201E-OM2407-00

OPERATION MANUAL

MINI-CRAWLER CRANE

MK353C

Serial No. K0001 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 Manuals written in some other languages. If a foreign language manual is necessary, contact your local distributor for availability.

MAEDA

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Chapter 1
INTRODUCTION

1.1 INTRODUCTION

This manual is a guidebook on how to ensure safe and effective use of this machine.

This manual describes the procedures and precautions that must be followed to ensure proper operation and maintenance of the machine.

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

Failure to observe the basic precautions described in this manual may lead to serious accidents.

⚠ WARNING

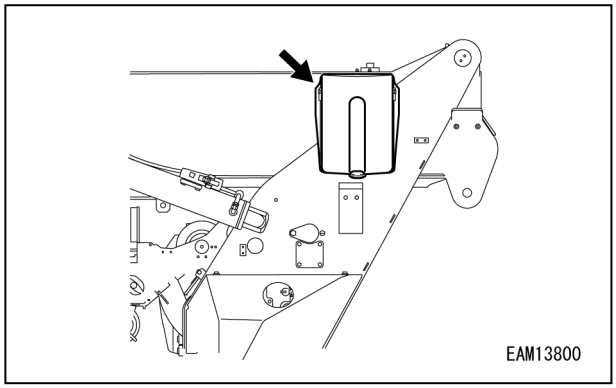
Improper operation of this machine can lead to serious injury or death.
Operators and maintenance personnel must always read this manual prior to operation or maintenance of this machine.
Keep this manual in a designated place so that all personnel that work on this machine can refer to it periodically.

- **Do not operate this machine before carefully reading this manual.**
- **Always keep this manual at hand so you can refer to it when necessary.**
- **If this manual becomes lost or damaged, contact us or our sales service agency promptly to order a new one.**
- **This manual should always accompany the machine if the machine is transferred to another owner.**
  If the machine is resold to a third party without informing us in advance, the warranty will no longer be valid.
- **The information contained in this manual is based on the data that was available at the time of its creation.**
  The information in this manual, including maintenance standards, tightening torques, pressures, measuring methods, adjustment values, and illustrations, are subject to change without prior notice due to continuous machine improvement.
  Such changes may affect the machine maintenance procedure. Always obtain the latest information from Maeda or our sales service agency before carrying out maintenance on this machine.
- **Additionally, the monitor display contents or the controls may change due to software modifications, for example. If the description in the manual differs from the actual display or behavior, please contact us or our sales and service agent.**

For safety information, refer to “1.2 SAFETY INFORMATION” and “Chapter 2 SAFETY.”

Instruction Manual Storage Location

The instruction manual box mounted on the left of the post



1.2 SAFETY INFORMATION

This manual classifies hazards as follows to ensure this manual and the safety labels attached to this machine are easy to understand:

⚠ DANGER	This indicates imminent hazards that can cause serious injury or death. It also provides information on how to avoid such hazards.
⚠ WARNING	This indicates hazards that can cause serious injury or death. It also provides information on how to avoid such hazards.
⚠ CAUTION	This indicates potential hazards that may cause minor or moderate injury or serious damage to the machine. It also provides information on how to avoid such hazards.

This manual also uses the following indications for precautions that must be adhered to and for other useful information:

IMPORTANT	This denotes that failure to properly handle the machine may damage it or shorten its service life.
☞	This denotes useful information.

The operating procedures, inspection and maintenance procedures, and safety precautions described in this manual apply only when the machine is used for the specified tasks.

The precautions given in this manual and on this machine do not necessarily cover every safety issue.

When carrying out machine operations or inspection and maintenance procedures that are not described in this manual, you are responsible for taking the necessary safety precautions.

Regardless of the above, never attempt to perform work or operations that are prohibited in this manual.

1.3 QUALIFICATIONS FOR OPERATION

⚠ WARNING

- **Crane operation is responsible for a large number of occupational accidents. Customers should be especially aware that even experienced operators may be involved in occupational accidents.**
- **Be sure to adhere to the safety precautions described in this manual when operating this machine.**

1.3.1 Qualifications Required 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.

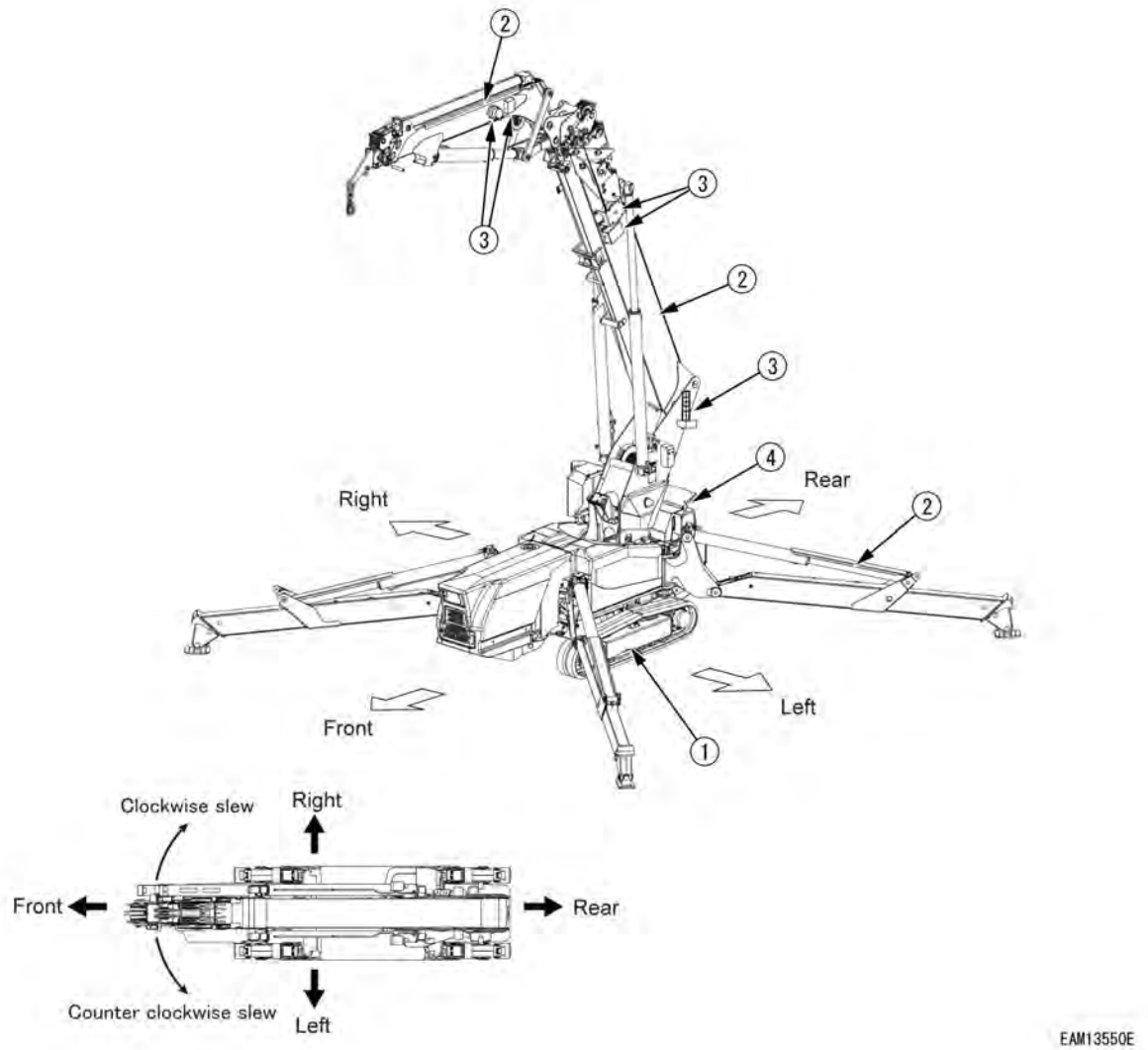
1.4 MACHINE INTRODUCTION

1.4.1 Specified Operations

This machine is only to be used for crane operation.
This machine is a mobile crane with a rubber track travelling dolly (carrier) mounted with a boom crane. This self-propelled crane is capable of moving (travelling) on a worksite and craning an object weighing within the rated total load capacity. This crane can be operated with a radio remote control system.

1.4.2 Machine Configuration

External View



(1) Carrier section
(2) Crane section
(3) Safety devices
(4) Monitor

Viewed from the advancing direction (forward) of the machine from the position where the monitor is operated, the front, rear, left and right of the machine are illustrated in this manual from the front of the machine. Boom slewing motion is determined with the machine viewed from directly above; slew clockwise (right) denotes right-handed motion and slew counter clockwise (left) denotes left-handed motion.

The main components of this machine are the travelling dolly and crane.

This machine consists of the following main units.

[1] Carrier Section

This consists of the traveling equipment, the power equipment, the traveling control equipment, the crane control equipment, and so on.

This machine is compact in design in order to keep the overall width between the crane and outrigger minimised while housed (in travelling position). This compact design is ideal for work in confined areas.

A lever operation enables direction changes forward, backward and right/left, and also pivot and spin turns.

A battery is provided to allow operation without exhaust gas emissions. (battery specification)

[2] Crane Section

This consists of the boom telescoping system, the derricking system, the jib telescoping system, the jib derricking system, the slewing system, the winch system, the outrigger system, and so on.

Through the combined use of telescoping, boom slewing and winch operation, the crane is capable of raising or lowering the hook block and moving an object weighing within the rated total load capacity to a designated position within the confines of the working area.

A radio remote control system allows remote crane operation.

[3] Safety Devices

The following safety devices are used on this machine:

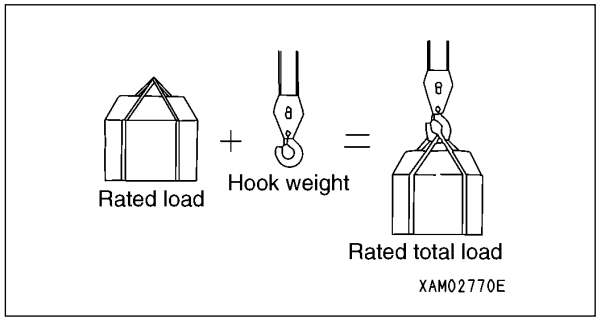
Boom overwinding detector

- Jib overwinding detector
- Over un-winding detector
- Boom angle sensor
- Jib angle sensor
- Boom length sensor
- Jib length sensor
- Hydraulic safety valve
- Hydraulic automatic locking device
- Wire rope latch, an alarm buzzer
- Level gauge
- Crane tip-over alarm (an alarm issued in the event of crane operation at 3-degree inclination and travelling at 10-degree inclination)
- Travell, outrigger or crane mode selector system (prevents crane operation when travelling)
- Outrigger interlock
- Crane interlock
- Moment limiter (with working range limiter)
- Working status lamp
- Radio remote control lamp

1.5 CRANE OVERVIEW

[1] Rated Total Load

The maximum load that can be applied, depending on the boom length and angle. The load includes the mass (weight) of the hoisting accessories (hooks) and slinging ropes.

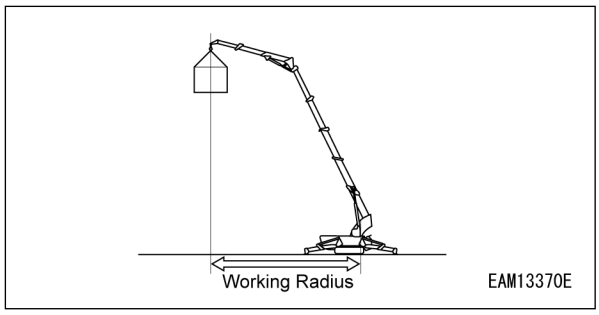


[2] Rated Load

The actual load that can be hoisted, derived by subtracting the mass (weight) of the hoisting accessories (hooks) and slinging ropes from the rated total load.

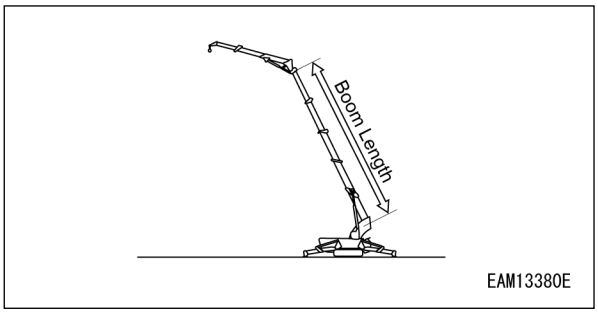
[3] Working Radius

The horizontal distance between the slewing axis and the hook center line.



[4] Boom Length

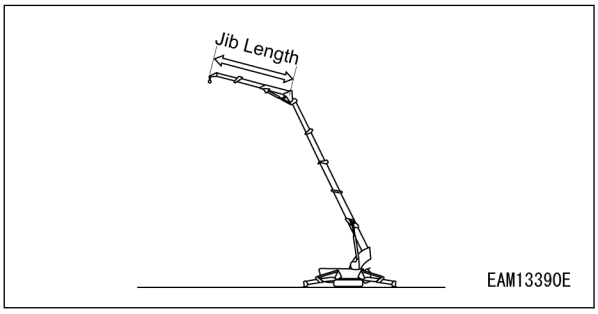
Refers to the distance between the boom base pin and the sheave pin on the boom end.



[5] Jib Length

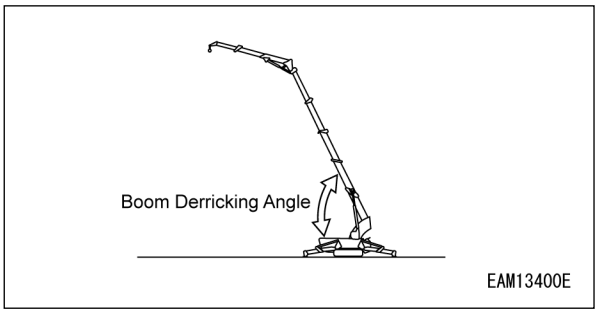
This refers to the distance from the base pin of the jib (the top pin of the boom) to the jib head load sheave.

When using a fixed hook, it is the distance from the base pin of the jib to the jib head shackle mount section.



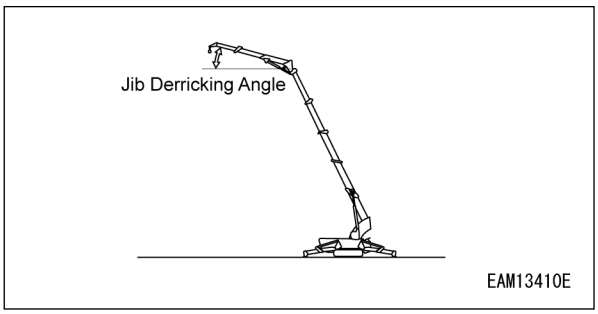
[6] Boom Derricking Angle

Refers to the vertical angle between the boom and the horizon.



[7] Jib Derricking Angle

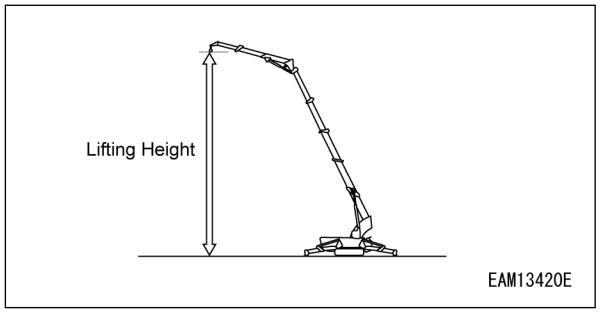
Refers to the vertical angle between the jib and the horizon.



[8] Lifting Height

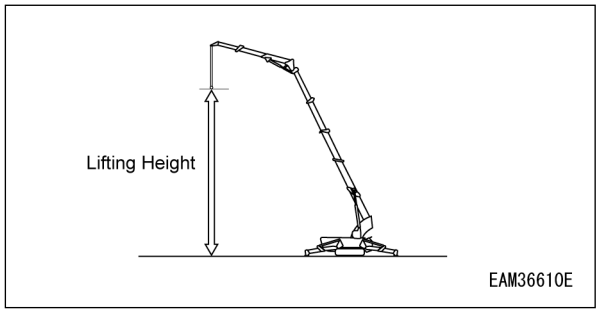
This refers to the perpendicular distance from the bottom edge of the hook to the ground.

- Fixed hook

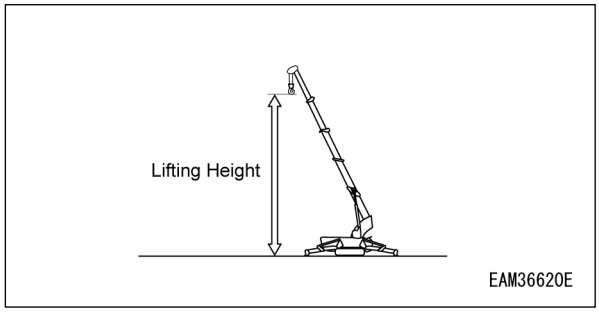


This refers to the perpendicular distance from the bottom edge of the hook to the ground when the hook is hoisted up to the upper limit.

- Single fall hook

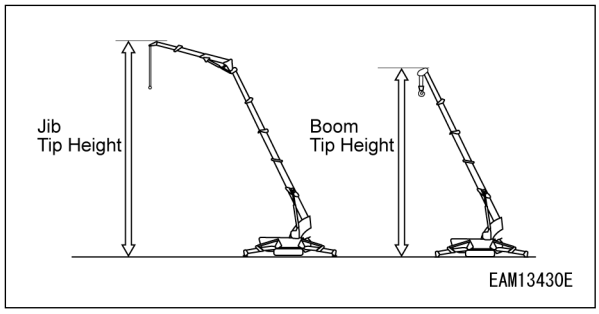


- 4-fall hook



[9] Tip Height

Refers to the vertical distance from the ground to the boom tip or jib tip.



1.6 REMOTE CONTROL SYSTEM INTRODUCTION

1.6.1 Intended Use

This R/C device features a transmitter and a receiver.

The R/C device uses a wireless transmitter, enabling the machine to be operated remotely from any convenient location within radio range.

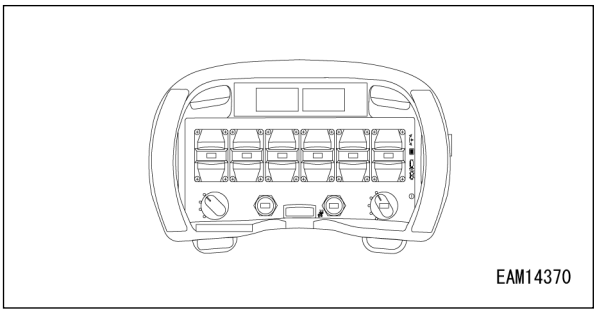
1.6.2 Device Functions

- The crane operation speed can be controlled by the operator from stationary to maximum speed using the engine speed, motor rotation speed and control levers.
- The R/C device transmitter can be used to start and stop the machine, move the machine, operate the crane, and operate optional devices fitted to the crane.
- The R/C device features an emergency stop function to stop traveling and crane operation in an emergency.
- This R/C device includes the ID data necessary for operating the transmitter.
- This R/C device automatically searches for unused frequencies.
- The engine cannot be started up using the R/C device transmitter if communication is not established when the power is turned on.
- If communication is interrupted during operation (due to poor reception or being out of radio range, for example), traveling and crane operation stops and the display indicates that radio communication has been lost to prevent erroneous operation or malfunctions.

1.6.3 Device Configuration

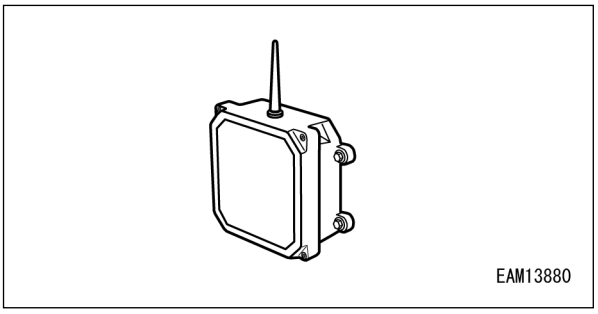
・Transmitter

The transmitter transmits operation signals by radio to the receiver mounted on the machine body, enabling the machine to be traveled and operated the crane remotely.



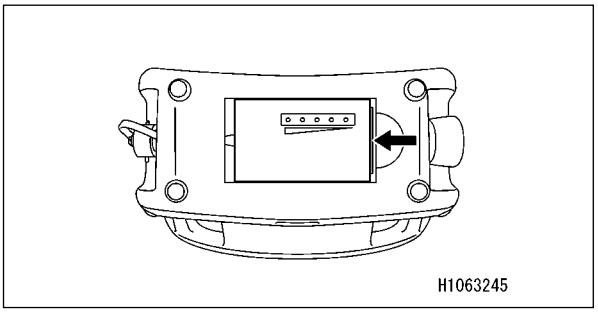
・Receiver

The receiver receives the operation signals sent from the transmitter to operate the machine.



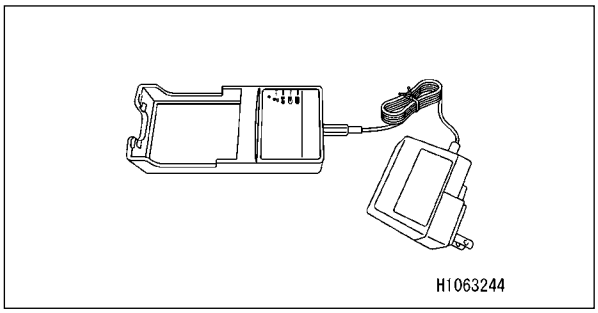
・Battery

This is the power source for operating the transmitter.



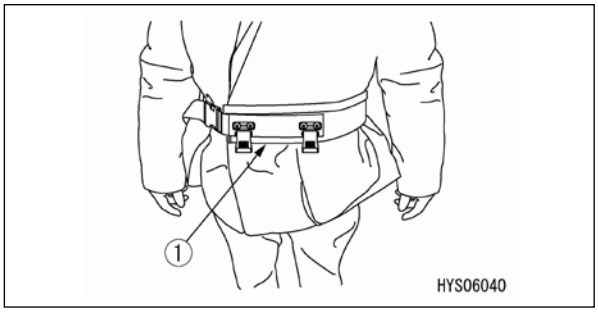
- **Charger**

  This is a device for charging the transmitter's battery.



- **Waist Belt**

  This is a belt (1) used to hold the transmitter while it is being used.



1.7 RUNNING-IN OPERATION

⚠ CAUTION

This machine should initially be run in for approximately 250 hours (the time displayed on the hour meter).
The performance and service life of the machine will be adversely affected if is overloaded during the running-in period.

While this machine is thoroughly adjusted and inspected before shipping, immediately using it for excessively difficult tasks will rapidly degrade its performance and shorten the service life of both the machine and crane.

Pay particular attention to the following during the running-in period:

- Be sure to allow the hydraulic equipment to warm up after starting the machine. Refer to "5.5 OPERATION ANDPRECAUTIONS AFTER THE MACHINE STARTS".
- Avoid overloading or operating at high speeds.
- Avoid sudden starting, sudden acceleration, unnecessary sudden stops, and sudden steering maneuvers.

Chapter 2
SAFETY

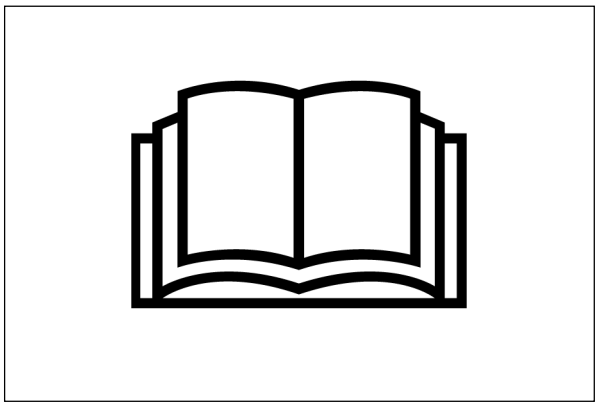
2.1 BASIC CAUTIONS

Incorrect operation and servicing may result in serious personal injury. Before starting operation and servicing, read this manual and safety labels and observe all warnings and precautions.

2.1.1 Precautions Before Starting Work

Observe the manual and safety label

- Read and make sure you understand this manual as well as the safety labels attached to the various parts of this machine. Attempting to drive or operate the machine without a full understanding of the manual may result in incorrect operation that could cause accidents involving personnel or damage to equipment.
- Make sure you fully understand the correct operating and inspection/maintenance procedures to ensure the machine is operated safely.
- Make sure this manual and the safety labels attached to various parts of this machine are always maintained in a legible condition.
  If they become illegible or are missing, order replacements from our sales service agency and reattach safety labels in their original locations.



Operating Qualifications

- Operators must be qualified to operate this machine.
  Operators must obtain the necessary qualifications before operating this machine. For details on the qualifications required for operation, refer to “1.3 QUALIFICATIONS FOR OPERATION.”
- Operators must have received training on handling methods at the business site to ensure sufficient operation skills before beginning work.

Awareness of safe operation

- Follow the instructions and signs given by the manager and work supervisor, and ensure that safety takes priority while working.
- Adhere to crane operation basics while working.
- Be sure to carry out pre-work inspections before operating the machine.
- Do not work under bad weather conditions such as strong wind, lightning, or fog.
- Never operate the machine if you are tired, under the influence of alcohol, or have taken drugs that cause drowsiness.
- Adhere to all workplace rules, safety regulations, and operating procedures when operating and servicing the machine.
- Pay constant attention to the surrounding conditions and personnel when operating the machine.
  If anyone approaches the machine inadvertently, stop operating the machine immediately and take appropriate measures (e.g., by issuing a warning).
- When operating the machine, always be prepared for unexpected situations so that you can take appropriate countermeasures immediately.
- Never attempt to operate the machine beyond the capabilities and purposes described in this manual.
- Adhere to the stipulated rated total load and working range when operating the machine.
- Never operate the machine unless fully attentive, never drive the machine aggressively, and never operate the machine beyond its capabilities.
- Always remove the starter key when leaving the operator’s seat.

2.1.2 Preparation for Safe Operation

Ensure safety devices are provided

- Check to ensure that all guards and covers are correctly fitted. Repair immediately if damaged.
- Make sure you fully understand how to use the safety devices to ensure correct operation.
- Never remove any of the safety devices. Maintain them to ensure that they always function correctly.
- Improper use of the safety devices may lead to serious personal injury.
- Do not overly rely on the presence of safety devices while operating the machine.

Be ready for problems

- Inspect and maintain the machine thoroughly to prevent problems before they arise.
- If you detect a problem with the machine, stop operating it immediately, make sure conditions are safe, and report to the manager.
- Appoint personnel in advance to take responsibility for measures to prevent secondary accidents.
- Never operate the machine if fuel or hydraulic oil is leaking from it. Report the issue to the manager, and ensure that any leaks have been completely repaired before using the machine.

  (Engine specification / Engine and electric specification)
  This machine uses diesel fuel. Be especially careful to check for fuel leaks.
- Before leaving the machine, lower the hoisted load to the ground, stop the machine, and remove the starter key.

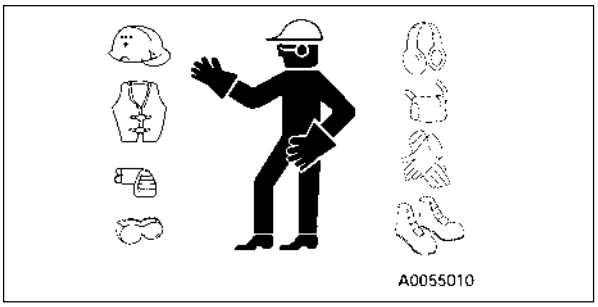
Temporary storage when there is a problem with the machine

If the machine is temporarily stored awaiting maintenance after a problem has been found, the following measures should be taken to notify all personnel that the machine is out of use due to a failure:

- Clearly indicate the details of the problem, the name and contact information of the storage manager, and the length of time in storage.
- Make sure the machine cannot be moved (e.g., by placing chocks in the crawler tracks).
- Remove the starter key and keep it with you.

