Lack of fuel • Air in fuel system • Water in fuel system • Defective fuel injection pump or nozzle • Starter motor cranks engine sluggishly • Pre-heating monitor does not light up • Defective compression • Defective valve clearance • Emergency stop switch is pressed	• Add fuel, see Check Before Starting • Repair place where air is sucked in, see Maintenance for Every 500 Hours • Drain water, see Irregular Maintenance or Check Before Starting (• Replace pump or nozzle) • See Electrical Components • See Electrical Components (• Adjust valve clearance) • Turn off emergency stop switch
Exhaust gas is white or blue	• Too much oil in oil pan • Improper fuel	• Drain oil to reach the specified capacity, see Check Before Starting • Change to the specified fuel
Exhaust gas sometimes turns black	• Clogging air cleaner element • Defective nozzle • Defective compression	• Clean or replace, see Irregular Maintenance (• Replace nozzle) (• See "Defective compression" above)
Combustion noise occasionally makes breathing sound	• Defective nozzle	(• Replace nozzle)
Abnormal noise generated (combustion or mechanical)	• Low grade fuel being used • Overheating • Damage inside muffler • Excessive valve clearance	• Change to the specified fuel • See above "Red range of engine water temperature gauge indicator lights up" (• Replace muffler) (• Adjust valve clearance)

8.5.4 MOMENT LIMITER

- Always contact us or our sales service agency when dealing with the items marked with ★ in the "Actions to be Taken" column.
- For causes of problems or causes that are not listed below, contact us or our sales service agency for repair services.

NOTES		
When an error code is displayed on the moment limiter display unit, see "Operation 2.3.10 Moment Limiter Causes of Errors and Actions to be Taken".		

★ When the moment limiter display is normal

Problem	Main Causes	Actions to be Taken
Crane operations does not stop even when overloaded	Defective relay circuit on the CPU card	★ Replace moment limiter transducer
	Defective emergency stop cancel switch	★ Check, replace emergency stop cancel switch
	Defective solenoid valve spool	★ Repair or replace solenoid valve
	Short circuit in the emergency power supply circuit	★ Check, replace solenoid valve wiring
Boom extending, boom lowering and hook hoisting operations not activated even when not overloaded	Defective wiring between the moment limiter transducer and solenoid valve	★ Check, repair, or replace wiring between moment limiter transducer and solenoid valve
	Defective solenoid valve coil or spool	★ Repair or replace solenoid valve

8.5.5 OVER HOIST DETECTOR

- Always contact us or our sales service agency when dealing with the items marked with ★ in the "Actions to be Taken" column.
- For causes of problems or causes that are not listed below, contact us or our sales service agency for repair services.

★ Boom extending or hook hoisting operation does not stop even when over hoisted

Problem	Main Causes	Actions to be Taken
Boom extending or hook hoisting operation does not stop even when over hoisted, but buzzer sounding	Short circuit in the emergency power supply circuit	★ Check, replace solenoid valve wiring
	Defective hook stowage switch	★ Check, replace hook stowage switch
	Defective ground cable	★ Repair or replace ground cable
Boom extending or hook hoisting operation does not stop even when over hoisted, but buzzer does not sound	Defective over hoist detector	★ Check or replace over hoist detector

★ **Boom extending or hook hoisting operation not activated even when not over hoisted**

Problem	Main Causes	Actions to be Taken
Boom extending or hook hoisting operation not activated even when not over hoisted, but buzzer sounding	Defective over hoist detector	★ Check, replace over hoist detector
	Breakage of over hoist detector wiring or entanglement of the wiring	★ Check, repair, or replace over hoist detector wiring
	Loss of over hoist detector weight	★ Check, replace over hoist detector weight
	Defective wiring between the moment limiter transducer and over hoist detector	★ Check, repair, or replace wiring between moment limiter transducer and over hoist detector
Boom extending or hook hoisting operation not activated even when not over hoisted However, buzzer does not sound.	Defective solenoid valve coil or spool	★ Repair or replace solenoid valve
	Defective wiring between the moment limiter transducer and solenoid valve	★ Check, repair, or replace wiring between moment limiter transducer and solenoid valve

INSPECTION AND MAINTENANCE

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1. PRECAUTIONS REGARDING MAINTENANCE

A thorough understanding of inspection and maintenance items is required in order to efficiently carry out inspection and maintenance tasks that contribute to the safe use of this machine.

WARNING

- **Do not perform any inspection or maintenance tasks that are not described in this manual. Potentially serious accidents or machine failure may occur if certain tasks are performed at the discretion of the individual.**
In the event that it is not possible for a judgment to be made on the severity of a failure or malfunction, contact us or our sales service agency to request repairs.
- **In the event that a failure or malfunction is observed while a machine is operating, or is discovered during an inspection, report it to your employer or supervisor immediately. Contact us or our sales service agency to request repairs accordingly.**
- **Inspection and maintenance tasks should be performed with the machine placed on firm level ground.**

CHECK THE SERVICE METERS

Read the service meters daily to check for any maintenance items that have reached the obligatory maintenance period.

USE GENUINE PARTS FOR REPLACEMENT

Always use genuine Maeda parts as specified in the parts catalogue when replacing parts.

USE GENUINE GREASE

Always use genuine recommended grease. The viscosity of the grease must conform to specifications according to ambient temperature.

USE CLEAN OIL AND GREASE

Always use clean oil, grease, and containers to keep out impurities.

USE CLEAN WINDOW WASHER FLUID

Always use automobile window washer fluid, and be careful not to let any dirt get into it.

KEEP THE MACHINE CLEAN

Keep the machine clean to facilitate detection of a malfunction. In particular, keep grease nipples, breather, and oil level gauge (oil access cap) clean to prevent the ingress of impurities.

HANDLE WATER AND OIL AT ADEQUATE TEMPERATURE

Drainage, drain oil, and the oil filter will still be very hot immediately after the machine comes to a stop. For safety reasons, remove drainage, drain oil, and the filter only after they have cooled sufficiently. On the other hand, if the oil is cold, warm it to approximately 40 degrees C before draining it.

CHECK DRAIN OIL AND OIL FILTER

When replacing the oil and filter, check the drain oil and oil filter to make sure there is not an excessive amount of metal powder or foreign objects present.

CAUTIONS REGARDING LUBRICATION

Do not remove the strainer for lubrication purposes if it is attached to the filler port.

PROTECT OIL FROM IMPURITIES

Be careful to keep dirt and dust out of the oil when inspecting and replacing the oil.

ATTACH A WARNING TAG

When draining coolant and oil, always remove the starter switch key to prevent the engine from accidentally starting. In addition, be sure to attach a warning tag to the work equipment control lever.

FOLLOW SAFETY PRECAUTIONS

Safety precautions provided on the machine should always be followed when using the machine.

CAUTIONS REGARDING WELD REPAIR

- Power off the machine. (Turn OFF the starter switch.)
- Do not continuously apply a voltage of 200V or greater.
- Ground the machine within one meter of the welding point.
- Be sure to disconnect the connectors of the moment limiting display unit and the moment limiting converter.
- Remove the negative terminal (-) of the battery.
- Make sure no sealing or bearing is present between welding and grounding points.
There is a possibility that sparks will damage the sealing if this warning is ignored.
- Do not ground around the boom pin or the hydraulic cylinder.
There is a possibility that sparks will damage the plated section if this warning is ignored.

KEEP FROM FLAME

Always clean the parts with noncombustible cleaning agent or light oil.

Keep the machine away from open flames when using light oil.

KEEP THE ATTACHMENT SURFACE CLEAN

Be sure to clean the attachment surface after removing a part to which an O-ring and gasket sealing are attached and replace the part with a new one.

Be sure to attach the O-ring and gasket again after cleaning.

EMPTY YOUR POCKETS

If you have to bend forward over the machine while the cover is open to carry out inspection and maintenance tasks, always empty your pockets beforehand.

ASSURE SAFE UNDERCARRIAGE

When operating the crane in a rocky location, check to see that the undercarriage is not damaged and that the nuts and bolts are not loose, cracked or suffering from abrasion. Loosen the tension of the crawler tread to a greater degree than usual.

CAUTIONS REGARDING MACHINE WASHING

- Do not direct a jet of steam at electrical parts or connectors.
- Keep the operation panel dry. In particular, the underside of the operator's seat and the area around the battery must be protected from water.
- Wash the machine with a clean cloth to rinse off any dirt or dust.

PRE- AND POST-WORK INSPECTION

Before operating the crane in muddy water, rain, snow or on the seashore, always check plugs and valves for looseness. After finishing the work, wash the machine and then check all the units for cracks and damage, and check that all nuts and bolts are tight and secure.

Carry out greasing in advance. Grease the work equipment pins that are submerged in muddy water on a daily basis.

CAUTIONS REGARDING WORKING AT A DUSTY SITE

The following precautions should be observed when working at a dusty site.

- When checking or replacing oil, move the machine to a clean location to avoid contamination.
- Check the air cleaner frequently to ensure it does not become clogged.
- Clean the radiator core more frequently to prevent it from becoming clogged.
- Clean or replace the fuel filter more frequently.
- Be sure to clean the electrical parts, especially the starter and alternator, to protect them from dust.

DO NOT MIX OILS

Never use or mix different types of oil from different manufacturers together under any circumstances.

When replacing the currently used oil, be sure to replace all of it with new oil.

Always use genuine Maeda parts when replacing parts.

2. BASIC MAINTENANCE

HANDLING OIL

- Oil is used under extremely harsh conditions (high temperature, high pressure) in the engine and working devices, which causes the oil to deteriorate over time.
Always use oil that meets the requirements stated in the operating manual, such as those for grade and operating temperature.
Be sure to carry out periodic replacement of oil irrespective of contamination in the oil.
- To a machine, oil is the equivalent of human blood. Exercise due caution when handling oil, keeping impurities (such as water, metal powder or dust) out of the oil. Most mechanical failures are attributed to the existence of impurities.
Extra caution is required to prevent impurities from entering the system when storing or lubricating the machine.
- Do not mix the oil with other oils of different grades or brands.
- The quantity of oil used for refill purposes must conform to the level specified.
Failure to add an adequate quantity can lead to machine failure.
- In the event that oil used in the working device turns cloudy, potential intrusion of moisture or air into the oil may be suspected.
Contact us or our sales service agency.
- When replacing oil, always replace the relevant filter as well.
- Do not use any hydraulic oil that has not been recommended by us. Failure to follow this instruction may cause the filters to become clogged. A small amount of oil remaining in piping and cylinders is not likely to cause problems even if mixed with other oil.

HANDLING FUEL

CAUTION

Always use diesel oil for the fuel.

To ensure good fuel consumption and exhaust gas characteristics, the engine mounted on this machine uses a high-pressure fuel injection device. This device requires high-precision parts and high-level lubricating properties. If, therefore, low viscosity fuel with low lubricating capabilities is used, its durability may be considerably degraded.

- The fuel pump is a precision item of equipment that becomes inoperative if fuel containing moisture or impurities is used.
Extra caution is required to prevent impurities from entering the system when storing or lubricating the machine.
- Do not remove the strainer of the filler port when replenishing fuel.
- Always use fuel that meets the requirements stated in the operating manual, such as those for grade and operating temperature.
- Ensure that the fuel tank is refilled after finishing the day's work to prevent condensation of the humid air inside the fuel tank. Resulting in moisture entering the fuel tank.
- Drain deposits and water out of the fuel tank before starting the engine or approximately 10 minutes after replacing the fuel.
- The air should be released from the circuit when the machine runs out of fuel or when a fuel filter is replaced.
- Clean the tank and fuel system if any foreign objects have entered the fuel tank.

STOCKING AND STORAGE OF OIL AND FUEL

- Stock and store oil and fuel indoors to keep impurities such as moisture or dust out of them.
- If oil or fuel have to be stored for long periods in drums, lay the drums down so that their taps is below the surface of the fuel (to prevent moisture from entering). Be sure to cover the drums with waterproof sheets if storing them outdoors.
- To prevent deterioration of oil and fuel resulting from long-term storage, employ the first-in first-out system for using oil and fuel.

HANDLING GREASE

- Grease is designed to prevent the joint from experiencing a backlash and generating noises.
- Any nipple that is not described in the Periodic Maintenance chapter is used for overhauls, and therefore does not require the grease to be replaced.
Only grease the nipple if long-term use may hinder its smooth characteristics.
- Wipe off any old grease that has been squeezed out after greasing.
When wiping away grease extra care is required for adhesion of sand or dust will accelerate the wearing away of the rotating part.

HANDLING THE FILTER

- A filter is an extremely important part that keeps major equipment free from impurities in oil, fuel, and the air circuit, which prevent associated failures from occurring. Periodic replacement of the filter is required in accordance with the operating manual.
The replacement period should be shortened in response to harsh operating environments as well as the oil and fuel (sulfur content) used.
- Do not reuse any washed filters (cartridge type) under any circumstances.
- After replacing an oil filter, check the old filter for the existence of metal powder.
If any metal powder is discovered on the used filter, contact us or our sales service agency.
- Regarding the replacement filter, always unpack it immediately before using it.
- Always use genuine Maeda filters.

HANDLING COOLANT

- River water contains a large amount of calcium and impurities. Use of river water will result in water sludge accumulating in the engine and radiator, which will cause a heat exchange error and lead to overheating.
Do not use any impure water.
- When using antifreeze, be sure to follow the precautions stated in the operating manual.
- Keep antifreeze away from open flames. Antifreeze is a flammable solution.
- The mixing proportion of antifreeze varies with outside air temperature.
See "Inspection and Maintenance 10.3 Irregular Maintenance (Cleaning inside of cooling system)" for the mixing proportions.
- In the event of overheating, replenish coolant when the engine is cold.
- Insufficient coolant may cause overheating and corrosion in the water-cooling circuit due to aeration.

HANDLING ELECTRICAL PART

- Current may leak if the electrical parts are wet or have damaged coatings, which will cause the machine to malfunction. Exercise due caution when handling the electrical parts.
- Inspection and maintenance tasks include the checking of belt tension, belt damage, and battery fluid level.
- Never remove and disassemble equipment (electrical parts) from the machine.
- Only optional electrical parts that accompany the machine can be installed.
- Keep electrical parts away from water when the machine is being washed or used in the rain.
- When using the machine on the seashore, keep electrical parts free of water and impurities to prevent corrosion.

HANDLING HYDRAULIC EQUIPMENT

- Hydraulic equipment will be very hot during and immediately after operation. Hydraulic equipment operates under high pressure.

The following precautions should be observed when carrying out inspection and maintenance tasks on hydraulic equipment.

- Place the machine in the travelling position on a level surface to reduce the pressure on the cylinder circuit.
- Be sure to stop the engine.
- Hydraulic oil and lubricating oil will be very hot and under high pressure immediately after equipment comes to a stop. Carry out inspection and maintenance tasks only after the oil temperature has cooled to a safe level. Internal pressure may still be exerted despite the temperature drop. When removing the plugs, screws and hose joints, stand aside and loosen them gradually while releasing internal pressure.
- Be sure to release the internal pressure by releasing air from the hydraulic tank before carrying out inspection and maintenance tasks of the hydraulic circuit.
- Inspection and maintenance tasks include checking the level of hydraulic oil and replacing filters and hydraulic oil.
- Check the O-ring for scratches when removing the high-pressure hose. If damaged, replace the O-ring.
- It will be necessary to bleed air from the hydraulic circuit after the following tasks are carried out: replacement and cleaning of the hydraulic oil filter element and strainer, repair and replacement of hydraulic equipment, and replacement of hydraulic piping.

3. LEGAL INSPECTION

If periodic inspection for machine safety assurance is stipulated by laws and regulations of your country, perform inspection complying with the inspection items listed below.

1. Make sure all safety devices are operating correctly.
2. Check the hoisting accessories including the hook block for any abnormalities.
3. Check the winch wire rope end and wire clip for damage.
4. Replace the wire rope promptly if it is damaged.
5. Check the hydraulic oil hose for oil leaks and friction flaws on the surface. Replace the hose if any surface flaws are detected.
6. Check the structure, including the boom for cracks and deformations.
7. Check that all mounting bolts and joints are tight and secure.
8. Check whether the crane operates and stops correctly during telescoping, derricking, and when swinging the boom.

If any checks uncover a malfunction, contact us or our sales service agency.

4. PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

To use the machine safely for an extended period of time, you must periodically replace the safety critical and fire prevention-related parts listed in the table of important parts.

The quality of these parts can change as time passes and they are likely to wear out or deteriorate. However, it is difficult to determine the extent of wear or deterioration when periodic maintenance checks are carried out. Hence, it is necessary to replace them with new ones regardless of their condition after a certain period of use. This is important to ensure that these parts maintain their full performance levels at all times.

Furthermore, should anything abnormal be found on any of these parts, replace it with a new one even if the periodic replacement time for the part has not yet been reached.

If any of the hose clamps show signs of deterioration such as deformation or cracking, replace the clamps at the same time as the hoses.

Also, perform the following checks for the hydraulic oil hoses that are not due for periodic replacement. If any abnormalities are discovered, tighten loose clamps and replace defective hoses, as required.

- When replacing hoses, always replace O-rings and gaskets at the same time.
- When replacing safety critical parts, contact us or our sales service agency.

SAFETY CRITICAL PARTS LIST

No.	Safety critical parts for periodic replacement	Quantity	Replacement cycle
1	Fuel hose (fuel tank – water separator)	1	Every two years or 4000 hours, whichever comes first
2	Fuel hose (water separator – feed pump)	1	
3	Fuel hose (feed pump – fuel filter)	1	
4	Fuel hose (fuel filter – injection pump)	1	
5	Fuel hose (fuel filter – fuel cooler)	1	
6	Fuel hose (fuel cooler – fuel tank)	1	
7	Spill hose (fuel filter – injection pump)	1	
8	Spill hose (between nozzles)	2	
9	Spill hose (nozzle – injection pump)	1	
10	Spill cap	1	
11	Hydraulic oil hose (main pump suction hose)	2	
12	Hydraulic oil hose (main pump delivery hose)	4	
13	Hydraulic oil hose (boom telescoping cylinder hose)	2	
14	Hydraulic oil hose (boom derricking cylinder hose)	2	
15	Hydraulic oil hose (winch motor hose)	6	
16	Hydraulic oil hose (swing motor hose)	2	
17	Seat belt	1	Replace every 3 years

All damaged parts found during the inspection should immediately be changed.

5. CONSUMABLES

Consumables such as filter elements and wire ropes are to be replaced during each instance of periodic maintenance, or prior to the wear limit being reached.

Correct replacement of consumables delivers increased economy of machine use.

Always use genuine Maeda parts when replacing parts.

See the parts catalogue for part numbers when ordering parts.

LIST OF CONSUMABLES

Part	Replacement cycle
Engine oil filter	Every 500 hours
Water separator	As required
Hydraulic oil filter	Every 250 hours
Main fuel filter	Every 500 hours
Air cleaner element	As required
Cylinder gasket	★ Every 3 years
Boom slide plate	Every 3 years
Part	Recommended inspection period
Winch wire rope	As required or every 3 years
Boom extending wire rope	As required or every 3 years
Boom retracting wire rope	As required or every 3 years

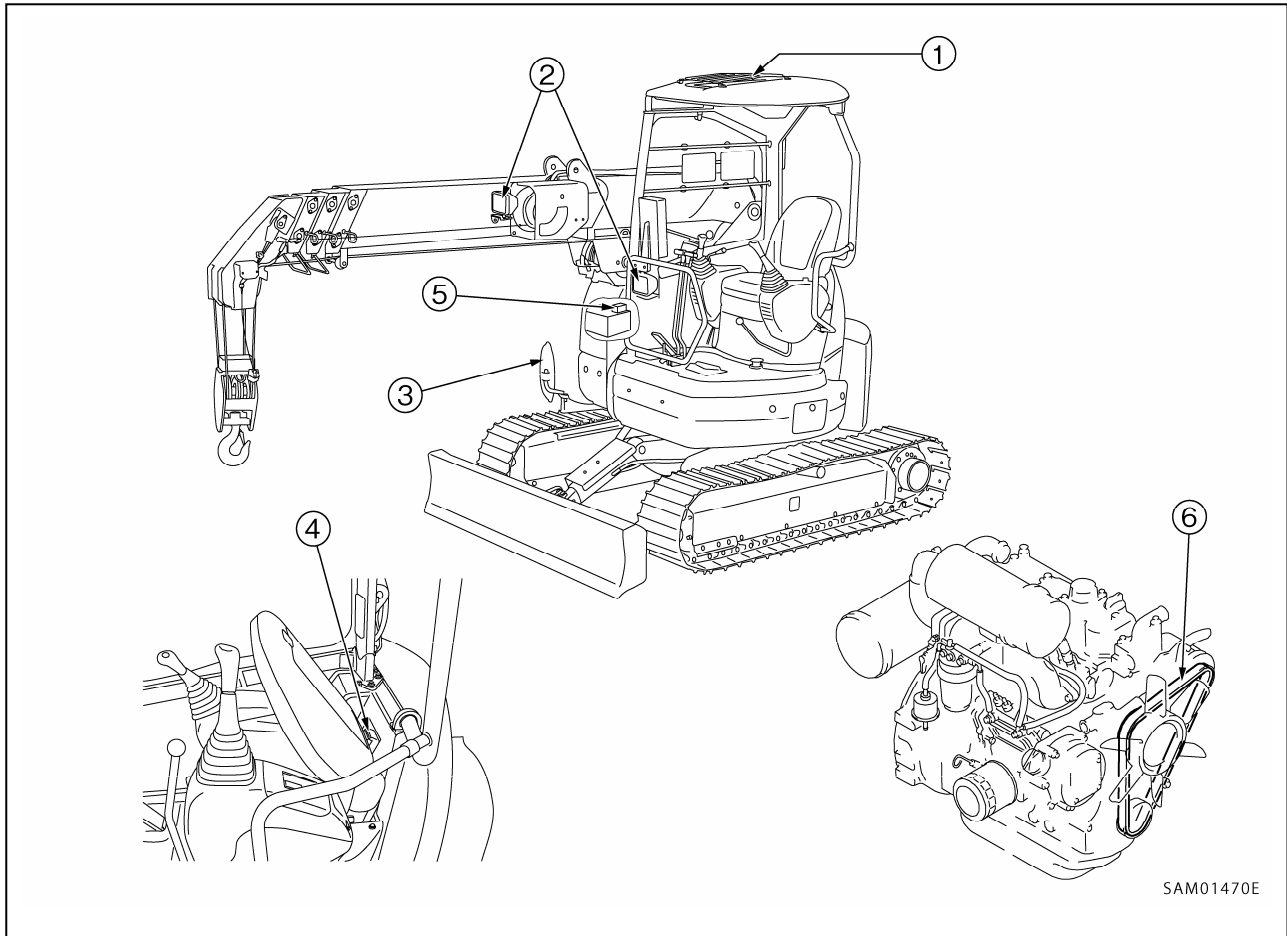
All damaged parts found during the inspection should immediately be changed.