Use of protective gear and appropriate clothing for the job

- Always wear a helmet, safety shoes, and safety belt. However, check that the safety belt does not interfere with the operating lever, starter switch, emergency stop switch, etc.
- Be sure to wear the necessary protective equipment for the relevant working conditions.
- Do not wear loose garments or accessories, as these may get caught on control levers or protrusions and could result in unexpected movement of the machine



Use of machine that was rented or previously used by someone else

Check the following points in writing before using any machine that was rented or previously used by someone else:
In addition, check the inspection record sheet for details on the state of maintenance, including periodic inspections.

(1) Crane capacity

(2) Crane maintenance status

(3) Behaviour and disadvantages particular to the crane

(4) Other points that require attention while operating

(a) Operating condition of equipment such as the brakes and clutch

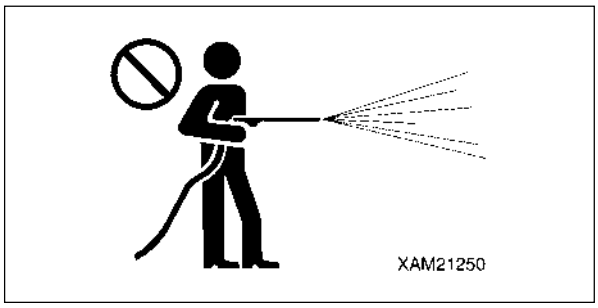
(b) Provision of the light and the working status lamp and checks on their functioning

(c) Operating condition of equipment such as the hook, winch, and boom, etc.

(d) The battery charging state (battery specification)

Always keep the machine clean

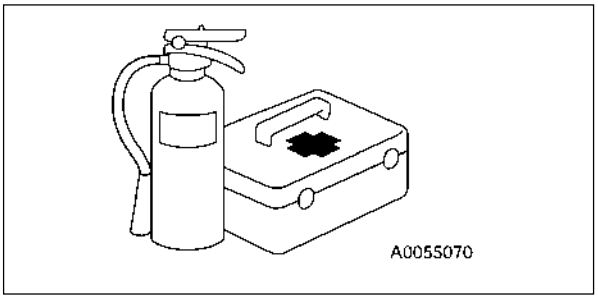
- If soil, sand, oil, or grease is allowed to build up on the machine, it may cause slipping or falling when climbing onto or down from the machine or when servicing it. Wipe off any soil, sand, oil, or grease to keep the machine clean at all times.
- When washing or steam-cleaning the machine, make sure water does not splash directly onto its electrical devices. Water entering the electrical system may cause electrical equipment to malfunction, causing the machine to operate unexpectedly or resulting in serious personal injury.



Provision of a fire extinguisher and first-aid kit

Always observe the following points to prepare for injuries and fires:

- To prepare for the possibility of fire, decide on a location and install a fire extinguisher. Be sure to read the usage instructions on the label attached to enable action to be taken in the case of an emergency.
- Decide on the location for a first-aid box. Also make sure that the first-aid box is inspected periodically and replenished as necessary.
- Decide on the procedures for dealing with injuries and fires.
- Decide on the procedures for reaching emergency contacts (such as an emergency doctor, ambulance, and fire department), and display these contacts in the designated position, where everyone can access them.



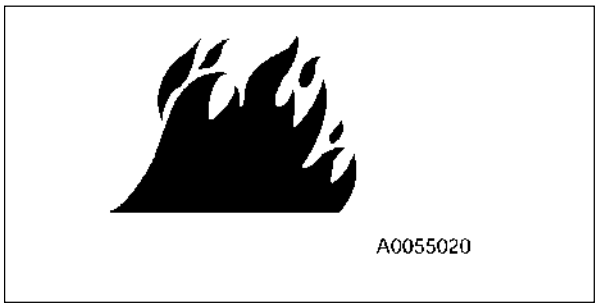
2.1.3 Fire-Prevention Precautions

What to do if a fire occurs

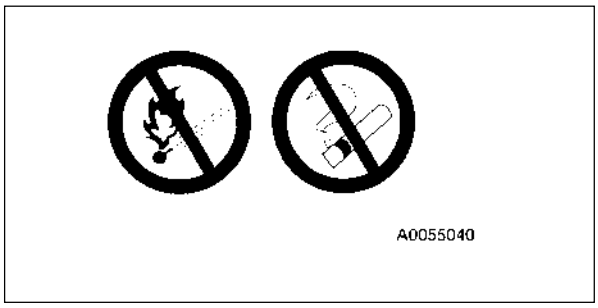
- Turn the starter switch to OFF to stop the machine.

Fire prevention

- **Fire caused by fuel, oil or anti-freeze fluid**
  There is a risk of ignition if open flames are brought near the fuel, oil or anti-freeze fluid. The following points must be strictly adhered to:



  - Do not smoke or use open flames near the machine.



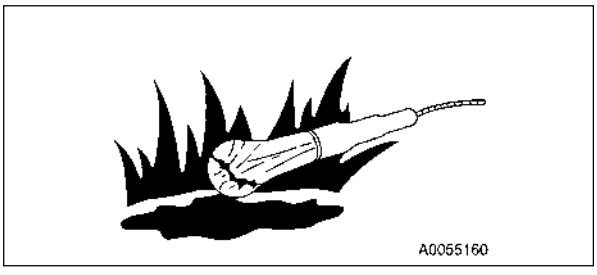
  - Be sure to turn off the engine when refuelling.
  - Do not leave the area when refuelling or replenishing the oil.
  - Close and securely tighten the fuel tank and hydraulic oil tank caps.
  - Do not spill fuel on hot surfaces or electrical systems.
  - After refuelling, wipe away any spilt fuel or oil.
  - Oily rags and any other combustible materials must be placed in a safe container and stored in a safe place.
  - Use non-combustible cleaning oil for cleaning components, and do not use diesel fuel, petrol, or anything else that may catch fire.
  - Do not weld or use gas cutting equipment on pipes or tubes containing flammable liquids.
  - Store fuel and oil in a designated well-ventilated location and prevent unauthorized access.
  - Move flammable materials to a safe place before using grinding or welding tools on the machine.

- **Fire due to accumulation of combustible materials (engine specification / engine and electric specification)**
  - Remove any build-up of combustible materials, (such as dead leaves, chips, litter, or charcoal dust) from around the engine exhaust manifold, exhaust pipe, battery, or underside covers.
  - To prevent fire caused by sparks from bonfires or other types of fire, remove any build-up of combustible materials (such as dead leaves, chips, litter, or charcoal dust) from around the cooling units (radiator and oil cooler).

- **Fire from electrical cables**
  Fire may occur due to short-circuiting of electrical systems. The following points must be strictly observed:
  - Keep all electrical wiring connections clean, and make sure they are securely in place.
  - Inspect electrical wiring for looseness and damage on a daily basis. Retighten any loose connectors or wiring clamps, and repair or replace any damaged electric wiring.

- **Fire from pipes**
  Check that all hose and tube clamps and cushions are securely tightened. If they are loose, they may vibrate or rub against other parts while the machine is being operated, damaging hoses and causing high-pressure oil to spurt out, resulting in fire or personal injury.

- **Explosion triggered by lighting fixtures**
  - When inspecting fuel, oil, electrolytes, and cooling water, use lighting equipment designed with explosion-proof specifications.
  - When power from the machine is drawn to power lighting equipment, adhere to the instructions in this operation manual.

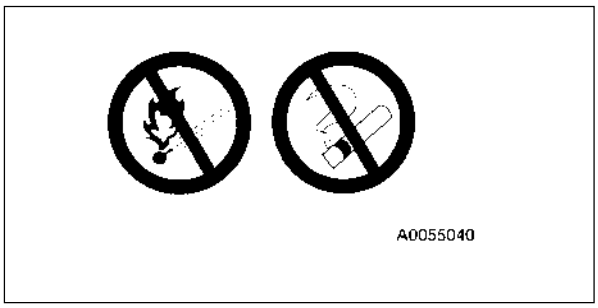


2.1.4 Cautions when Handling the Battery [engine specification / engine and electric specification]

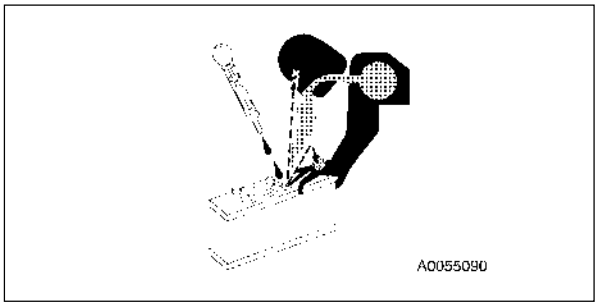
Cautions when handling battery

The electrolytes contain diluted sulphuric acid and generates hydrogen gas, and causes accidents and fires if handled improperly, so always observe the following precautions:

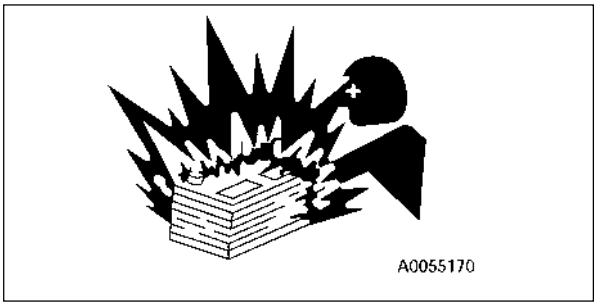
- Do not smoke or bring any other fire source near the battery.



- Always wear protective glasses and rubber gloves when handling the battery.
- If the electrolytes contact clothing or skin, immediately wash away using a large quantity of water.
- If the electrolytes enter your eyes, rinse immediately with plenty of water and see a doctor as soon as possible.
- If you have accidentally swallowed the electrolytes, immediately drink a huge quantity of water, and see a 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 such as petrol or paint thinner.
- Fully tighten the battery cap.
- If the electrolytes are frozen, do not charge battery or start the engine using another power source. Such act may cause the battery to catch fire.
- Unfreeze the electrolytes and check for electrolytes leak before charging or starting the engine.
- Always detach the battery from the machine frame before charging the battery.

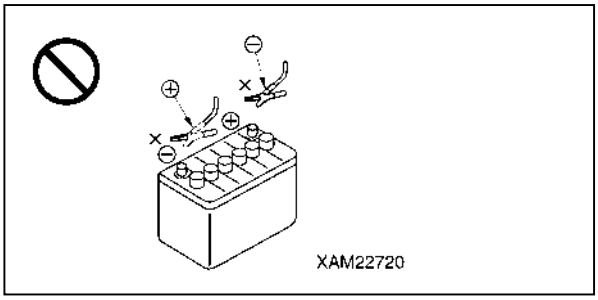


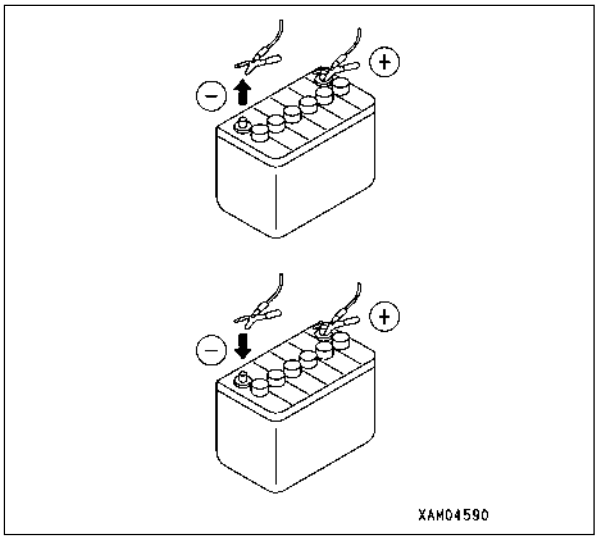
Cautions when starting up using booster cable

Wrong booster cable connection method may result in fire, so always observe the following.

- Start the engine with two persons, with 1 standing on the operation position in the travel operation panel side.
- When starting the engine 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 frame of the broken Machine when connecting the ground as the last procedure.
  Refer to section “6.14.4.2 Starting up using a booster cable.”

- Avoid contact between clips of the booster cable, and contact between the clip and the machine when disconnecting the booster cable.

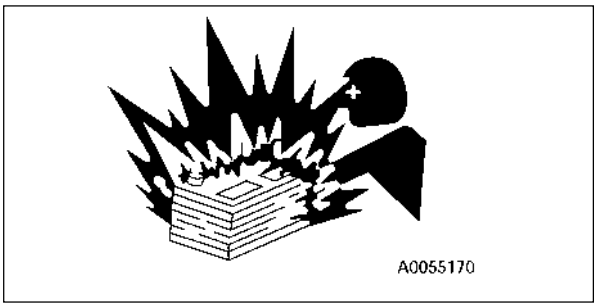




Cautions when charging the battery

Improper handling when charging the battery may cause the battery to explode. Follow the manuals attached to the Machine and the charger, and always observe the following.
Refer to the section “6.14.4.1 Cautions when charging the battery.”

- Carry the charger to a location with good ventilation, then remove the battery cap. Doing so causes the hydrogen gas to disperse and prevents explosion.
- Adjust the charger voltage to suit the voltage of the battery to be charged. Mistakes in adjusting the voltage may cause explosions due to overheat and ignition of the charger.
- Securely fix the (+) charge clip of the charger to the (+) terminal of the battery, then securely fix the (-) charge clip to (-) terminal of the battery.
- Set the charge current to no more than 1/10 of the rated capacity of the battery, or, in case of quick charge, set to the rated capacity of the battery or smaller.
- Excessive charge current may cause fire and explosions due to fluid leaks or fluid deficiency.



2.1.5 Cautions when handling the lithium-ion battery [battery specification]

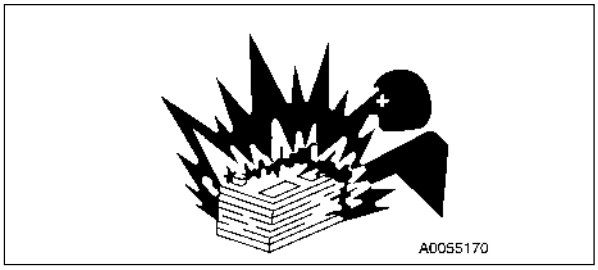
Cautions regarding fire

The following points must be strictly observed to prevent fire:

- Keep the battery away from open flames.
- Do not heat or throw the battery onto a fire.
- Do not leave the battery in a hot location for extended periods.
- Do not use any battery charger other than the one provided. Doing so may cause electrolyte leakage, abnormal heating, smoke, rupture, or fire.
- Do not charge the battery except using the specified voltage. There is a risk of fire if charged at an excessive voltage.
- Do not allow static electricity to be generated in the vicinity. There is a risk of ignition or explosion due to static electricity.
- Do not solder the terminals.

- **Measures to take if the lithium-ion battery catches fire**
  - Fire extinguishing agent
    We recommend a powder fire extinguisher and carbon dioxide as fire extinguishing agents. In addition, to prevent the fire spreading, pouring large quantities of water on the surroundings to cool them is effective.

- Fire extinguishing method
  When extinguishing a fire, wear respiratory and protective gear and extinguish the fire from upwind to ensure you do not inhale toxic gases.



Cautions regarding electric shocks

The following points must be strictly observed to prevent electric shock:

- Do not unplug the power plug by pulling on the cable.
- Do not open the charging port cover except when charging.
- Unplug the charging cable except when charging.
- Do not touch with wet hands.
- Do not touch parts inside the machine when the power plug is plugged in.
- Do not charge in rainy weather.

Handling the battery terminals

- Wear insulating gloves and do not touch the positive or negative terminals with your bare hands. Before handling the battery, turn the starter switch to the “OFF” position, and then be sure to wait at least one minute before turning the disconnect switch to “UNLOCK”.
- Do not allow a short circuit between the positive and negative terminals. Otherwise there is a risk of damage to electronic components or of burn injuries from overheated components.
- Do not connect the positive and negative terminals in reverse. Otherwise there is a risk of damage due to fluid leakage, overheating, rupture, or fire.
- Tighten the battery terminals securely. There is a risk of fire if the battery terminals are loose.
  (Designated torque: 5.0 to 6.8 N·m)

High-Voltage Cable Precautions

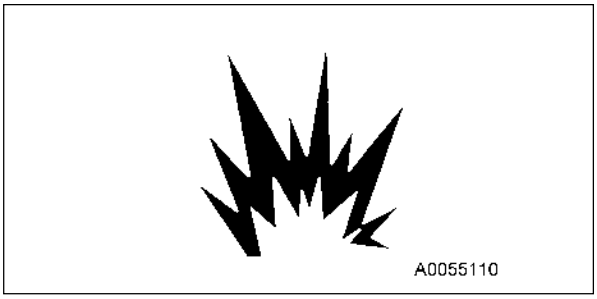
The cables in the vicinity of the disconnect switch are high-voltage cables. Do not touch these cables with your bare hands. Otherwise there is a risk of burns or fatal accident due to electric shock. In situations where it is necessary to touch the cables, be sure to turn the starter switch to the “OFF” position and then wait for at least one minute before turning the disconnect switch to “UNLOCK”. Be sure to wear insulating gloves when handling.

Warning Signs During Maintenance

In situations where it becomes necessary to move away from the machine while carrying out maintenance or repairs on the battery unit, place warning signs around the machine indicating “High Voltage Work in Progress. Do Not Touch” to prevent other workers from touching the machine.

Disassembly and modification forbidden

Otherwise there is a risk of accidents or malfunction due to electrolytes leakage, overheating, smoke generation, fire, rupture, or electric shock.



Cautions during maintenance and management tasks

Do not wear electrically conductive items such as rings, necklaces, or wristwatches when carrying out work, as these items carry a risk of short-circuiting or electric shock.

- Maintenance work must be carried out by skilled personnel who have received the specified training.
- Insulated tools and protective equipment must be used when carrying out work. Inspect the tools and protective equipment before use to make sure they are not damaged.

- Stop charging and isolate the charging circuit before carrying out maintenance work.
- If any worker receives an electric shock, helpers must wear insulated protective equipment to prevent further accidents due to electric shock.
- If smoke is emitted or fire occurs due to malfunctioning or incorrect usage, extinguish any fire and cool down the battery immediately.
- Do not mix different battery types together during use. Otherwise there is a risk of accidents or equipment malfunctions and failure.
- Do not open the battery output terminal covers except when carrying out work.
- Be sure to protect the output terminals with insulators when the battery is removed.

Usage environment cautions

Avoid using or storing the battery under the following conditions. Otherwise there is a risk of accidents, malfunction, or failure due to fluid leakage, overheating, smoke generation, fire, or electric shock.

- Cold or hot locations at temperatures outside the operating temperature range of -20°C to 40°C
- Locations where the humidity exceeds 85%RH
- Locations where condensation may occur due to sudden temperature fluctuations
- Locations where the battery may be splashed with water or left standing in water
- Locations subject to strong vibration or impact
- Dusty locations
- Locations where corrosive gases, combustible gases, or salt, iron, or oil mists are present
- Locations in direct sunlight or close to equipment generating heat
- Locations close to equipment that generates strong radio waves or magnetic fields

Electrolyte solution leakage

If electrolyte leakage is suspected (e.g., if the exterior is cracked or damaged, bulging or deformed, discoloured or corroded, or if there is an acrid smell), move the battery away from any open flames and stop using it.

If electrolyte leakage occurs, take the following actions:

- Move the battery away from any open flames and stop using it. Otherwise there is a risk of fire.
- Wipe up the leakage immediately wearing protective clothing, rubber gloves, and protective glasses. Never touch the leakage with bare hands.
- If you inhale electrolyte fumes, move immediately to a location with fresh air, remain at rest, and seek medical attention.
- If electrolytes splash onto clothing, change out of the contaminated clothing immediately.
- If electrolytes come into contact with your skin, rinse immediately using copious amounts of soap and water, then seek medical attention.
- If electrolytes come into contact with your eyes, do not rub, but rinse immediately under running water for at least 15 minutes. Then seek medical attention.
- If you ingest electrolytes, rinse out your mouth with water immediately, then seek medical attention.
- If smoke is emitted or fire occurs, extinguish any fire and cool down the battery immediately. Carbon dioxide gas fire extinguishers, powder fire extinguishers, or dry sand should be used to extinguish fire.

Mixing different batteries is forbidden

Do not use different battery types mixed together. Always use the specified battery type.

Dealing with Emergencies

In emergencies such as machine failure or toppling, keep away from the machine, as there is a danger of electric shock. The machine must be handled only by experienced personnel who have received specialist training and are wearing insulating protective gear.

2.1.6 Other Cautions

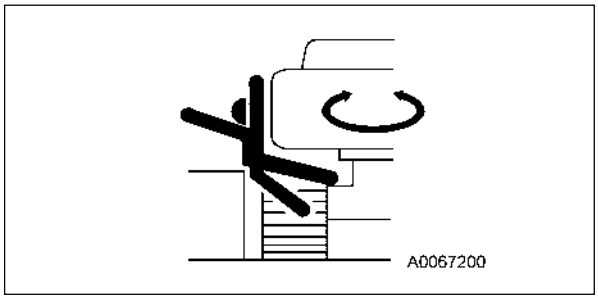
Cautions regarding becoming trapped

The gaps around the slewing part and crane unit vary depending on the movement of the derricking cylinder and winch. If the operator is caught in the machinery, serious personal injury may result.

Keep persons away from all rotating and telescoping sections.

In particular, keep your body away from any of the following gaps:

- Between the boom and the slewing part
- Between the boom and the derricking cylinder
- Between winch drum and wire rope
- Between each sheave and wire rope



Machine modification is prohibited

Never attempt to modify the machine without our written consent. In particular, welding the machine may damage the safety devices.

Modifications may create safety issues. Consult us or our sales service agency before attempting to make modifications.

Maeda can accept no liability for any personal injury or failure caused by modifications to the machine that were performed without consulting us.

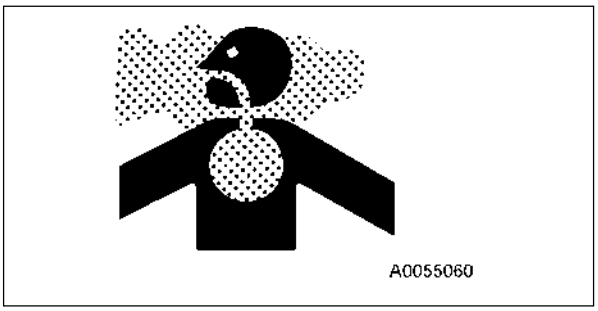
Precautions on attachments and optional units

- Maeda can accept no liability for any personal injury, failures, or property damage caused by the use of unauthorized attachments or optional units.
- Installing attachments or optional units may create safety and legal issues. The customer should therefore consult with us or our sales service agency beforehand.
- Some combinations of attachments and optional units may interfere with the cab and machine parts, possibly causing serious personal injury. Check that attachments and optional units used do not interfere with the machine, and use them within safe ranges.
- Be sure to read the descriptions of the attachments and optional units in the instruction manual of the installed attachments as well as this manual.

Precautions when running the engine indoors (engine specification / engine and electric specification)

When starting the engine or handling fuel, cleaning oil, or paint indoors or in a poorly ventilated location, open the windows and doors to prevent the risk of gas poisoning.

If the ventilation is insufficient even after opening the windows and doors, install an extractor fan.



2.2 SAFETY LABEL LOCATIONS

The safety labels must be kept clean and visible at all times.

If any labels are lost, reattach or replace immediately with new ones.

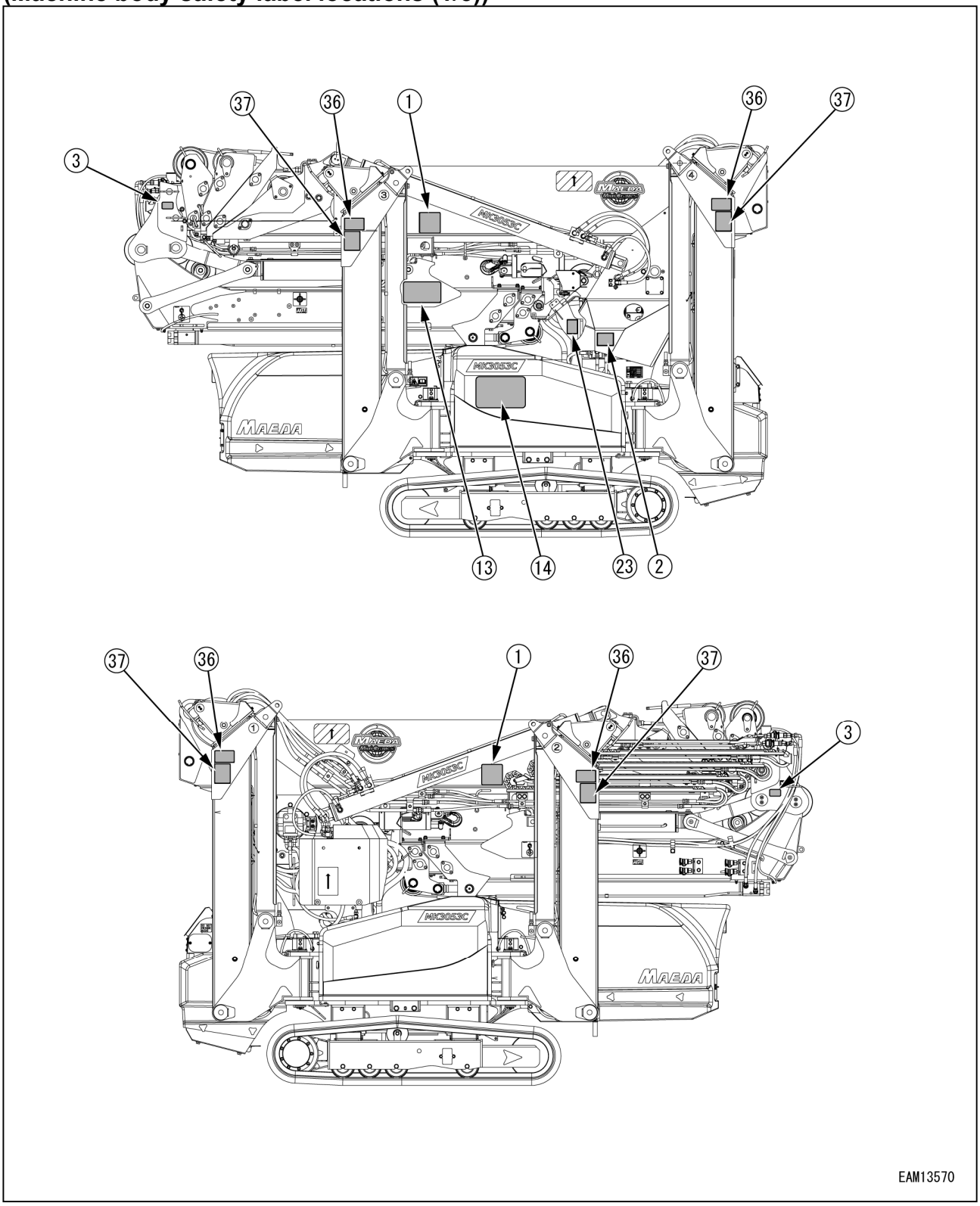
Labels other than the safety labels shown below should also be treated in the same manner.

[Signal words]

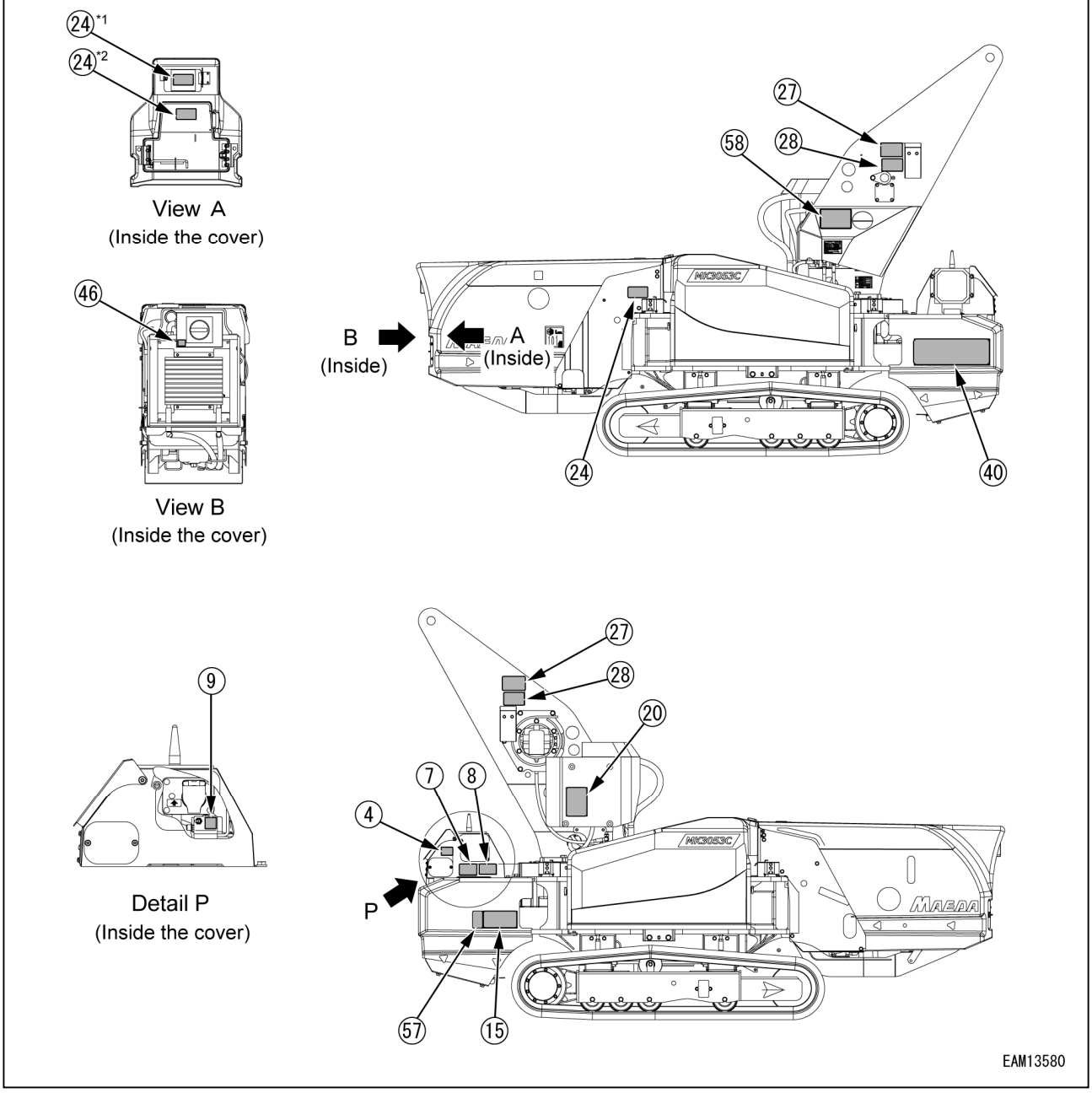
The following artwork may be used to explain the meaning of the different signal words as defined in this standard

⚠ DANGER	DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury
⚠ WARNING	WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury
⚠ CAUTION	CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury
NOTICE	NOTICE is used to address practices not related to physical injury
SAFETY INSTRUCTIONS	Safety Instruction (or equivalent) signs indicate specific safety-related instructions or procedures

(Machine body safety label locations (1/5))



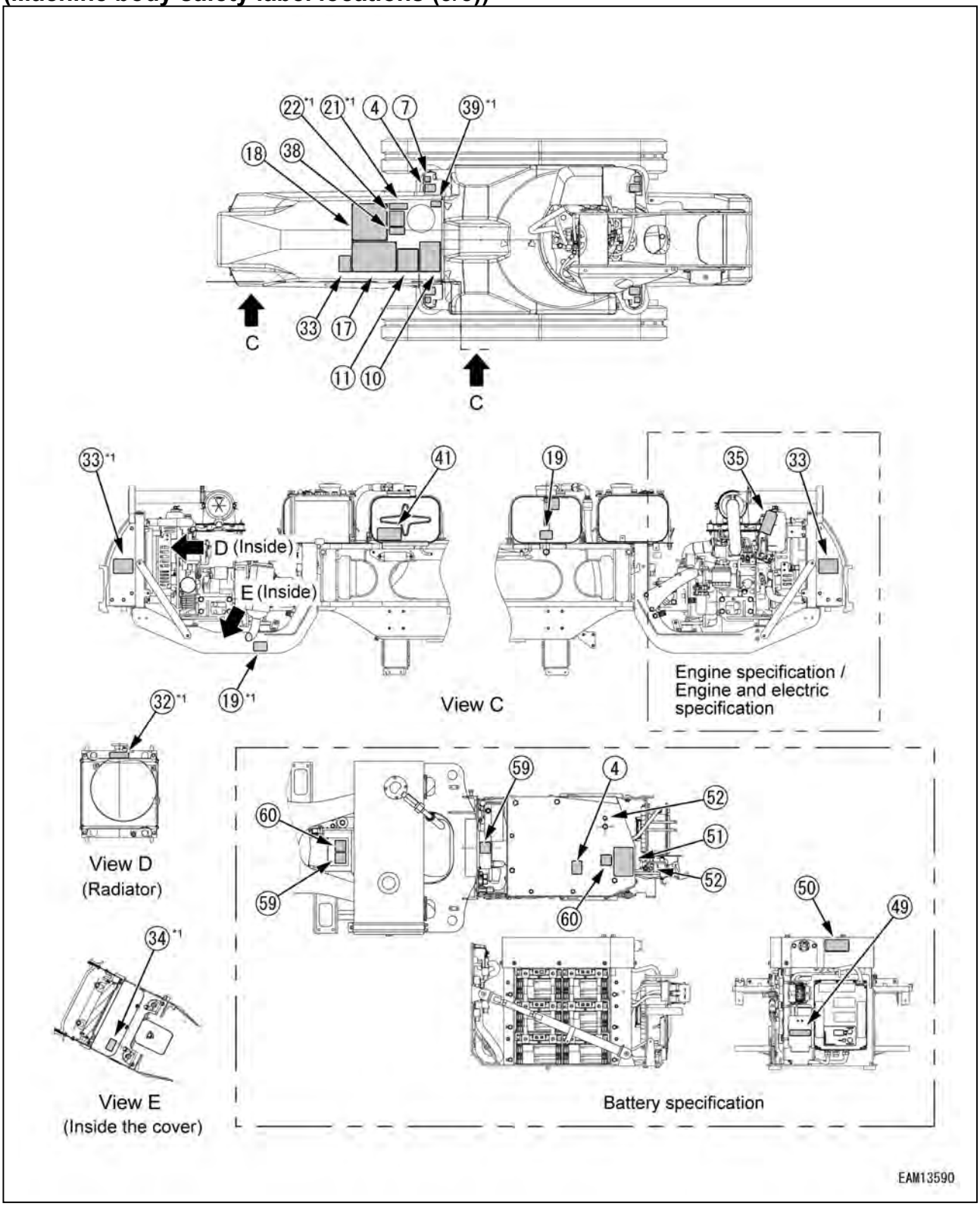
(Machine body safety label locations (2/5))



*1: Only for Engine specification / Engine and electric specification

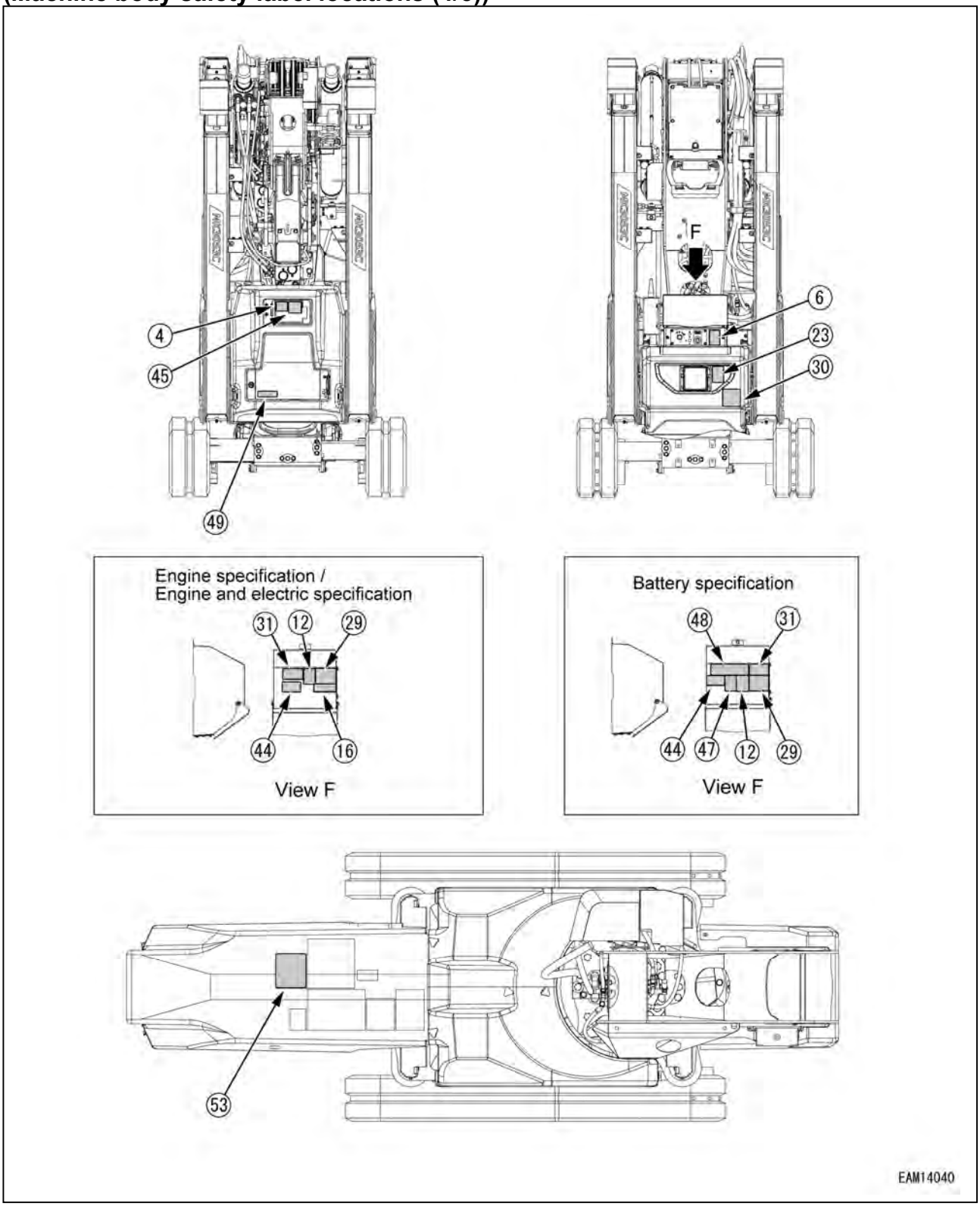
*2: Only for Engine and electric specification

(Machine body safety label locations (3/5))

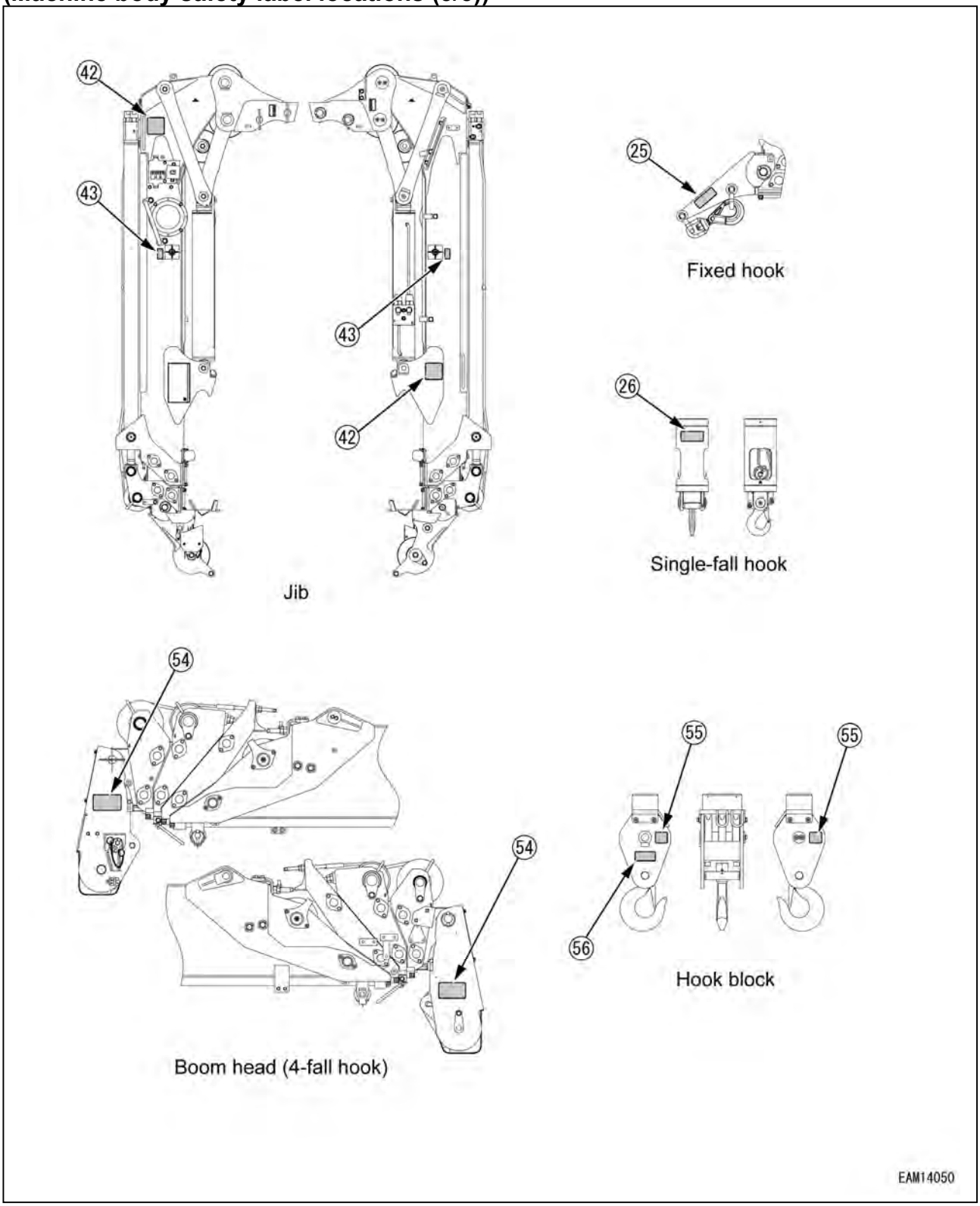


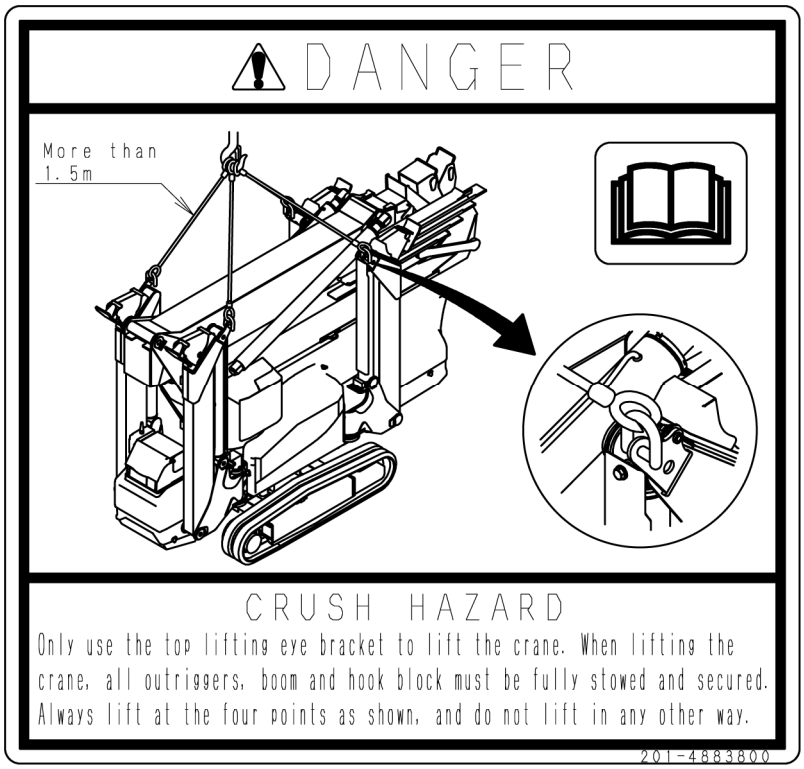
*1: Only for Engine specification / Engine and electric specification

(Machine body safety label locations (4/5))



(Machine body safety label locations (5/5))





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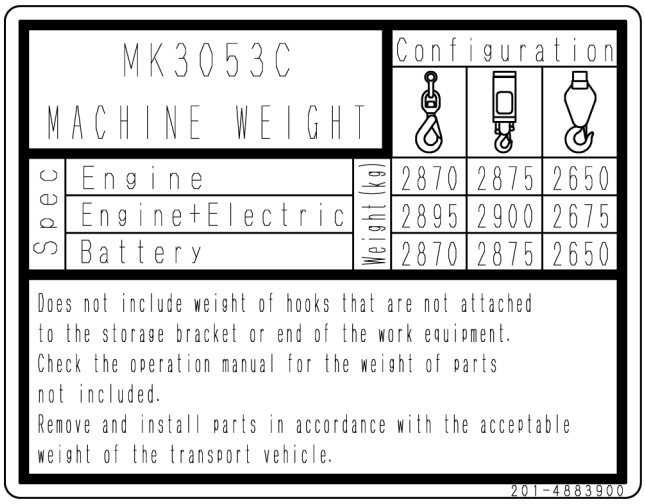

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[4] 350-4539700

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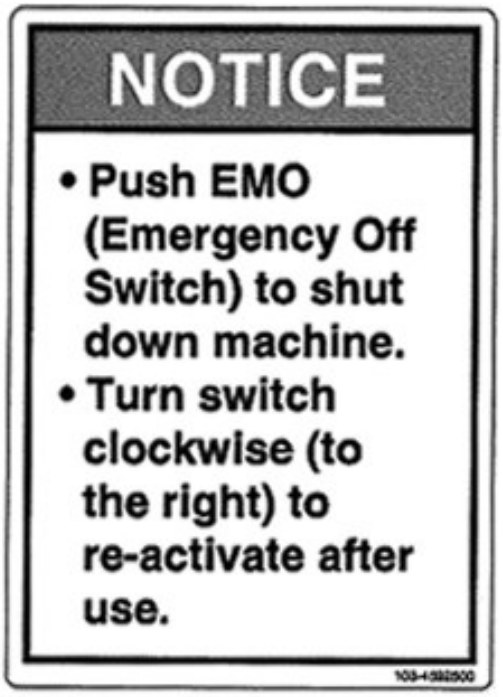

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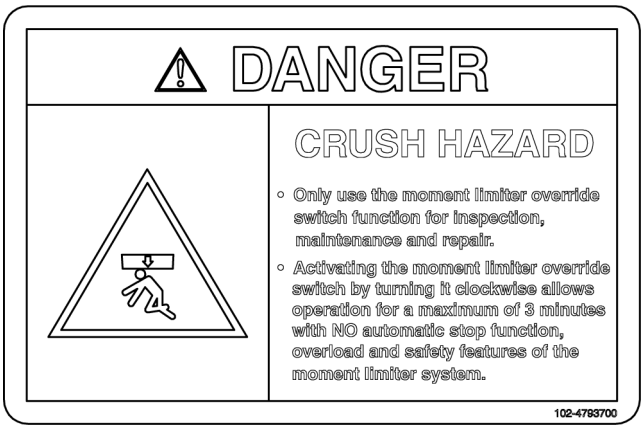

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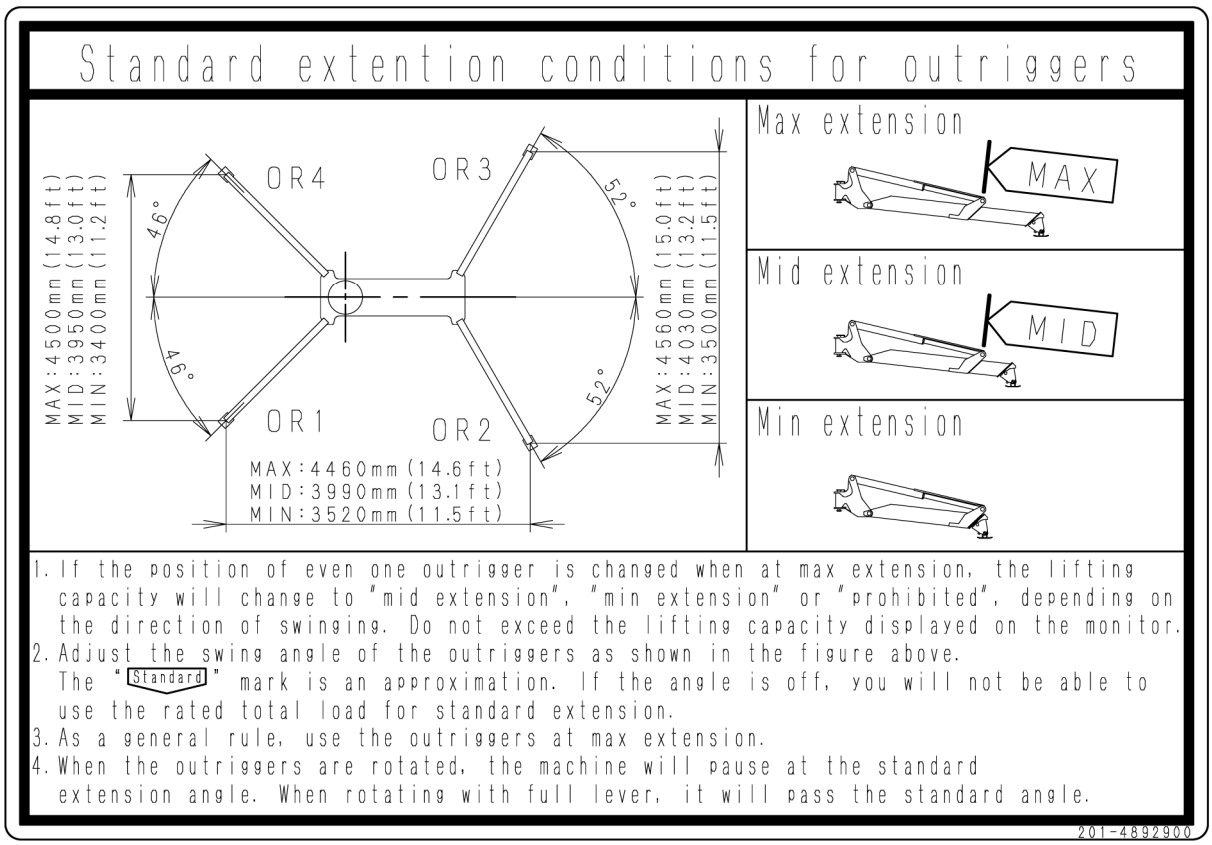
[8] 201-4886600

[9] 201-4886700



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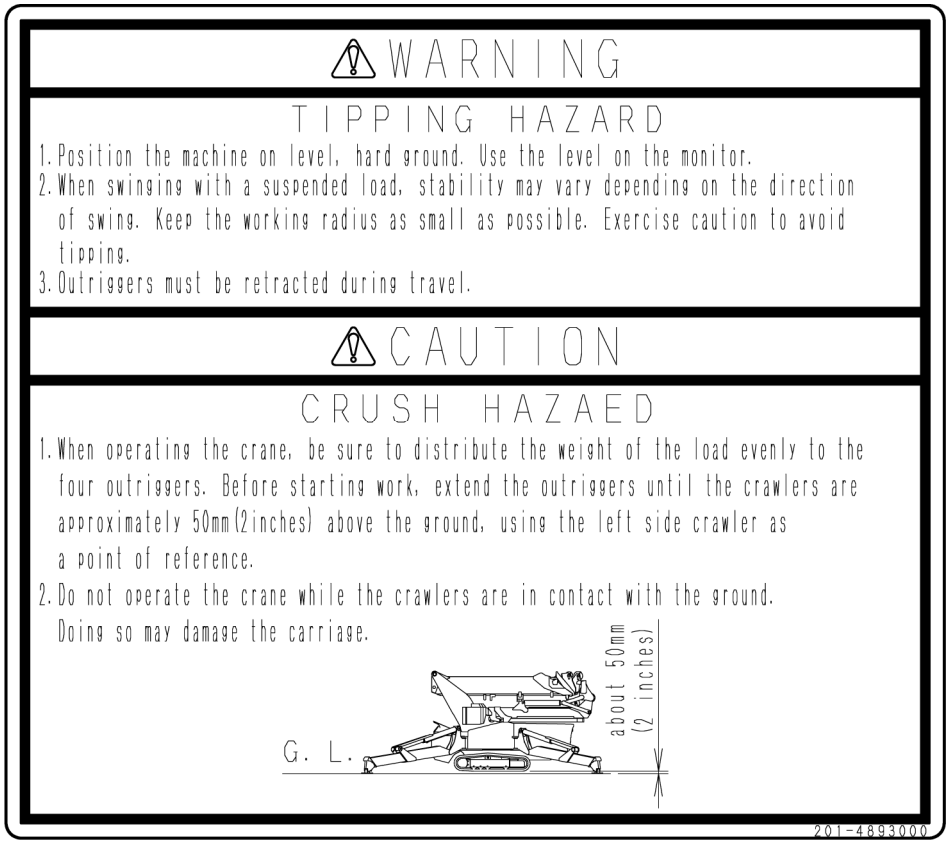

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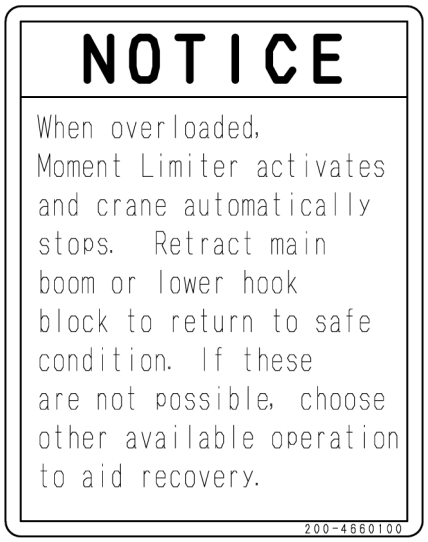

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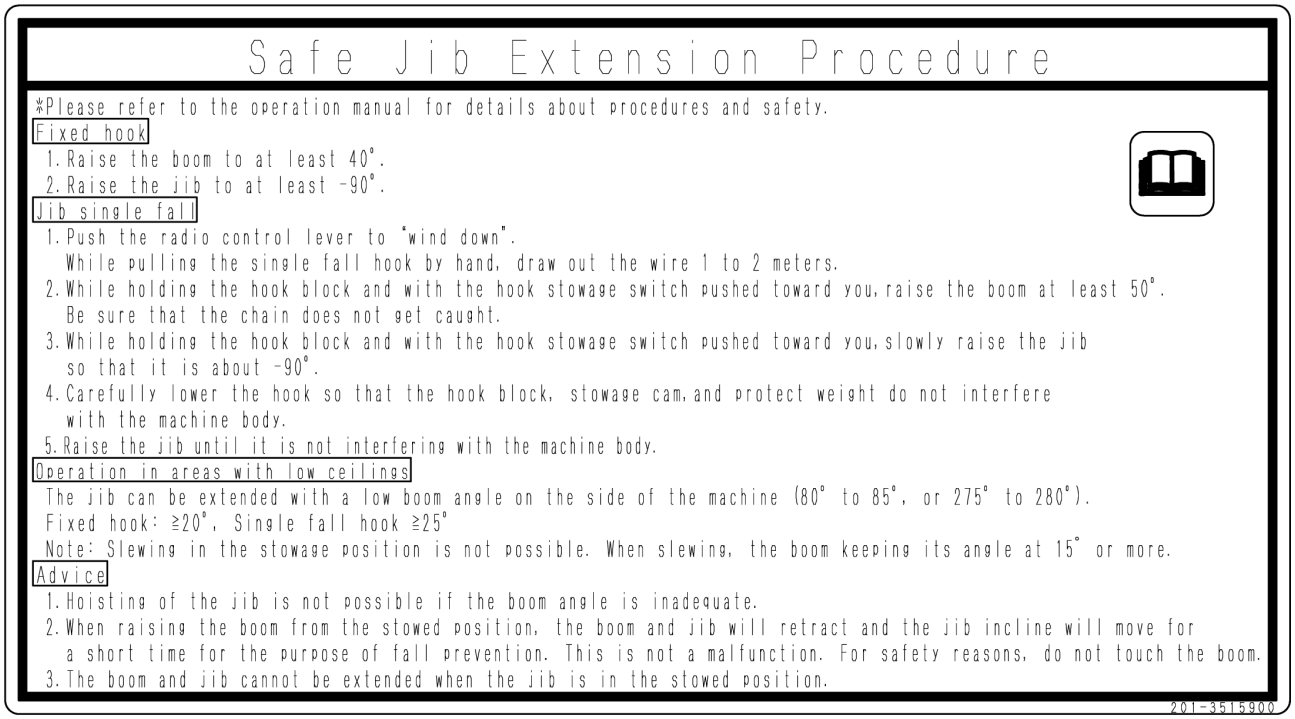