* The cycles marked with a star "★" in replacement cycle are time related (not working hours).

** When replacing parts marked with a star "★", contact us or our sales service agency.

6. OTHER COMPONENTS

When ordering parts, please inform us or our service agency of your machine number to confirm the correct part numbers.



LIST OF OTHER PARTS

- | | |
|---------------------------|------------------------|
| (1) Clear plate | (4) Fuse |
| (2) Working lamp assembly | (5) Fusible link (45A) |
| (3) Mirror | (6) Fan belt |

7. USE OF FUEL, COOLANT AND LUBRICANT

- In order to keep your machine in the best condition for long periods, it is recommended that the oil, grease and coolant specified in this operating manual be used.
- Failure to use recommended oil(s) may result in reduced life or excess wear of the engine, power train and cooling system.
- Commercially available lubricant additives may degrade oil performance. Maeda does not recommend any commercially available lubricant additive.
- Use the oil recommended according to the ambient temperature shown in the chart below.
- Specified capacity refers to the total amount of oil including the oil in the piping. Refill capacity refers to the amount of oil needed to refill the system during the inspection and maintenance task.
- When starting the engine at temperatures below 0 degrees C, be sure to use the recommended multi-grade oil even if the ambient temperature may rise during the course of the day.

7.1 USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURES

Use the oil selectively according to the ambient temperature shown in the chart below.

Reservoir	Fluid type	Selective use depending on ambient temperature (degree C)		Recommended genuine Maeda oil
		Lowest	Highest	
Engine oil pan	Engine oil	-20	10	SAE 10WCD
		-20	40	SAE 10W30CD
		-15	40	SAE 15W40CD
		0	40	SAE 30WCD
Final drive case	Power train oil (Note 1)	-20	40	SAE 30
Hydraulic system	Engine oil	-20	40	SAE 10WCD *
Winch motor reduction gear case	Gear oil	-20	40	ISO VG320
Cooling system	Supercoolant Dilution water (Note 2)	-30	40	AF-NAC
Fuel tank	Diesel oil	-30	20	ASTM** Grade No.1-D S16 ASTM Grade No.1-D S500
		-10	40	ASTM Grade No.2-D S15 ASTM Grade No.2-D S500

* Be sure to use our recommended diesel engine oil for a hydraulic system: SAE 10WCD.

“JX Nippon Oil & Energy, HDS-3 10W” is adopted for a hydraulic oil system as factory default.

**ASTM: American Society of Testing and Material

Reservoir	Specified capacity (Liters)	Refill capacity (Liters)
Engine oil pan	7.4	6.9
Final drive case (for each on the left and right)	0.6	0.6
Hydraulic system	54	28.5
Winch motor reduction gear case	0.75	0.75
Cooling system	5.5	–
Fuel tank	42	–

CAUTION

Always use diesel oil for the fuel.

To ensure good fuel consumption and exhaust gas characteristics, the engine mounted on this machine uses a high-pressure fuel injection device. This device requires high-precision parts and high-level lubricating properties. If, therefore, low viscosity fuel with low lubricating capabilities is used, its durability may be considerably degraded.

Note 1: Power train oil has different properties from engine oil. Be sure to use the recommended oils.

Note.2: Supercoolant (AF-NAC)

- (1) Supercoolant has the important function of acting as an anticorrosion liquid as well as antifreeze.
Even in the areas where freezing is not an issue, the use of antifreeze coolant is essential.
Maeda machines are supplied with Supercoolant AF-NAC. Supercoolant AF-NAC has excellent anticorrosion, antifreeze, and cooling properties and can be used continuously for 2 years or 4000 hours. Supercoolant AF-NAC is strongly recommended whenever available.
- (2) For details about the ratio when diluting Supercoolant with water, see "Maintenance 10.3 Irregular Maintenance (Clean the inside of cooling system)".
Supercoolant AF-NAC may be supplied in premix. In this case, always top up with premix solution. (Never dilute with water)
- (3) To maintain the anticorrosion properties of Supercoolant AF-NAC, always keep the density of Supercoolant above 30%.

8. TIGHTENING TORQUE SPECIFICATIONS

8.1 STANDARD TIGHTENING TORQUE LIST

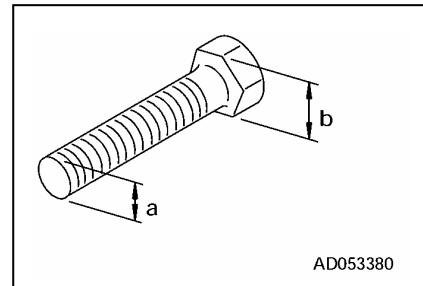
⚠ CAUTION

Tightening by using an unspecified torque may cause damage or a tightened item to become loose, which may lead to problems or a malfunction. Be extremely careful when tightening any item.

Torque the metric nuts and bolts to the values shown in the following table.

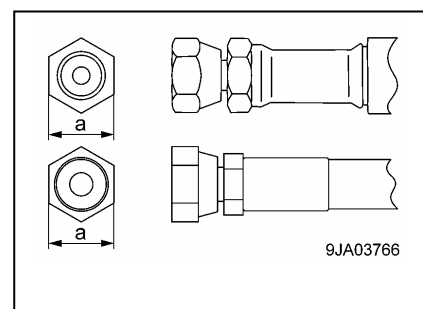
Adequate tightening torque is determined with respect to the width across flat (b) of the bolt or nut.

Thread diameter of bolt a (mm)	Width across flats b (mm)	Tightening torque {Nm (kgfm)}	
		Target value	Range
6	10	13.2 (1.35)	11.8 - 14.7 (1.2 - 1.5)
8	13	31.0 (3.20)	27.0 - 34.0 (2.8 - 3.5)
10	17	66.0 (6.70)	59.0 - 74.0 (6.0 - 7.5)
12	19	113 (11.5)	98.0 - 123 (10.0 - 12.5)
14	22	172 (17.5)	153 - 190 (15.5 - 19.5)
16	24	260 (26.5)	235 - 285 (23.5 - 29.5)
18	27	360 (37.0)	320 - 400 (33.0 - 41.0)
20	30	510 (52.3)	455 - 565 (46.5 - 58.0)
22	32	688 (70.3)	610 - 765 (62.5 - 78.0)
24	36	883 (90.0)	785 - 980 (80.0 - 100)
27	41	1295 (132.5)	1150 - 1440 (118 - 147)
30	46	1720 (175.0)	1520 - 1910 (155 - 195)
33	50	2210 (225.0)	1960 - 2450 (200 - 250)
36	55	2750 (280.0)	2450 - 3040 (250 - 310)
39	60	3280 (335.0)	2890 - 3630 (295 - 370)



Torque the hoses to a value shown in the following table.

Thread diameter of bolt No.	Width across flats a (mm)	Tightening torque {Nm (kgfm)}	
		Target value	Range
02	19	44 (4.5)	35 - 54 (3.5 - 5.5)
03	22	74 (7.5)	54 - 93 (5.5 - 9.5)
	24	78 (8.0)	59 - 98 (6.0 - 10.0)
04	27	103 (10.5)	84 - 132 (8.5 - 13.5)
05	32	157 (16.0)	128 - 186 (13.0 - 19.0)
06	36	216 (22.0)	177 - 245 (18.0 - 25.0)



9. INSPECTION AND MAINTENANCE LIST

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10 MAINTENANCE PROCEDURES

10.1 INITIAL 500-HOUR MAINTENANCE (ONLY FOR FIRST TIME MAINTENANCE OF A NEW MACHINE)

Carry out the following maintenance tasks when performing maintenance on a new machine for the first time after operating it for 500 hours.

- REPLACING OIL IN WINCH MOTOR REDUCTION GEAR CASE

For the maintenance procedure, see maintenance every 1000 hours.

10.2 CHECKING BEFORE OPERATION

Inspections specified in this section are required to be completed prior to starting an engine at the start of the day.

For the items used in the Checking Before Operation, see "9. Inspection and Maintenance List."

For the applicable parts of each of the inspection items listed in the Checking before Operation and the inspection procedure, see "Operation 3.1 Checking/Adjusting before Starting Engine."

10.3 IRREGULAR MAINTENANCE

CHECKING, CLEANING AND REPLACING AIR CLEANER ELEMENT

WARNING

- Checking and cleaning the air cleaner while the engine is running may allow dirt and dust to enter the engine, and subsequently cause damage. Be sure to work after the engine is stopped.
- Using compressed air can lead to personal injury due to scattered litter. Always use protective glasses, a dust mask, and other protective equipment.

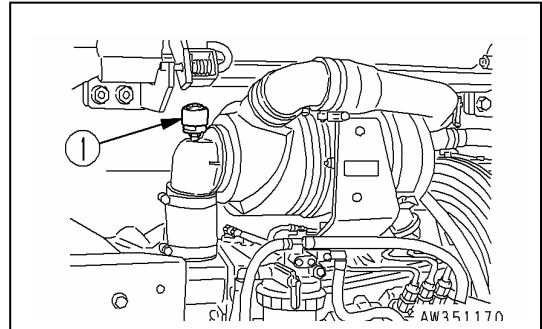
INSPECTION

If the red piston has appeared in the transparent portion of the dust indicator (1), clean the air cleaner element.

CAUTION

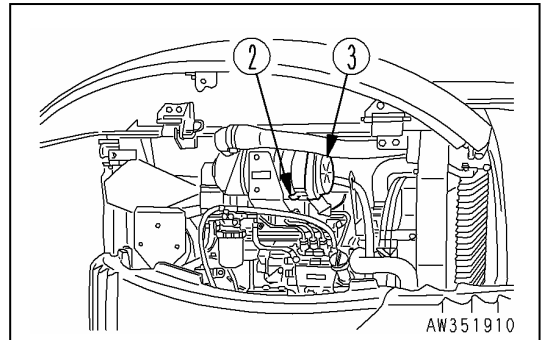
Do not clean the air cleaner element before the red piston appears in the transparent portion of the dust indicator (1).

If the air cleaner element is cleaned frequently before the red piston appears, the air cleaner will not provide the originally intended level of performance, which will reduce the level of cleaning efficiency.

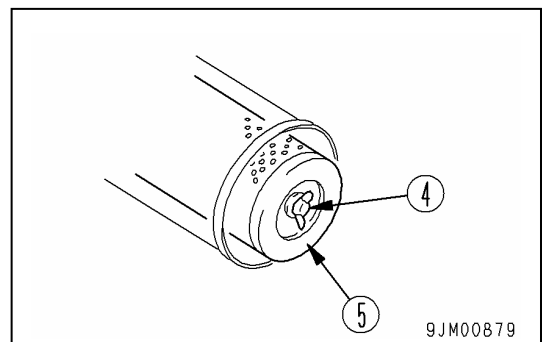


CLEANING AND REPLACING ELEMENT

1. Open the engine hood in the rear side of the machine, remove clip (2) and remove dust cup (3).
2. Remove dust in dust cup (3), then clean the inside.



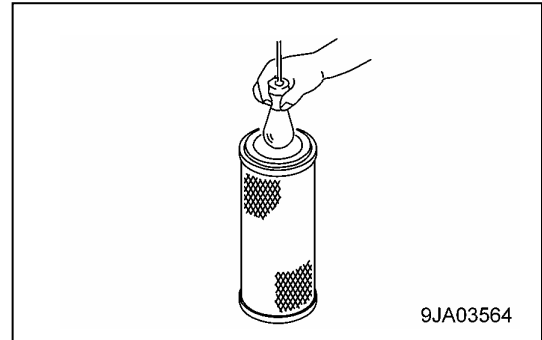
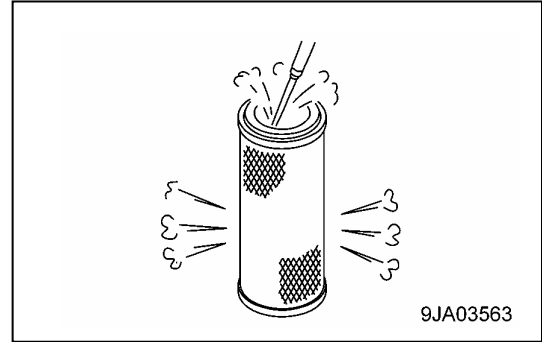
3. Remove wing nut (4) and remove element (5). Then, using a piece of clean cloth or tape, cover the air connector side in the back of the body of the air cleaner to prevent any dust from entering.
4. Clean the inside of the body of the air cleaner.



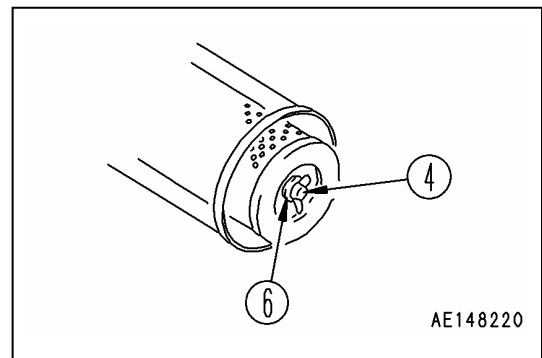
5. Blow dry compressed air (Max. 0.69 MPa{7 kg/cm²}) from the inside of the outer element along its folds. Then, blow the compressed air from the outside along the folds, and blow it again from the inside.
 - 1) Replace the element after it has been cleaned five times or used for one year.
 - 2) Even when the cleaning frequency of the element is less than five times, you must replace it if the dust indicator turns red.
6. After cleaning, if any small holes or thinner parts are found on the element when it is checked by shining a light through it, replace the element.

CAUTION

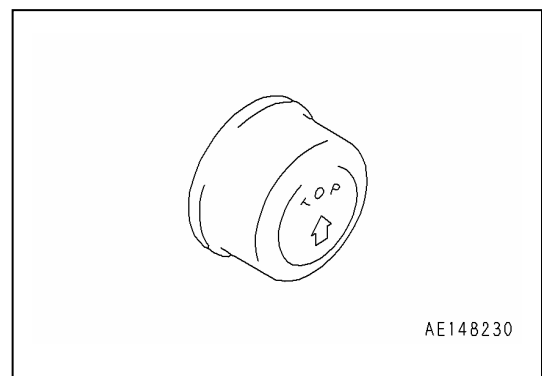
When cleaning the element, do not hit it or bump it against nearby objects. Do not use an element whose folds, gasket or seal are damaged. Wrap unused elements and store them in a dry place.



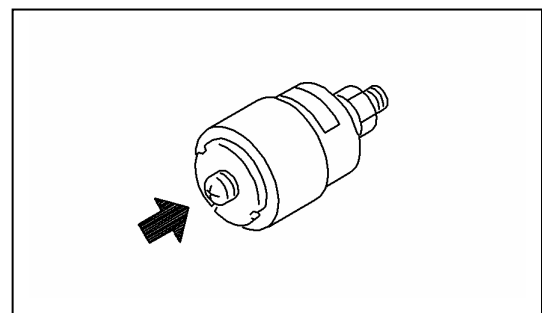
7. Remove the cloth or tape-made cover currently applied to the air connector side in the back of the body of the air cleaner.
8. Set the cleaned element and fix it using wing nut (4).
9. If seal washer (6) is damaged or the screw of wing nut (4) is damaged, replace it with a new one.



10. After turning the arrow on dust cup (3) up, place it on the body of the air cleaner and then fix using clip (2).



11. Press the button of dust indicator (1) to return the red piston to its original position.



CLEANING INSIDE OF COOLING SYSTEM

WARNING

- Immediately after the engine is stopped, the coolant will still be hot and the radiator will still be under high internal pressure. If the cap is removed to drain the coolant in this condition, you may be burned. Wait for the temperature to fall, then turn the cap slowly to release the pressure.
- Start the engine and carry out cleaning. When standing up or leaving the operator's seat, set the lock lever to the LOCK position.
- For the engine starting procedure, see "Operation 3.1 Checking/Adjusting before Starting Engine" and "Operation 3.2 Starting Engine."
- The engine is operated when washing, so it is dangerous if the machine moves when you are standing behind it. Never stand behind the machine when the engine is running.

Stop the machine on level ground, then clean or replace the coolant.

Clean the inside of the cooling system and change the coolant according to the table below.

Type of coolant	Cleaning of inside of cooling system and replacement of coolant
Supercoolant AF-NAC	Every 2 years (in autumn) or every 4000 hours, whichever comes first
Permanent type antifreeze (All-season type*)	Every year (in autumn) or every 2000 hours, whichever comes first

*: Permanent type antifreeze shall meet the requirements of ASTM D3306-03.

The coolant has the important function of preventing corrosion as well as preventing freezing.

Even in the area where freezing is not an issue, the use of antifreeze coolant is essential.

Maeda machine are supplied with Supercoolant (AF-NAC). Supercoolant (AF-NAC) has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 2 years or 4000 hours. Supercoolant (AF-NAC) is strongly recommended whenever available.

To maintain the anticorrosion properties of Supercoolant (AF-NAC), always keep the density of Supercoolant between 30% and 68%.

When deciding the ratio of antifreeze to water, check the lowest temperature in the past, and decide from the mixing ratio table given below. Practically, set the temperature at approximately 10 degrees C lower than the lowest level.

Freezing temperature of 100% undiluted Supercoolant is -15 degrees C. Do not store undiluted antifreeze at a temperature below -15 degrees C.

MIXING RATIO OF WATER AND SUPERCOOLANT

Minimum atmospheric temperature (Degrees C)	-10 or above	-15	-20	-25	-30
Mixing quantity (Liters)					
Quantity of Supercoolant	1.7	2.0	2.3	2.5	2.8
Quantity of water	3.8	3.5	3.2	3.0	2.7

⚠ WARNING

- Antifreeze is flammable; keep it away from flames.
- Supercoolant is toxic. When removing the drain plug, be careful not to get Supercoolant-mixed water on yourself. If any gets in your eyes, flush your eyes with a large amount of fresh water and see a doctor immediately.
- When processing the Supercoolant-added cooling water that has been drained when replacing the coolant or repairing the radiator, you should employ a specialized contractor, or contact us or our sales service agency. Supercoolant is toxic, so never pour it into a drainage ditch or scatter it on the ground.

CAUTION

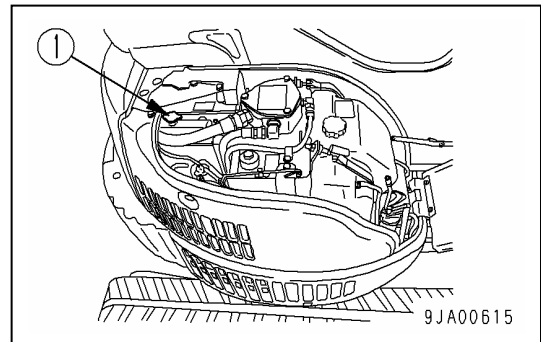
Use genuine Maeda Supercoolant (AF-NAC) for the coolant. In principle, any coolant other than genuine Maeda Supercoolant AF-NAC is not recommended.

Use tap water as a diluting liquid. Contact us or our sales service agency if you have to use river water, well water, or water from a private water supply system.

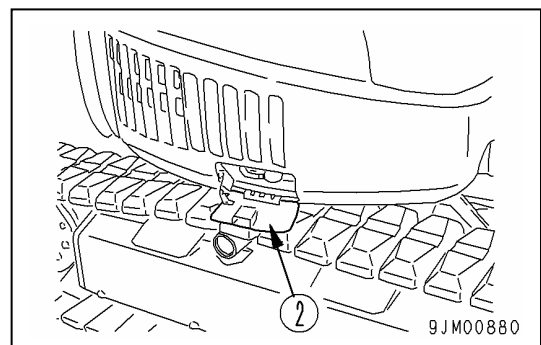
It is recommended that the mixing ratio using Supercoolant concentration meter is controlled.

Prepare a container with a capacity of at least 5.5 liters to receive the coolant.

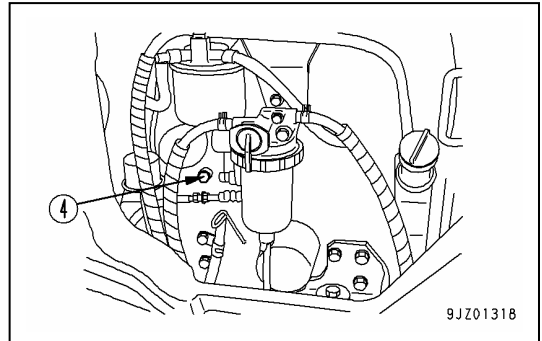
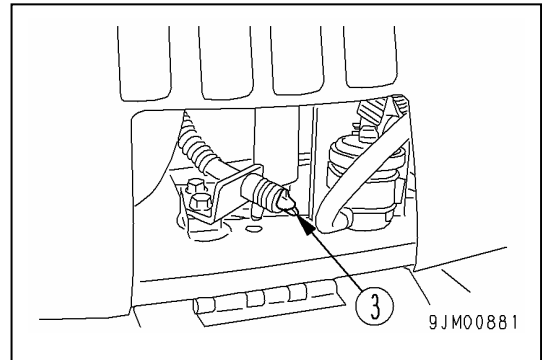
1. Open the dust cover on the right side of the machine body.
2. After making sure that the surface temperature of the radiator cap has cooled down and is able to be touched with bare hands, release the pressure by turning radiator cap (1) gradually until it contacts the stopper.
3. Push and turn radiator cap (1) further until it contacts the stopper to remove it.



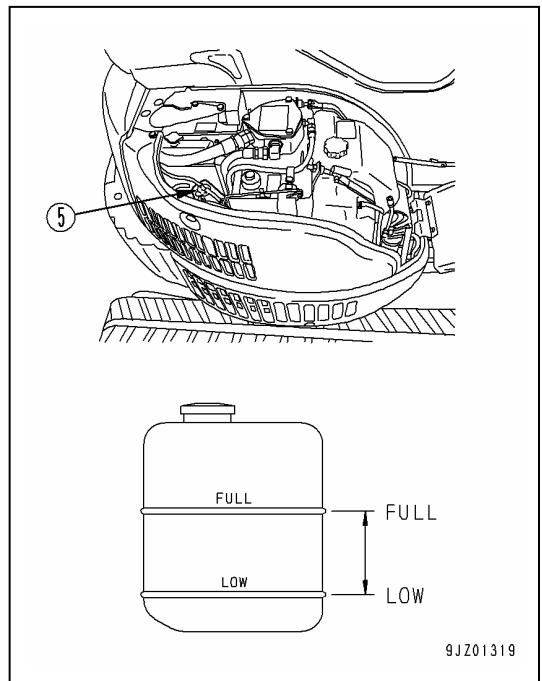
4. Open dust cover (2) on the lower right side of the machine body.
5. Place a container to receive the coolant at the bottom of drain valve (3) and drain plug (4) of the engine cylinder block.
6. Open drain valve (3) to drain the water. Remove drain plug (4) to drain the water.
7. After draining the water, close drain valve (3) and drain plug (4) and pour in the tap water. When the water has filled up the radiator, start and run the engine at a low idle and heat the water temperature to 90 degrees C or above. Keep the engine running for about 10 minutes.