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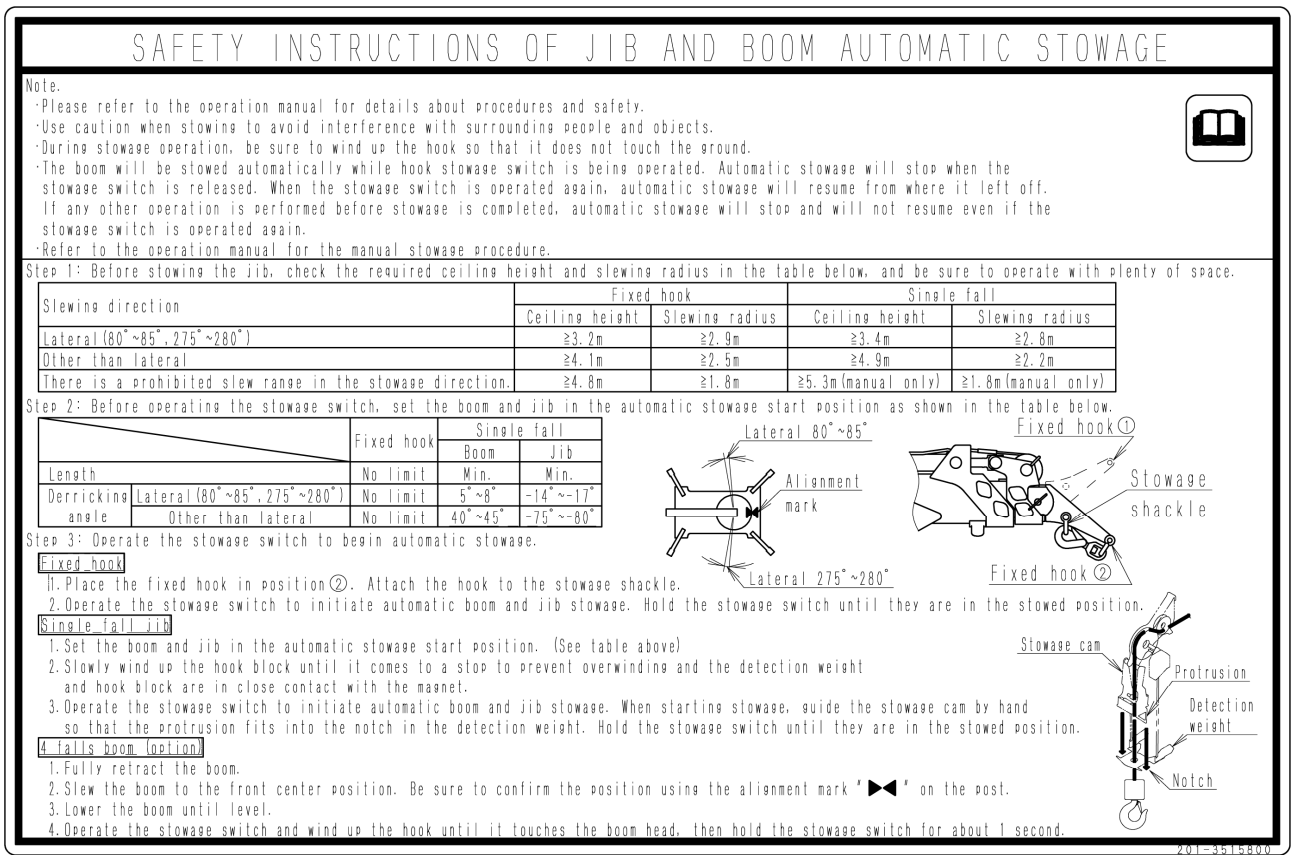

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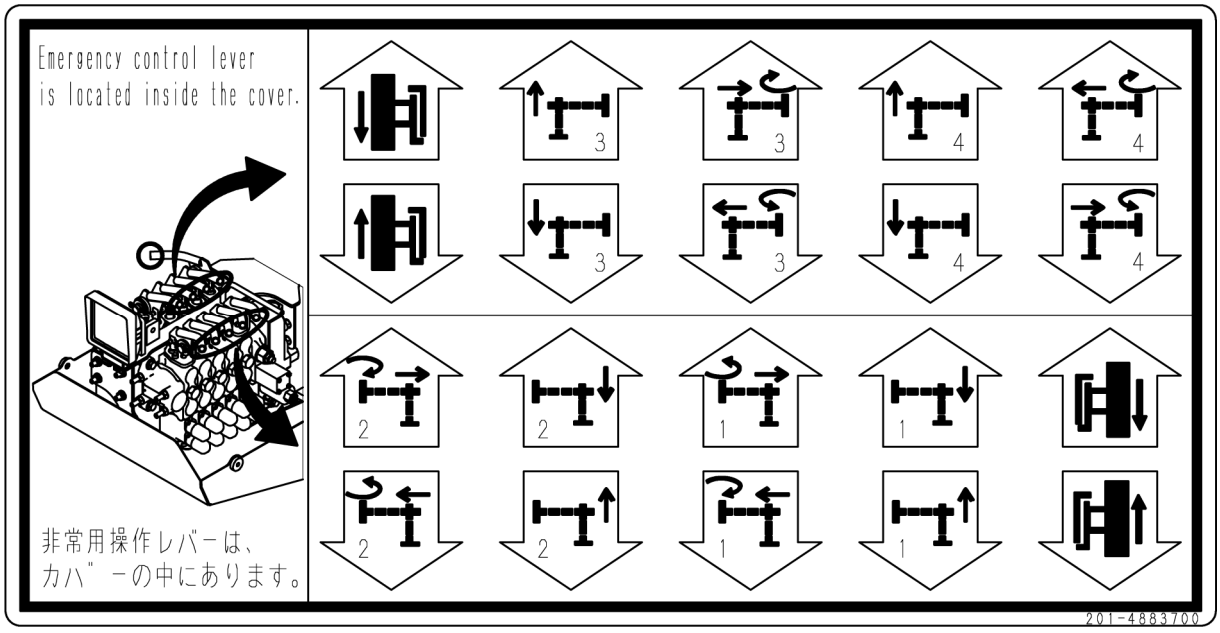

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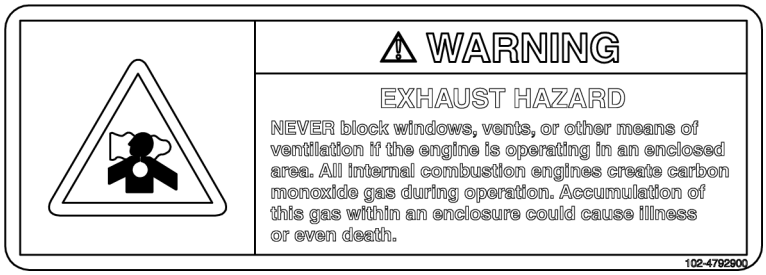
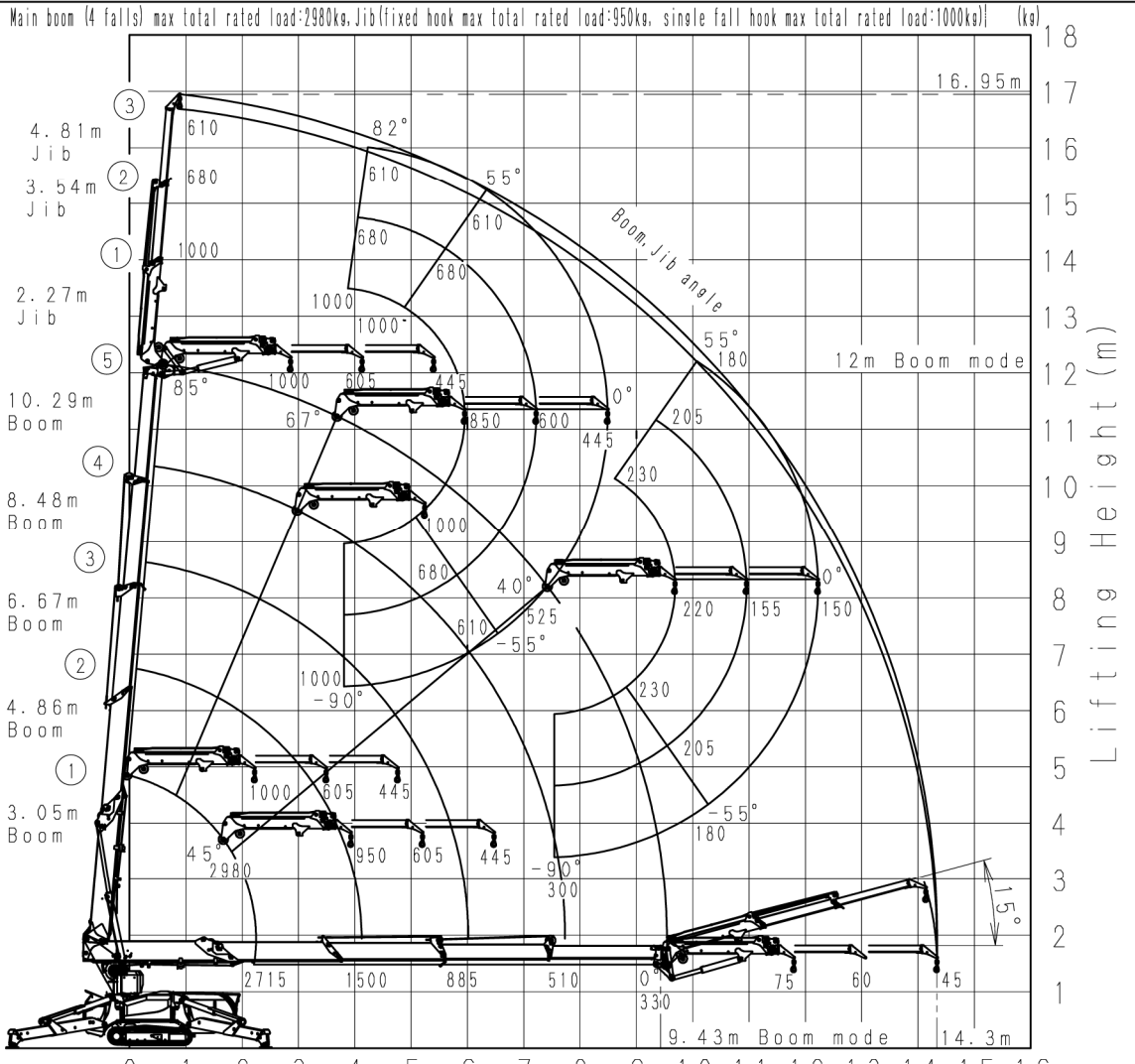


[16] 102-4792900

MK3053C Working Range Chart (360°)

1. The working range chart is based on the actual working radius, including deflection under load, and also includes the weight of lifting equipment (fixed hook weight:2kg, single fall hook:8kg, 4 falls hook:30kg) when the crane is at a level position using the outriggers.
2. The working radius shown in this chart does not include boom and jib deflection.
3. When the 2nd stage boom is extended even slightly, work using the rated total load of the 2nd stage boom.
4. When the 'O' mark passes the 2nd stage boom, work using the rated total load of the 3rd stage boom.
5. When the second 'O' mark passes the 2nd stage boom, work using the rated total load of the 4th stage boom.
6. When the third 'O' mark passes the 2nd stage boom, work using the rated total load of the 5th stage boom.
7. When the second stage jib is extended even slightly, work with the rated total load of the second stage jib.
8. When half of the '□' mark passes the 1st stage jib, work with the rated total load of the 3rd stage jib.
9. Rough crane operation is very dangerous. Please be sure to operate the crane safely.
10. Depending on the conditions of the boom, the boom may interfere with the machine body or the ground. Work with caution.
11. When lifting a load, use the minimum boom length possible, and extend the boom after the desired angle is met.
12. For total rated loads other than those shown here, check the respective total rated load charts.
13. Be sure to match the monitor settings to the actual jib head position or boom head condition.

Main boom (4 falls) max total rated load:2980kg, Jib(fixed hook max total rated load:950kg, single fall hook max total rated load:1000kg)] (kg)



Lifting height underground (m)	Working radius (m)	2.19	2.5	3.0	4.0	5.0	6.0	7.0	8.0	9.0	9.43	10.0	11.0	12.0	13.0	14.0	14.3
	Single fall		-56.0	-55.9	-55.2	-54.2	-53.2	-52.2	-51.2	-50.2	-49.8	-49.2	-48.2	-47.2	-46.2	-45.1	-43.8
	4 falls (option)	-13.1	-13.0	-12.9	-12.6	-12.4	-12.1	-11.9	-11.6	-11.4	-11.3						

201-3507300

[17] 201-3507300

MK3053C RATED TOTAL LOAD CHART (Jib/Fixed Hook/Single Fall/360°)

Main boom	Main boom angle (°)	Jib angle (°)	①2.27m Jib			②3.54m Jib			③4.81m Jib		
			Outrigger extension status			Outrigger extension status			Outrigger extension status		
			Max	Mid	Min	Max	Mid	Min	Max	Mid	Min
① 3.05m Boom	85	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	1000	710	710	710	610	610	610
		0	1000	1000	1000	605	605	605	445	445	445
	45	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	950	950	950	710	710	710	610	610	610
		0	950	950	950	605	605	605	445	445	445
	0	0	950	950	780	605	605	525	445	445	390
② 4.86m Boom	85	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	1000	710	710	710	610	610	610
		0	1000	1000	1000	605	605	605	445	445	445
	67	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	1000	710	710	710	610	610	610
		0	1000	1000	1000	605	605	605	445	445	445
	45	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	950	950	730	710	710	625	610	610	470
		0	950	800	510	605	560	390	445	425	300
	0	0	725	540	300	540	410	230	425	325	185
③ 6.67m Boom	85	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	1000	710	710	710	610	610	610
		0	1000	1000	1000	605	605	605	445	445	445
	67	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	1000	710	710	710	610	610	610
		0	1000	1000	700	605	605	480	445	445	370
	50	90	1000	1000	740	1000	1000	740	1000	1000	740
		85	1000	975	680	1000	935	655	610	610	610
		55	980	670	480	710	550	395	610	460	330
		0	800	555	375	590	410	280	445	320	205
	35	90	900	595	320	900	595	320	900	595	320
		85	850	560	310	820	540	320	610	525	320
		55	630	420	245	530	355	210	455	305	175
		0	510	355	185	400	275	140	325	220	115
	0	0	380	260	105	300	210	80	250	170	55

Main boom	Main boom angle (°)	Jib angle (°)	①2.27m Jib			②3.54m Jib			③4.81m Jib		
			Outrigger extension status			Outrigger extension status			Outrigger extension status		
			Max	Mid	Min	Max	Mid	Min	Max	Mid	Min
④ 8.48m Boom	85	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	1000	710	710	710	610	610	610
		0	1000	1000	1000	605	605	605	445	445	445
	67	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	1000	1000	1000	610	610	610
		55	1000	1000	750	710	710	595	610	610	490
		0	1000	825	570	605	580	380	445	445	300
	55	90	1000	810	535	1000	810	535	1000	810	535
		85	1000	720	495	1000	690	480	610	610	465
		55	770	520	355	640	435	290	545	375	240
		0	630	435	260	480	335	205	385	265	160
	40	90	570	365	205	570	365	205	570	365	205
		85	540	350	185	530	340	180	520	330	180
		55	415	270	130	360	235	115	320	205	90
		0	335	230	90	270	180	70	225	150	
	0	0	195	100		160	90		130	70	
⑤ 10.29m Boom	85	90	1000	1000	1000	1000	1000	1000	1000	1000	1000
		85	1000	1000	1000	680	680	680	610	610	610
		55	1000	1000	1000	680	680	680	610	610	610
		0	1000	1000	1000	605	605	605	445	445	445
	67	90	1000	1000	845	1000	1000	845	1000	1000	845
		85	1000	1000	775	680	680	680	610	610	610
		55	1000	745	535	680	605	435	610	505	365
		0	850	610	350	590	450	290	445	350	225
	55	90	660	470	300	660	470	300	660	470	300
		85	630	445	290	610	430	280	590	420	270
		55	515	340	205	445	295	180	390	255	145
		0	440	290	135	335	230	80	285	185	
	40	90	300	190		300	190		300	190	
		85	285	180		280	175		275	165	
		55	230	140		205	120		180	105	
		0	220	120		155	95		150	75	
	0	0	75			60			45		

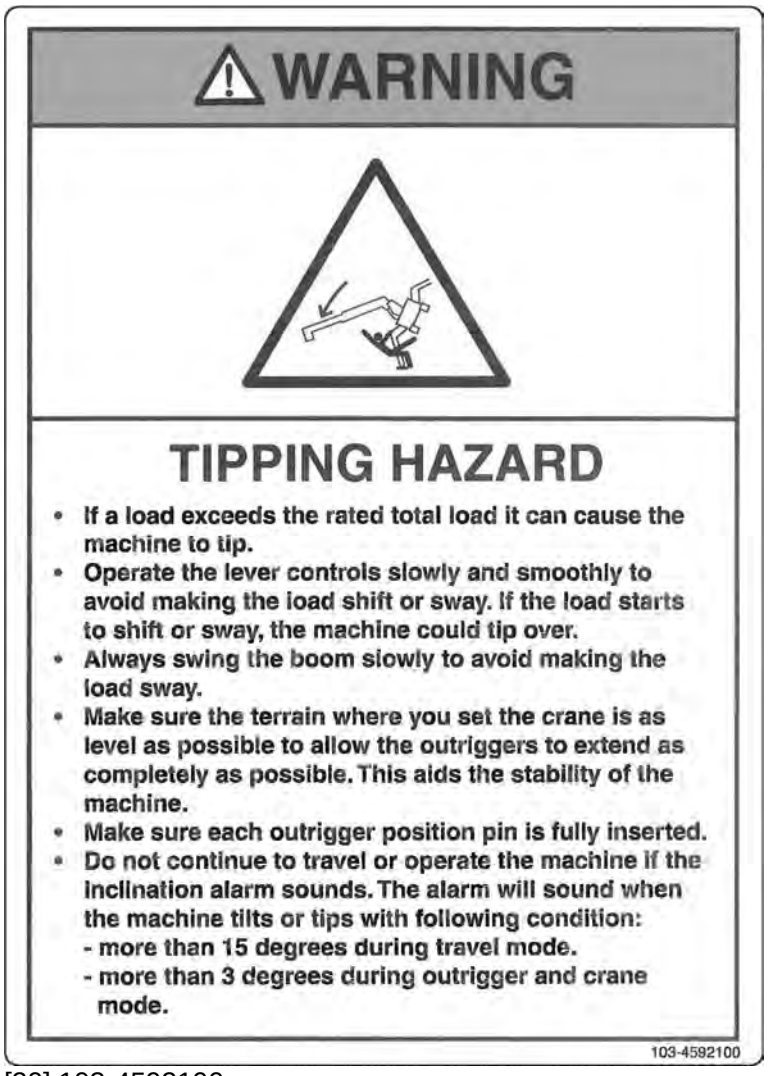
Notes:

- Jib length for single fall: Value in the table -0.07m
- Fixed hook (green): 950kg
- Single fall max rated total load: 1000kg

201-3507000

[18] 201-3507000

[19] 106-4855400



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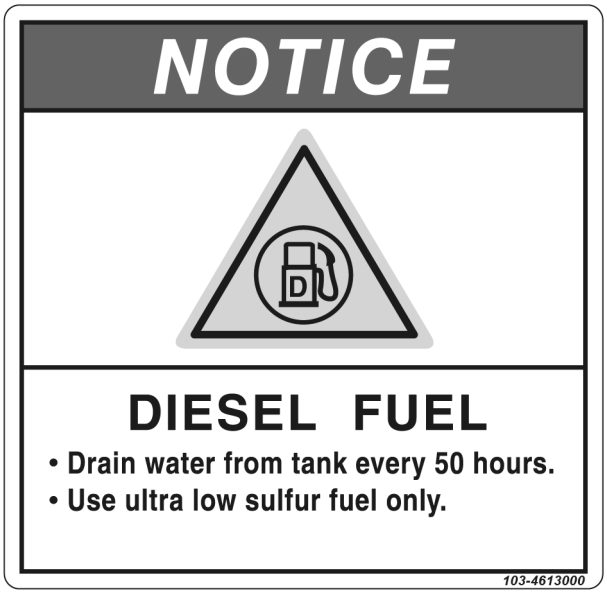

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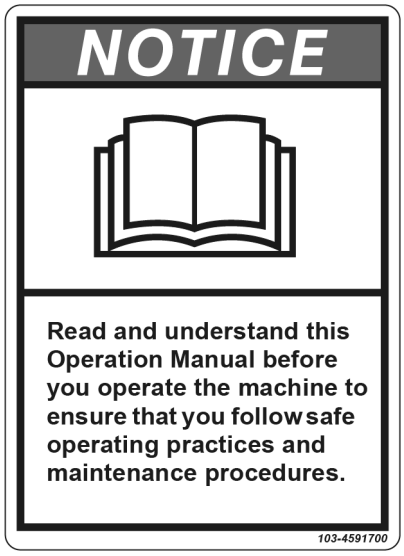

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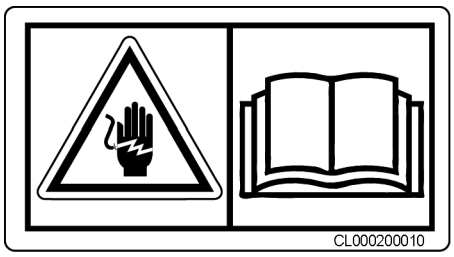

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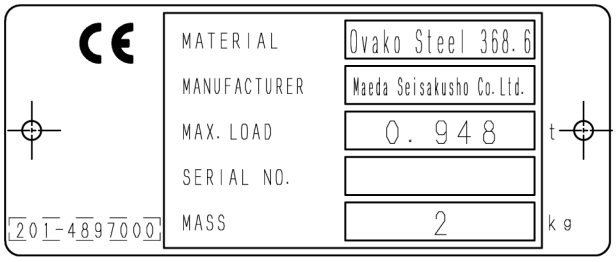

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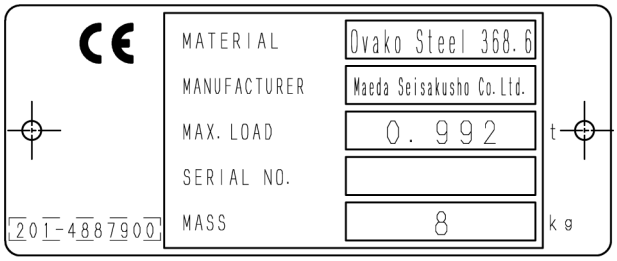

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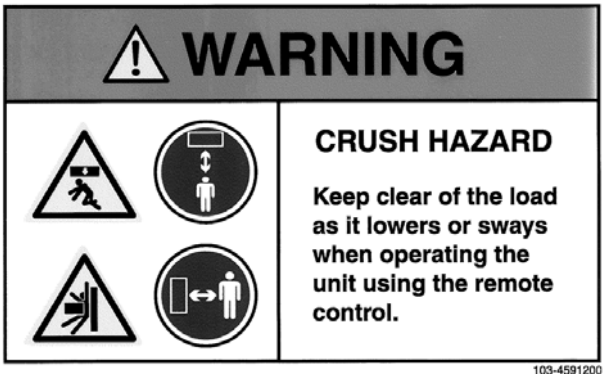

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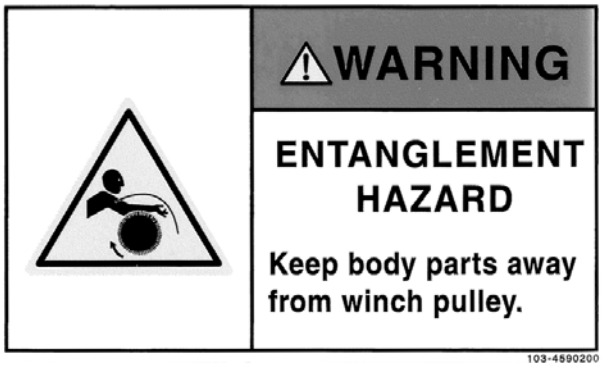

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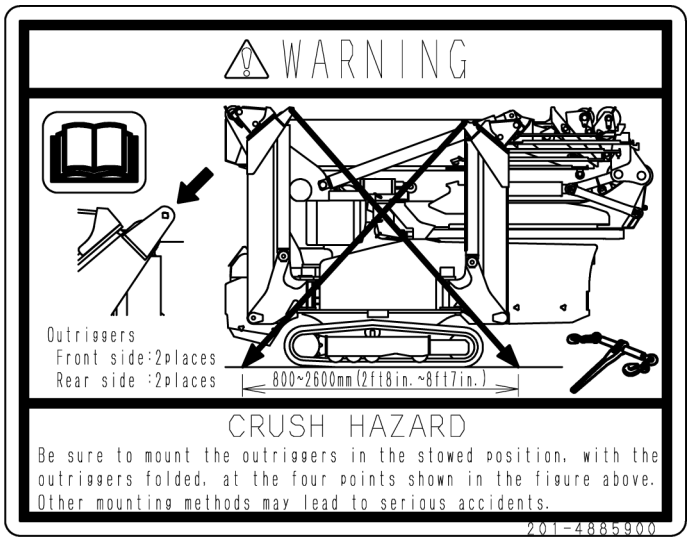

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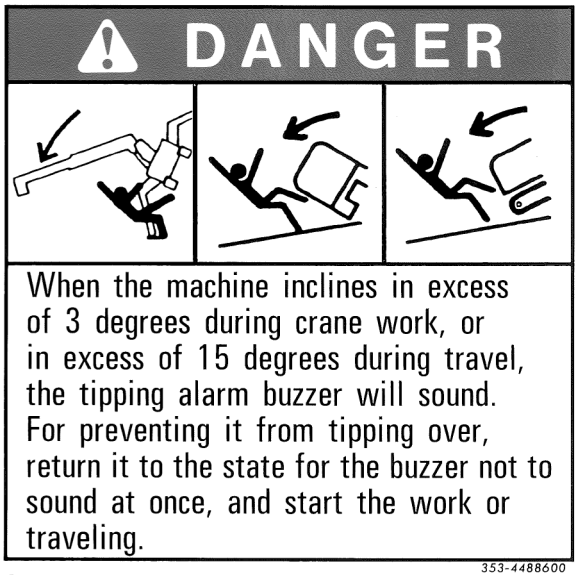

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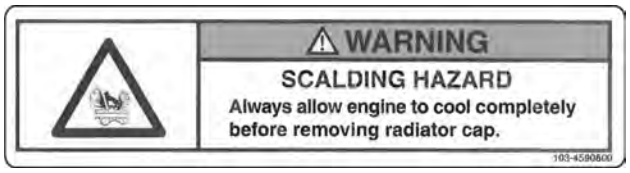

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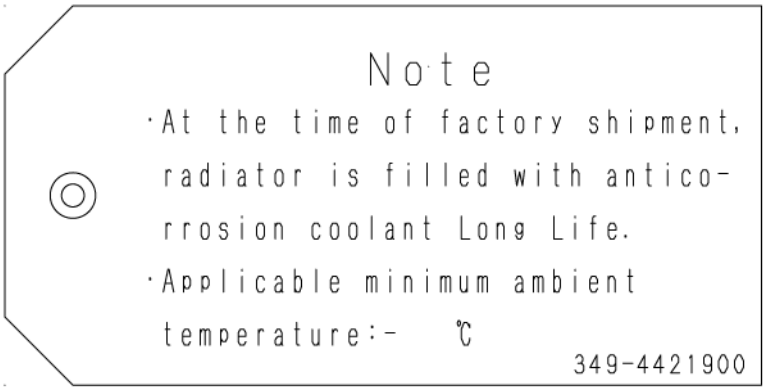

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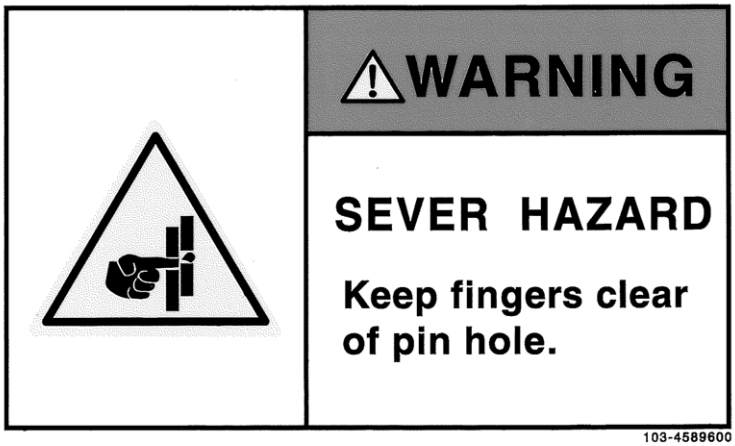

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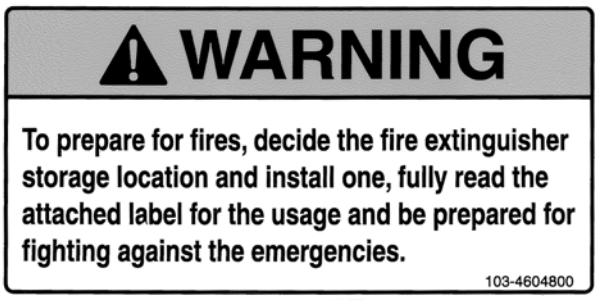

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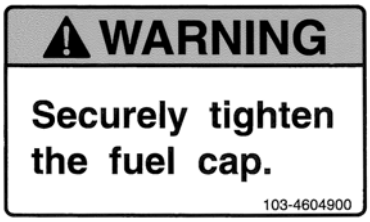

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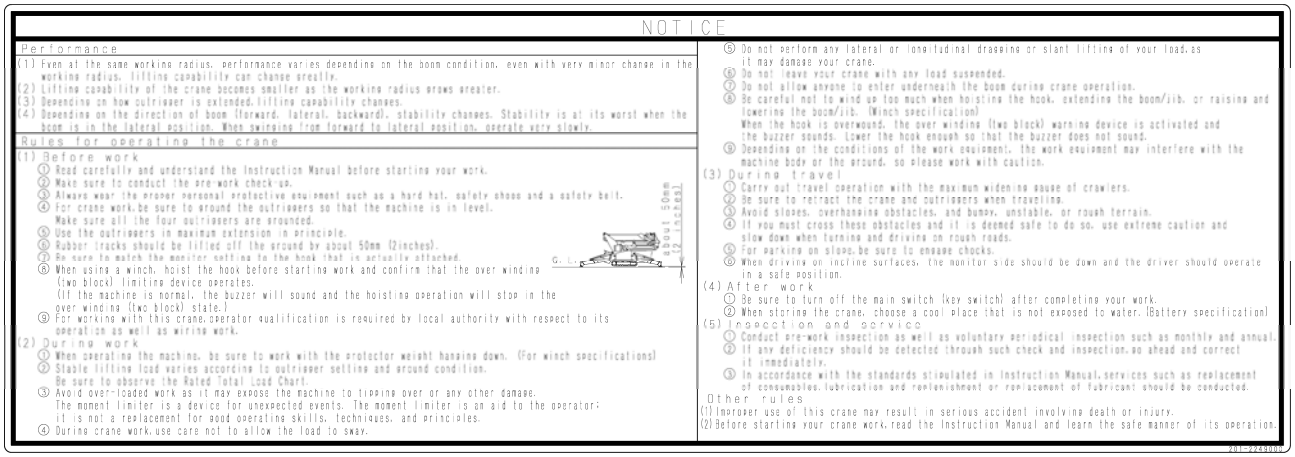

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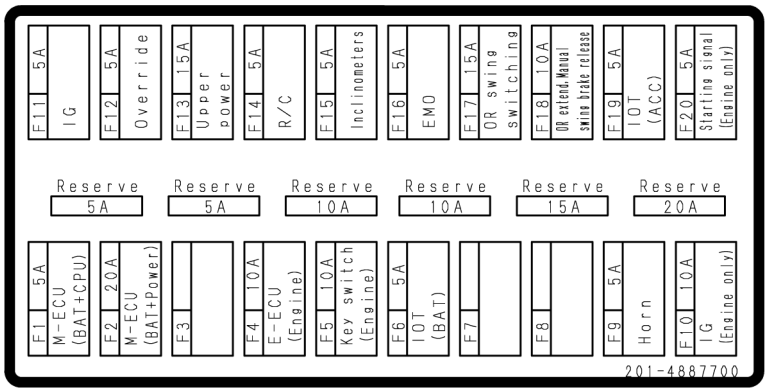

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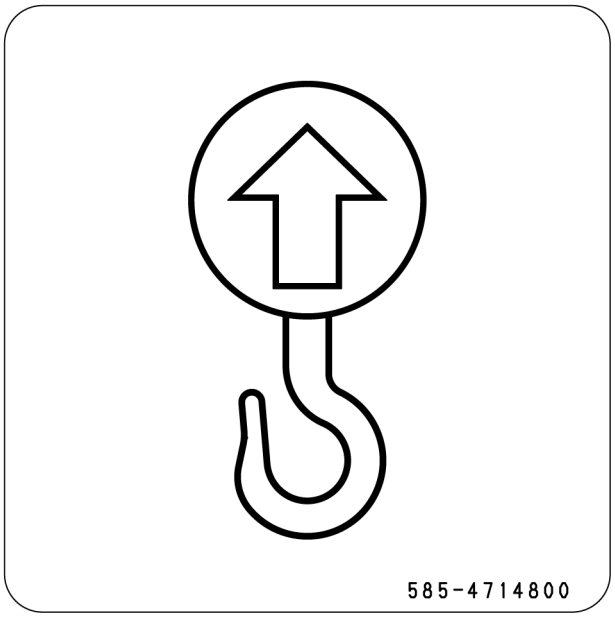

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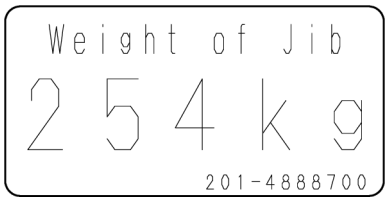

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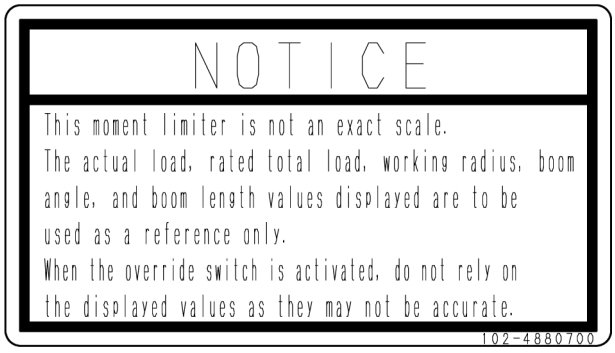

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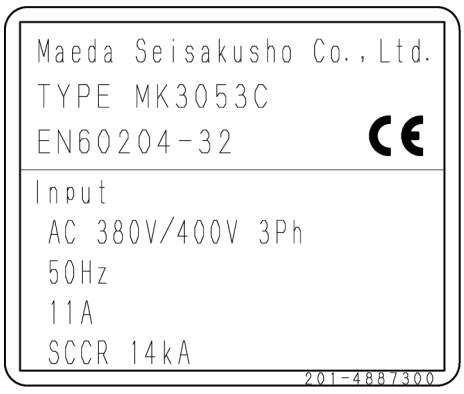

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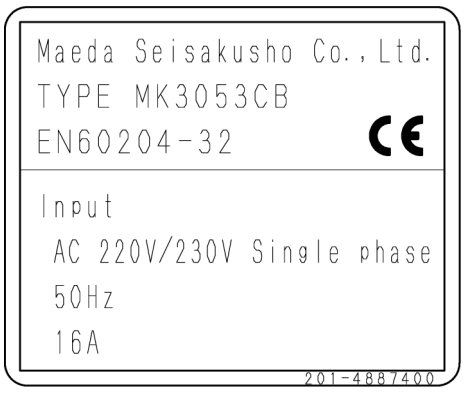

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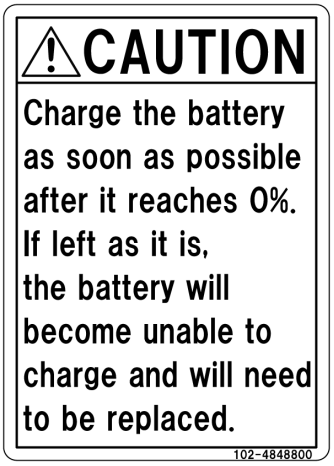
[47] 102-4850600



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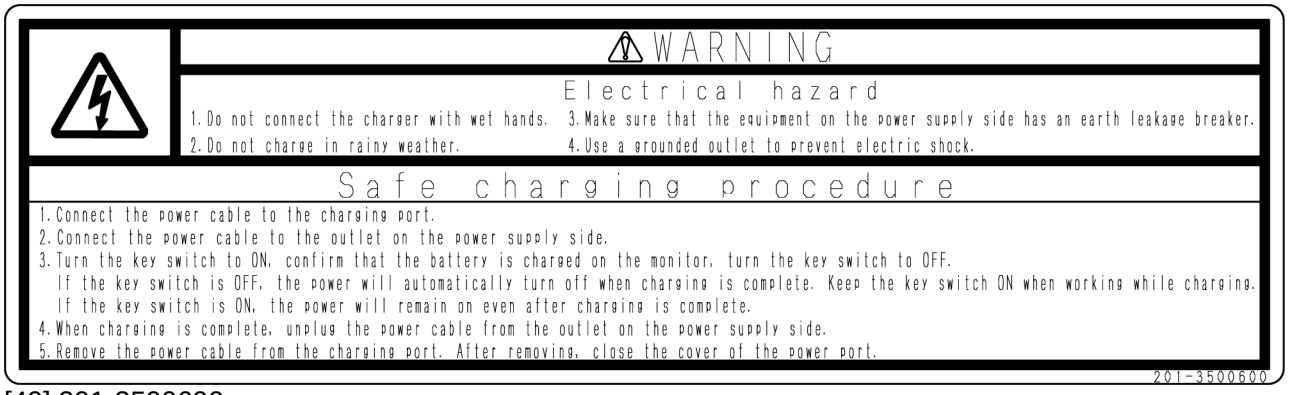

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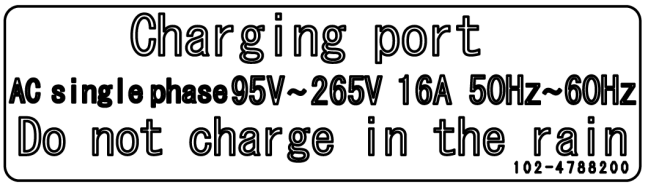

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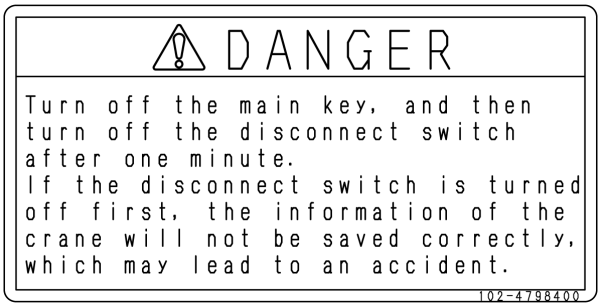

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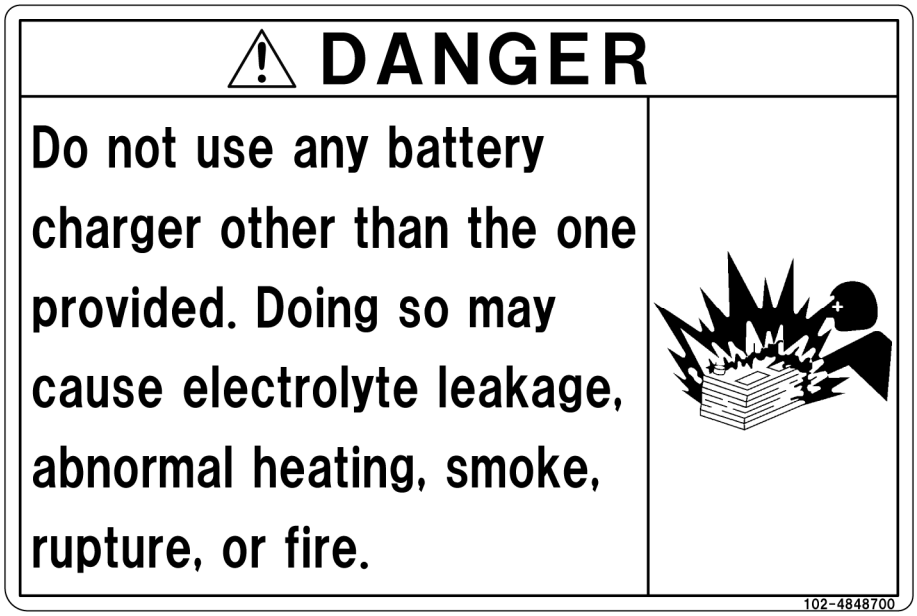

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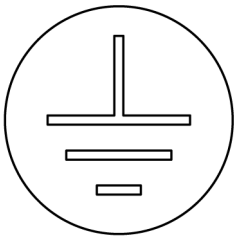

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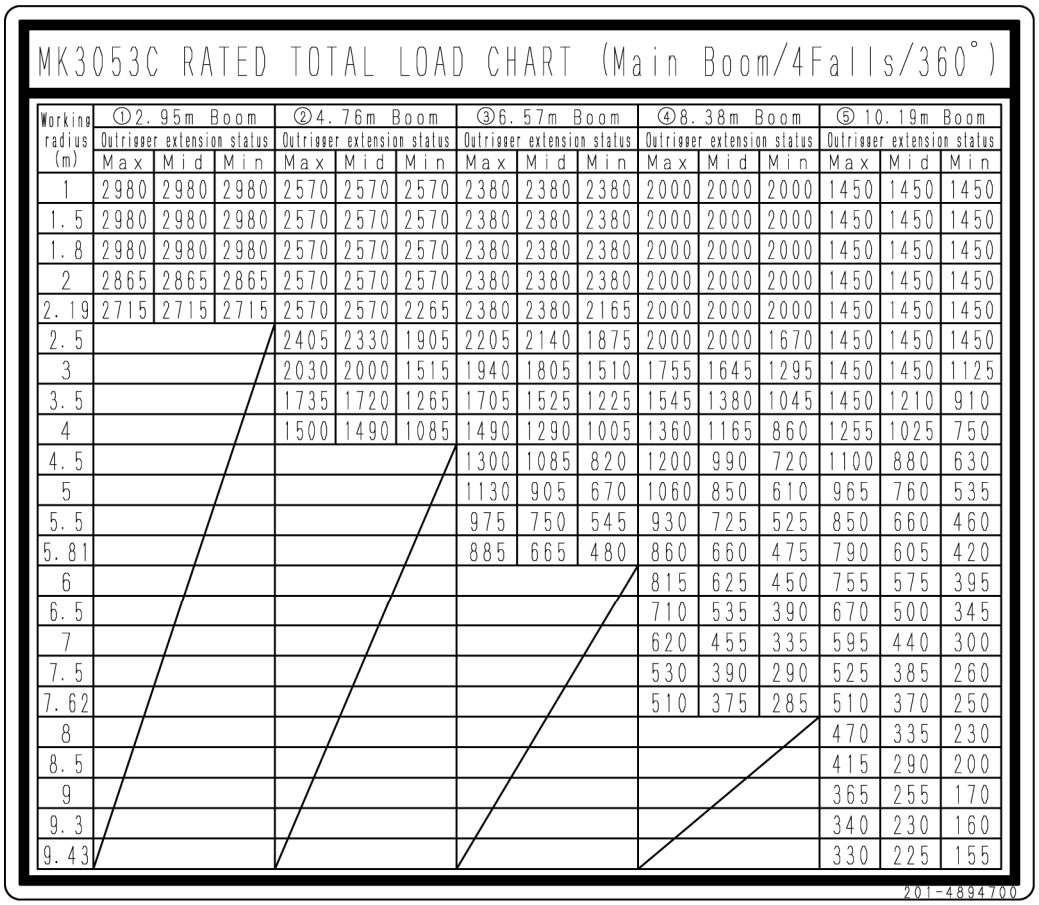


MK3053C RATED TOTAL LOAD CHART (Main Boom/4Falls/360°)

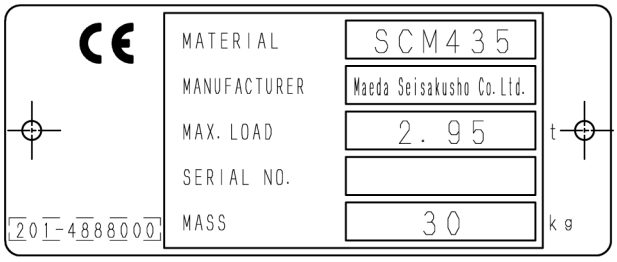
Working radius (m)	①2.95m Boom Outrigger extension status			②4.76m Boom Outrigger extension status			③6.57m Boom Outrigger extension status			④8.38m Boom Outrigger extension status			⑤10.19m Boom Outrigger extension status		
	Max	Mid	Min	Max	Mid	Min	Max	Mid	Min	Max	Mid	Min	Max	Mid	Min
1	2980	2980	2980	2570	2570	2570	2380	2380	2380	2000	2000	2000	1450	1450	1450
1.5	2980	2980	2980	2570	2570	2570	2380	2380	2380	2000	2000	2000	1450	1450	1450
1.8	2980	2980	2980	2570	2570	2570	2380	2380	2380	2000	2000	2000	1450	1450	1450
2	2865	2865	2865	2570	2570	2570	2380	2380	2380	2000	2000	2000	1450	1450	1450
2.19	2715	2715	2715	2570	2570	2265	2380	2380	2165	2000	2000	2000	1450	1450	1450
2.5				2405	2330	1905	2205	2140	1875	2000	2000	1670	1450	1450	1450
3				2030	2000	1515	1940	1805	1510	1755	1645	1295	1450	1450	1125
3.5				1735	1720	1265	1705	1525	1225	1545	1380	1045	1450	1210	910
4				1500	1490	1085	1490	1290	1005	1360	1165	860	1255	1025	750
4.5							1300	1085	820	1200	990	720	1100	880	630
5							1130	905	670	1060	850	610	965	760	535
5.5							975	750	545	930	725	525	850	660	460
5.81							885	665	480	860	660	475	790	605	420
6										815	625	450	755	575	395
6.5										710	535	390	670	500	345
7										620	455	335	595	440	300
7.5										530	390	290	525	385	260
7.62										510	375	285	510	370	250
8													470	335	230
8.5													415	290	200
9													365	255	170
9.3													340	230	160
9.43													330	225	155

201-4894700

[53] 201-4894700

[54] 103-4589600

[55] 103-4592400



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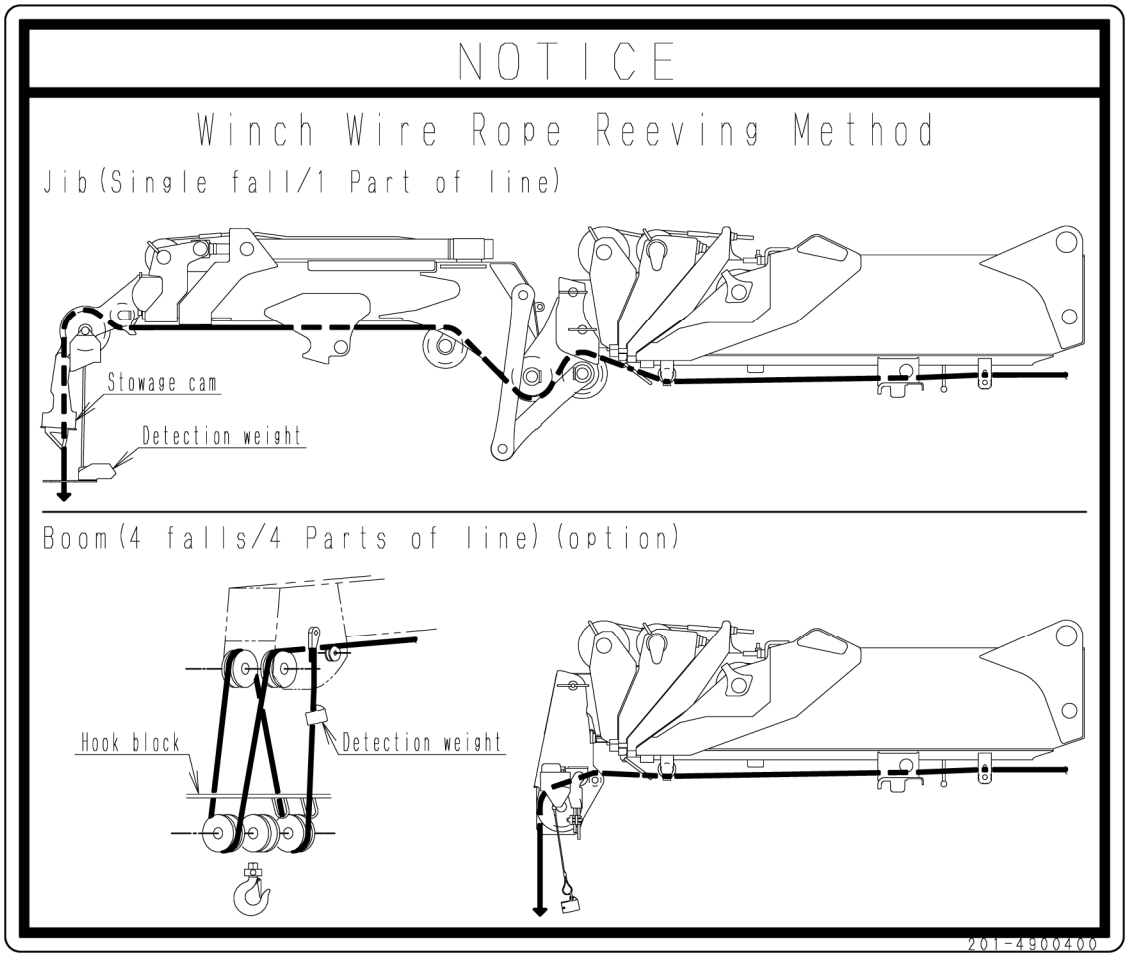
[57] 201-4895500



[58] 201-4900400

[59] 553-4267700

[60] 553-4267300

Chapter 3
SPECIFICATIONS

3.1 MAIN SPECIFICATIONS

3.1.1 Machine Body

3.1.1.1 Specifications

Max. rated total load Boom / Jib				2.98t x 1.8m / 1.0t x 5.2m
Max. working radius Boom / Jib				9.4m / 14.3m
Max. lifting height (above ground) Boom / Jib				12.0m / 16.95m
Boom	Telescopic system	Type		Fully automatic 5-stage pentagonal telescopic boom
		Boom length (when there is a jib boom head)		3.1m - 10.3m
		Boom telescoping stroke / time	Engine	7.2m / 45.4sec
			Battery	7.2m / 42.3sec
	Boom derrick system	Derrick angle / time		0 to 85deg / 26sec
Jib	Telescopic system	Type		Fully automatic 3-stage pentagonal telescopic jib
		Jib length		2.3m - 4.8m
		Jib telescoping stroke / time		2.5m / 18.6sec
	Jib derrick system	Derrick angle / time		195° / 17.5sec
Slew system		Slew angle / speed	Engine	360° / 1.3rpm
			Battery	360° / 1.4rpm
Winch system		Hook wind up speed (four-layer single-fall hook block)	Engine	40.4m / min
			Battery	39.8m / min
Outrigger system		Type		Hydraulic cylinder direct acting type
		Max. extended width		(Lateral)4,460 x (Front)4,560 x (Rear)4,500mm
		Set-up rotation angle		Multi (stepless)
Traveling system		Type		Hydraulic motor driven, stepless speed changer
		Travel speed		0- 2.4km/h
		Gradability NARROW/WIDE (STD)		17.5° /24.7°
		Crawler ground length x width		950mm x 180mm
		Gauge width		780mm - 1,050mm
		Ground pressure		83.4kpa [0.85kgf/㎠]
Engine (MK3053CW,MK3053CWE)		Model		KUBOTA Z482-E4B
		Displacement		0.479L [479cc]
		Rated output		7.2kw/2,600min⁻¹ [9.8ps/2,600rpm]
		Fuel		Diesel
Electric Motor (MK3053CWE)		Motor type		Totally enclosed fan-cooled motor 4.0kw, 4P 380V(200-415V)

Battery system (MK3053CWB)	Type		Lithium Ion Battery
	5-hour rate capacity		DC55V-135Ah, 7.4kWh
	Input Voltage / current		Single phase AC200V/16A, AC100V/14A
	Charging time	with AC-200V	80% : 2h20min / 100% : 3h30min
		with AC-100V	80% : 5h20min / 100% : 7h00min
	Operating time		Up to a full working day if charged during operation
	Charging during operation		Available
Remote control system	Type		Paddle type radio & Proportional control
Overall length x width x height			3,195mm x 780mm x 1,945mm
Machine weight (MK3053CWE / MK3053CWB, MK3053CW) (single-fall hook block)			2,900kg / 2,875kg
Optional item	4-fall hook block, Black or White rubber tracks (depends on specification), Extra battery unit (EBU) (battery specification), Stowage bracket, Outrigger cylinder rod guard, Jib derricking cylinder rod guard, Jib auxiliary tools		
Parts weight The weight of the OPT and unattached hooks is not included in the machine weight.	Jib: 254kg Fixed hook: 2kg Single-fall hook block: 7kg, Jib winch head (single-fall): 14kg 4-fall hook block (OPT): 30kg, Boom head (4-fall) (OPT): 21kg Stowage bracket (OPT): 4kg Outrigger cylinder rod guard (OPT): 12kg Jib derricking cylinder rod guard (OPT): 1kg Jib auxiliary tools (OPT): 6kg		
Safety devices	Boom overwinding detector, jib overwinding detector, Over un-winding detector, Boom angle sensor, Jib angle sensor, Boom length sensor, Jib length sensor, Hydraulic safety valve, Hydraulic automatic locking device, Wire rope latch, Alarm buzzer, Level gauge, Crane tip-over alarm, Travell, outrigger or crane mode selector system, Outrigger interlock, Crane interlock, Moment limiter (with working range limiter), Working status lamp, Radio remote control lamp		

3.1.1.2 Usage Temperature, Storage Temperature, Humidity

Specification	Usage temperature (℃)	Storage temperature (℃)	Humidity (%)
MK3053CW, MK3053CWE	-15 °C to +40 °C	-20 °C to +60 °C	90
MK3053CWB	-20 °C to +40 °C	-20 °C to +55 °C	85