8. Stop the engine, and open drain valve (3) and remove drain plug (4) to drain the water.
9. After draining the water, clean the inside using detergent. Follow the cleaning procedure provided on the detergent used.
10. Close drain valve (3), and wrap drain plug (4) with sealing tape and close it, too.
11. Pour in Supercoolant and tap water up to the opening through the water filler port. For the mix ratio for Supercoolant and water, see "Mixing Ratio of Water and Supercoolant".



12. To bleed the air from the coolant, run the engine at a low idle for five minutes and then run it at a high idle for another five minutes. (When doing this, leave the radiator cap off.)
13. Drain the coolant in sub tank (5), and clean the inside of the sub tank and feed coolant up to halfway point of FULL-LOW.
14. Stop the engine. After about three minutes, fill tap water nearly up to the water filler port and close the cap.



CHECKING LEVEL OF BATTERY ELECTROLYTE

Check the level before operating the machine.

⚠ WARNING

- Do not use the battery if the battery electrolyte level is below the **LOWER LEVEL** (minimum electrolyte level). Using the battery in the above condition will not only shorten its life by accelerating internal deterioration but also increase the risk of it exploding.
- The battery generates flammable gas. Do not allow any open flame or sparks near the battery.
- Battery electrolyte is a dangerous substance. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor.
- Do not fill the battery electrolyte beyond the **UPPER LEVEL** (maximum electrolyte level). If the electrolyte level is too high, it may leak and damage the painted surface or corrode the parts.

CAUTION

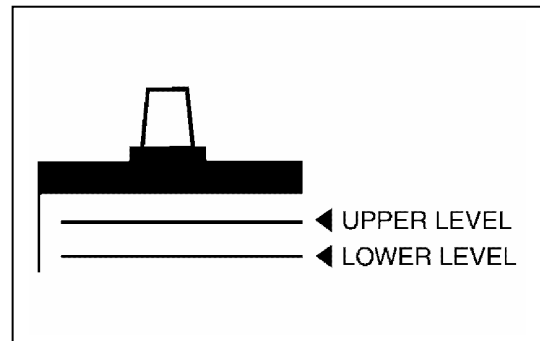
If there is a fear that the refilled purified water (e.g. commercially available battery replenishing fluid) may become frozen overnight, refill it next day before starting the day's work.

Inspect the battery electrolyte level at least once a month following the standard given below.

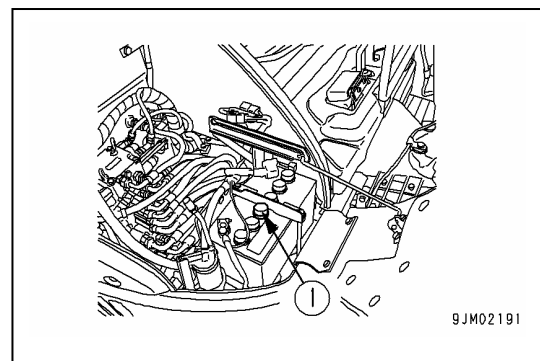
WHEN CHECKING ELECTROLYTE LEVEL FROM SIDE OF BATTERY

If it is possible to check the electrolyte level from the side of the battery, check it as follows.

1. Open the dust cover on the right side of the machine body.
2. Clean the area around the electrolyte level lines using a piece of cloth dampened with water and make sure that the electrolyte level is between the **UPPER LEVEL** (Maximum electrolyte level: U.L) and **LOWER LEVEL** (Minimum electrolyte level: L.L).
If you use a dry cloth, a battery may catch fire and explode due to the resulting static electricity.



3. If the electrolyte level is below the halfway line between U.L and L.L, remove cap (1) immediately and refill purified water (e.g. commercially available battery replenishing fluid) up to U.L.
4. After refilling, close cap (1) tightly.



NOTES

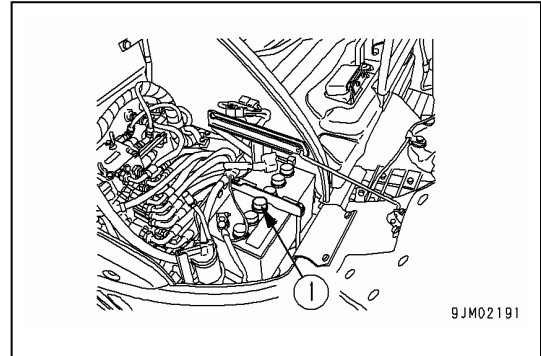
If you added purified water beyond U.L, suction excessive water using a syringe to lower the level down to U.L. Neutralize the removed fluid with sodium bicarbonate, then flush it away using a large amount of water.

Or, contact us, our sales service agency or the battery manufacturer.

WHEN UNABLE TO CHECK ELECTROLYTE LEVEL FROM SIDE OF BATTERY

If it is not possible to check the electrolyte level from the side of the battery, or if there is no indication of UPPER LEVEL on the side face of the battery, check the level as follows.

1. Open the dust cover on the right side of the machine body.
2. Remove cap (1) on the top face of the battery and look through fluid filler port (2) to confirm the electrolyte level. If the electrolyte does not reach sleeve (3), add distilled water (e.g. commercially available battery replenishing fluid) until the level reaches the bottom of the sleeve (Maximum electrolyte level: UPPER LEVEL).



(A) Suitable level:

Electrolyte level is up to bottom of sleeve, so surface tension causes electrolyte surface to bulge and poles appear bent.

(B) Low:

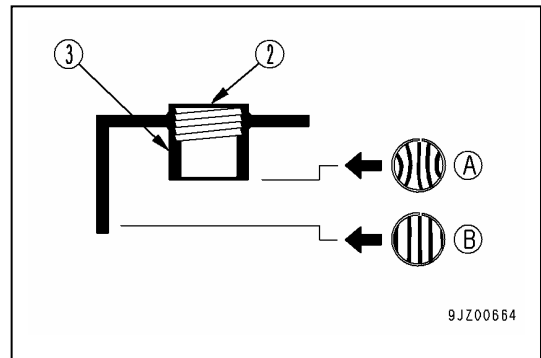
Electrolyte level is not up to bottom of sleeve, so poles appear straight and not bent.

3. After refilling, close cap (1) tightly.

NOTES

If distilled water is added to above the bottom tip of the sleeve, use a syringe to remove electrolyte. Neutralize the removed fluid with sodium bicarbonate, then flush it away with a large amount of water.

Or, contact us, our sales service agency or the battery manufacturer.



WHEN IT IS POSSIBLE TO USE INDICATOR TO CHECK ELECTROLYTE LEVEL

If it is possible to use an indicator to check the electrolyte level, follow the instructions given.

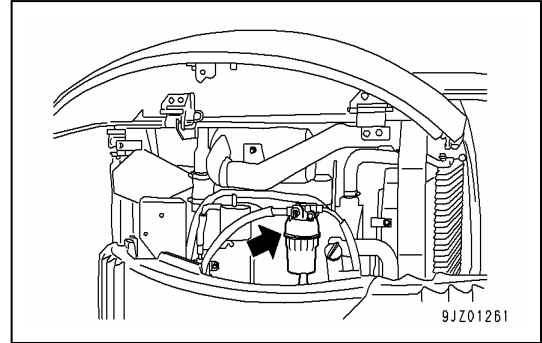
CLEANING WATER SEPARATOR ELEMENT

WARNING

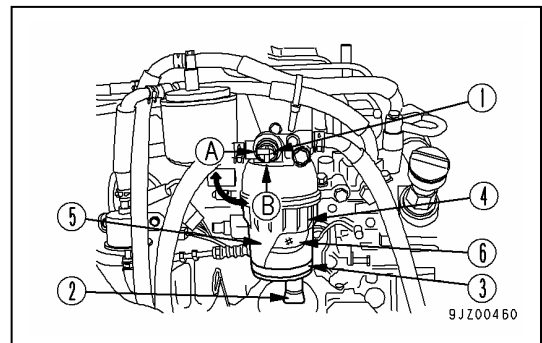
Keep this part away from open flames.

- Prepare a filter wrench.
- Prepare a container to receive drained fuel.

1. Open the engine hood.



2. Set handle (1) of the water separator to the Close position (A).
3. Loosen drain plug (2), drain piled up water until red ring (3) contacts the bottom, then close plug (2).
4. Loosen ring (4) using the filter wrench to remove element cup (5), then remove element (6). Exercise care not lose red ring (3) in the cup.
5. Clean the inside of cup (5) and element (6) using diesel oil or flushing oil.
6. After cleaning, install element (6).
7. Place red ring (3) in element cup (5) and fill the cup with fuel. Then place the cup on the filter holder and tighten it using ring (4).
- Tightening torque: 14.7 - 19.6 Nm{1.5 - 2.0 Kgm}
8. Set handle (1) of the water separator to the Open position (B).
9. After cleaning the water separator, bleed air from it. For the air bleeding procedure, see "Inspection and Maintenance 10.6 Maintenance every 500 Hours (Replacing Fuel Filter Cartridge)."

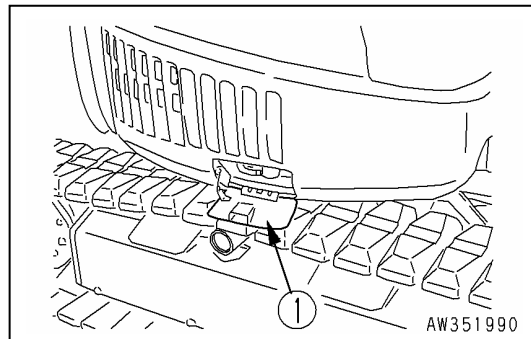


DRAINING WATER AND SEDIMENT FROM FUEL TANK

CAUTION

Do not use trichloroethylene for cleaning inside of the tank.

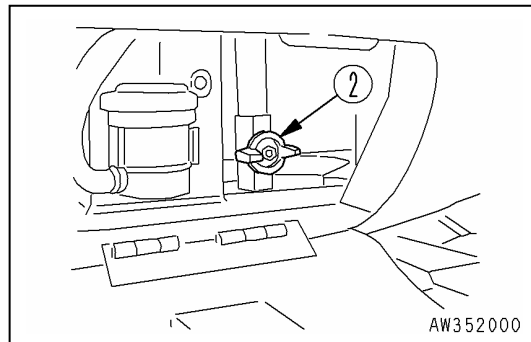
1. Draining them before operating the machine.
2. Prepare a container to receive drained fuel.
3. Open cover (1) on the right side of the machine body.



4. Open drain valve (2) at the bottom of the tank, then drain the piled up sediments and accumulated water along with fuel.

When doing this, be careful not to get any fuel on yourself.

5. When only clean fuel comes out, close drain valve (2).
6. Close cover (1).



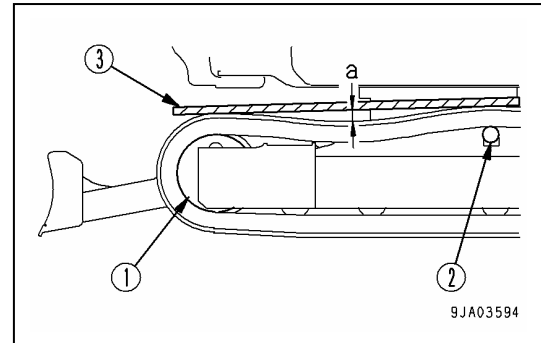
CHECKING/ADJUSTING TRACK TENSION

The wearing speed of the pins and bushings on the undercarriage varies depending on the working conditions and type of soil, so you must check the track tension frequently to maintain the standard tension.

Stop the machine on firm level ground when carrying out the inspection and maintenance tasks.

INSPECTION

1. Run the engine at a low idle, move the machine forward by the ground contact length, then stop the machine gradually.
2. Choose a wooden block (3) that reaches from idler (1) to carrier roller (2) and then place it on the track.
3. Measure the maximum deflection between the top surface of the track and the bottom surface of the wooden block.
 - Standard deflection
If deflection "a" is 5 to 15 mm, the tension is normal.



If the given deflection deviates from the standard tension, adjust it according using the following procedures.

ADJUSTMENT

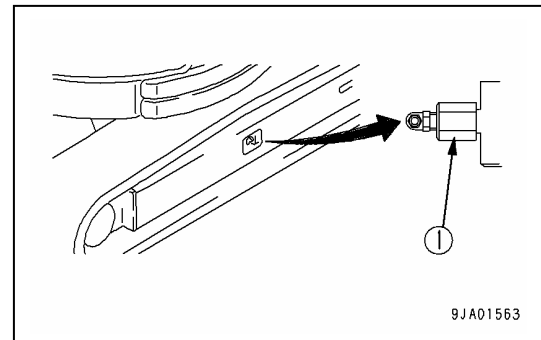
⚠ WARNING

Do not loosen plug (1) more than one turn.

If you loosen it more than one turn, plug (1) may jump out due to the high internal pressure of the grease.

When doing this, do not loosen any part other than plug (1). Never turn your face to the mounting direction of plug (1).

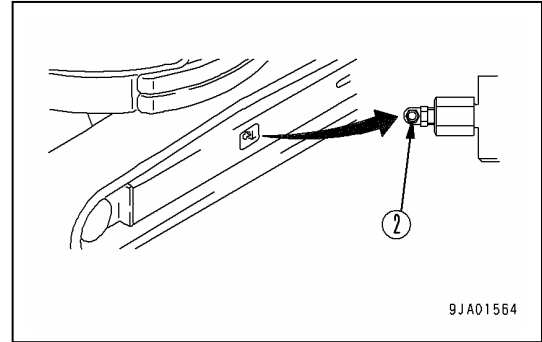
If the track tension cannot be loosened with the procedure given here, please contact us or our sales service agency.



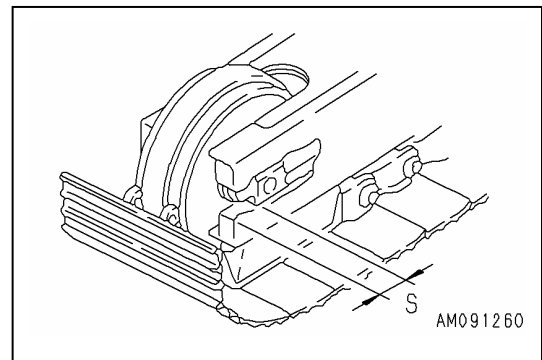
INCREASING TRACK TENSION

Prepare a grease gun.

1. Inject grease from the grease gun into the grease fitting (2).
2. To check that the track tension is correct, run the engine at a low idle, move the machine forward by the ground contact length and then stop the machine.
3. Check the track tension again. If the tension is not appropriate, adjust it again.



4. It is permissible to inject grease until "S" travels to 0 mm. However, if the track remains loose, the pin and bushing must be seriously worn out. In this case, you must invert or replace them.
Contact us or our sales service agency for repair services.



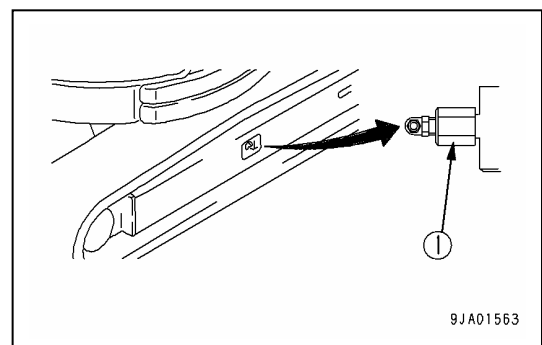
LOOSENING TRACK TENSION

WARNING

It is extremely dangerous to discharge the grease using any method except the procedure given below.

If track tension is not relieved by this procedure, contact us or our sales service agency for repair services.

1. Loosen plug (1) gradually to discharge grease.
2. When loosening plug (1), turn it a maximum of one turn.
3. If the grease does not come out smoothly, move the machine slightly forward and backward.
4. Tighten plug (1).
5. To check that the track tension is correct, run the engine at a low idle, move the machine forward by the ground contact length and then stop the machine.
6. Check the track tension again. If the tension is not correct, adjust it again.

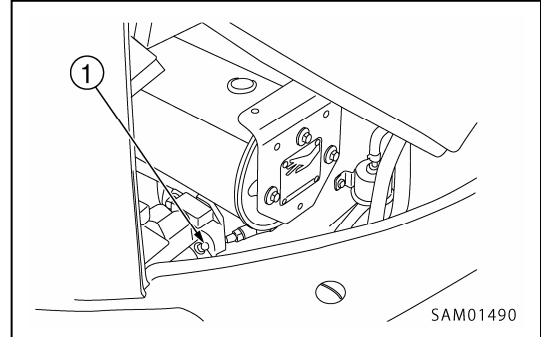


BLEEDING AIR FROM HYDRAULIC SYSTEM

CAUTION

Operating the pump without filling the pump case with hydraulic oil can produce abnormal heat and damage the pump prematurely. Be sure to bleed the air completely.

1. Bleeding air from the piston pump
 - 1) Remove the oil filler cap from the hydraulic tank.
 - 2) Loosen air bleed plug (1) and confirm that oil oozes out from the plug (indicating that air bleeding is completed).
 - 3) After completing the air bleeding operation, tighten the air bleed plug.
Tightening torque: $8.8 \pm 1.0 \text{ Nm}$ $\{0.9 \pm 0.1 \text{ Kgm}\}$



- 4) Tighten the oil filler cap on the hydraulic tank

CAUTION

If you do not pressurize the hydraulic tank, equipment will be adversely affected due to suction of air by the pump.

- 5) Retract the boom to the minimum length and raise it fully, lower the blade to the ground, attach the oil filler cap and then pressurize the inside of the tank.
- 6) After air bleeding, check the oil level in the hydraulic tank. For details, see "Operation 3.1.2 Check before Starting (Checking/Refilling Oil Level in Hydraulic Tank)."

CAUTION

If the engine is run at high speed immediately after startup or a cylinder is pushed up to its stroke end, the air taken inside the cylinder may cause damage to the piston packing.

2. Start the engine. For details, see "Operation 3.2 Starting Engine". Maintain the engine at a low idle for 10 minutes before starting another task.
3. Bleeding air from the cylinder
 - 1) Run the engine at a low idle, and extend and retract each cylinder four to five times while taking care not to operate them to the stroke end (stop the cylinders at a position approximately 100 mm short of the stroke end).
 - 2) Then operate each cylinder three to four times to the end of its stroke.
 - 3) Finally, operate each cylinder four to five times to the end of its stroke to completely bleed the air.

CAUTION

- When the air bleeding procedure specified by the manufacturer is used for the given attachment, follow the procedure for bleeding the air.
- After finishing the air bleeding, stop the engine once for five minutes or more before starting it again. The above operation discharges air bubbles in the tank.
- Check for oil leakage and, if any, wipe off spilled oil.

REPLACING WIRE ROPES

⚠ WARNING

Always wear leather work gloves when replacing the wire rope.

CAUTION

- Measure diameter of a wire rope at the section where the wire rope repeatedly passes through the sheave. Measure the diameter from three directions and calculate their mean value. (A measurement should be performed at several points, with spacing between the points.)
- Do not use an old wire rope even when it has not been used before.
- Always use Maeda genuine wire rope.

BENCHMARK FOR REPLACING WIRE ROPES

A wire cable undergoes wear and tear over time.

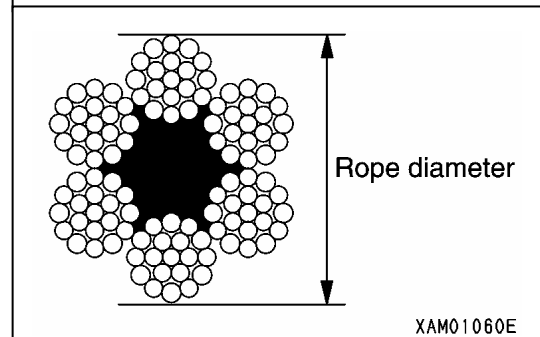
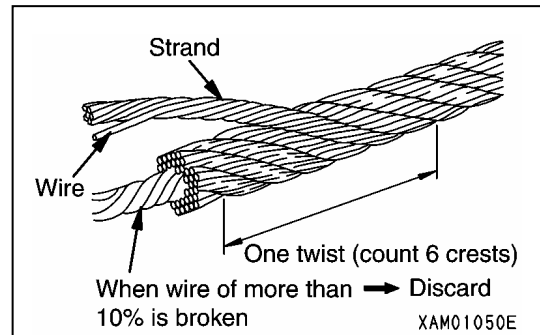
Prompt replacement is required if any of the following have occurred to the wire cable.

1. Percentage of snapped wires to total wires (except filler wires) in outer strands exceeds the ratio below:
 - (1) 10% or more of the wires in one twist of the wire cable, or 5% or more when such snapped wires are in one single strand.
 - (2) 20% or more of the wires in five twists of the wire cable.
2. The diameter of the wire cable is worn for 7% or more of the nominal diameter

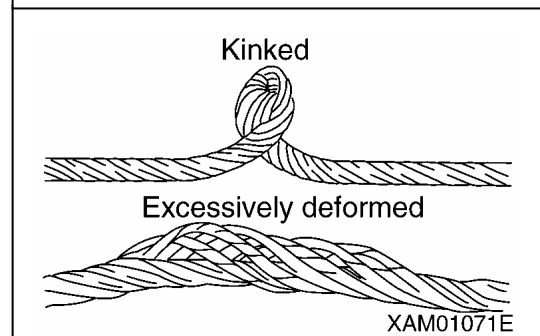
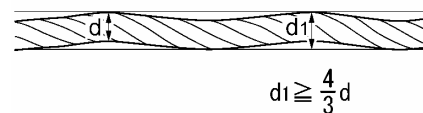
NOTES

- A wire cable with a diameter of 9 mm must be replaced if its diameter has worn to 8.4 mm.
- A wire cable with a diameter of 8 mm, it must be replaced when its diameter is worn to 7.5 mm.
- A wire cable with a diameter of 6 mm must be replaced if its diameter has worn to 5.6 mm.

3. The wire cable, corroded as below:
 - (1) Wire surface has pitched or pitted.
 - (2) Wires become slack due to internal corrosion.
4. Excessively deformed as below:
 - (1) The cable is twisted and has some kinks.
 - (2) Waviness width is $\frac{4}{3}d$ or more in a distance within 25 times of nominal diameter d .
 - (3) The minimum diameter is $\frac{2}{3}$ or less of the maximum diameter due to local pressure and being flattened.
 - (4) Core wire or wire core projects.
 - (5) Excessively curved.
 - (6) Basket-like deformation.
 - (7) A strand sinks inside.
 - (8) One strand or more is slack.
 - (9) Wires project excessively.
5. The cable shows some abnormality at the terminals.



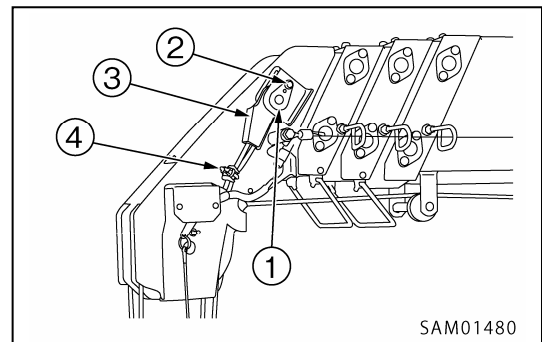
Waviness width



REMOVING WINCH WIRE ROPE

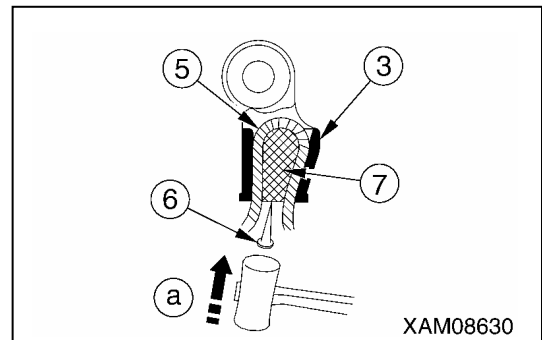
Use the following procedure to remove the wire rope.

1. Set the machine on level and solid ground.
2. Operate the right work equipment control lever to the BOOM RAISING position (pull it toward the left) to raise the boom a little.
3. Operate the right work equipment lever to the DOWN position (push it forward) to lower the hook block nearer the ground.
4. Operate the right work equipment lever to the LOWER position (push toward the right side) to lower the hook block to the ground.
5. Remove wedge socket mounting bolt (2) and pull out wedge socket pin (1), and then remove wedge socket (3).
6. Remove wire clip (4).



7. Remove wire rope (5) from wedge socket (3) following the procedure provided below.

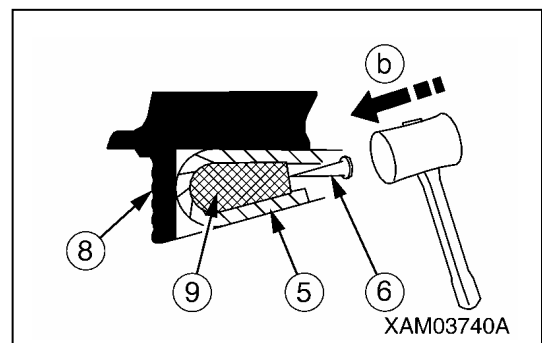
- (1) Apply 4 to 6 mm long round bar (6) to rope wedge (7).
- (2) Move round bar (6) toward arrow direction (a) by tapping it lightly with the hammer to remove rope wedge (7).



8. Operate the right work equipment control lever to the DOWN position (push it forward) to wind off wire rope (5) from the winch drum.

9. After winding off the wire rope of the winch drum, remove the end of the wire rope (5) fixed to winch drum (8) by following the procedure provided below.

- 1) Apply 4 to 6 mm long round bar (6) to rope wedge (9).
- 2) Move round bar (6) toward arrow direction (b) by tapping it lightly with the hammer to remove rope wedge (9).



10. Wind up remaining wire rope (5) completely.

Removal of the winch wire rope is completed.

INSTALLING WINCH WIRE ROPE

WARNING

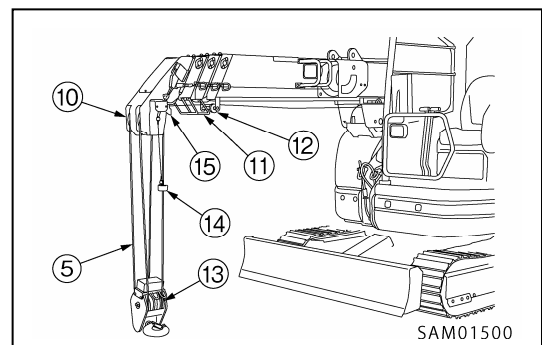
The rope wedge to secure the wire rope must be fastened correctly and firmly. Otherwise, the wire rope may slip out, which may cause a serious accident.

CAUTION

- Ensure the wire rope winds normally onto the winch drum.
- After attaching a new rope, hoist an object (2.9 to 4.9 kN{300 to 500 kg}) with the boom extended and raised fully. Repeat hook raising and lowering several times to break in the new rope.
- The wire rope is coiled. Exercise caution to prevent any kinks from forming in the rope when winding it up. Be sure to uncoil by rotating the rope to pull it out of the rope drum.

Use the following procedure to attach the wire rope.

1. Holding the end of wire rope (5), reeve it through the load sheave (10) at the boom end, wire guide (11) of No. 2 and 3 booms and snap sheave (12).

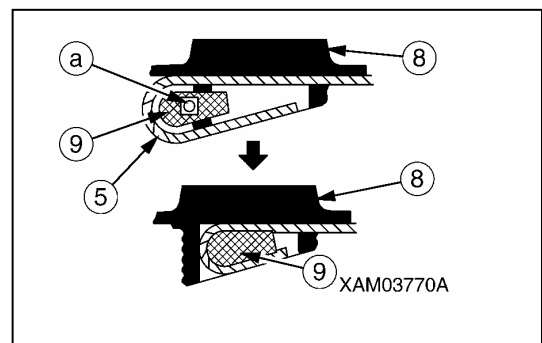
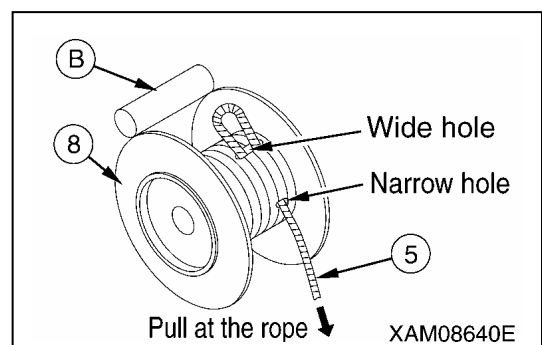


2. Reeve wire rope (5) through the mounting hole on winch drum (8) and then secure wire rope (5) to winch drum (8), following the procedure provided below.

- (1) Reeve wire rope (5) through winch drum (8) after loosening it.

- (2) Place rope wedge (9) in position (a), apply wire rope (5) to it and pull it firmly in the direction indicated by the arrow.

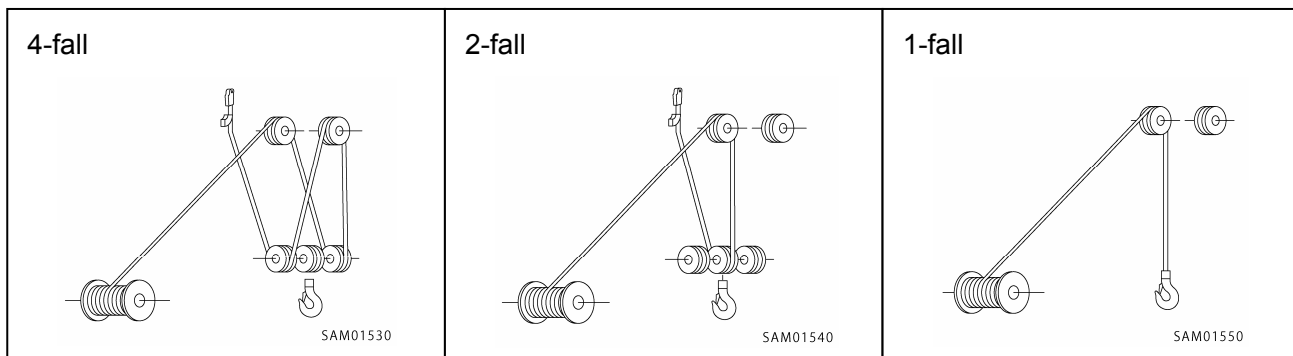
When doing this, adjust the length of wire rope (5) so that its end does not protrude outside the narrower side of the hole on winch drum (8).



3. Set the right work equipment control lever to the UP position (pull it toward you) slowly to wind up wire rope (5) to winch drum (8).

When doing this, wind the wire rope to a place between the irregular winding prevention roller (B) and winch drum while leaving about 10 m long wire rope unwound beyond the boom end.

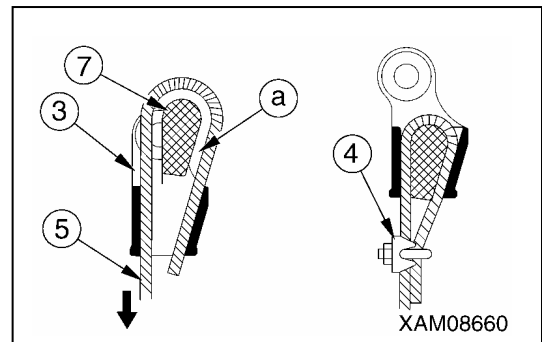
4. Depending on the given number of falls, reeve the wire rope through the load sheave (10) at the boom end, hook block sheave (13), weight of the over hoist detector (14) and guide sheave (15) as shown in the figure below.



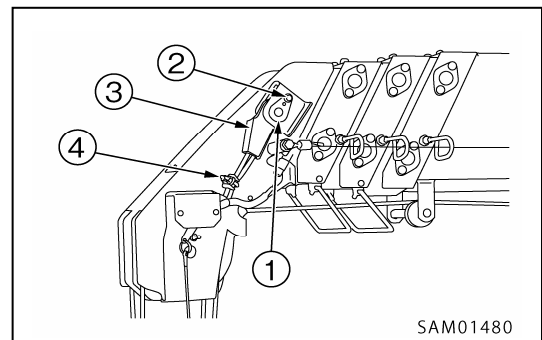
5. Secure the end of wire rope (5) to wedge socket (3), following the procedure provided below.

- 1) Reeve wire rope (5) through wedge socket (3) as shown in the figure to the right.
- 2) Place rope wedge (7) in position (a) and pull wire rope (5) strongly in the direction indicated by the arrow.

6. Install rope clip (4) to wire rope (5).



7. Secure wedge socket (3) to the boom using wedge socket pin (1), and tighten wedge socket mounting bolt (2).



8. Set the right work equipment control lever to the RAISE position (pull it toward the left) or the left work equipment control lever to the EXTEND position (push it forward) to raise the hook block.

NOTES

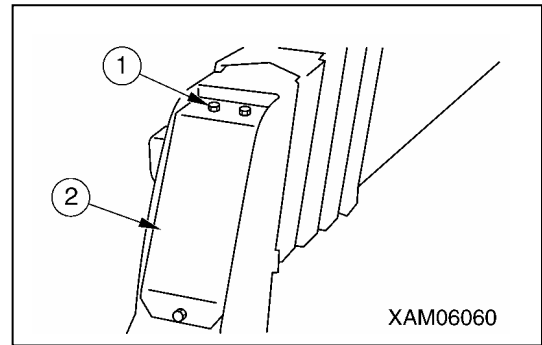
Do not proceed to winch operation until the hook block is raised. Otherwise, irregular winding on the winch drum can result.

9. Extend and raise the boom fully and set the right work equipment control lever to the DOWN position (push it forward) until three to four windings of wire rope (5) are left on winch drum (8).
10. With wire rope (5) held under tension, set the right work equipment control lever to the HOOK RAISING position (pull it toward you) to wind up wire rope (5) to winch drum (8).

CHECKING/ADJUSTING BOOM TELESCOPING WIRE ROPE

Prompt adjustment is required if the following event appears in the boom extending wire rope.

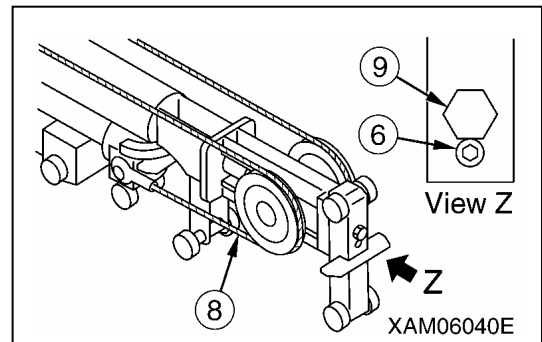
1. Fully retract the boom.
2. Remove three mounting bolts (1) in the boom end and remove cover (2).



3. Remove lock bolt (6) in the end of the telescoping cylinder in the boom, and turn the adjustment bolt (9) for the boom extending wire clockwise.

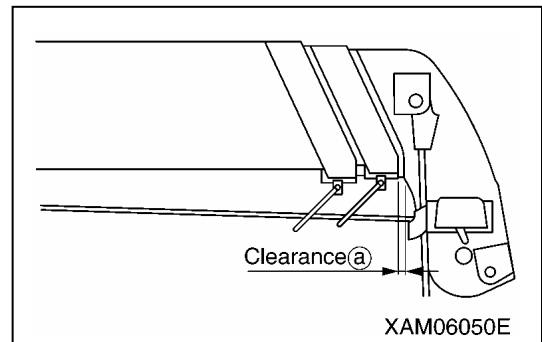
If No. 4 boom extends when adjustment bolt (9) is turned, tension of the boom extending wire (8) is normal.

If No. 4 boom does not extend, adjust the boom extending wire. For details see "Maintenance 10.3 Irregular Maintenance (Adjusting Boom Telescoping Wire Rope)".



4. Set the boom horizontally and retract it fully. Then check whether the clearance (clearance (a) in the figure to the right) between No. 3 and No. 4 booms is 5 mm or greater.

If the clearance is 5 mm or greater, see "Inspection and Maintenance 10.3 Irregular Maintenance (Adjusting Boom Telescoping Wire Rope)" and adjust it.



ADJUSTING BOOM TELESCOPING WIRE ROPE

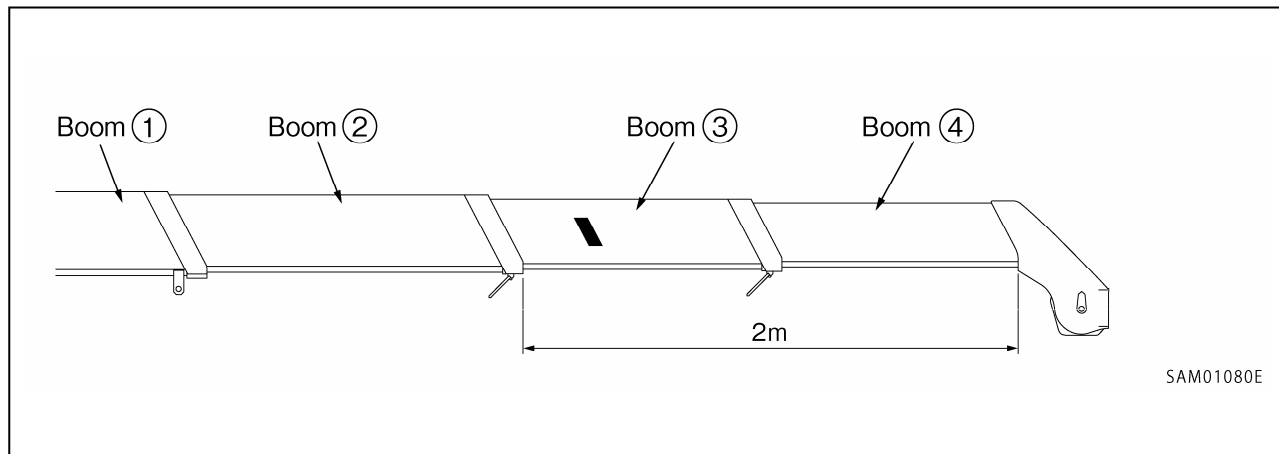
CAUTION

When adjusting wire ropes, be careful not to apply excessive tension to them.

A single wire rope is used for each of boom extending and boom retracting respectively.

The following adjustment procedure is prepared for these wire ropes. Be sure to follow it.

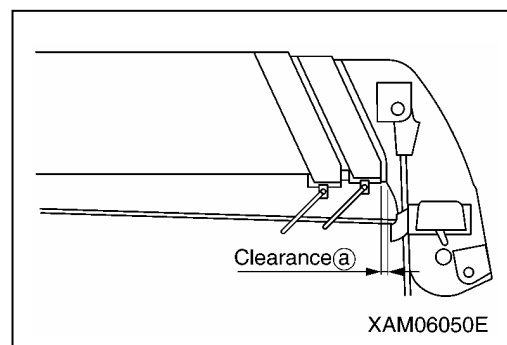
1. Retract the boom fully and set it horizontally. Then extend the booms so that it is telescoped simultaneously about 2 m.



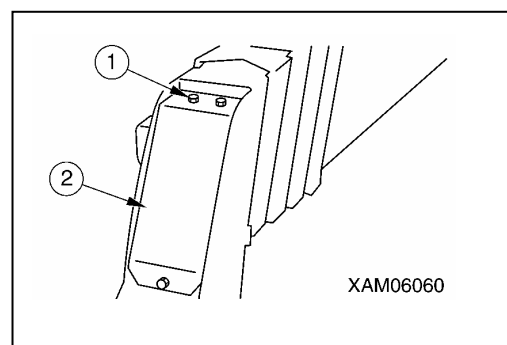
2. Retract the boom gradually to the stowing state.

From this state, measure the dimension of clearance (a) and proceed with the following adjustment.

- When clearance (a) is 5 mm or greater, adjust retracting wire rope (5) of No. 4 boom.
- When clearance (a) is "0 (zero)", start adjustment from Step 5 "Adjusting No. 4 boom extending wire rope (8)".

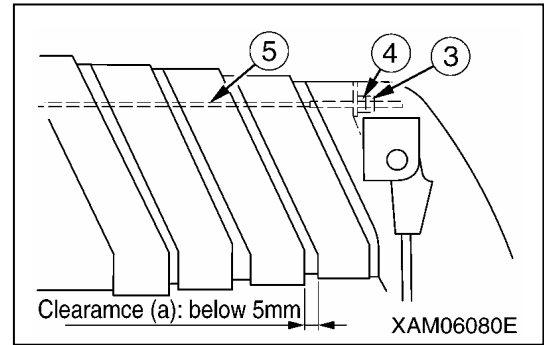


3. Remove three mounting bolts (1) in the boom end and remove cover (2).



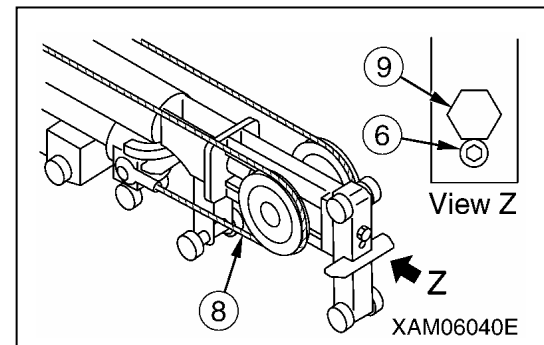
4. Adjusting No. 4 boom retracting wire rope (5)

- 1) Loosen lock nut (3), and then tighten left and right adjustment nuts (4) evenly in the direction that tensions retracting wire rope (5) (clockwise direction) until clearance (a) becomes "0 (zero)".
- 2) If it is found after the operation and measurement of Steps 1 and 2 that the retracting wire rope is loosened or clearance (a) is 5 mm or greater, you must repeat the adjustment again.



5. Adjusting No. 4 boom extending wire rope (8)

- (1) Remove lock bolt (6), and then tighten adjustment bolt (9) in the direction that tensions No. 4 boom extending wire rope (8) (clockwise direction) until just before No. 4 boom starts to extend.
- (2) Tighten left and right adjustment nuts (4) for No. 4 boom retracting wire rope (5) by two turns.
- (3) Fix adjustment nut (4) for No. 4 boom retracting wire rope (5) with lock nut (3).
- (4) Tighten adjustment bolt (9) for No. 4 boom extending wire rope (8) by two turns and fix it using lock bolt (6).