3.1.2 Remote Control

3.1.2.1 Transmitter

Equipment/Item	Transmitter specifications
Unique address	Factory set to one of over 1 million possible addresses
Supply voltage	3.7 V DC
Frequency band	2,402 MHz to 2,480 MHz
Channel raster	12.5 kHz, 1 MHz
Antenna	Internal
Operating ambient temperature	-20 °C to +70 °C
Housing materials	Glass fiber reinforced plastics (GFRP)
Dimensions	255 mm × 162 mm × 169 mm
Weight	Approximately 1.8 kg (including the battery)
Protective structure	IP 65

3.1.2.2 Receiver

Equipment/Item	Receiver specifications
Unique address	Factory set to one of over 1 million possible addresses
Power source voltage	10 V to 30 V DC
Power consumption	Maximum 6 W
Interface	CAN open, Safety CAN
Frequency band	2,402 MHz to 2,480 MHz
Channel raster	12.5 kHz, 1 MHz
Antenna	External (externally mounted antenna + cable connection)
Operating ambient temperature	-25 °C to +70 °C
Housing materials	Plastic
Dimensions	165 mm × 165 mm × 70 mm
Weight	Approximately 1.0 kg
Protective structure	IP 65

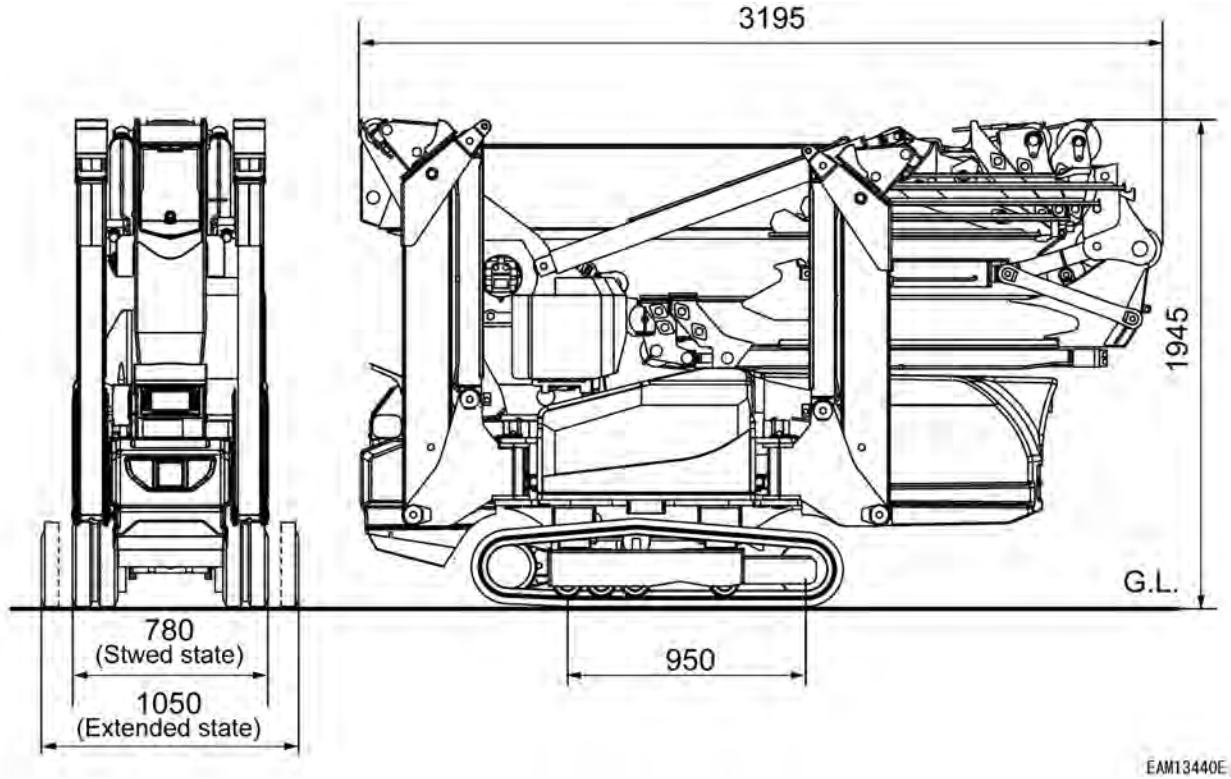
3.1.2.3 Battery

Equipment/Item	Radio remote control device battery
Operating voltage	10 V to 30 V DC
Battery type	BA405000 (Lithium ion)
Battery capacity	6 Ah
Continuous operating time	Approximately 20 hours
Charging time	Less than 5 hours
Operating temperature	0 °C to 45 °C
Housing materials	Plastic
Charging voltage	4.2 V

3.2 DIMENSIONAL DRAWINGS

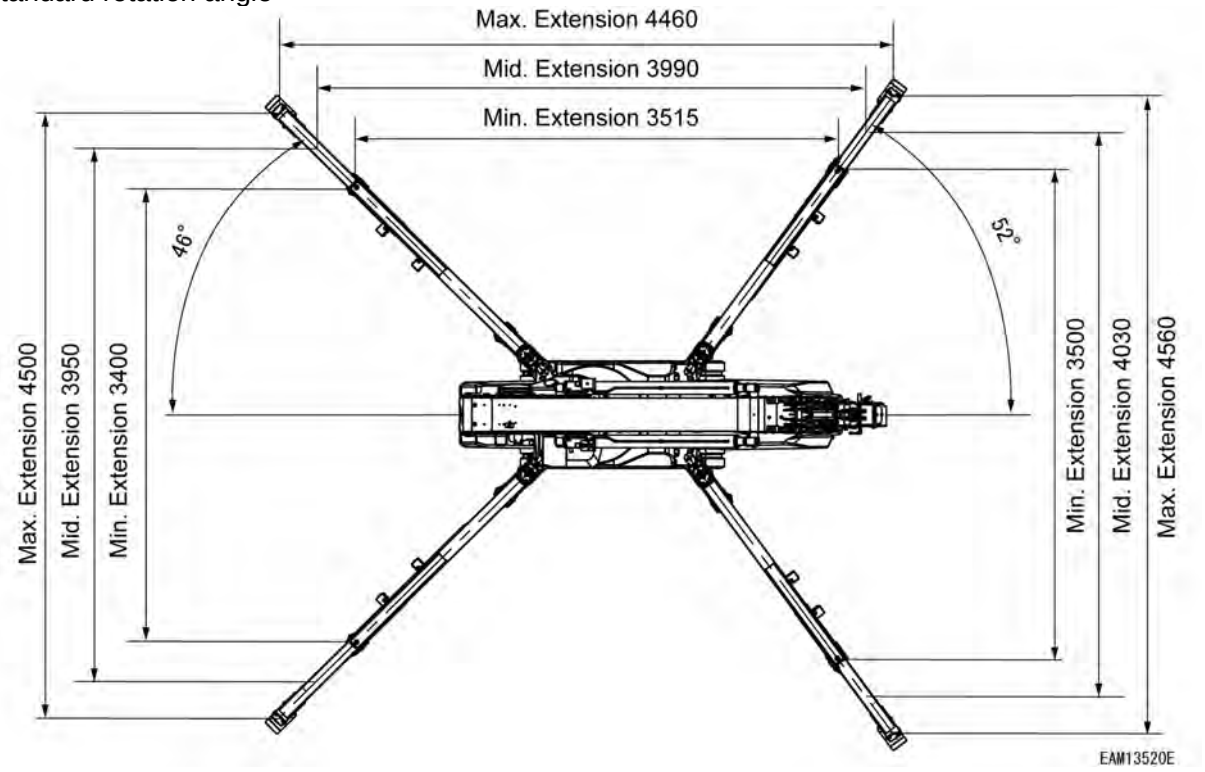
3.2.1 Machine Body

MK3053C Standard Specification

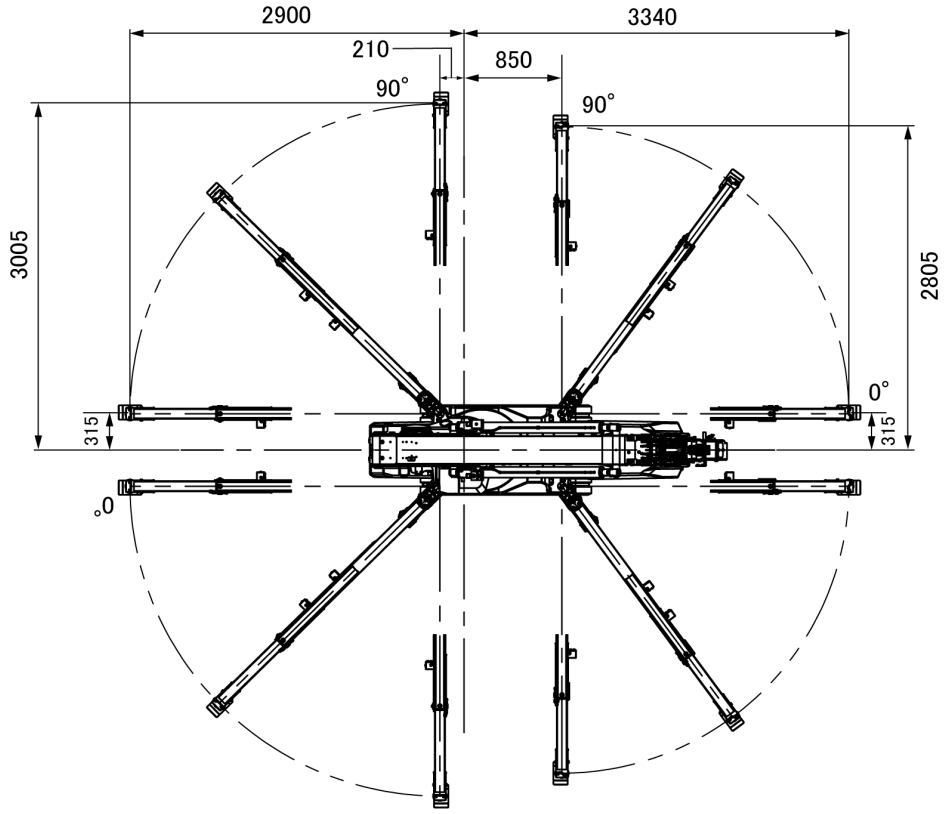


3.2.2 Outrigger Width Dimensional Drawing

Standard rotation angle



Other than the standard rotation angles



3.3 RATED TOTAL LOAD CHARTS

3.3.1 How to Read Rated Total Load Charts

⚠ CAUTION

- **The rated total load charts values are for firm, level ground. Therefore, please carry out tasks on firm, level ground.**
  The machine may topple over depending on how the outrigger is installed or on the state of the ground surface. So, take sufficient care when carrying out tasks.
- **The values in the Rated Total Load Charts are determined based on the working radius, allowing for deflection that is developed when load is applied to the boom.**
- **If the length of the boom or the jib exceeds the specified length, carry out the task with the rated total load chart with the boom or the jib length one section higher.**
- **When the boom angle falls below the value in the "Boom angle" column of the chart even by a little, carry out the task with the rated total load charts with the "Boom angle" column one smaller.**
- **When the jib angle falls below the value in the "Jib angle" column of the chart even by a little, carry out the task with the rated total load charts with the "Jib angle" column one smaller.**
- **When the crane is used with the outriggers extended other than at maximum extension, crane operation should proceed with respect to the values specified on the monitor's working range display.**

3.3.2 How to Read the Angle Indicator

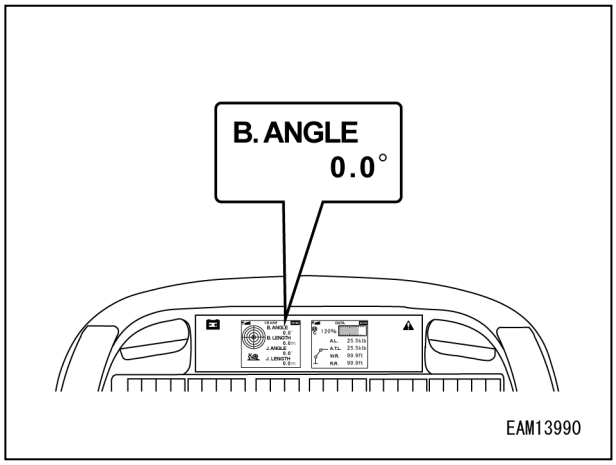
⚠ WARNING

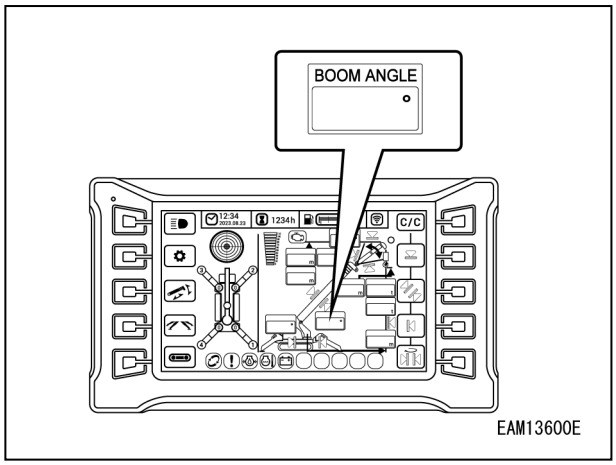
When hoisting a load, decide on the length of the boom (number of boom sections) and boom angle beforehand. Compare the rated total load to the weight of the load being hoisted. Make sure that the total weight of the hoisting accessories, load, and slinging tools does not exceed that rated total load.

The angle indicator can be checked on the remote control display or on the machine monitor.

Boom Angle

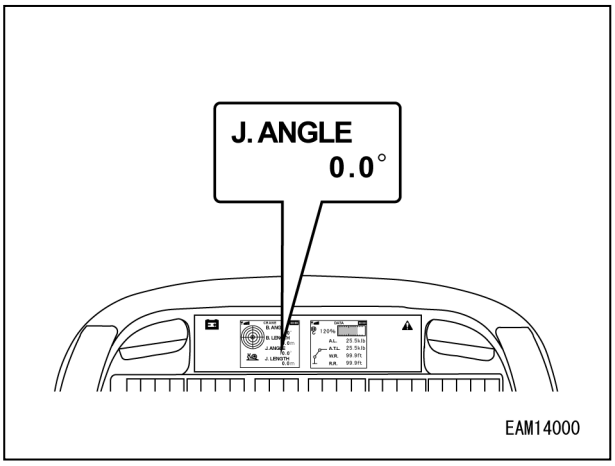
- Read the angle displayed on the remote control display or the monitor.
  The angle displayed is the boom angle.





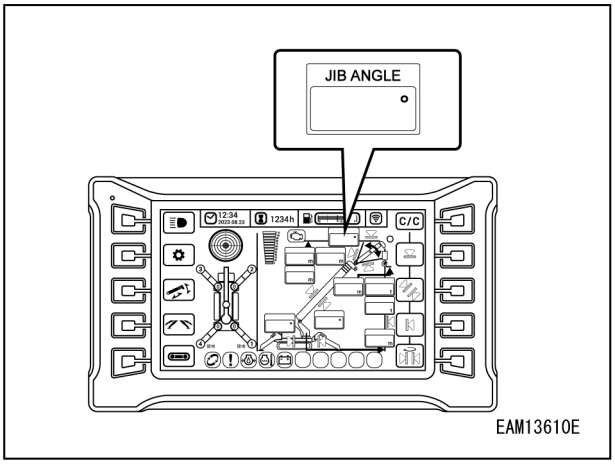
Jib Angle

- Read the angle displayed on the display or the monitor.
  The angle displayed is the jib angle.



When in the jib mode, R.R 0.0° is displayed, but this value is not used. (There is no change, but this is normal.)

When there is a 4-fall hook block, the R.R at that time is displayed.



3.3.2.1 Boom Length

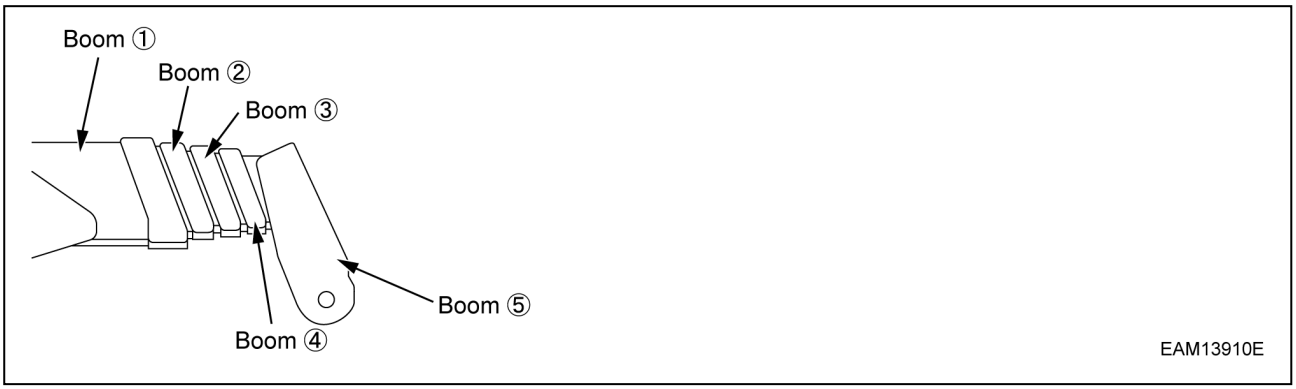
The rated total load charts provide the maximum loads that the crane is capable of hoisting depending on the boom length by working radius.

"3.05 m Boom," "4.86 m Boom," "6.67 m Boom," "8.48 m Boom," and "10.29 m Boom" of the top columns at the top denote the respective states of the following figures:

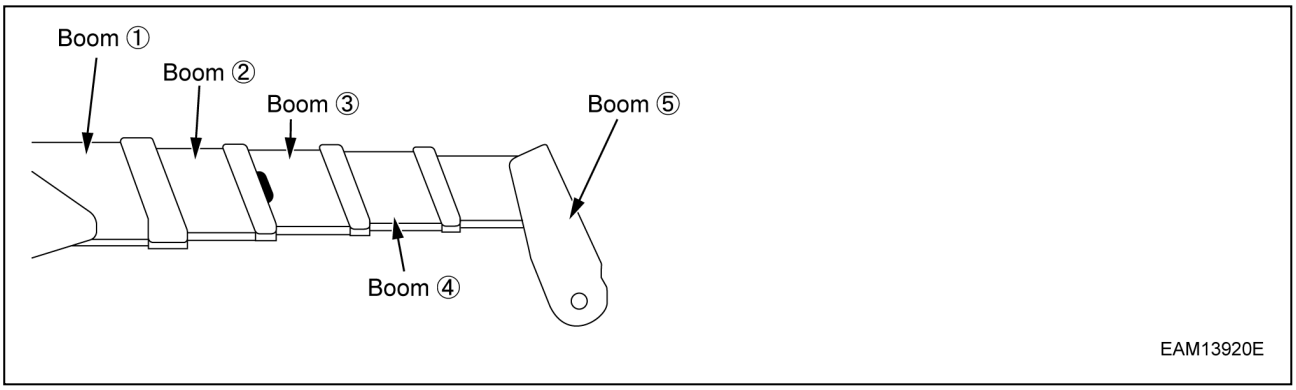
Check the number of sections of the boom from the home screen of the monitor and the label (mark) of the side of the boom (3).

Refer to "4.2.2 Home screen" regarding the home screen of the monitor.

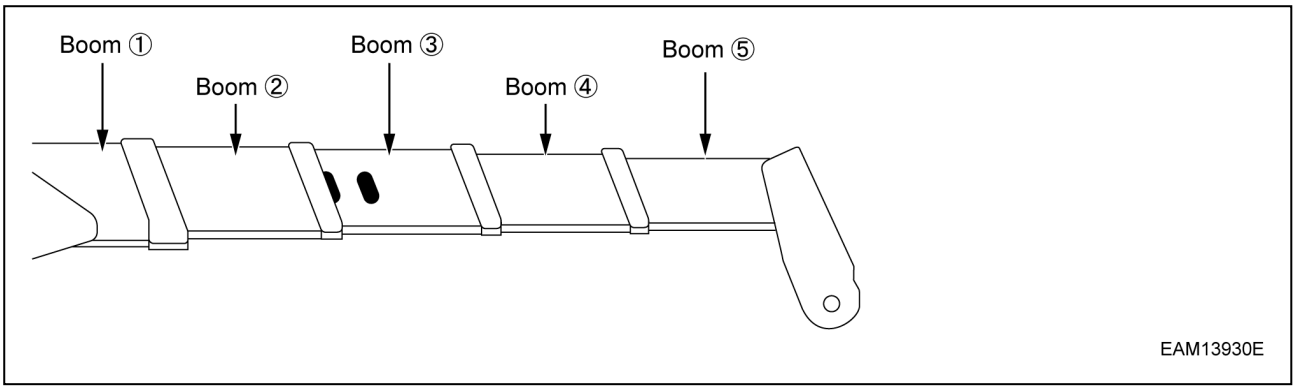
1. "3.05 m Boom": all the booms are retracted.



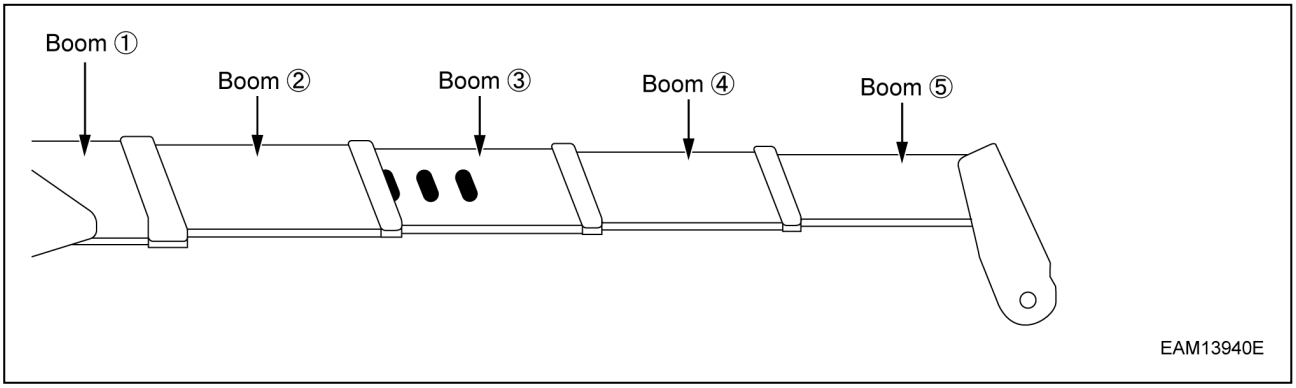
2. "4.86 m Boom": the first label (mark) of boom (3) is half visible.
   If boom (2) is extended even by a small amount, work within the capacity indicated in this column.



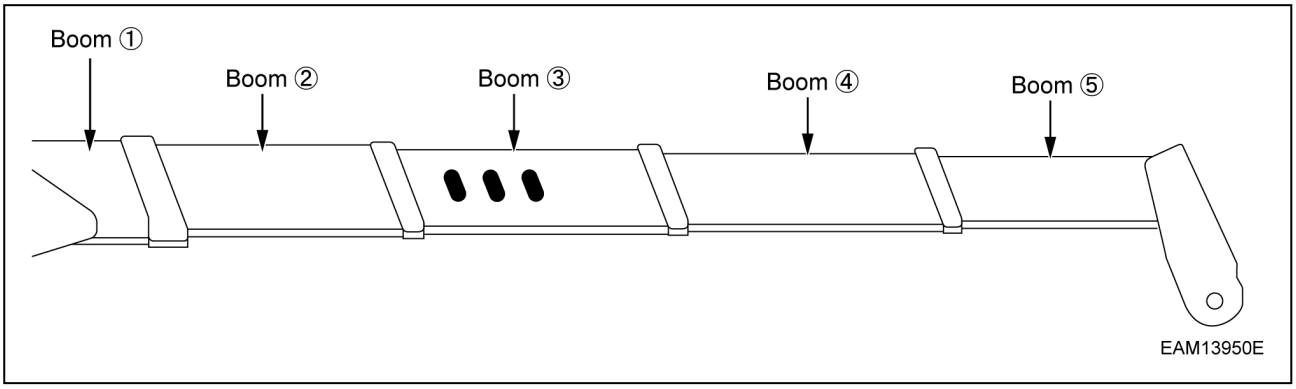
3. "6.67 m Boom": the second label (mark) of boom (3) is half visible.
   When the first label (mark) is exposed halfway from boom (2), work within the capacity of this column.



4. “8.48 m Boom”: the third label (mark) of boom (3) is half visible.
   When the second label (mark) is exposed half way from boom (2), work within the capacity of this column.



5. “10.29 m Boom”: all the booms are fully extended.
   When the third label (mark) is exposed half way from boom (2), work within the capacity of this column.

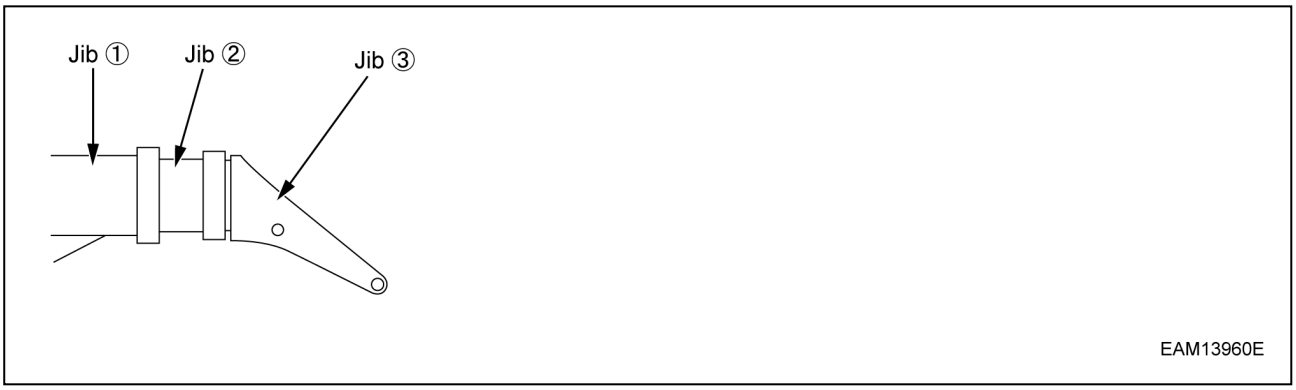


3.3.2.2 Jib Length

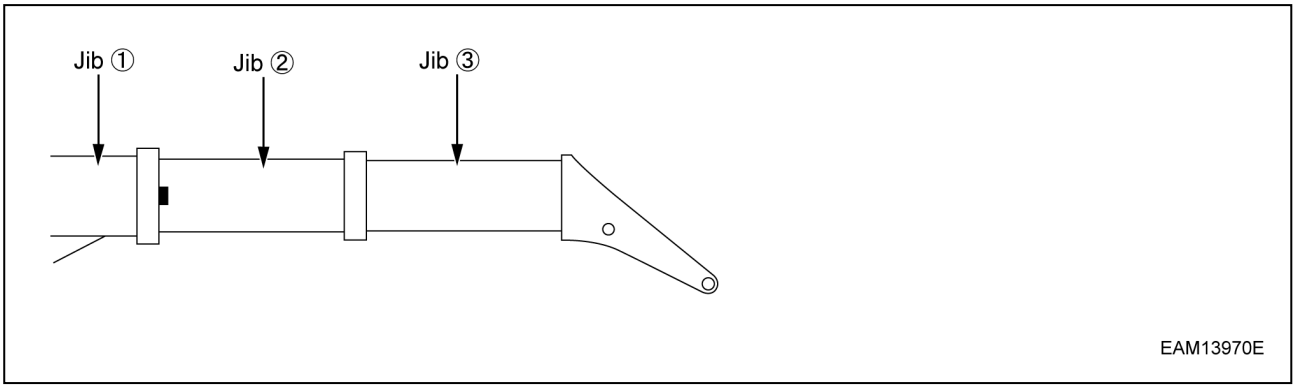
“2.27 m Jib,” “3.54 m Jib,” and “4.81 m Jib” of the “Jib number of sections” of the rated total load chart denote the respective states of the following figures:

Check the number of sections of the jib from the home screen of the monitor and the label (mark) of the side of the jib (2).
Refer to “4.2.2 Home screen” regarding the home screen of the monitor.