6. After the adjustment, install boom end cover (2) using three mounting bolt (1).

10.4 MAINTENANCE EVERY 50 HOURS

GREASING

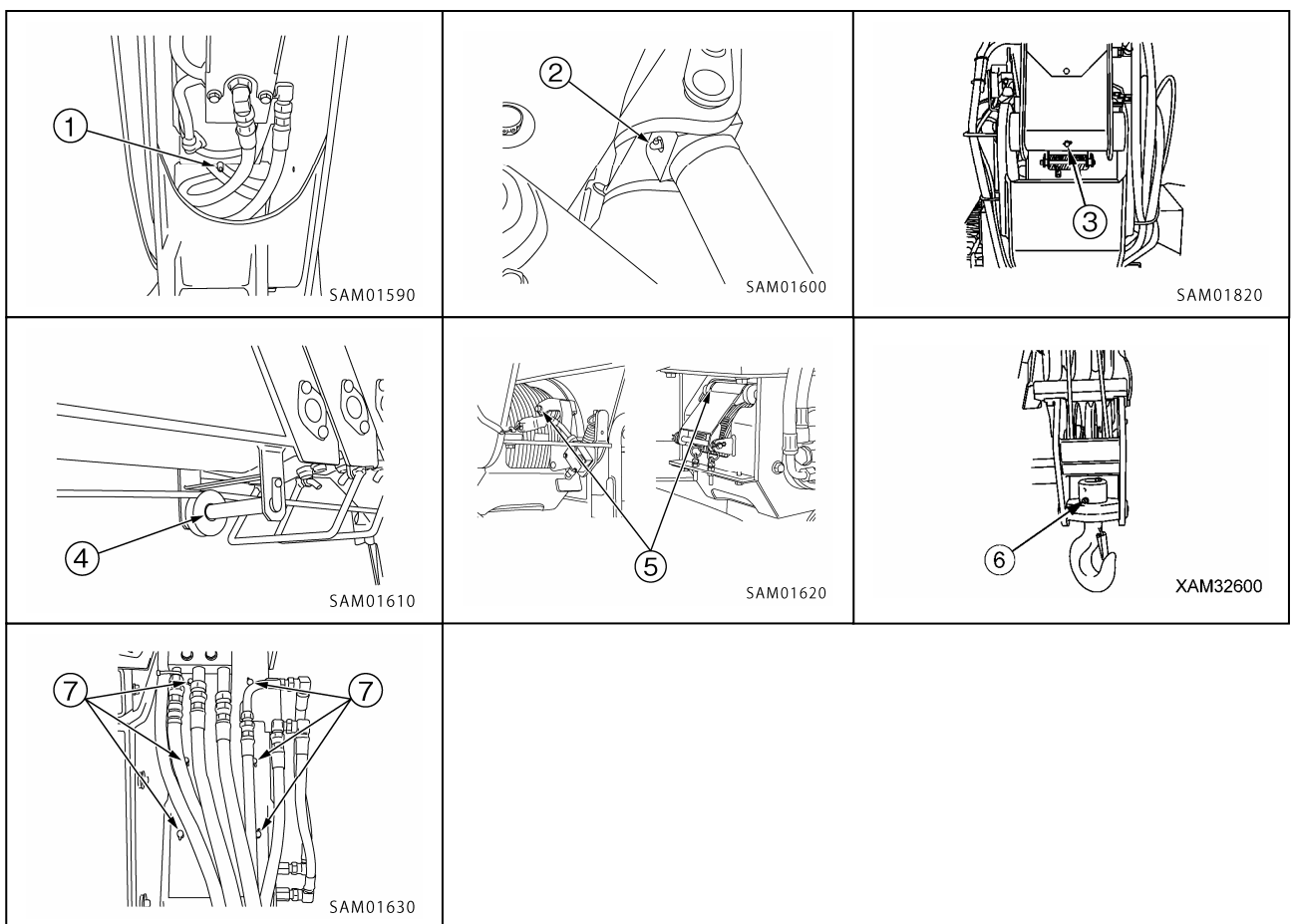
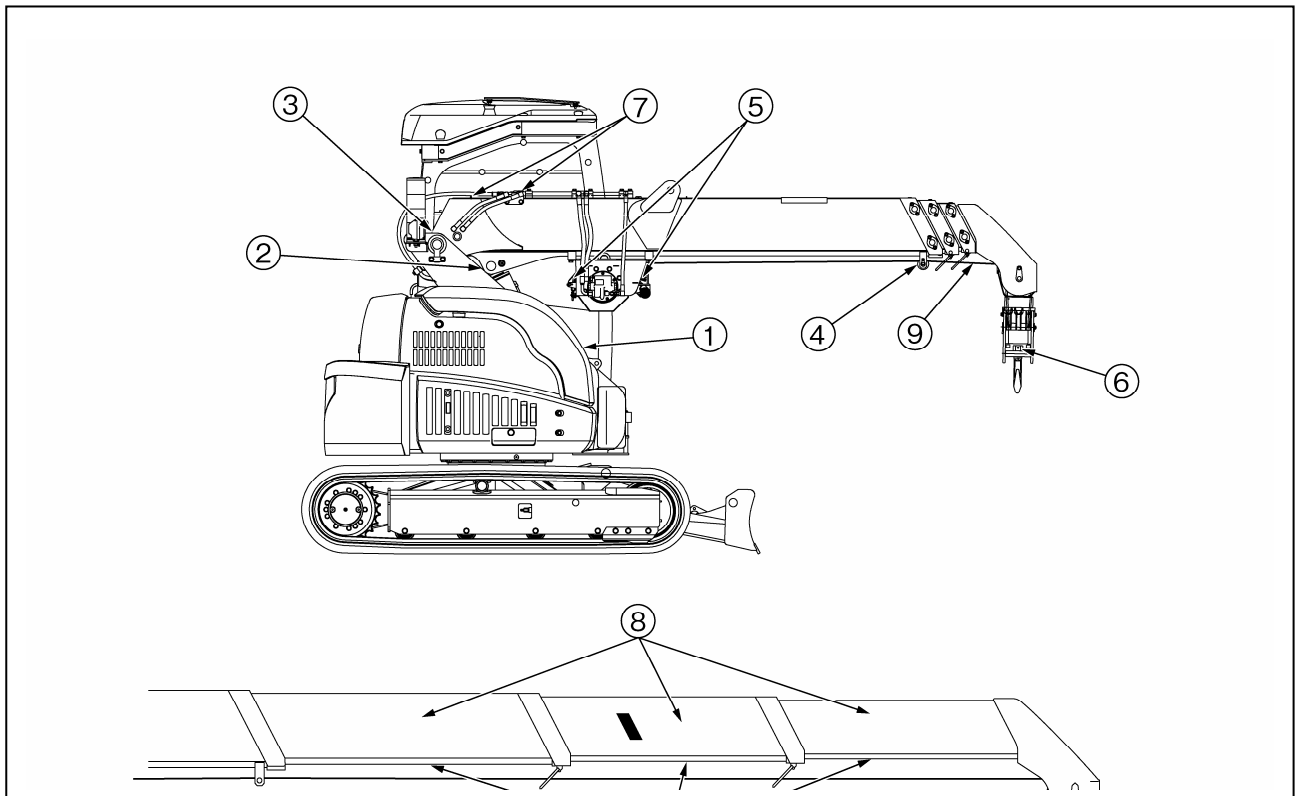
CAUTION

- Type of grease used varies with greasing points. Failure to grease properly may shorten the machine life.
- For a new machine that requires an initial running-in, grease it once every 10 hours until it has been operated for up to 100 hours.

Use the grease specified below according to the greasing points.

No.	Greasing points		Grease type
1	Greasing of the derrick cylinder bottom side mounting pin	1 place	Lithium grease
2	Greasing of the derrick cylinder rod side mounting pin	1 place	
3	Greasing of the boom mounting pin	1 place	
4	Greasing of the guide sheave	1 place	
5	Greasing of wire support roller pin	1 place	
6	Greasing of the hook block	1 place	
7	Greasing of the boom slide plate	6 places	Molybdenum grease
8	Greasing of both sides and bottom of a boom	Each boom	
9	Greasing of the winch wire rope	1 rope	Rope oil

1. With the use of the grease gun, grease the greasing points (No. 1 to 7) specified in the above table through corresponding grease plugs. (See the following page.)
2. After greasing, wipe off any old grease that has been pushed out.
3. When greasing both side and bottom of a boom or a wire rope, set the left work equipment control lever to the EXTEND position (push it forward) to extend the boom.
4. Apply red rope grease to prevent wire rope abrasion and rust formation.
With the rope surface cleaned, grease the rope using a brush.



10.5 MAINTENANCE EVERY 100 HOURS

GREASING

Carry out this maintenance in tandem with the maintenance tasks that are performed every 50 hours.

⚠ WARNING

When greasing the swing circle and swing pinion, exercise care not to swing them while greasing them.

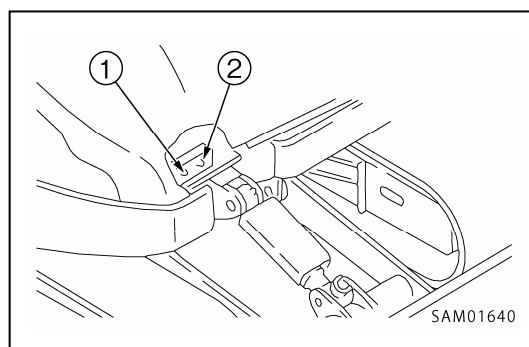
CAUTION

- For the new machine that requires an initial running-in, grease it once every 10 hours until it has been operated for up to 100 hours.
- If any abnormal noise is heard from a specified greasing point, grease it irrespective of the inspection/maintenance intervals.

(1) Swing circle (1 place)

(2) Swing pinion (1 place)

When greasing the swing pinion, do it while changing the machine position in four directions 90 degrees at a time.



10.6 MAINTENANCE EVERY 250 HOURS

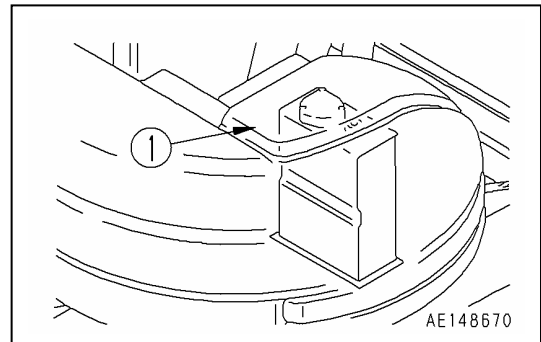
Carry out this maintenance in tandem with the maintenance tasks that are performed every 50 and 100 hours.

REPLACING HYDRAULIC OIL FILTER ELEMENT

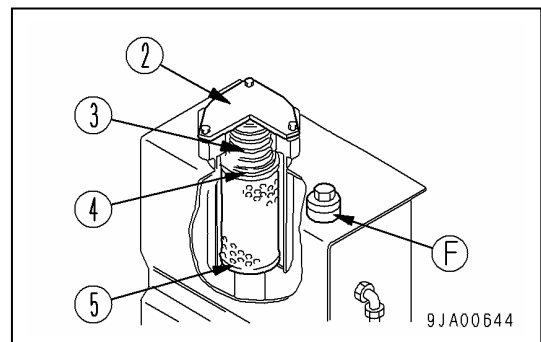
WARNING

- Parts and oil will still be very hot immediately after the engine is stopped, and have the potential to cause burns. Wait for the temperatures of these components to drop before performing this operation.
- When removing the cap of oil filter port, turn it slowly to release the internal pressure. Otherwise, it may gush out.

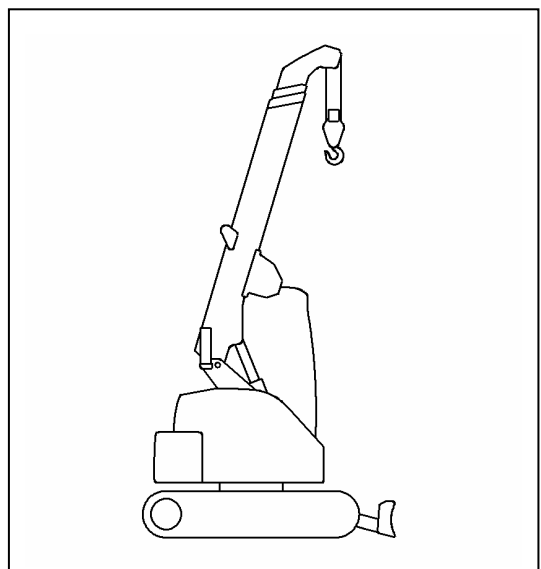
1. Open dust cover (1) on the right side of the machine body.



2. Remove cap of oil filler port (F) to release the internal pressure.
3. Loosen three bolts, and remove cover (2). When doing this, the cover may fly off due to the force of spring (3). So hold the cover down when removing the bolts.
4. After removing spring (3) and valve (4), take out element (5).



5. Clean the removed parts in diesel oil.
6. Install the new element in the place where old element (5) was installed.
Check the O-ring to be set between the hydraulic tank and cover (2). If it is damaged, replace it with a new one.
7. Set valve (4) and spring (3) on the element.
8. Set cover (2) and, while holding it with your hands, install cover (2) using the mounting bolt.
9. As shown in the figure to the right, retract the boom to the minimum length and raise it fully, lower the blade to the ground, attach the oil filler cap and then pressurize the inside of the tank.
10. Close dust cover (1) on the right side of the machine body.



CHECKING/REFILLING OIL LEVEL IN WINCH MOTOR REDUCTION GEAR CASE

WARNING

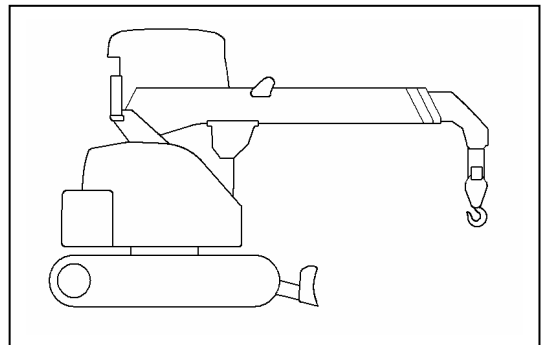
The parts and oil will still be very hot immediately after the engine is stopped.
Wait for the oil temperature to drop and do not try to remove the plug of the port immediately.

CAUTION

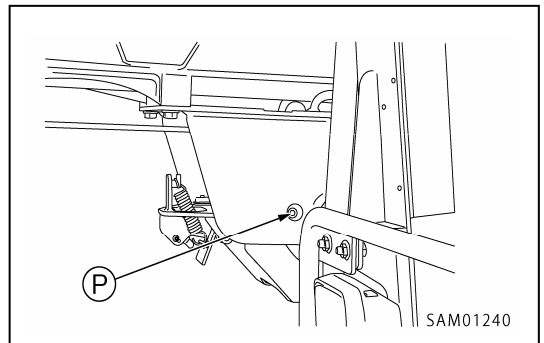
- For the oil used, see "Inspection and Maintenance 7.1 Use of Fuel, Coolant and Lubricants According to Ambient Temperatures".
- After refilling the oil, use seal tape to prevent leakage of oil from the threaded portion of the plug, then securely tighten the plug.

- A container for receiving drained oil: Prepare a 1-liter or larger pan.
- Hex bar wrench for removing plug: 8 mm
- Refilled oil capacity in swing reduction gear case: 0.75 liters

1. Stop the machine on a level ground.
2. As shown in the figure to the right, retract the boom to the minimum length, lower it fully and set it horizontally.



3. Turn the winch slowly until the boom comes to a position horizontal against plug (P).
4. Place a container for receiving oil under plug (P).
5. Using a hexagon wrench, remove plug (P). If the oil is filled near to the lower end of the hole of plug (P), the level is appropriate.
6. If the oil is insufficient, add the gear oil until it overflows from the hole of plug (P).
7. After filling oil, install plug (P) and tighten it securely.



NOTES

Wipe off the oil completely if spilled.

10.7 MAINTENANCE EVERY 500 HOURS

Carry out this maintenance in tandem with the maintenance tasks that are performed every 50, 100 and 250 hours.

REPLACING OIL IN ENGINE OIL PAN AND ENGINE OIL FILTER CARTRIDGE

WARNING

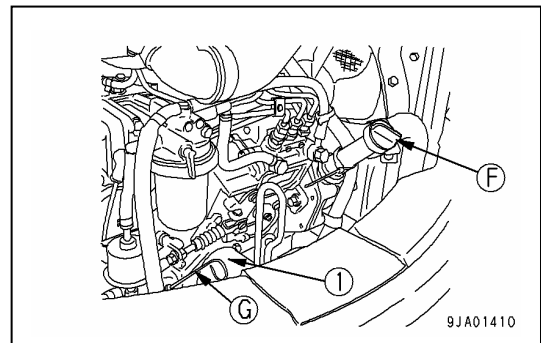
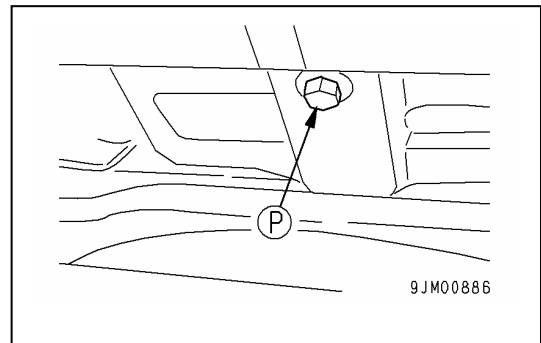
Parts and oil will still be very hot immediately after the engine is stopped, and have the potential to cause burns. Wait for the temperatures of these components to drop before performing this operation.

- Oil pan refill capacity: 6.9 liters
- Prepare a filter wrench.

When the number of operating hours in six months does not reach 500, replace the oil and the filter cartridge at the end of every six month period.

If the number of operating hours reaches 500 within six months, replace them at the point when 500 hours have elapsed.

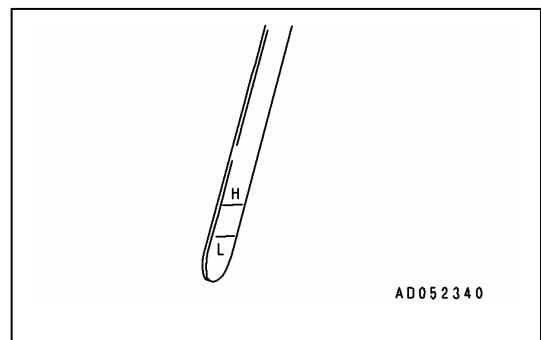
1. Place a container for receiving oil just under drain plug (P).
2. Open drain plug (P) gradually and drain the oil. Be careful not to get any oil on yourself.
3. Check drained oil, and if a large amount of metal powders or foreign substance is found, contact us or our service agency.
4. Install drain plug (P).
5. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
6. Clean the filter holder and install a new filter cartridge after coating its threaded portion and packing it with clean oil (or a small amount of grease).



NOTES

Check that there is no old packing stuck to the filter holder. If there is any old packing stuck to the holder, it will cause oil to leak.

7. When installing, tighten the packing by 1/2 to 3/4 turns after its surface contacts the seal surface of the filter holder.
8. After replacing the filter cartridge, add oil through oil filler port (F) until the oil level comes between H and L marks on the level gauge (G).
9. Run the engine at an idle for some time, then stop the engine, and check that the oil level is between the H and L marks on the level gauge. For details, see "Operation 3.1.2 Checking before Starting (Checking/Refilling Oil Level in Engine Oil Pan)."

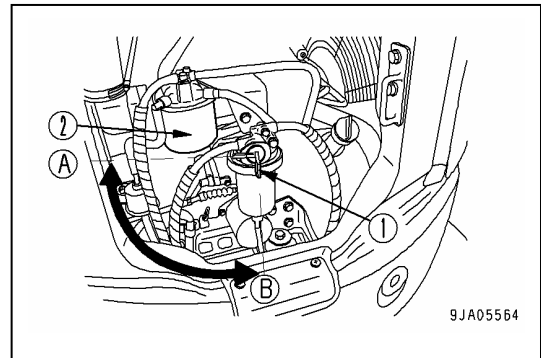


REPLACING FUEL FILTER CARTRIDGE

WARNING

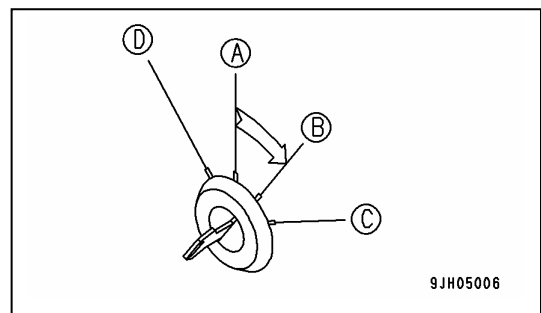
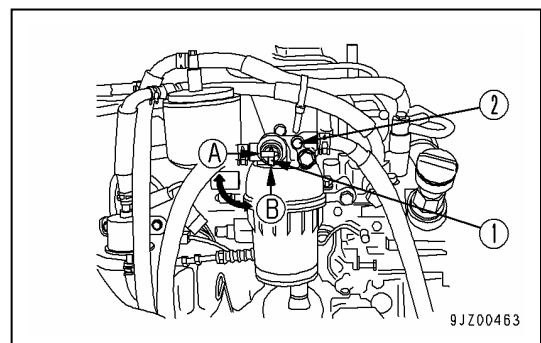
- Since each part will still be very hot immediately after the engine is stopped, do not try to replace the filter immediately. Be sure to proceed with the work after they have cooled down.
- Keep this part away from open flames.

- Prepare a filter wrench.
 - Prepare a cloth
1. Open the engine hood.
 2. Place a cloth under the filter cartridge.
 3. Set handle (1) of the water separator to the Close position (A).
 4. Using a filter wrench, turn filter cartridge (2) counterclockwise to remove it. If any fuel spills, clean it using a cloth.
 5. Clean the filter holder, fill the new filter cartridge with clean fuel and install it to the filter holder after coating the packing surface thinly with a small amount of fuel.
 6. When installing, turn the packing surface clockwise to contact it against the filter holder, and tighten it by approximately one turn using the filter wrench.
Tightening torque: 19.6 - 23.5 Nm {2.0 - 2.4 Kgm}
 7. Set handle (1) of the water separator to the Open position (B).
 8. After replacing the fuel filter cartridge, bleed air from it. See "Procedure for Bleeding Air" for the above operation.



PROCEDURE FOR BLEEDING AIR

1. Completely fill the fuel tank with fuel.
2. Set handle (1) of the water separator to the Open position (B).
3. Loosen air bleeding bolt (2) of the water separator by two to three turns.
4. Once the fuel flows without air bubbles, out of air bleeding bolt (2), tighten air bleeding bolt (2).
5. Turn the starter switch to the ON position (B) and then return it to the OFF position (A) after 10 to 15 seconds. Automatic air bleeding device allows bleeding air automatically.



NOTES

Even when the machine runs out of fuel, you can bleed air using the same procedure.

CHECKING/REFILLING OIL LEVEL IN FINAL DRIVE

⚠ WARNING

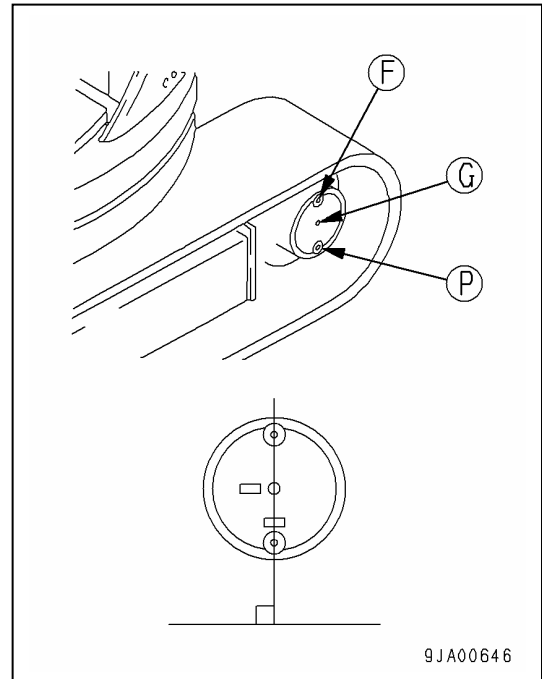
- Parts and oil will still be very hot immediately after the engine is stopped, and have the potential to cause burns. Wait for the temperatures of these components to drop before performing this operation.
- If internal pressure is present inside the case, the oil plug might spring out. Loosen the plug slowly to release the internal pressure.

- Container to receive drained oil
- Prepare a hexagon wrench.

1. Set plug (F) and plug (P) vertical to the ground with plug (F) at the top.
2. Place a container for receiving oil under drain plug (P).
3. Using a hexagon wrench, remove plug (G). If the oil is filled near to the lower end of the hole of plug (G), the level is appropriate.
4. When the oil is insufficient, remove plug (F) using the hexagon wrench and fill oil through the hole of plug (F). Fill power train oil until it flows out of the hole of plug (G).
5. After checking, install plug (F) and plug (G).

NOTES

Wipe off the oil completely if spilled.