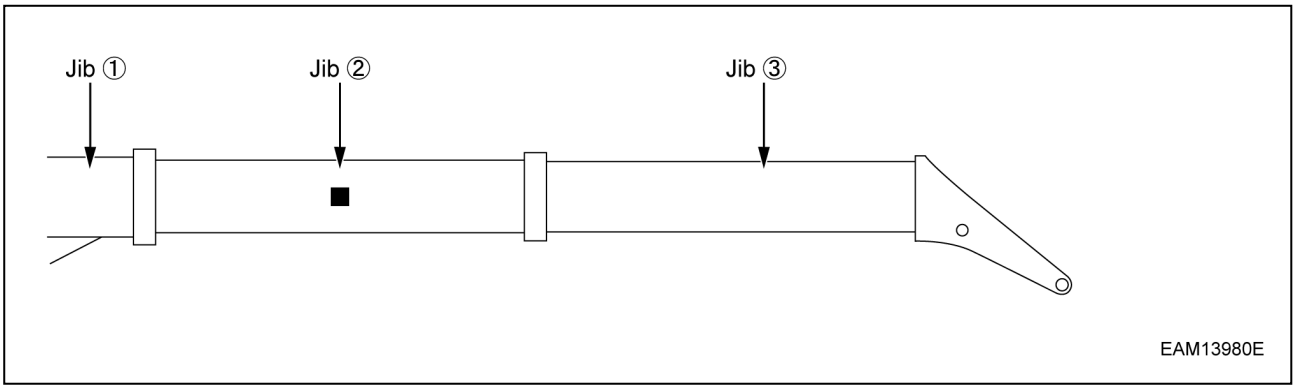
1. “2.27 m Jib”: all the jibs are retracted.



2. “3.54 m Jib”: the label (■ mark) of the jib (2) is half visible.
   If the jib is extended even by a small amount, work within the capacity indicated in this column.



3. “4.81 m Jib”: all the jibs are fully extended.
   When the label (■ mark) is exposed half way from jib (2), work within the capacity of this column.



3.3.3 Rated Total Load Charts (RTL Charts)

3.3.3.1 RTL Chart When the Jib is Mounted and a fixed hook or single-fall hook block is attached

Outrigger (OR) MAX extension at standard (STD) rotation angle

★ The rated total load chart indicates the load including the mass of hoisting accessories.
(hook mass: 2 kg when the fixed hook is attached, when single-fall hook block is attached: 8 kg).

IMPORTANT

- **The rated total load when the fixed hook is attached is limited to a maximum of 950 kg. When the fixed hook is attached, if 1000 kg, 980 kg, or 975 kg is displayed for the rated total load, read this as 950 kg.**
- **The rated total load when single-fall hook block is attached is a maximum of 1000 kg.**

☞ When the fixed hook is attached, if the oil temperature has become high, for example, it may not be possible to raise the load of the rated total load chart with the jib. In that case, after setting the desired jib angle with no load, lift up the load by raising and extending the boom.
However, at this time, refer to the section “5.8.2 Precautions and prohibitions while operating the crane” and be careful to avoid side pulling, pulling near, and diagonal suspension.

OR MAX extension at STD rotation angle

Unit: kg

3.05 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
45°	1000	1000	950	950	1000	1000	710	605	1000	610	610	445
0°				950				605				445

4.86 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
45°	1000	1000	950	950	1000	1000	710	605	1000	610	610	445
0°				725				540				425

Unit: kg

6.67 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
50°	1000	1000	980	800	1000	1000	710	590	1000	610	610	445
35°	900	850	630	510	900	820	530	400	900	610	455	325
0°				380				300				250

8.48 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
55°	1000	1000	770	630	1000	1000	640	480	1000	610	545	385
40°	570	540	415	335	570	530	360	270	570	520	320	225
0°				195				160				130

10.29 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	680	680	605	1000	610	610	445
67°	1000	1000	1000	850	1000	680	680	590	1000	610	610	445
55°	660	630	515	440	660	610	445	335	660	590	390	285
40°	300	285	230	220	300	280	205	155	300	275	180	150
0°				75				60				45

3.3.3.2 RTL Chart When the Jib is Mounted and a fixed hook or single-fall hook block is attached
Outrigger (OR) MID extension at standard (STD) rotation angle or
Outrigger (OR) MIN extension at standard (STD) rotation angle

★ The rated total load chart indicates the load including the mass of hoisting accessories.
(hook mass: 2 kg when the fixed hook is attached, when single-fall hook block is attached: 8 kg).

IMPORTANT

- **The rated total load when the fixed hook is attached is limited to a maximum of 950 kg. When the fixed hook is attached, if 1000 kg, 980 kg, or 975 kg is displayed for the rated total load, read this as 950 kg.**
- **The rated total load when single-fall hook block is attached is a maximum of 1000 kg.**

☞ When the fixed hook is attached, if the oil temperature has become high, for example, it may not be possible to raise the load of the rated total load chart with the jib. In that case, after setting the desired jib angle with no load, lift up the load by raising and extending the boom.
However, at this time, refer to the section “5.8.2 Precautions and prohibitions while operating the crane” and be careful to avoid side pulling, pulling near, and diagonal suspension.

OR MID extension at STD rotation angle

Unit: kg

3.05 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
45°	1000	1000	950	950	1000	1000	710	605	1000	610	610	445
0°				950				605				445

4.86 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
45°	1000	1000	950	800	1000	1000	710	560	1000	610	610	425
0°				540				410				325

Unit: kg

6.67 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
50°	1000	975	670	555	1000	935	550	410	1000	610	460	320
35°	595	560	420	355	595	540	355	275	595	525	305	220
0°				260				210				170

8.48 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	825	1000	1000	710	580	1000	610	610	445
55°	810	720	520	435	810	690	435	335	810	610	375	265
40°	365	350	270	230	365	340	235	180	365	330	205	150
0°				100				90				70

10.29 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	680	680	605	1000	610	610	445
67°	1000	1000	745	610	1000	680	605	450	1000	610	505	350
55°	470	445	340	290	470	430	295	230	470	420	255	185
40°	190	180	140	120	190	175	120	95	190	165	105	75
0°												

OR MIN extension at STD rotation angle

Unit: kg

3.05 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
45°	1000	1000	950	950	1000	1000	710	605	1000	610	610	445
0°				780				525				390

Unit: kg

4.86 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
45°	1000	1000	820	510	1000	1000	705	390	1000	610	500	300
0°				300				230				185

6.67 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	1000	700	1000	1000	710	480	1000	610	610	370
50°	750	750	525	375	750	750	420	280	750	610	350	205
35°	320	310	245	185	320	320	210	140	320	320	175	115
0°				105				80				55

8.48 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	1000	710	605	1000	610	610	445
67°	1000	1000	750	570	1000	1000	605	380	1000	610	500	300
55°	535	510	355	260	535	490	290	205	535	470	240	160
40°	205	185	130	90	205	180	115	70	205	180	90	
0°												

10.29 m Boom												
Jib angle / Boom angle	2.27 m Jib				3.54 m Jib				4.81 m Jib			
	90°	85°	55°	0°	90°	85°	55°	0°	90°	85°	55°	0°
85°	1000	1000	1000	1000	1000	680	680	605	1000	610	610	445
67°	945	860	550	350	945	680	455	290	945	610	365	225
55°	300	290	205	135	300	280	180	80	300	270	145	
40°												
0°												

3.3.3.3 RTL Chart When the Jib is Unmounted and 4-fall hook block is attached OR MAX extension at STD rotation angle

★The rated total load chart indicates the load including the mass of hoisting accessories. (hook mass: 30 kg).

OR MAX extension at STD rotation angle

Unit: kg

Working radius (m)	2.95 m Boom	4.76 m Boom	6.57 m Boom	8.38 m Boom	10.19 m Boom
1	2980	2570	2380	2000	1450
1.5	2980	2570	2380	2000	1450
1.8	2980	2570	2380	2000	1450
2	2865	2570	2380	2000	1450
2.19	2715	2570	2380	2000	1450
2.5		2405	2205	2000	1450
3		2030	1940	1755	1450
3.5		1735	1705	1545	1450
4		1500	1490	1360	1255
4.5			1300	1200	1100
5			1130	1060	965
5.5			975	930	850
5.81			885	860	790
6				815	755
6.5				710	670
7				620	595
7.5				530	525
7.62				510	510
8					470
8.5					415
9					365
9.3					340
9.43					330

3.3.3.4 RTL Chart When the Jib is Unmounted and 4-fall hook block is attached OR MID extension at STD rotation angle or OR MIN extension at STD rotation angle

★ The rated total load chart indicates the load including the mass of hoisting accessories. (hook mass: 30 kg).

OR MID extension at STD rotation angle

Unit: kg

Working radius (m)	2.95 m Boom	4.76 m Boom	6.57 m Boom	8.38 m Boom	10.19 m Boom
1	2980	2570	2380	2000	1450
1.5	2980	2570	2380	2000	1450
1.8	2980	2570	2380	2000	1450
2	2865	2570	2380	2000	1450
2.19	2715	2570	2380	2000	1450
2.5		2330	2140	2000	1450
3		2000	1805	1645	1450
3.5		1720	1525	1380	1210
4		1490	1290	1165	1025
4.5			1085	990	880
5			905	850	760
5.5			750	725	660
5.81			665	660	605
6				625	575
6.5				535	500
7				455	440
7.5				390	385
7.62				375	370
8					335
8.5					290
9					255
9.3					230
9.43					225

OR MIN extension at STD rotation angle

Unit: kg

Working radius (m)	2.95 m Boom	4.76 m Boom	6.57 m Boom	8.38 m Boom	10.19 m Boom
1	2980	2570	2380	2000	1450
1.5	2980	2570	2380	2000	1450
1.8	2980	2570	2380	2000	1450
2	2865	2570	2380	2000	1450
2.19	2715	2265	2165	2000	1450
2.5		1905	1875	1670	1450
3		1515	1510	1295	1125
3.5		1265	1225	1045	910
4		1085	1005	860	750
4.5			820	720	630
5			670	610	535
5.5			545	525	460
5.81			480	475	420
6				450	395
6.5				390	345
7				335	300
7.5				290	260
7.62				285	250
8					230
8.5					200
9					170
9.3					160
9.43					155

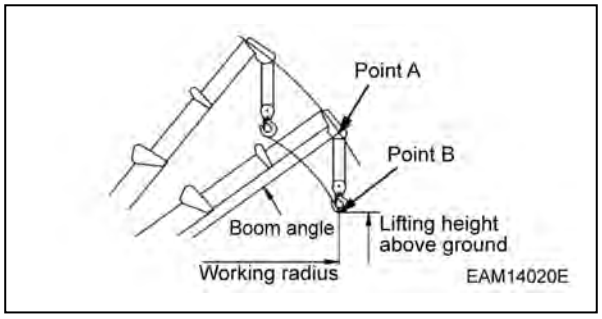
3.4 WORKING RADIUS / LIFTING HEIGHT DIAGRAMS

3.4.1 How to Read Working Radius and Lifting Height Diagrams

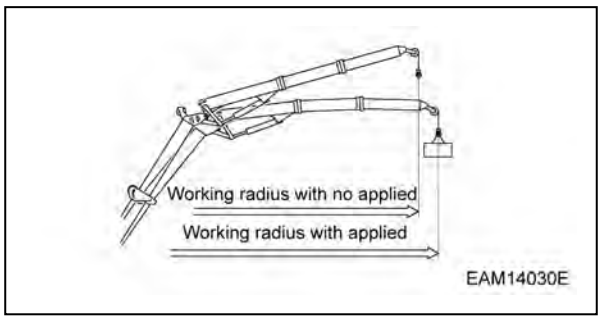
⚠ WARNING

- **The numerical value for the rated total load (kg) when the outrigger is extended at the standard maximum is stated in the figure.**
  - **The rated total load when the fixed hook is attached is limited to a maximum of 950 kg. When the fixed hook is attached, if 1000 kg, 980 kg, or 975 kg is displayed for the rated total load, read this as 950 kg.**
  - **The rated total load when single-fall hook block is attached is a maximum of 1000 kg.**
- **The working radius / lifting height diagrams do not include the boom or jib deflections.**

1. Point A in the figure indicates the boom angle and point B, the lifting height above the ground.
The working radius for points A and B are the same.
However, they differ when using a single-fall.



2. The working radius and lifting height diagram shows the relationship under no load and does not include boom deflection.
Deflection occurs in the boom and jib when an object is hoisted, which causes the working radius to widen slightly.
The rated total load decreases as the working radius increases. Actual crane operation requires planning for work, allowing for sufficient clearance beyond that indicated in the diagram.

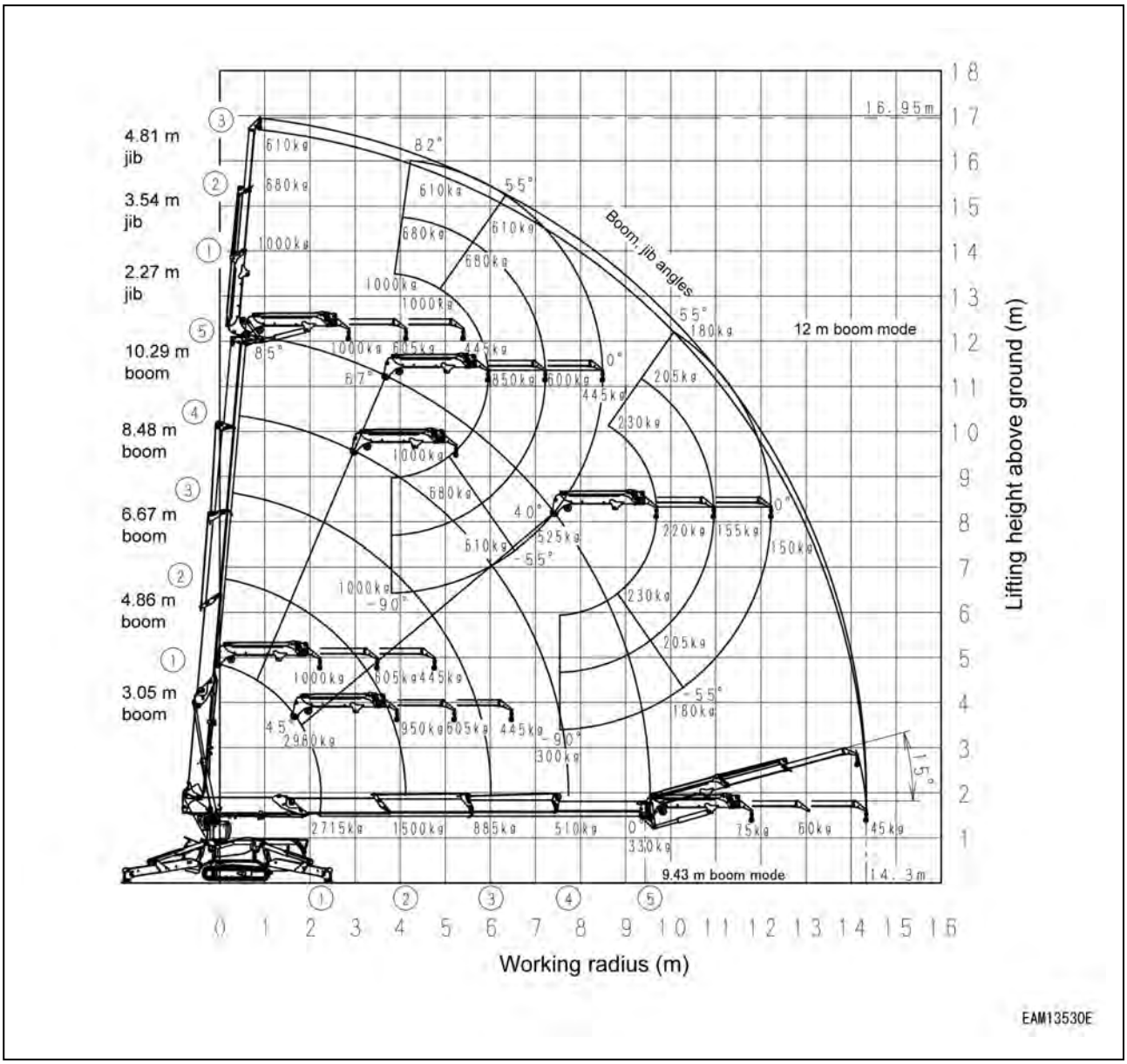


3.4.2 Working Radius / Lifting Height Diagrams

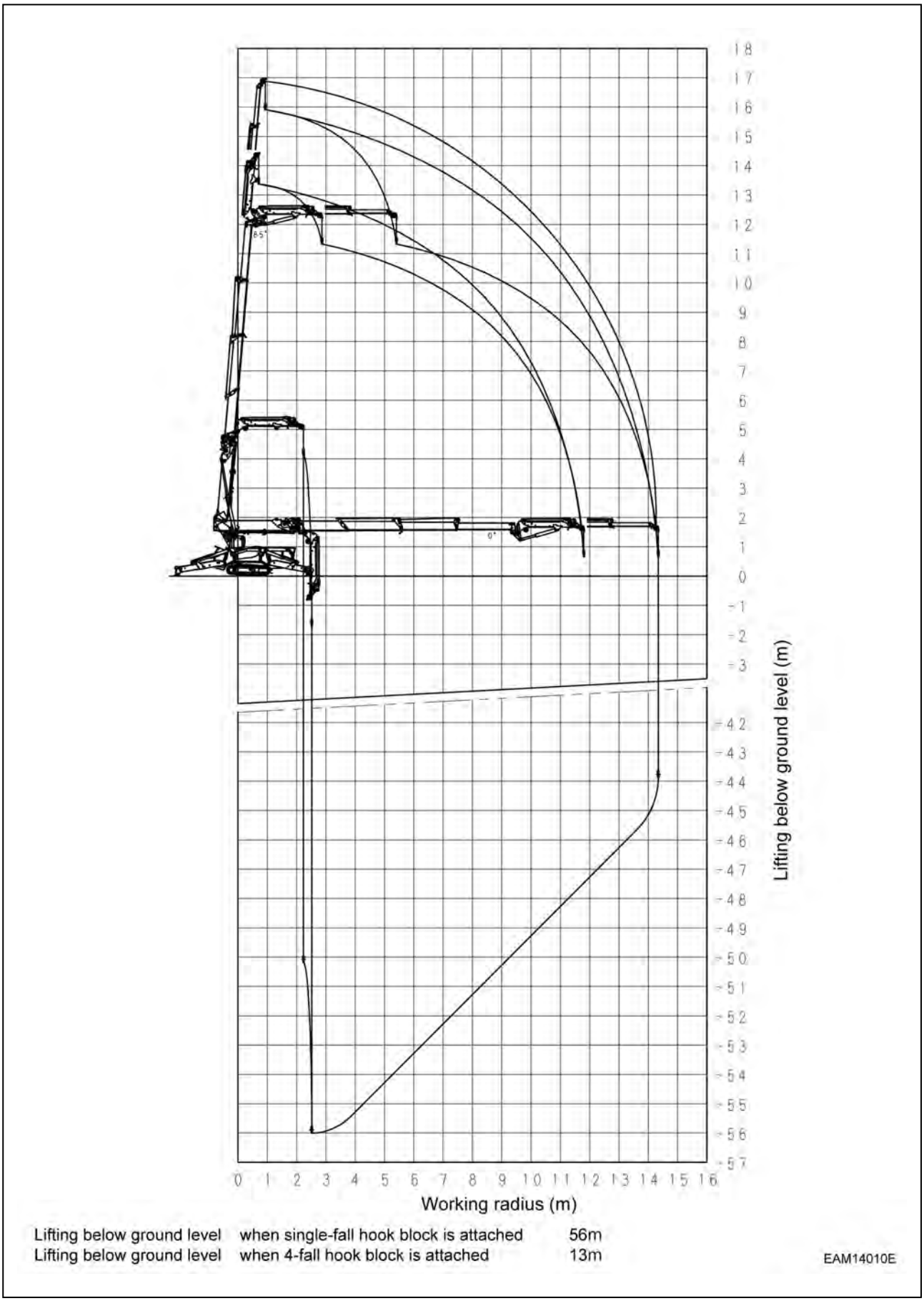
3.4.2.1 Working Radius / Lifting Height Diagrams

⚠ CAUTION

- **The range of working when the jib is mounted (when a fixed hook or single-fall hook block is attached) is expressed in red characters on the top of the name plate.**
- **The jib length when the single-fall hook block is attached is 0.07 m shorter than in the diagram.**
- **The working range when the jib is unmounted (when 4-fall hook block is attached) is expressed in blue characters above of the name plate.**
- **Check the name plate for the respective working range when the jib is mounted and the jib is unmounted.**



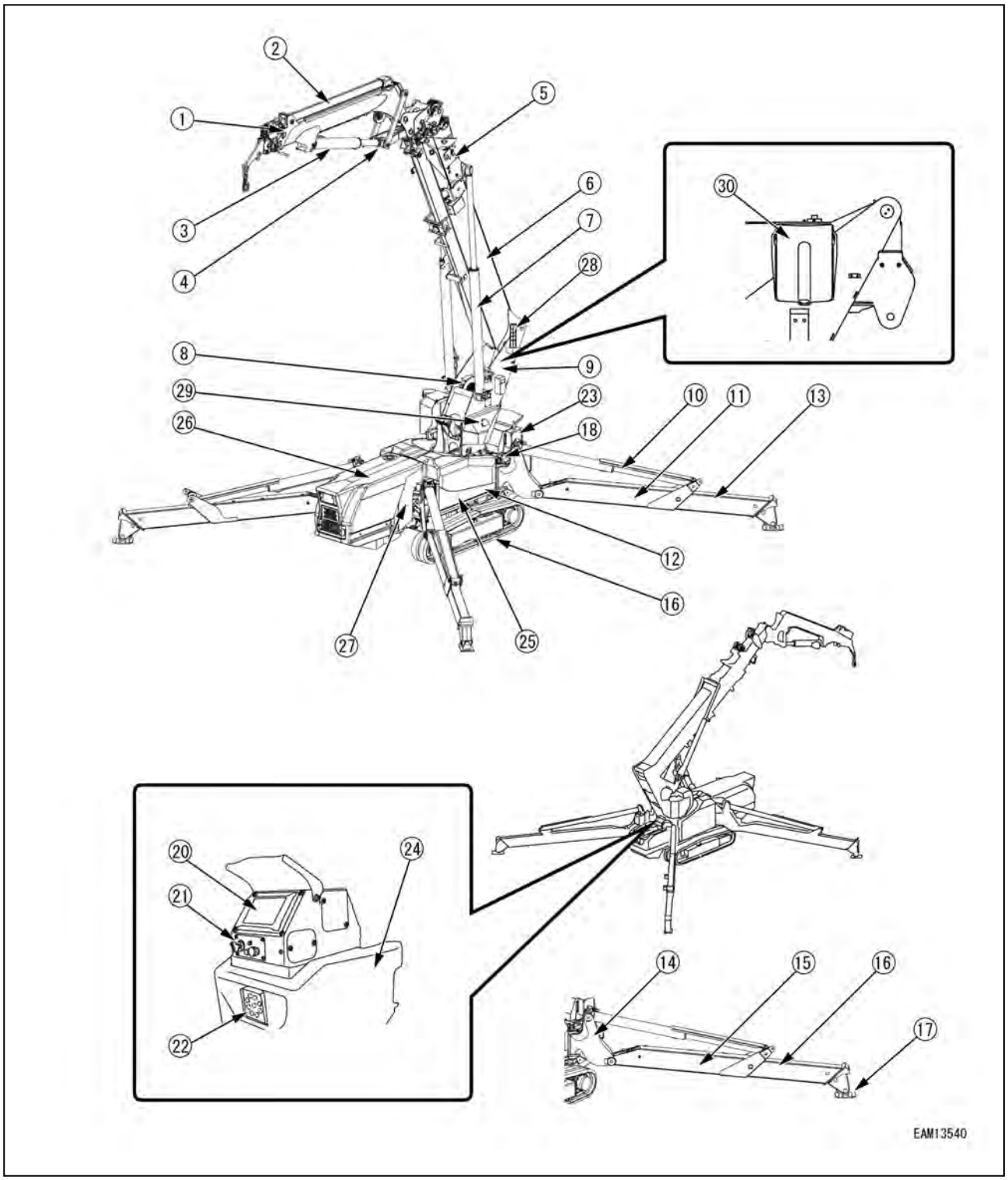
3.4.2.2 Lifting Below Ground Level Diagram



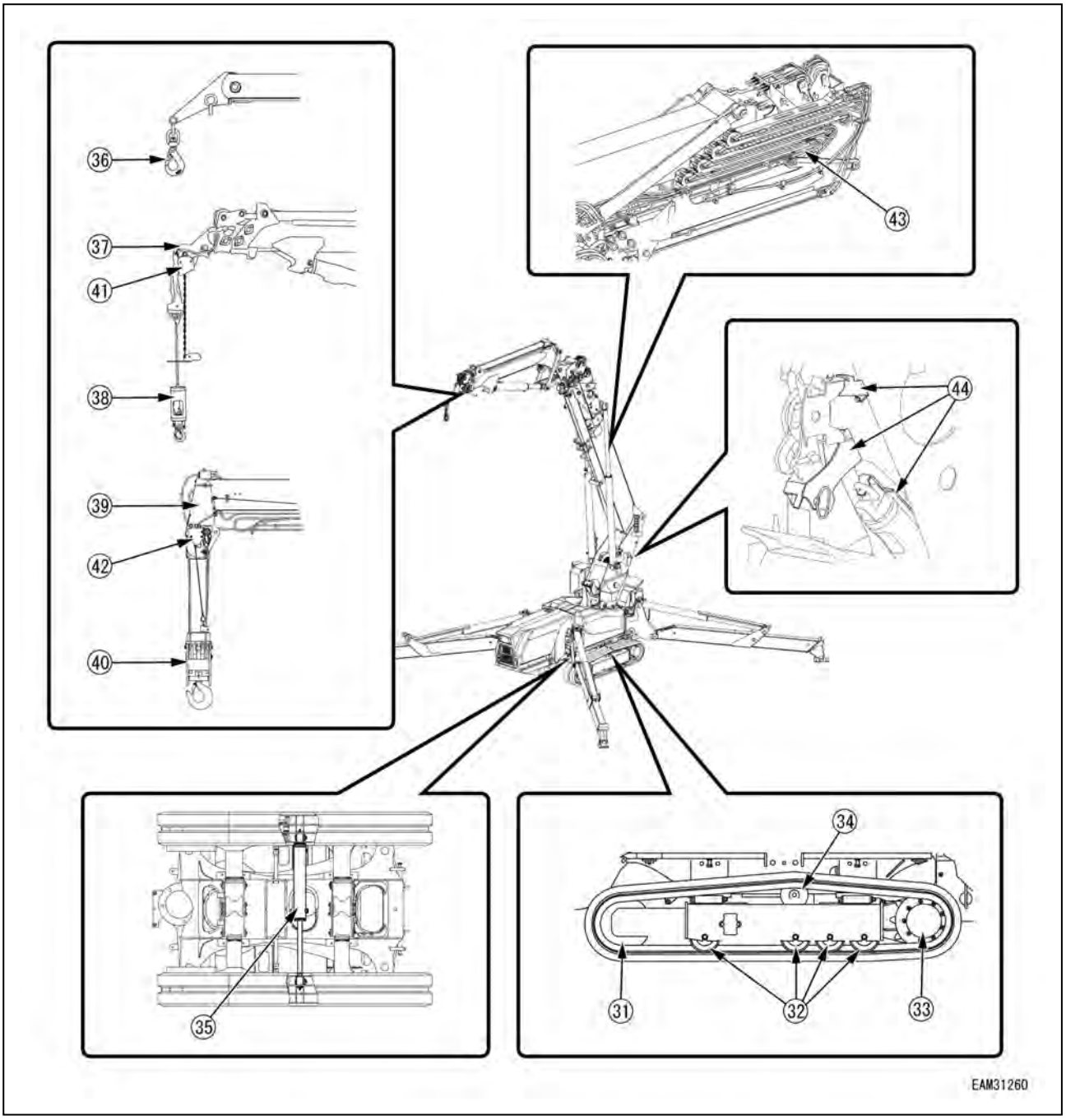
Chapter 4
COMPONENT AND FUNCTIONS

4.1 COMPONENT

4.1.1 Machine component



(1) Jib
(2) Jib telescoping cylinder
(3) Jib derricking cylinder
(4) Link
(5) Boom
(6) Boom telescoping cylinder (inside the boom)
(7) Boom derricking cylinder
(8) Winch
(9) Post
(10) Outrigger grounding cylinder
(11) Outrigger extension cylinder (inside the box)
(12) Outrigger rotation cylinder (inside the machinery cover)
(13) Outrigger
(14) Rotary
(15) Outer box
(16) Inner box
(17) Outrigger foot
(18) Slewing device
(19) Rubber tracks
(20) Monitor
(21) Control section
(22) Working light
(23) Radio controller receiver
(24) Operating cover
(25) Left and right machinery cover
(26) Engine cover (engine specification / engine and electric specification)
Battery cover (battery specification)
(27) Left and right engine cover (engine specification / engine and electric specification)
Left and right battery cover (battery specification)
(28) Working status lamp
(29) Radio remote control lamp
(30) User manual box



(31) Idler
(32) Track roller (bottom roller wheel)
(33) Travel motor sprocket
(34) Carrier roller (top roller wheel)
(35) Variable gauge cylinder
(36) Fixed hook
(37) Jib winch head
(38) Single-fall hook block
(39) Boom head
(40) 4-fall hook block
(41) Jib overwinding detector
(42) Boom overwinding detector
(43) Hose guide and cable carrier
(44) Stowage bracket (optional)

4.1.1.1 Machine component description

[1] Jib (1)

This jib has a three-stage telescoping mechanism.