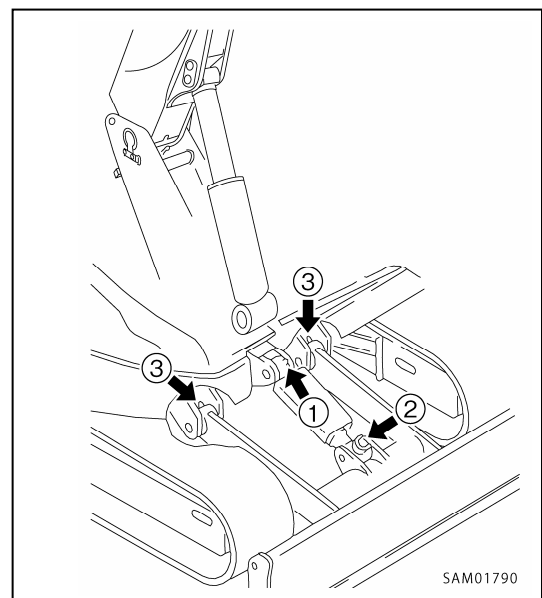


GREASING BLADE

CAUTION

- Grease type is lithium grease. Failure to grease properly may cause the machine to shorten its useful life.
- Greasing a new machine is required once every 10 hours until the machine attains the first 100 hours of operation, this is the running in period.

1. Lower the blade to ground and stop the engine.
2. Using a grease gun, pump in grease through the grease plugs shown by arrows.
3. After greasing, wipe off any old grease that was pushed out.
 - (1) Blade cylinder foot pin (1 place)
 - (2) Blade cylinder rod end pin (1 place)
 - (3) Blade connecting pin (2 places)



CLEANING/CHECKING RADIATOR FINS, OIL COOLER FINS AND FUEL COOLER FINS

WARNING

Note that your body may be directly hit by compressed air, compressed water or steam in this operation, which may scatter litter and cause a personal injury. Always use protective glasses, a dust mask, and other protective equipment.

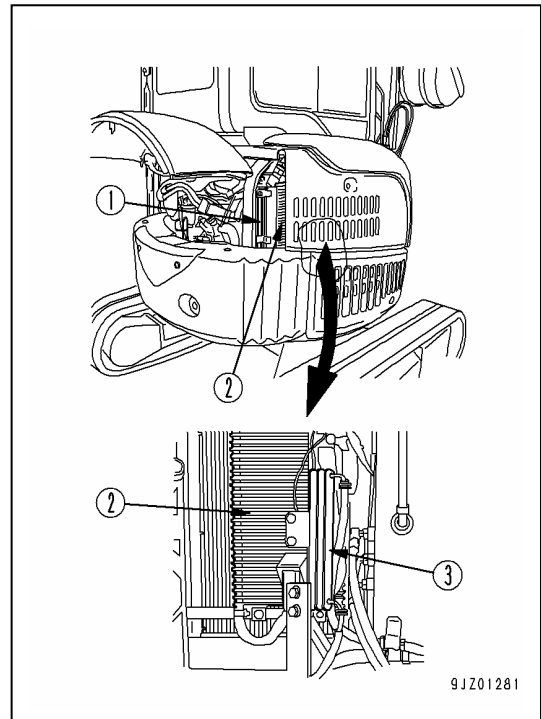
CAUTION

When using compressed air, keep a distance between the air nozzle and the fins to prevent damage to the fins. Particularly when blowing compressed air to the after cooler from above at a 45-degree position, the nozzle must be kept a minimum of 300 mm away from the after cooler.

Apply compressed air vertically to the core as much as practicable. Damaged fins may cause water leakage or overheating.

At a dusty site, check the fins daily irrespective of the maintenance interval.

1. Open the engine hood.
2. Using compressed air, blow off mud, litters or leaves clogging radiator fins (1), oil cooler fins (2) and fuel cooler fins (3).
Steam or water may be used instead of compressed air.

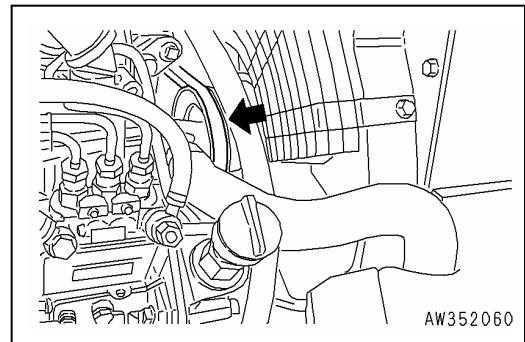


CHECKING/ADJUSTING FAN BELT TENSION

Special tools are required for this inspection and adjustment. Before starting the inspection or replacement, contact us or our sales service agency.

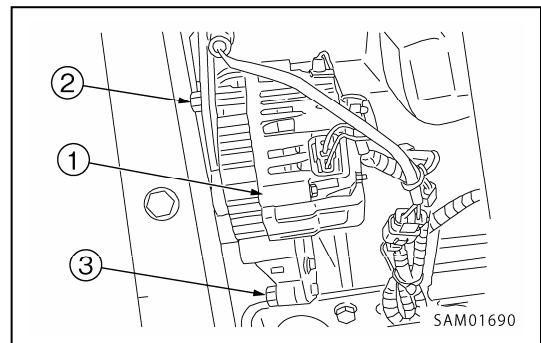
INSPECTION

Press at a midway point between the alternator pulley and fan pulley, the fan belt tension is normal if it deflects approximately 5 to 6 mm (approximately 58.5N {6 Kg $\bar{f}$ }).



ADJUSTMENT

- Wooden bar
1. Remove the radiator guard and loosen bolts (2) and (3).
 2. Using the wooden bar, push alternator (1) from the back side of the machine body to the front side, and then move alternator (1) so that the belt tension deflects approximately 10 to 15 mm (approximately 58.5 N {6 Kg $\bar{f}$ }). At the above state, tighten bolt (2).
 3. Tighten bolt (3) to fix alternator (1).
 4. Install the radiator guard.



CAUTION

- Check each pulley for damage, wear on the V-groove and on the V-belt. In particular, be sure to check that the V-belt is not touching the bottom of the V-groove.
- If the belt is stretched and no allowance for adjustment is left, or if it is cut or cracked, or it generates sliding sounds or other noises, contact us or our sales service agency for a replacement.

10.8 MAINTENANCE EVERY 1000 HOURS

Carry out this maintenance in tandem with the maintenance tasks that are performed every 50, 100, 250 and 500 hours.

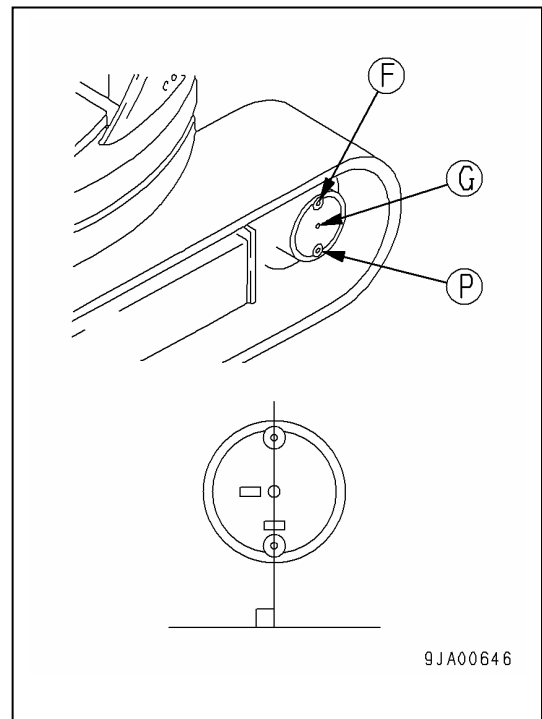
REPLACING OIL IN FINAL DRIVE CASE

⚠ WARNING

- **Parts and oil will still be very hot immediately after the engine is stopped, and have the potential to cause burns. Wait for the temperatures of these components to drop before performing this operation.**
- **If internal pressure is remaining inside the case, the oil or plug may spring out. Loosen the plug slowly to release the internal pressure.**

- Refilling capacity: 0.6 liters for each left and right sides
- Prepare a hexagon wrench.

1. Set plug (F) and plug (P) vertical to the ground with plug (F) at the top.
2. Place a container for receiving oil under drain plug (P).
3. Using a hexagon wrench, remove plugs (P), (G) and (F) and drain oil.
4. Tighten drain plug (P).
5. Refill power train oil through the hole of plug (F).
6. When the oil begins to flow out of the hole of plug (G), install plugs (G) and (F).



CHECKING/ADJUSTING ENGINE VALVE CLEARANCE

Special tools are required for the inspection and maintenance tasks. Contact us or our sales service agency.

REPLACING OIL IN WINCH MOTOR REDUCTION GEAR CASE

WARNING

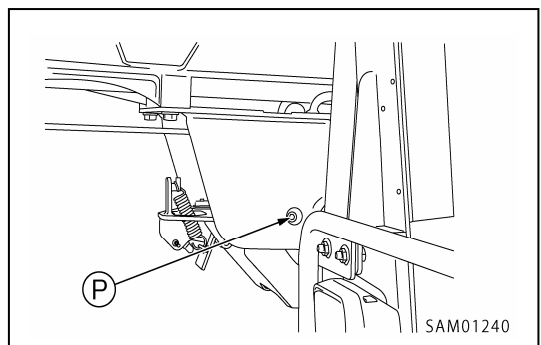
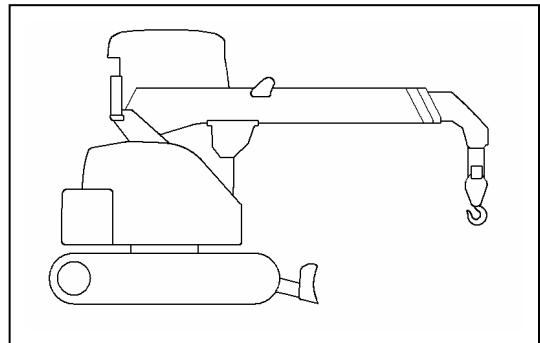
- The oil is at high temperature immediately after the engine is stopped. Wait for the oil temperature to drop and do not try to remove the plug of the port immediately.
- If internal pressure remains inside the winch case, the oil or plug may spring out. Loosen the plug slowly to release the internal pressure.

CAUTION

- For the oil used, see "Inspection and Maintenance 7.1 Use of Fuel, Coolant and Lubricants According to Ambient Temperatures".
- After refilling the oil, use the seal tape to prevent leakage of oil from the threaded portion of the plug, then securely tighten the plug.

- A container for receiving drained oil: Prepare a 1-liter or larger pan.
- Hex bar wrench for removing plug: 8 mm
- Refilled oil capacity in swing reduction gear case: 0.75 liters

1. Stop the machine on level ground.
2. As shown in the figure to the right, retract the boom to the minimum length, lower it fully and set it horizontally.
3. Turn the winch slowly until plug (P) comes to a point just beneath the ground.
4. Place a container for receiving oil under plug (P).
5. Using a hexagon wrench, loosen plug (P) gradually to remove it, while releasing the internal pressure. Gear oil in the reduction gear case will be drained.
6. After gear oil in the reduction gear case has completely drained, turn the winch slowly until plug (P) becomes visible through the opening.
7. Using an oil pump, etc., refill gear oil through the hole of plug (P).
8. After filling with oil, install plug (P) and tighten it securely.



NOTES

- Wipe off the oil completely if spilled.
- If it is difficult to drain the oil, install plug (P), set the boom to the fully extended and raised state, and repeat raising and lowering of the winch to increase the oil temperature until the winch surface (vicinity of plug (P)) is felt warm when touched with bare hand. Then resume the work starting from Step 2.
- If the winch surface is too hot to touch with bare hands, wait for the temperature to drop before starting this operation.

10.9 MAINTENANCE EVERY 1500 HOURS

Carry out this maintenance in tandem with the maintenance tasks that are performed every 50, 100, 250 and 500 hours.

CHECKING/CLEANING FUEL INJECTION DEVICE

The fuel injection valve must operate normally in order to secure an optimum engine performance. Check and clean the fuel injection valve. Special tools are required for the inspection and maintenance task. Contact us or our sales service agency.

CHECKING CRANKCASE BREATHER

The crankcase breather must operate normally to ensure conformance of the engine to the regulations on exhaust gas during the period of its service. Check the diaphragm for damage and the spring for breakage. Special tools are required for the inspection and maintenance task. Contact us or our sales service agency.

10.10 MAINTENANCE EVERY 2000 HOURS

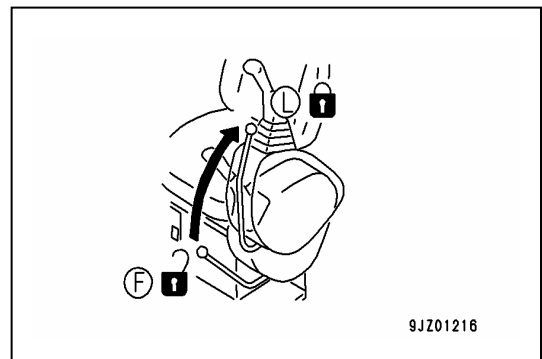
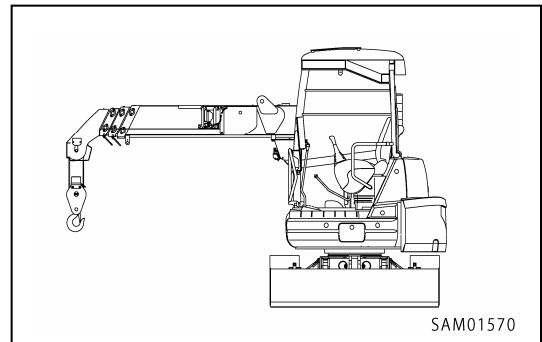
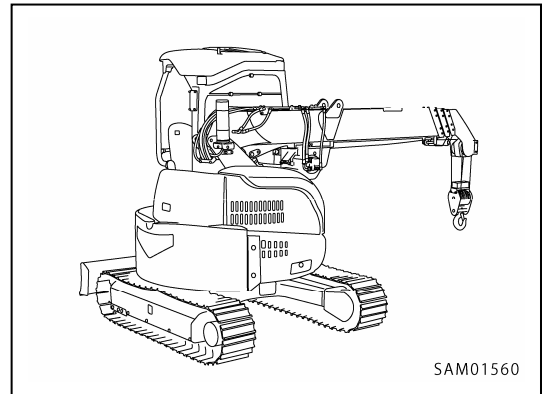
Carry out this maintenance in tandem with the maintenance tasks that are performed every 50, 100, 250, 500 and 1000 hours.

REPLACING OIL IN HYDRAULIC TANK AND CLEANING STRAINER

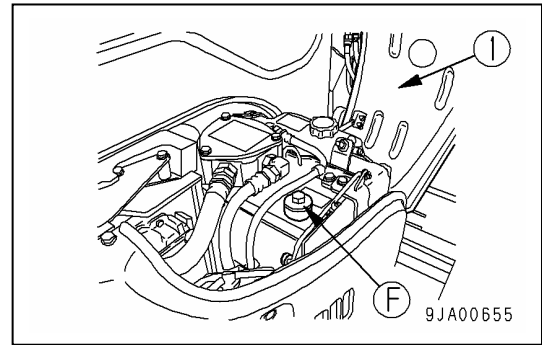
WARNING

- Parts and oil will still be very hot immediately after the engine is stopped, and have the potential to cause burns. Wait for the temperatures of these components to drop before performing this operation.
- When removing the cap of oil filter port, turn it slowly to release the internal pressure. Otherwise, it may gush out.

- Refill capacity: 28.5 liters
 - Prepare a handle (for the socket wrench).
1. Swing the machine so that the drain plug at the bottom of the hydraulic tank comes to the midpoint between the left and right tracks.
 2. Retract the boom to the minimum length and lower it fully to get the blade down to the ground.
 3. Set the lock lever to the LOCK position (L) and stop the engine.



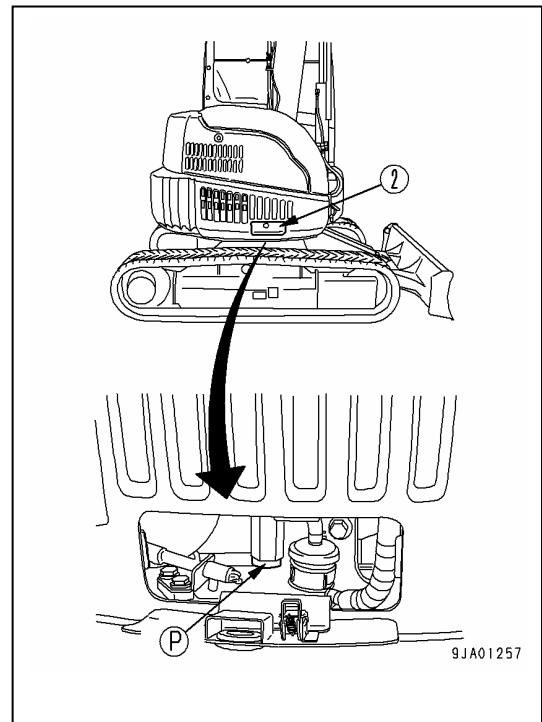
4. Open dust cover (1) on the right side of the machine body and remove cap of oil filler port (F) to release the internal pressure.



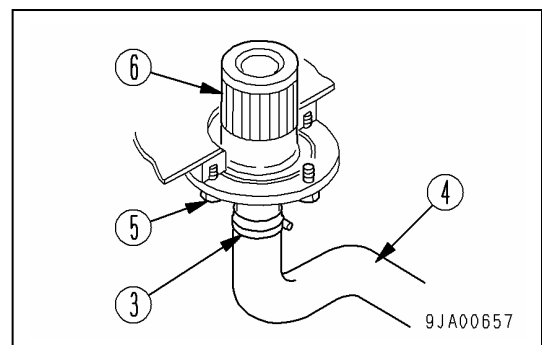
5. Open inspection cover (2) on the right side of the machine body and set a container for receiving oil at the bottom of drain plug (P). Remove drain plug (P) using the handle and drain oil. Check the O-ring installed to drain plug (P), and if it is damaged, replace it with a new one. After draining oil, tighten drain plug (P) securely.

Drain plug tightening torque is 44.1 to 53.9 Nm {4.5 to 5.5 Kgm}.

- When removing drain plug (P), be careful not to get any oil on yourself.



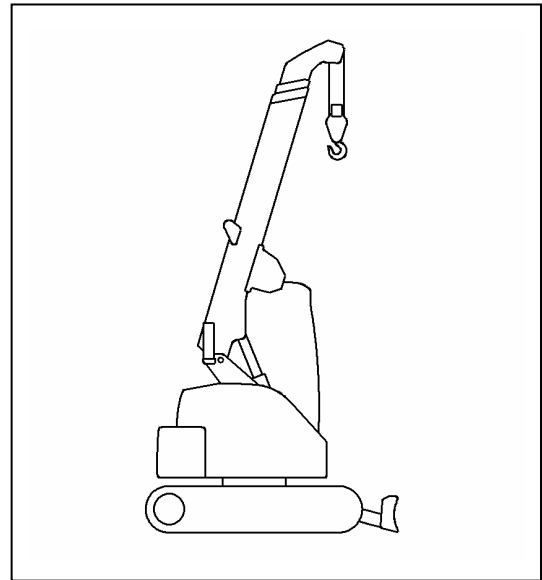
6. Loosen hose clamp (3) to remove hose (4) and loosen bolt (5) to take out strainer (6).
7. Remove any dust that has adhered to strainer (6) and clean it using clean diesel oil or flushing oil. If strainer (6) is damaged, replace it with a new one.
8. Fix strainer (6) using bolts (5), install hose (4) and fix it using hose clamp (3).
9. Add the refilling amount of oil through oil filler port (F). Make sure that the oil level is between the H and L marks of the sight gauge.



10. As shown in the figure to the right, retract the boom to the minimum length and raise it fully, lower the blade to the ground, attach the oil filler cap and then pressurize the inside of the tank.
11. After refilling the oil, set each control lever to the neutral position and run the engine at a low idle for two to three minutes before starting the operation.

CAUTION

If you do not pressurize the hydraulic tank, equipment will be adversely affected due to suction of air by the pump.



CHECKING ALTERNATOR AND STARTER MOTOR

Since the brushes may be worn out or the bearing may have run out of grease, contact us or our sales service agency for inspection and repairs.

If the engine is started frequently, contact us or our sales service agency for an inspection once for every 1000 hours.

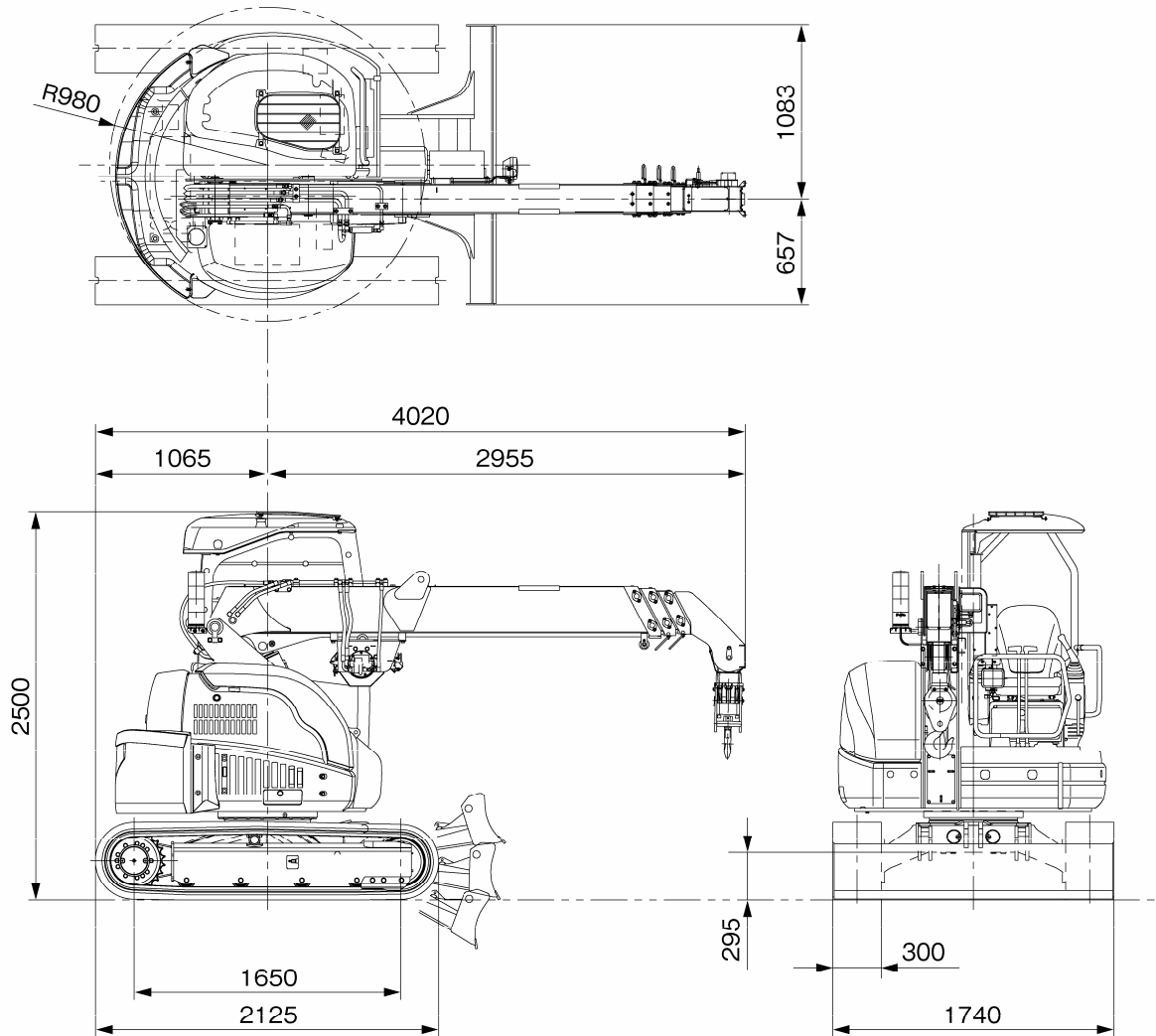
SPECIFICATIONS

1. SPECIFICATION LIST	5- 2
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3. RATED TOTAL LOAD CHART	5- 4
4. WORKING RADIUS AND LIFTING HEIGHT	5- 7

1. SPECIFICATION LIST

System / Item			LC383M-5
Mass and dimensions	Machine mass		4,400kg
	Overall length × width × height		4,020mm x 1,740mm x 2,500mm
	Distance between idler and sprocket		1,650mm
	Track gauge		1,440mm
	Track width		300mm
	Swing radius at machine rear end		980mm
Capacity	Maximum rated total load × working radius		2.93t x 1.5m
	Maximum working radius		8.38m
	Maximum lifting height		9.30m
Winch system	Method		Swash plate axial piston motor, differential gear deceleration, friction plate brake, and grooved drum
	Number of falls		4-falls/2-falls (1-fall Optional)
	Winding speed		20.8m/min (4th drum, 4 ropes)
	Hoisting rope		IWRC 6 x Ws (26) 0/0 Type B φ8mm x 73m
Boom telescoping system	Method		2 sequential telescoping double acting hydraulic cylinders + 1 wire rope telescoping device
	Boom type		Pentagonal sectioned hydraulic automatic telescoping boom, 4 sections (section 2: sequential, sections 3 and 4: simultaneous)
	Boom length		3.18m~5.03m~6.87m~8.71m
	Boom telescoping stroke/time		5.53m/14.3sec
Boom derrick system	Method		Direct push-type hydraulic double-acting cylinder
	Derrick angle/ time		0 to 80 deg./12.2sec
Slewing system	Method		Hydraulic motor drive, fixed displacement piston (with safety valve and pivot brake)
	Slewing angle/ speed		360 degrees, continual, 2.6 rpm
Traveling system	Method		Variable displacement piston type
	Travel speed	Low	Forward/backward: 0 – 2.9km/h
		High	Forward/backward: 0 – 5.0km/h
	Gradability		20 deg.
Hydraulic system	Hydraulic pump		Variable piston pumps and dual gear pump
	Hydraulic oil tank capacity		28.5 liters
Engine	Model		YANMAR 3TNV88
	Type		Vertical in-line, Water cooled, 4-cycle, Direct fuel injection type
	Displacement		1.642 liters (1642cc)
	Rated output (continuous)		21.5kW/2400min ⁻¹ (29.2PS/2400rpm)
	Fuel tank capacity		Light oil/42liters
Safety device	Overwind protections, moment limiter (with working envelope restriction), wire rope latch, hydraulic safety valve, alarm buzzer, machine body inclination alarm, working status lamp, level, control lock lever, travel lock bar, side mirror, emergency stop switch, and crane/blade interlock device		

2. SPECIFICATION DIMENSIONAL DRAWING



SAM01740

3. RATED TOTAL LOAD CHART

[1] RATED TOTAL LOAD CHART AT WIRE ROPE 4 FALLS

Unit: kg

Working radius (m)	3.18m Boom		5.03m Boom		6.87m Boom	8.71m Boom
	Stationary	Pick & Carry	Stationary	Pick & Carry	Stationary	Stationary
1.50	2930	1465	2930	1465	1870	1190
2.00	1730	865	1710	855	1710	1190
2.50	1200	600	1190	595	1190	1190
2.85	980	490	980	490	980	980
3.00			900	450	900	900
3.50			720	360	720	720
4.00			600	300	600	600
4.50			500	250	500	500
4.70			460	230	460	460
5.00					430	430
5.50					370	370
6.00					330	330
6.54					290	290
7.00						260
7.50						235
8.00						215
8.38						200

★Boom length:

3.18m boom → Boom retracted minimum

5.03m boom → Boom length more than 3.19m less than 5.03m

6.87m boom → Boom length more than 5.04m less than 6.87m

8.71m boom → Boom length 6.88m or more

★The Rated total load Chart is based on the actual working radius including boom deflection.

★The weight of hoisting accessory (hookblock:30kg) must be included as part of the load shown in the Rated total load Chart.

[2] RATED TOTAL LOAD CHART AT WIRE ROPE 2 FALLS

Unit: kg

Working radius (m)	3.18m Boom		5.03m Boom		6.87m Boom	8.71m Boom
	Stationary	Pick & Carry	Stationary	Pick & Carry	Stationary	Stationary
1.50	1480	740	1480	740	1480	1190
2.00	1480	740	1480	740	1480	1190
2.50	1200	600	1190	595	1190	1190
2.85	980	490	980	490	980	980
3.00			900	450	900	900
3.50			720	360	720	720
4.00			600	300	600	600
4.50			500	250	500	500
4.70			460	230	460	460
5.00					430	430
5.50					370	370
6.00					330	330
6.54					290	290
7.00						260
7.50						235
8.00						215
8.38						200

★Boom length:

3.18m boom → Boom retracted minimum

5.03m boom → Boom length more than 3.19m less than 5.03m

6.87m boom → Boom length more than 5.04m less than 6.87m

8.71m boom → Boom length 6.88m or more

★The Rated total load Chart is based on the actual working radius including boom deflection.

★The weight of hoisting accessory (hookblock:30kg) must be included as part of the load shown in the Rated total load Chart.

[3] RATED TOTAL LOAD CHART AT WIRE ROPE 1 FALL

Unit: kg

Working radius (m)	3.18m Boom		5.03m Boom		6.87m Boom	8.71m Boom
	Stationary	Pick & Carry	Stationary	Pick & Carry	Stationary	Stationary
1.50	750	375	750	375	750	750
2.00	750	375	750	375	750	750
2.50	750	375	750	375	750	750
2.85	750	375	750	375	750	750
3.00			750	375	750	750
3.50			720	360	720	720
4.00			600	300	600	600
4.50			500	250	500	500
4.70			460	230	460	460
5.00					430	430
5.50					370	370
6.00					330	330
6.54					290	290
7.00						260
7.50						235
8.00						215
8.38						200

★Boom length:

3.18m boom → Boom retracted minimum

5.03m boom → Boom length more than 3.19m less than 5.03m

6.87m boom → Boom length more than 5.04m less than 6.87m

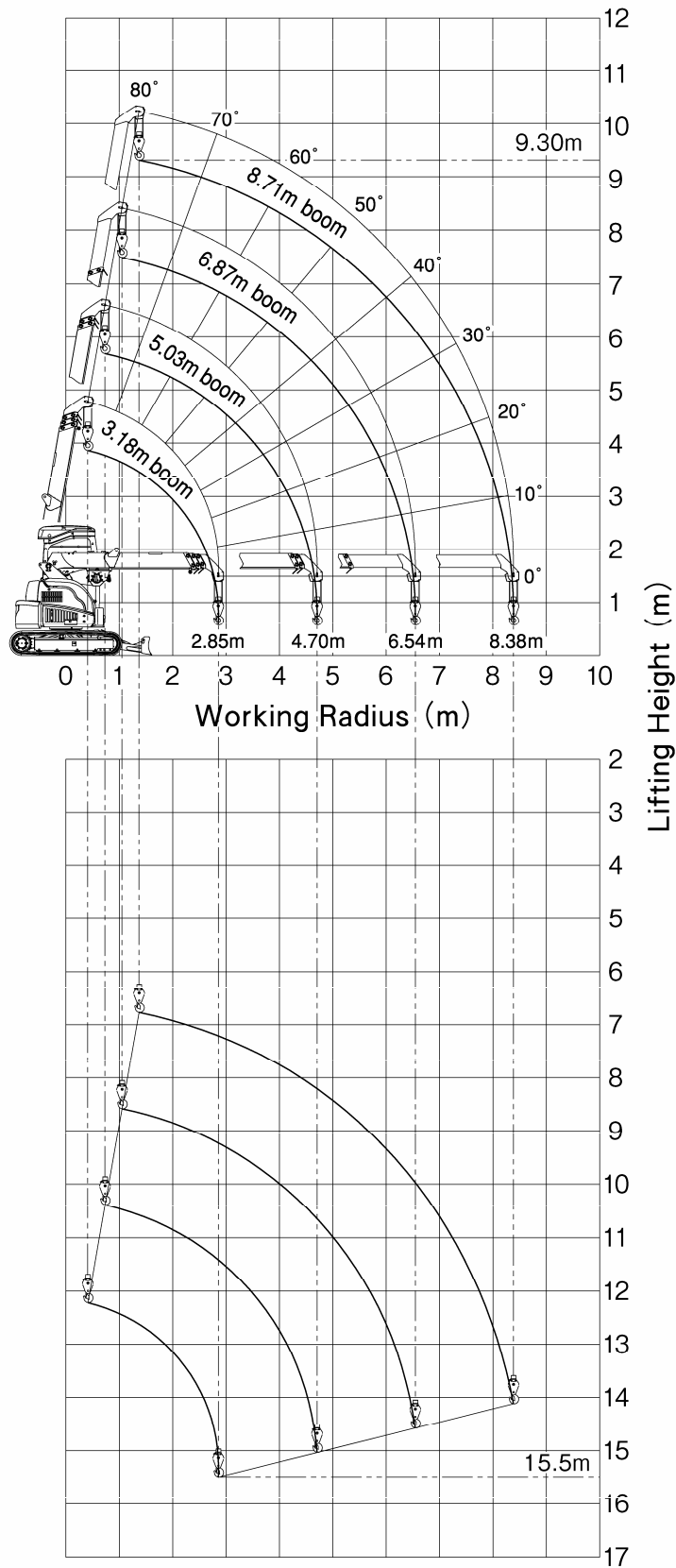
8.71m boom → Boom length 6.88m or more

★The Rated total load Chart is based on the actual working radius including boom deflection.

★The weight of hoisting accessory (hookblock:20kg) must be included as part of the load shown in the Rated total load Chart.

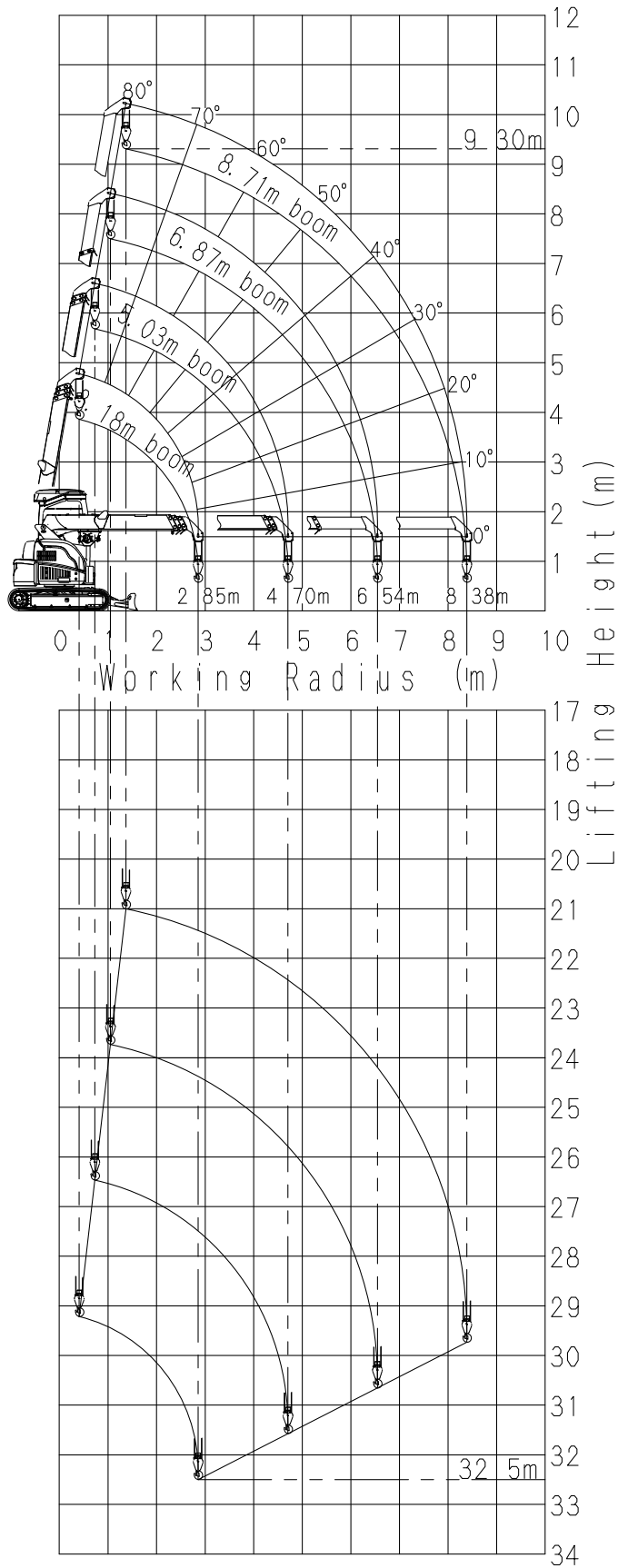
4. WORKING RADIUS AND LIFTING HEIGHT

[1] WORKING RADIUS AND LIFTING HEIGHT AT WIRE ROPE 4 FALLS



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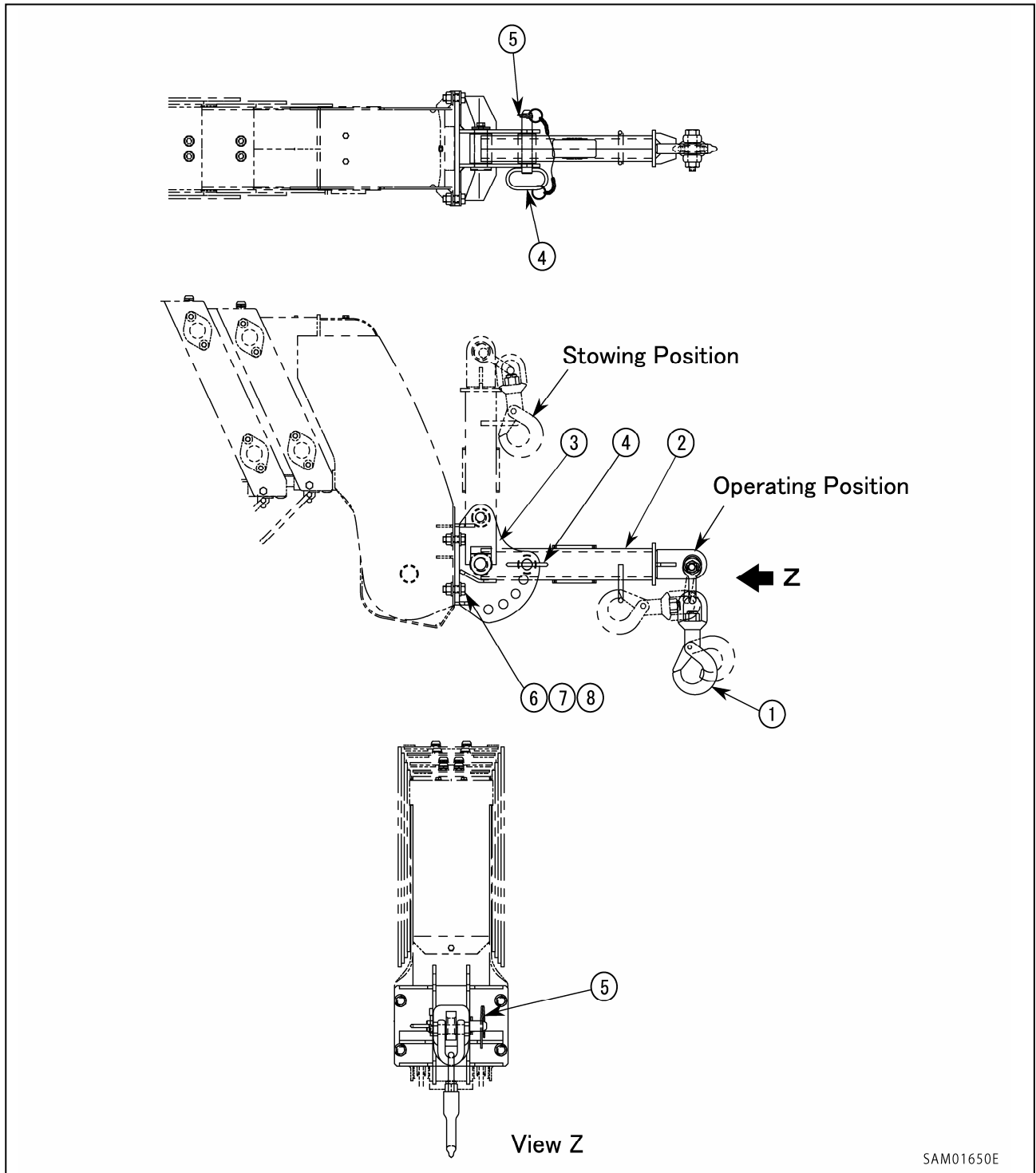
[2] WORKING RADIUS AND LIFTING HEIGHT AT WIRE ROPE 2 FALLS



SEARCHER HOOK

1. SEARCHER HOOK EACH SECTION	6- 2
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3. OPERATION	6- 5
4. INSPECTION AND MAINTENANCE	6- 8
5. WORKING RADIUS AND RATED TOTAL LOAD	6-11

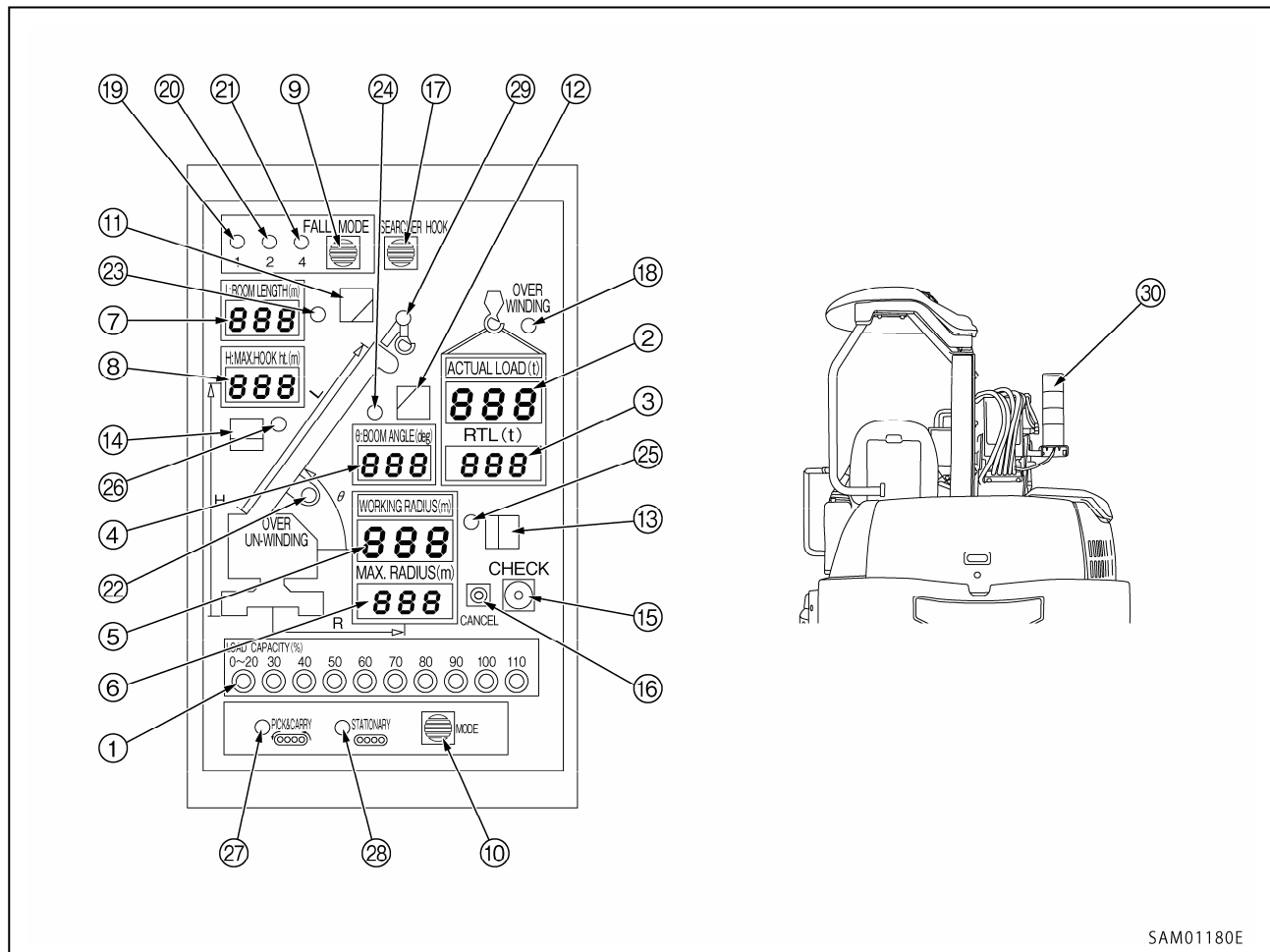
1. SEARCHER HOOK EACH SECTION



- (1) Hook
- (2) E-Boom
- (3) Bracket
- (4) Position pin

- (5) Snap pin
- (6) Hex. head bolt
- (7) Hex. head nut
- (8) High tension washer

2. MOMENT LIMITER DISPLAY UNIT



- | | |
|--|---|
| (1) Load capacity display | (16) Cancel switch |
| (2) Actual load display | (17) Searcher hook mode switch |
| (3) Rated total load display | (18) Overwind detection LED (Red) |
| (4) Boom angle display | (19) 1 fall LED (Green) |
| (5) Working radius display | (20) 2 falls LED (Green) |
| (6) Rated radius display | (21) 4 falls LED (green) |
| (7) Boom length display | (22) Over un-winding detection LED (Red) |
| (8) Lifting height display | (23) Boom angle upper limit LED (green) |
| (9) Fall mode selector switch | (24) Boom angle Lower limit LED (green) |
| (10) Pick & Carry/ Stationary mode select switch | (25) Working radius upper limit LED (green) |
| (11) Boom angle upper limit switch | (26) Lifting height upper limit LED (green) |
| (12) Boom angle lower limit switch | (27) Pick & carry mode selection LED (Red) |
| (13) Working radius upper limit switch | (28) Stationary mode selection LED (Orange) |
| (14) Lifting height upper limit switch | (29) Searcher hook LED (Orange) |
| (15) Check switch | (30) Working status lamp |

[1] DESCRIPTIONS OF SWITCHES ON MOMENT LIMITER DISPLAY UNIT

CAUTION

For general operation, see "OPERATION 2.3 MORMENT LIMITER".

1. Searcher hook mode switch

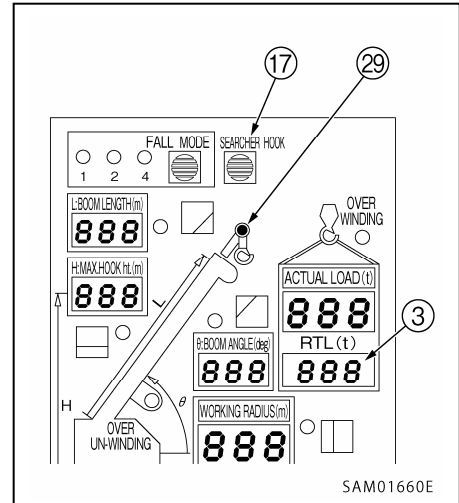
! DANGER

- Searcher hook mode must be set when operating searcher hook. Otherwise moment limiter would not work correctly and thus may result in serious accidents.
- Travel lock bar must be in lock position when operating searcher hook. Pick & carry operation is prohibited.

Keep pressing the searcher hook mode switch (17) for 3 seconds. The setting changes to searcher hook mode, and searcher hook LED (29) turns on. Rated total load display window (3) now shows value of searcher hook rated total load chart.

NOTES

When changing the setting right after doing so, release your hand from the switch, and then press the switch again.

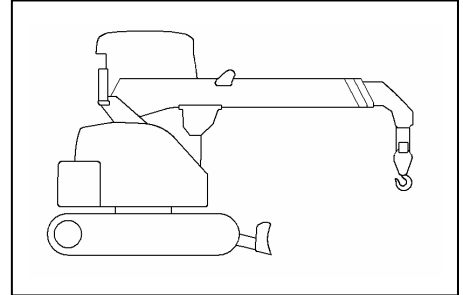


3. OPERATION

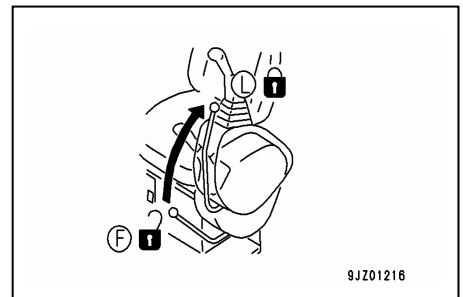
DANGER

- Do not use searcher hook other than in searcher hook mode. It cause moment limiter to function incorrectly, and thus may cause serious accident.
- Main hook block must not be used in searcher hook mode.
- When operate searcher hook, surely set travel lock bar to lock position.
- Pick and carry operation is prohibited.
- Refer to “Operation 3 Machine Operation and Control” for how to operate the crane.

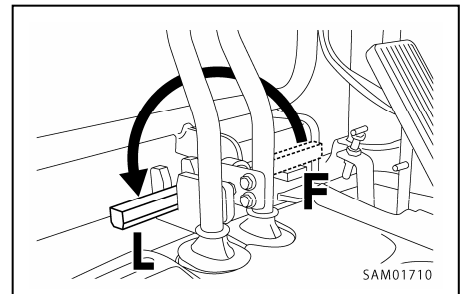
1. If machine posture is not like the figure as shown on the right, start engine, and fully retract and fully lower boom with low rotation engine speed to make the boom level and then stop engine. Then pull out starter key.



2. Pull up the lock lever to lock position (L).



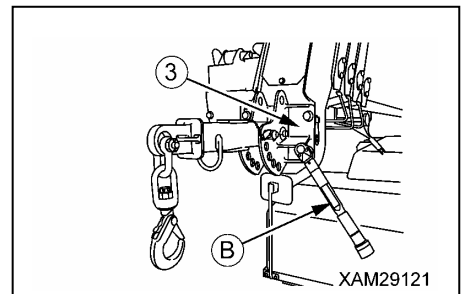
3. Set the travel lock bar to lock position (L) in the ditch.



4. Using 4 sets of M12 bolt and nut, fix searcher bracket (3) to main boom. Tighten the bolts at tightening torque of $93\text{Nm}(\pm 14\text{Nm})$ using a torque wrench (B).

DANGER

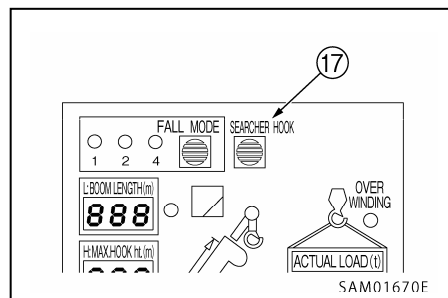
- To prevent searcher hook from falling off, be sure to tighten and fix searcher hook fix bolts at tightening torque of $93\text{Nm} \pm 14\text{Nm}$.
- Check that bolt is not cracked, squashed, or stretched before use.



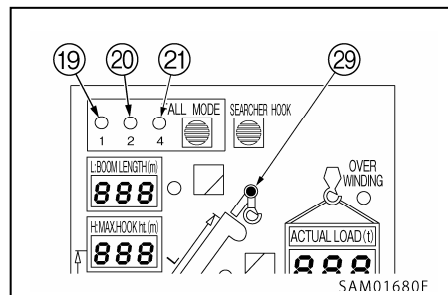
5. Press searcher hook mode switch (17) for 3 seconds.

! DANGER

Do not operate searcher hook other than in the searcher hook mode. Moment limiter would not work correctly and thus may result in serious accidents.

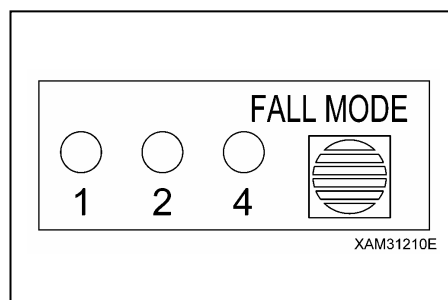


6. Make sure the searcher hook LED (29) is turned on, and fall mode LEDs (19) ~ (21) are turned off.

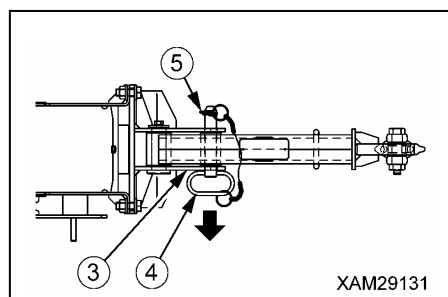


NOTES

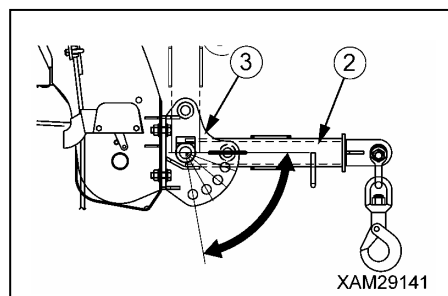
When searcher hook mode is turned off, fall mode returns to the last setting before shifting to searcher hook mode.



7. Remove the snap pin (5) from the end of position pin (4) of bracket (3), and remove the position pin (4).



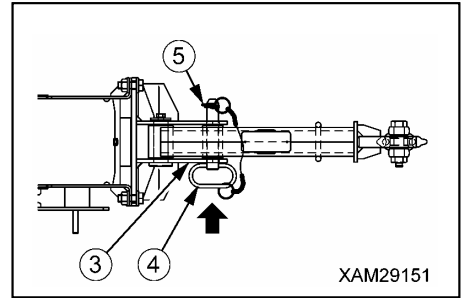
8. Move E boom (2) to the required angle for the work, and line up the holes in the E boom (2) and bracket (3).



9. Insert the position pin (4) through the hole of bracket (3), and secure it with the snap pin (5) to the tip of position pin (4).

⚠ DANGER

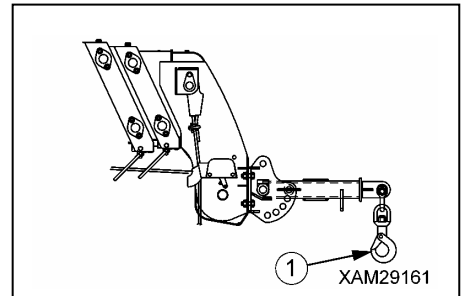
Always secure the position pin (4) with the snap pin (5). If the snap pin falls out during operations, serious injury or damage to the machine may result.



10. Attach the load securely to the hook (1) and start operations.

⚠ DANGER

When hoist load in searcher hook mode, hoist up the load from ground by boom raising or extending operation and soon stop once to see if the load is safe or not.

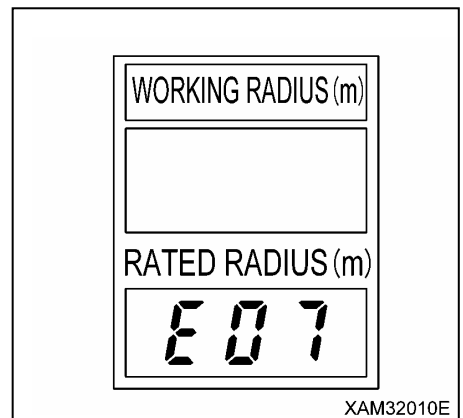
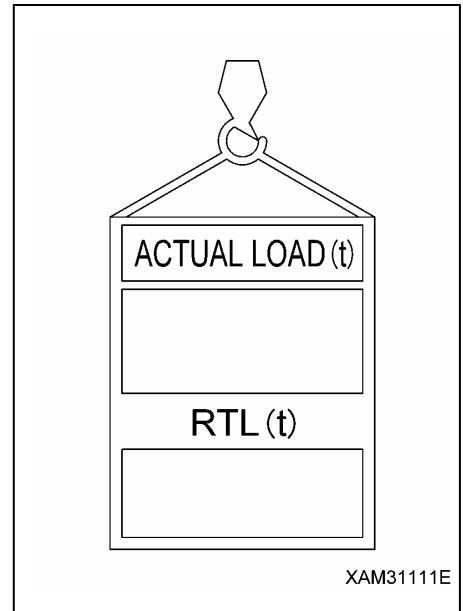


⚠ WARNING

Always work in accordance with all appropriate local regulations concerning your own and others' safety.

NOTES

- When crane function is automatically cut out by overload work, retract boom to recover crane function. Refer to "Operation 2.3.3 Moment Limiter Operation (Recovery operation from auto stop)".
- In searcher hook mode, rated total load display shows value of searcher hook rated total load chart.
- In searcher hook mode, boom raising operation will also be locked when overloaded. Refer to "Operation 2.3.3 Moment Limiter Operation".
- If travel levers are operated in searcher hook mode, buzzer sounds, and rated total load display window shows error code "E07", but this is not failure.



4. INSPECTION AND MAINTENANCE

4.1 LEGAL INSPECTION

In the event that federal or local law or regulation requires regular inspection to maintain safe operation of machine, check items below:

1. Check disorder of safety devices.
2. Check disorder of lifting equipment such as hook.
3. Check cracks or deformations of structure members such as boom.
4. Check loose or missing of fasteners.
5. Check correct motion and stoppage of boom by actual operation.

In the event that such inspections detect any disorder, contact our sales partner for your location.

4.2 CONSUMABLES

Parts for mounting searcher hook fixing bolts are consumable items. Replace it at periodic inspection or before it reaches abrasion limits. Replace consumable items regularly, which will ensure economical use of this machine. Always replace with our genuine items. Check parts catalog for the correct part number for parts required.

[CONSUMABLES LIST]

Part	Replacement cycle
Searcher hook fix bolt M12x35L (4pcs)	# Every 6 months or when damage, crack, or squash is found
Searcher hook fix nut M12x1grade (4pcs)	# Every 6 months or when damage, crack, or squash is found
Searcher hook fix washer M12x3.2t (high tension)(8pcs)	# Every 6 months or when damage, crack, or squash is found

★ The cycles marked with a “#” in Replacement cycle are time related not hours.

★ Contact us or our sales service agency for part replacement.

4.3 INSPECTION AND MAINTENANCE LIST

This document only covers searcher hook kit. For crane body, please refer to “Inspection and Maintenance” and follow its precautions.

Inspection and maintenance items	Page
4.4.1 INSPECTION OF BEFORE OPERATION	6- 9
[CHECKING BEFORE STARTING ENGINE]	6- 9
[1] CHECKING BOOM AND BRACKET	6- 9
[2] CHECKING SEARCHER HOOK FIX BOLTS	6- 9
[3] CHECKING ELECTRICAL WIRING FOR DAMAGE	6- 9
[CHECKING AFTER STARTING ENGINE]	6-10
[1] CHECKING FUNCTIONS OF BOOM	6-10
[2] CHECKING MOMENT LIMITER FOR OPERATION (SEARCHER HOOK MODE)	6-10

4.4 MAINTENANCE PROCEDURES

4.4.1 INSPECTION OF BEFORE OPERATION

[CHECKING BEFORE STARTING ENGINE]

Check the followings in this section without starting the engine and before starting work every day.

[1] CHECKING BOOM AND FRAME

- Check each part of the boom and frame for cracks, excessive deformation and contamination etc. In addition, check bolts, nuts and pins for any looseness, drop, or damage etc. If you find any abnormality, repair.

[2] CHECKING SEARCHER HOOK FIXING BOLTS

DANGER

If any damage is found on searcher hook fixing bolts, please replace with new ones immediately.

Breakage of bolts will cause the searcher hook to fall off.

- Check if there are cracks, damage, or squashed area of threaded part of bolts.
If cracked, damaged or squashed area is found, change the bolts with new ones, even it is earlier than expected bolt life.

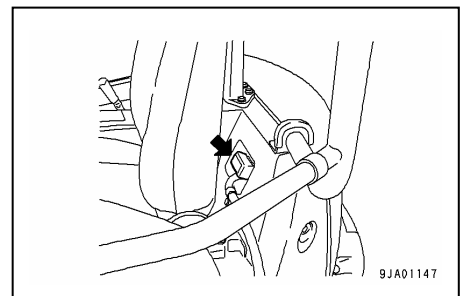
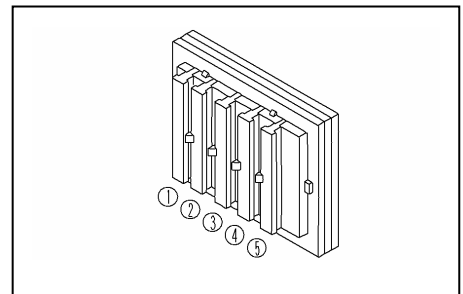
[3] CHECKING ELECTRICAL WIRING (FUSE BOX) FOR DAMAGE

WARNING

If fuses are brown frequently or if you find the trace of a short circuit created in the electrical wiring, be sure to find the cause and fix the problem.

Check the fuse behind the operator's seat for damage and meltdown and if a fuse of specified capacity is being used.

If a fuse has melted down or the trace of an open/short circuit is found in the electrical wiring, ask us or our sales service agency for repair.



[CHECKING AFTER STARTING ENGINE]

Check the followings in this section after starting the engine and before starting work every day.

CAUTION

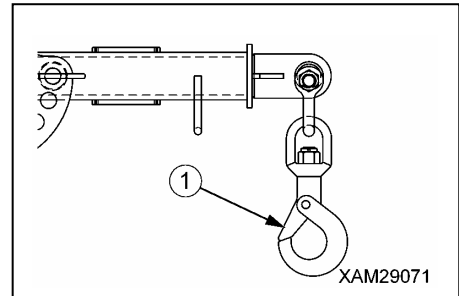
The checks described in this section should be carried out after starting the machine. Refer to "Operation 3.2 Starting Engine" and later to execute the engine startup, travelling and crane operations.

[1] CHECKING FUNCTIONS OF BOOM

! WARNING

During the performance of the function check for boom, ensure that the boom and hook cannot interfere with the safety of personnel or any other objects.

1. Check abnormal noise from boom and searcher hook during crane operation.
2. Operate crane without load and check for loose or missing bolts.
3. Check hook for deformation, abnormal noise from bearing and correct function of wire rope latch, (1).



[2] CHECKING MOMENT LIMITER FOR OPERATION (SEARCHER HOOK MODE)

! WARNING

If you find any abnormality with the moment limiter, immediately contact us or our sales service agency.

1. Set the starter switch to the ON position.
2. Check the working status lamp. All three colors light up for approximately three seconds at first, then only the green light remains lit.
3. Check the moment limiter display unit.
Verify that no error code is displayed at the "RATED TOTAL LOAD" display on the display panel.
4. Start the engine and operate the crane as follows to verify whether the moment limiter correctly displays the value.

Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed "boom length" with the boom length at minimum	3.2 m
Displayed "boom length" with the boom length at maximum	8.7 m
Displayed "working radius" with the boom length of "3.2 m" (first section of the boom) and boom angle of "50.0 degrees"	1.9 ± 0.2 m

5. Prepare a standard weight of known actual mass. Hoist it to ensure that the displayed "actual load" value is identical to the total masses of the standard weight and the slinging equipment. Take note, however, that there may be a slight error due to the condition of the boom.
6. Operate the crane until the moment limiter display values indicate the boom length is "3.2 meters" (3.2 m boom) and boom angle is "50 degrees", and then measure the "boom angle" and "working radius". If the measured value(s) differ from the moment limiter display value, contact us or our sales service agency.

NOTES

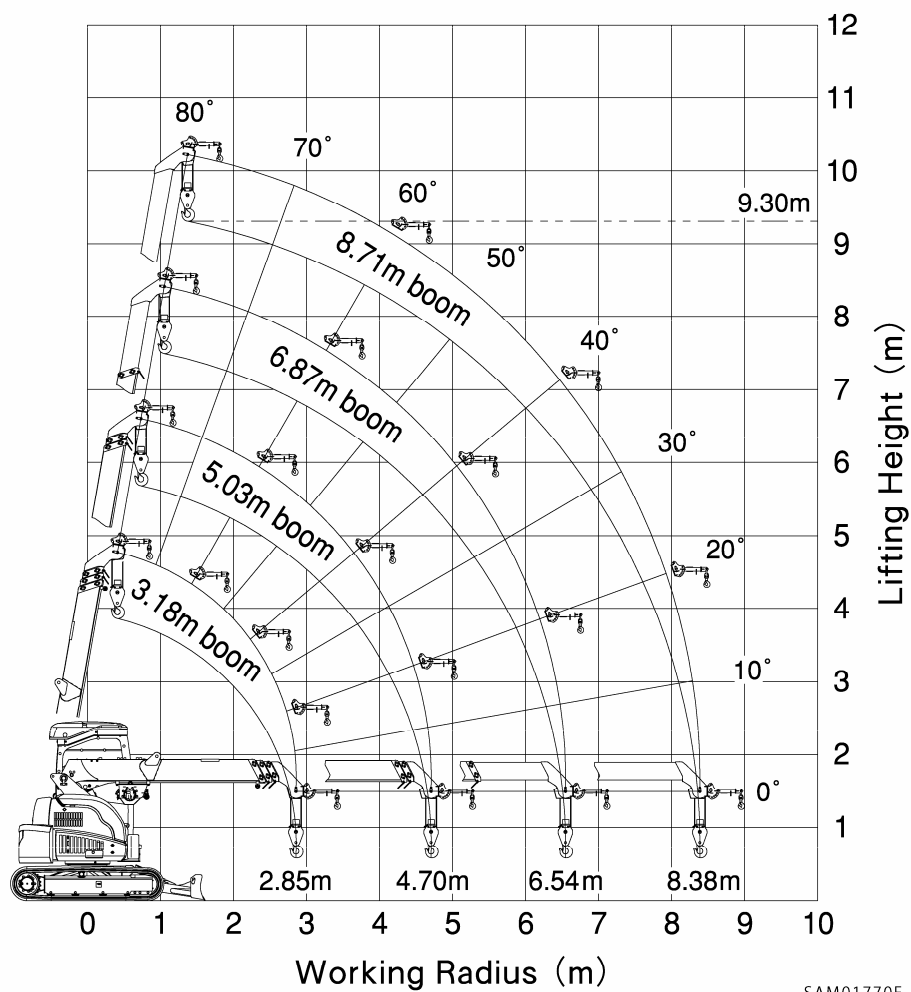
Working radius measure varies by position of searcher hook position pin. Measure with hookblock.

5. WORKING RADIUS AND RATED TOTAL LOAD

⚠ DANGER

- The diagram of working radius and lifting height shows the relationships the working radius of this machine, boom angle, and lifting height above the ground with no object hoisted. The diagram has been made allowing for no deflection in the boom.
- When using the searcher hook, be sure to set searcher hook mode for moment limiter.
- Do not use the searcher hook and the crane hook simultaneously.
- Main hook block must not be used in searcher hook mode.
- Pick & carry operation is prohibited when operating searcher hook.

5.1 WORKING RADIUS AND LIFTING HEIGHT FOR SEARCHER HOOK



5.2 RATED TOTAL LOAD CHART FOR SEARCHER HOOK

Unit : Kg

Working radius (m)	3.18m boom	5.03m boom	6.87m boom	8.71m boom
	Stationary	Stationary	Stationary	Stationary
1.50	500	500	500	500
2.00	500	500	500	500
2.50	500	500	500	500
2.85	500	500	500	500
3.00		500	500	500
3.50		500	500	500
4.00		440	430	430
4.50		370	370	370
4.70		350	350	350
5.00			320	320
5.50			280	280
6.00			250	250
6.54			220	220
7.00				200
7.50				180
8.00				160
8.38				150

★ Boom length

- 3.18m boom → Fully retracted boom
- 5.03m boom → Boom length 3.19m~5.03m
- 6.87m boom → Boom length 5.04m~6.87m
- 8.71m boom → Boom length more than 6.88m

- ★ The values in the rated total load chart are determined based on the working radius allowing for deflection that is developed when load is applied to the boom.
- ★ The rated total load is a load NOT including the mass of a hoisting accessory (hook: 30kg and searcher hook: 12kg).

MAEDA CRAWLER CRANE LC383M-5 OPERATION MANUAL

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