[2] Jib telescoping cylinder (2)

This cylinder is for telescoping the jib.

[3] Jib derricking cylinder (3)

This cylinder is for derricking the jib.

[4] Link (4)

This device is for smoothly derricking the jib.

[5] Boom (5)

This boom has a 5-stage telescoping mechanism.

[6] Boom telescoping cylinder (6)

This is a telescoping cylinder that is built in to the boom.

[7] Boom derricking cylinder (7)

This cylinder is for derricking the boom.

[8] Winch (8)

This device consists of a motor and drum and winds the winch rope in and out.
For details of how to operate the winch, refer to section “5.8.6 Hoist Up/Down the hook block.”

[9] Post (9)

This is the frame of the slewing part that is mounted on the crane part.

[10] Outrigger grounding cylinder (10), Outrigger extension cylinder (11), Outrigger rotation cylinder (12), Outrigger (13) Rotary (14) Outer box (15) Inner box (16) Outrigger foot (17)

This device consists of four parts and is for stabilizing the machine horizontally.
For details of setting up the outriggers, refer to section “5.7.3 Setting the outriggers,” and for details of stowing them, refer to section “5.7.4 Stowing the outriggers.”

[11] Slewing device (18)

This device is for slewing the crane part.

[12] Rubber tracks (19)

This crawler made from rubber is for travelling.

For details of how to adjust the tension of the rubber tracks, refer to section “6.11.3 [1] Inspecting and adjusting the rubber tracks tension.”

[13] Monitor (20)

This is a display device for displaying the machine’s status.

In addition, you can perform emergency operations from the monitor if the radio controller operation fails.

[14] Control section (21)

Contains all the various control switches.

For details, refer to section “4.1.3 Control section.”

[15] Working light (22)

This working light illuminates the area surrounding the monitor.

[16] Radio controller receiver (23)

This is the radio controller receiver.

[17] Operating cover (24)

This is the cover below the monitor.

[18] Left and right machinery cover (25)

This is a left and right split type machine cover.

[19] Engine cover (engine specification / engine and electric specification) (26) or battery cover (battery specification) (26)

A cover for the engine or the battery surrounds.

The name and part of the shape vary depending on the specification.

[20] Left and right engine cover (engine specification / engine and electric specification) (27) or left and right battery cover (battery specification) (27)

This is a cover for the left and right side of the engine or the battery.

The name and part of the shape vary depending on the specification.

[21] Working status lamp (28)

A red, yellow, or green lamp is lit depending on the operation status of the machine.

[22] Radio remote control lamp (29)

This lamp is lit when communication is established with the radio controller.

[23] User manual box (30)

This box stows the user manual and the emergency operation lever.

[24] Idler (31), Track roller (bottom roller wheel) (32), Travel motor and sprocket (33), Gear roller (top roller wheel) (34)

This is travel device for travelling.

For details of how to travel, refer to the sections from section “5.6.2 Travelling posture of machine” to section “5.6.5 Changing the travelling direction of the machine.”

[25] Variable gauge cylinder (35)

This cylinder is for altering the width of the crawler tracks.

[26] Fixed hook (36)

This is a lifting hook that is fixed to the end of the jib.

It cannot be used together with a single-fall hook block.

For details, refer to section “5.9.4 Jib—Attaching a fixed hook” or “5.9.5 Jib—Detaching the fixed hook.”

[27] Jib winch head (37)

This head is fitted when the single-fall hook block is being used on the jib.

It cannot be used together with the fixed hook.

For details, refer to section “5.9.9 Attaching the jib winch head” or “5.9.10 Detaching the jib winch head.”

[28] Single-fall hook block (38)

This is a single-fall hook block for use with the winch.

It can only be attached when the jib winch head is mounted.

For details, refer to section “5.9.7 Jib—Attaching a single-fall hook block” or “5.9.8 Jib—Detaching a single-fall hook block.”

[29] Boom head (39)

This head is fitted when using the 4-fall hook block on the boom.

It cannot be used together with the jib.

For details, refer to section “5.9.13 Attaching the boom head” or “5.9.14 Detaching the boom head.”

[30] 4-fall hook block (40)

This is a 4-fall hook block for use with the winch.

It can only be attached when the boom head is mounted.

For details, refer to section “5.9.11 Boom—Attaching a 4-fall hook block” or “5.9.12 Boom—Detaching a 4-fall hook block.”

[31] Jib overwinding detector (41), Boom overwinding detector (42)

This is safety device to prevent the winch wire from overwinding.

For details of the device, refer to section “4.4.7 Overwinding detector.”

[32] Hose guide and cable carrier (43)

These are guides to provide hydraulic pressure and electricity to the jib.

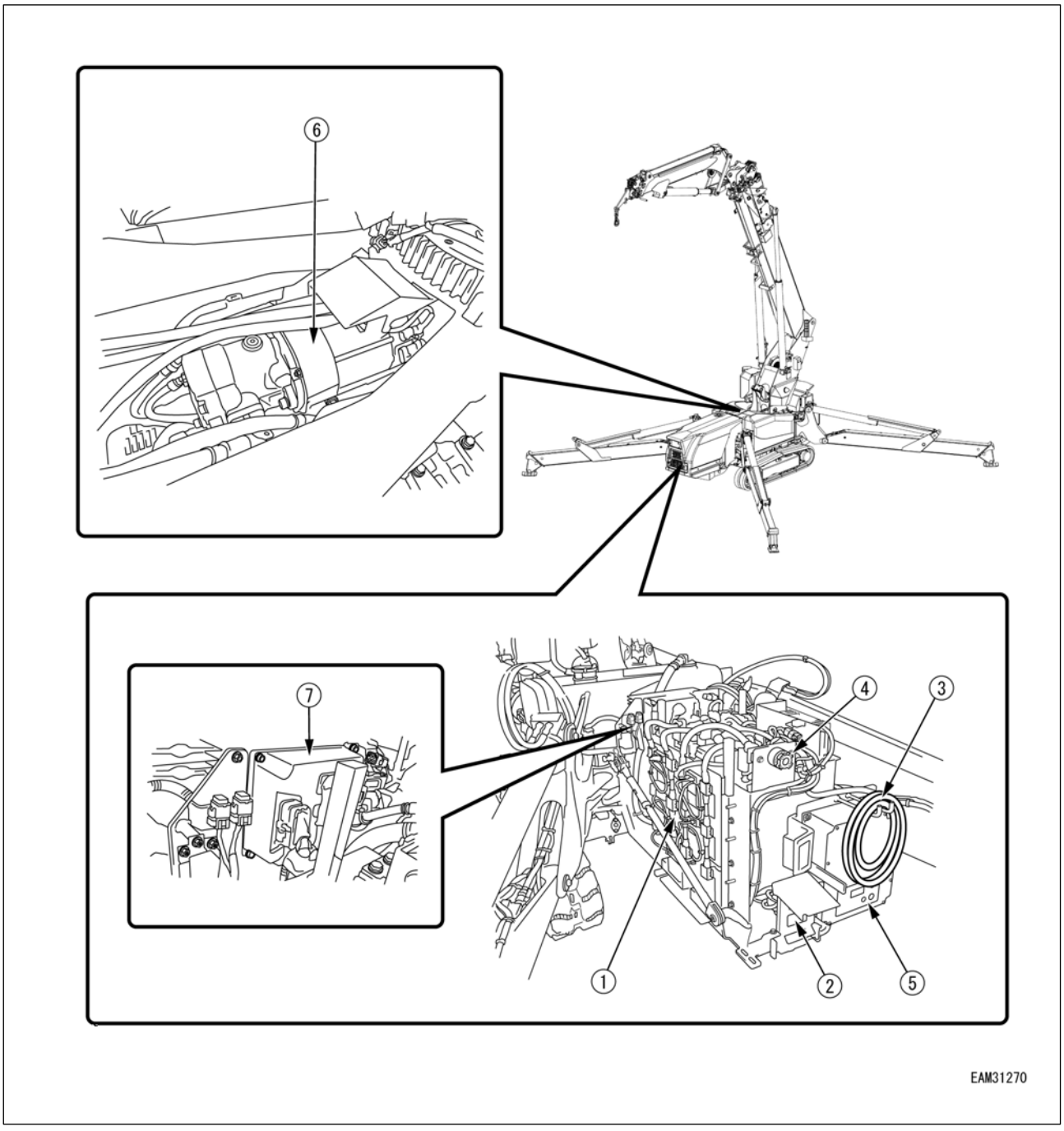
[33] Stowage bracket (optional) (44)

These are brackets for stowing the single-fall hook block, the fixed hook, the jib winch head, and the protection weight when removed.

For details, refer to section “4.7.1 Stowage bracket.”

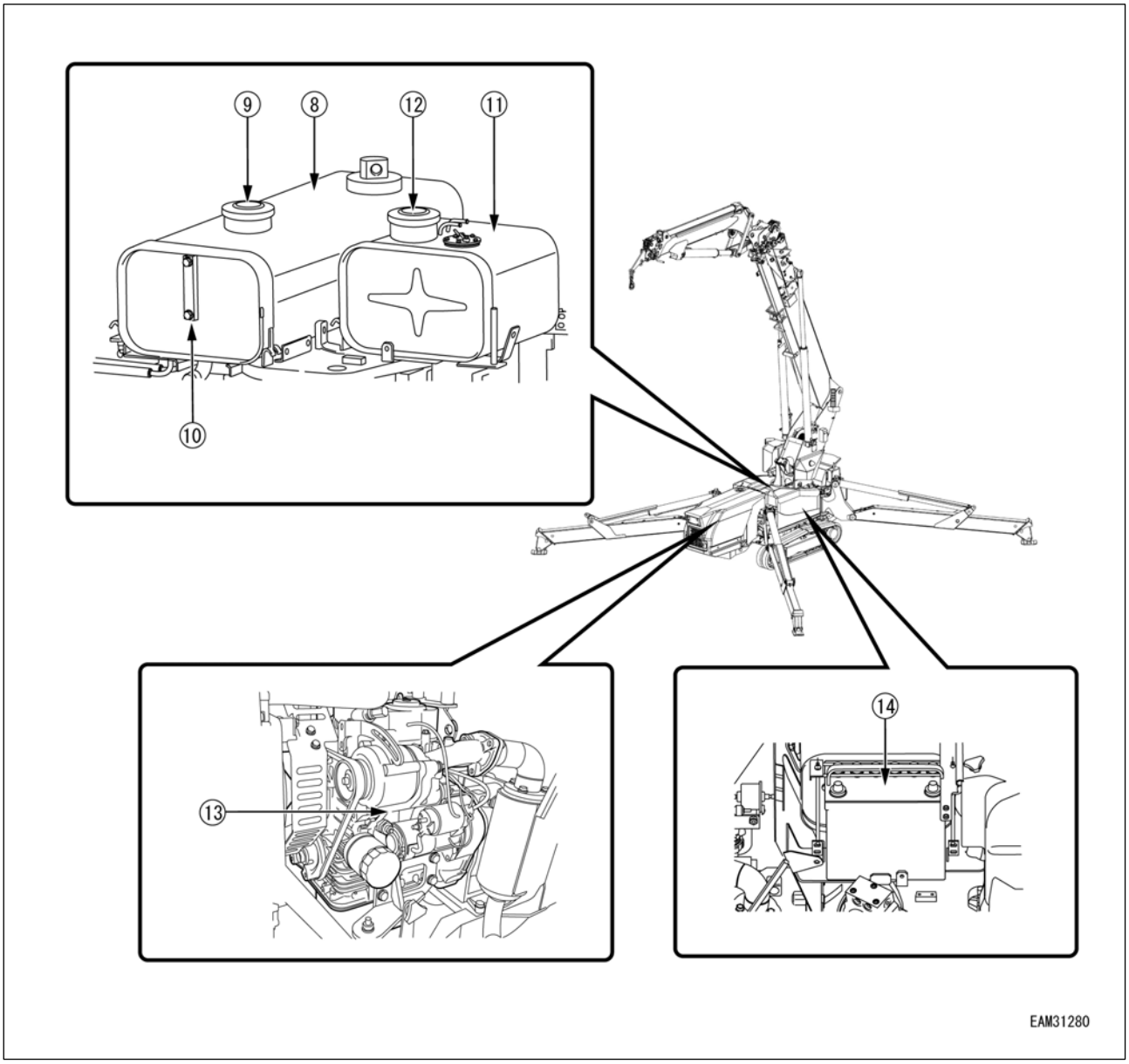
4.1.2 Machine component

[Battery specification]



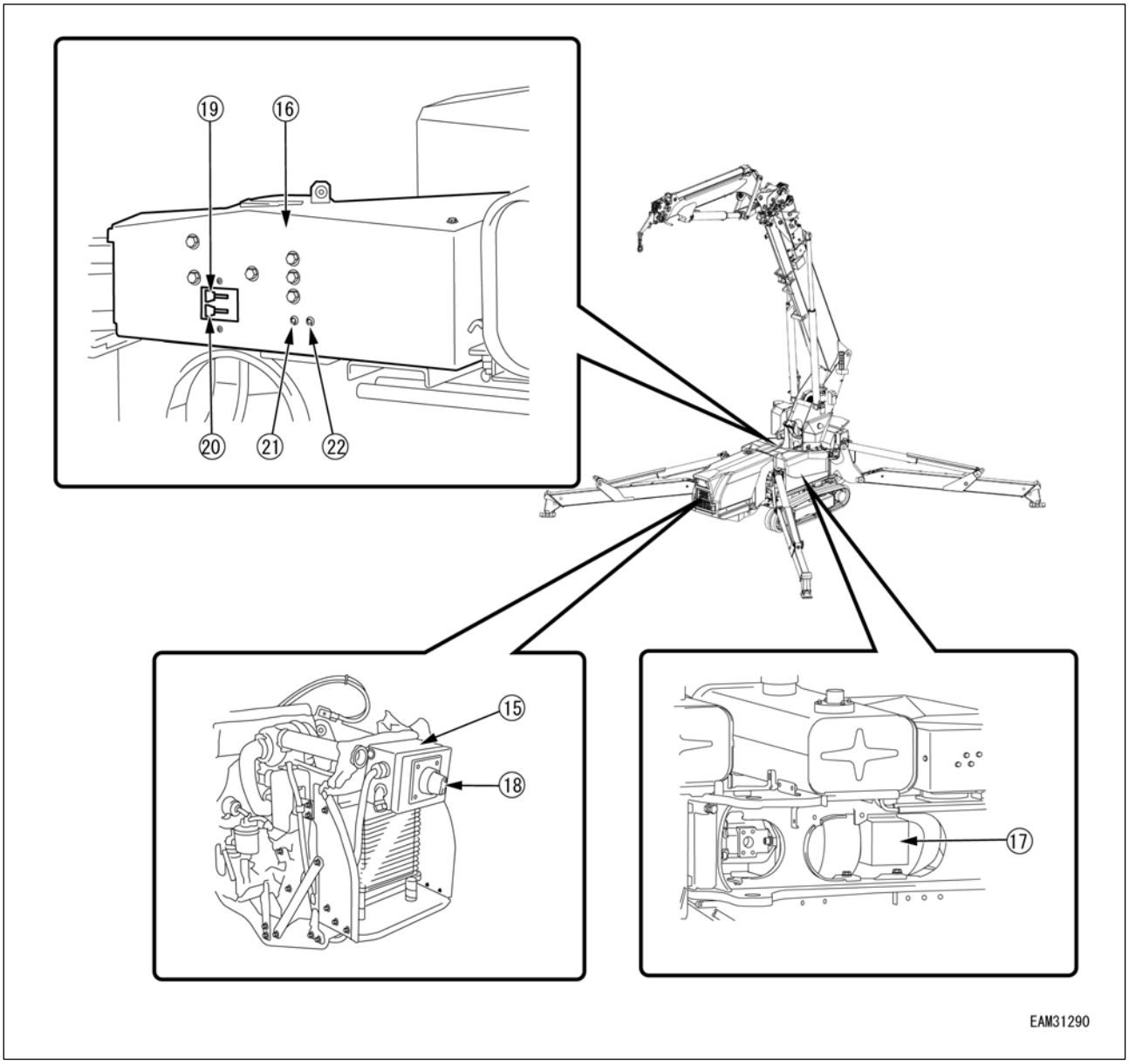
(1) Battery unit
(2) Battery charging port
(3) Power cable
(4) Disconnect switch
(5) Battery charger
(6) Motor
(7) Motor controller

[Engine specification / engine and electric specification]



(8) Hydraulic oil tank
(9) Hydraulic oil tank oil refill port
(10) Hydraulic oil tank level gauge
(11) Fuel tank
(12) Fuel tank oil refill port
(13) Engine
(14) Battery

[Engine and electric specification]



(15) Power supply box
(16) Control panel
(17) Power unit
(18) Main breaker switch
(19) AC power supply breaker
(20) DC power supply breaker
(21) Electric motor power supply lamp
(22) Electric motor control panel malfunction lamp

4.1.2.1 Machine component descriptions

[1] Battery unit (battery specification) (1)

This is a power supply unit that is the source of the machine's power.

[2] Battery charging port (battery specification) (2)

This is the port to which the power cable connects when charging the battery. (100 V, 200 V dual use)

[3] Power cable (battery specification) (3)

This is the cable that connects the charging port to the power supply outlet to charge the battery.

[4] Disconnect switch (battery specification) (4)

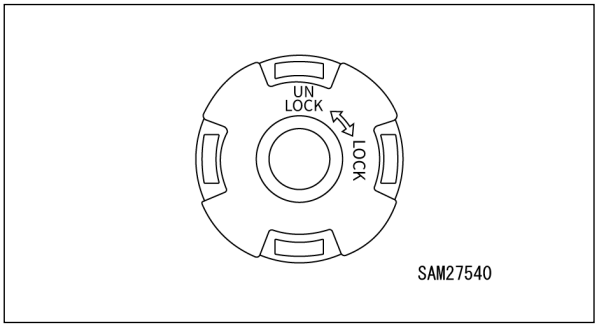
⚠ CAUTION

Be sure to turn the starter switch to the OFF position and wait for at least one minute before turning the disconnect switch to OFF. If the disconnect switch is turned to UNLOCK and the electricity is cut off with the starter switch in the ON state, the machine information will not be recorded correctly and there is the danger that this will lead to an accident.

☞ If the disconnect switch is turned to UNLOCK, the switch becomes removable. When the switch is turned to UNLOCK, be careful not to lose it.

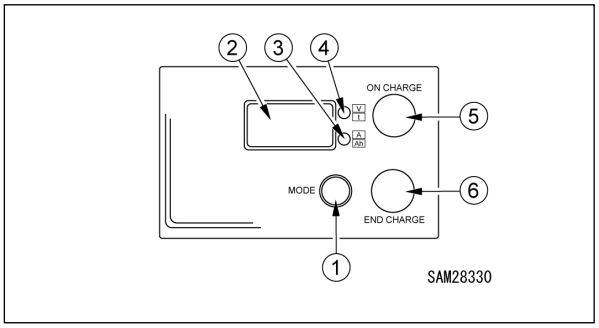
This is a switch that cuts off the battery's electric current.

- UNLOCK : disconnects off the battery
- LOCK : starts the electric current from the battery



[5] Battery charger (battery specification) (5)

This device generates power for charging from the input current to control battery charging.



The battery charger is equipped with a display with the following functions:

(1) Mode switch (MODE)

Pressing the switch displays information on the display.

(2) Display

Displays various information.

(3) Current/time display switching LED

Press to toggle the display between current and time.

The LED illuminates when information is displayed.

During battery charging, the current/time and the voltage/capacity are alternately displayed.

(4) Voltage/capacity display switching LED

Press to toggle the display between voltage and capacity.

The LED illuminates when information is displayed.

During battery charging, the current/time and the voltage/capacity are alternately displayed.

(5) Charging lamp (ON CHARGE)

The lamp illuminates while charging.

(6) Charging complete lamp (END CHARGE)

The lamp lights up when charging is completed.

[6] Motor (battery specification) (6)

This is a motor that converts electrical energy into mechanical energy.

[7] Motor controller (battery specification) (7)

This is a controller that controls the motor.

[8] Hydraulic oil tank (8), hydraulic oil tank oil refill port (9) Hydraulic oil tank level gauge (10)

This is the tank for the hydraulic oil that drives the hydraulic device.

When refilling the oil, first refer for details to "6.11.2 [6] Inspection of the quantity of oil in the hydraulic oil tank and replenishment" then refill the tank.

[9] Fuel tank (engine specification / engine and electric specification) (11), Fuel tank oil refill port (engine specification / engine and electric specification) (12),

This is the tank for the fuel that drives the engine.

To refill with oil, first refer to "6.11.2 [4] Fuel quantity inspection and replenishment [engine specification / engine and electric specification]."

[10] Engine (engine specification / engine and electric specification) (13)

This unit is the source of the machine's power.

When conducting engine maintenance, first refer to each item of "Chapter 6 INSPECTIONS AND MAINTENANCE," then conduct the maintenance.

[11] Battery (engine specification / engine and electric specification) (14)

This is a battery for driving the engine and powering electrical components such as the monitor.

[12] Power supply box (engine and electric specification) (15)

This is a box for storing parts such as the breaker.

[13] Control panel (engine and electric specification) (16)

This unit controls the device when the device is driven by the electric motor.

[14] Power unit (engine and electric specification) (17)

This is the source of the motive power when the device is driven by the electric motor.

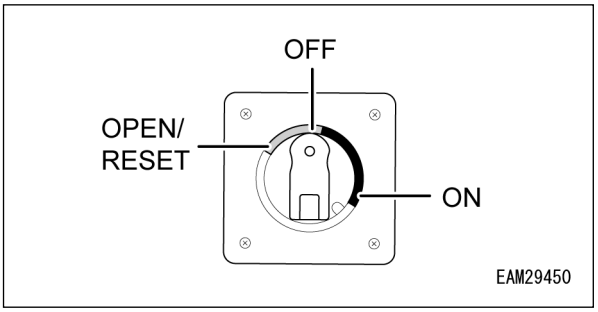
[15] Main breaker switch (engine and electric specification) (18)

⚠ WARNING

- **When the power supply unit is not connected to the machine or after the job is finished, be sure to set the breaker switch to the OFF position.**
- **During operation, when the breaker has automatically turned to the OFF position, an anomaly has occurred somewhere, such as around the control panel, around the electric motor, with the electric wiring, etc. Be sure to inspect those places and confirm that there is no smell of burning or burn marks, etc. After that, contact us or our sales service agency to request an inspection and repairs.**
- **To restore the power supply, when setting the breaker switch to "ON," do so only after completing the inspection and repairs. Restoring the power without conducting an inspection and repairs may cause a fire or device breakdown.**

When an anomaly such as overcurrent or overvoltage has occurred in the power supply that distributes electricity from the control panel to the electric motor, the power supply is automatically cut off to prevent fire or device breakdown.

In addition, the breaker controls the power supply to the electric motor and control panel internals.



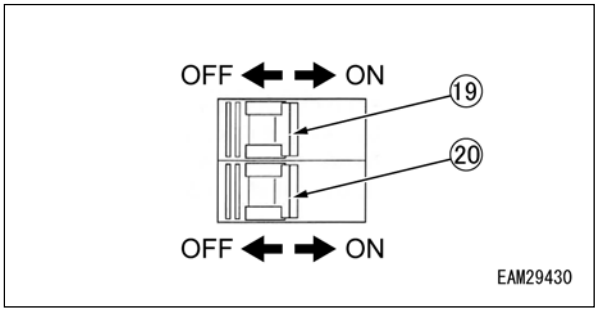
- ON : the power is supplied.
- OFF : the power supply is cut off.
- OPEN/RESET : the power supply box's door lock is unlocked.

[16] AC power supply breaker (19)

This is used for the AC power supply output to the control panel.

- ON : The power is supplied to the control panel.
- OFF : The power supply to the control panel is cut off.

☞ Even if the AC power supply breaker is always in the ON state, this will not cause any safety problems.

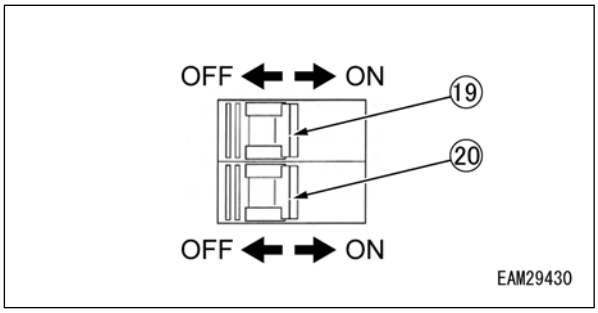


[17] DC power supply breaker (20)

This is used for the direct current output to the crane operation system.

- ON : Power is supplied to the crane operation system
- OFF : the power supply to the crane operation system is cut off.

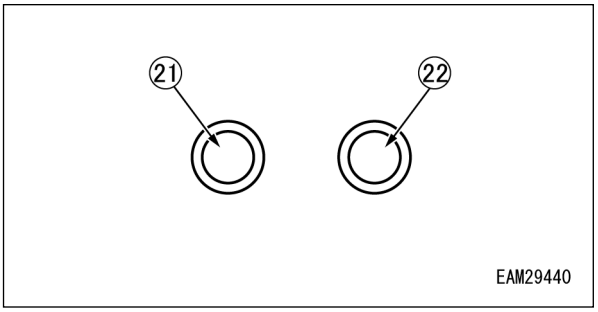
☞ Even if the DC power supply breaker is always in the ON state, this will not cause any safety problems.



[18] Electric motor power supply lamp (21)

This lamp notifies the operator that the power supply on the power supply unit side is supplying electricity to the machine.

- Lit : the power supply on the power supply unit side is supplying electricity to the machine.
- Unlit : the power supply unit side's power supply to the machine is cut off.



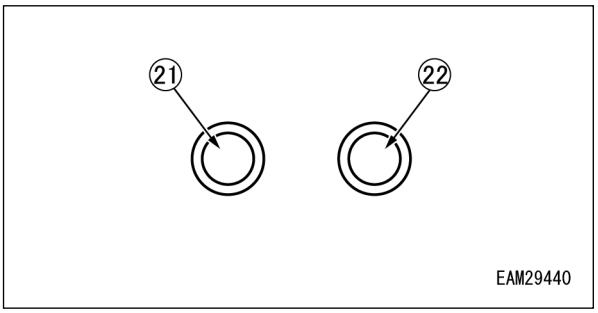
[19] Electric motor control panel malfunction lamp (22)

⚠ WARNING

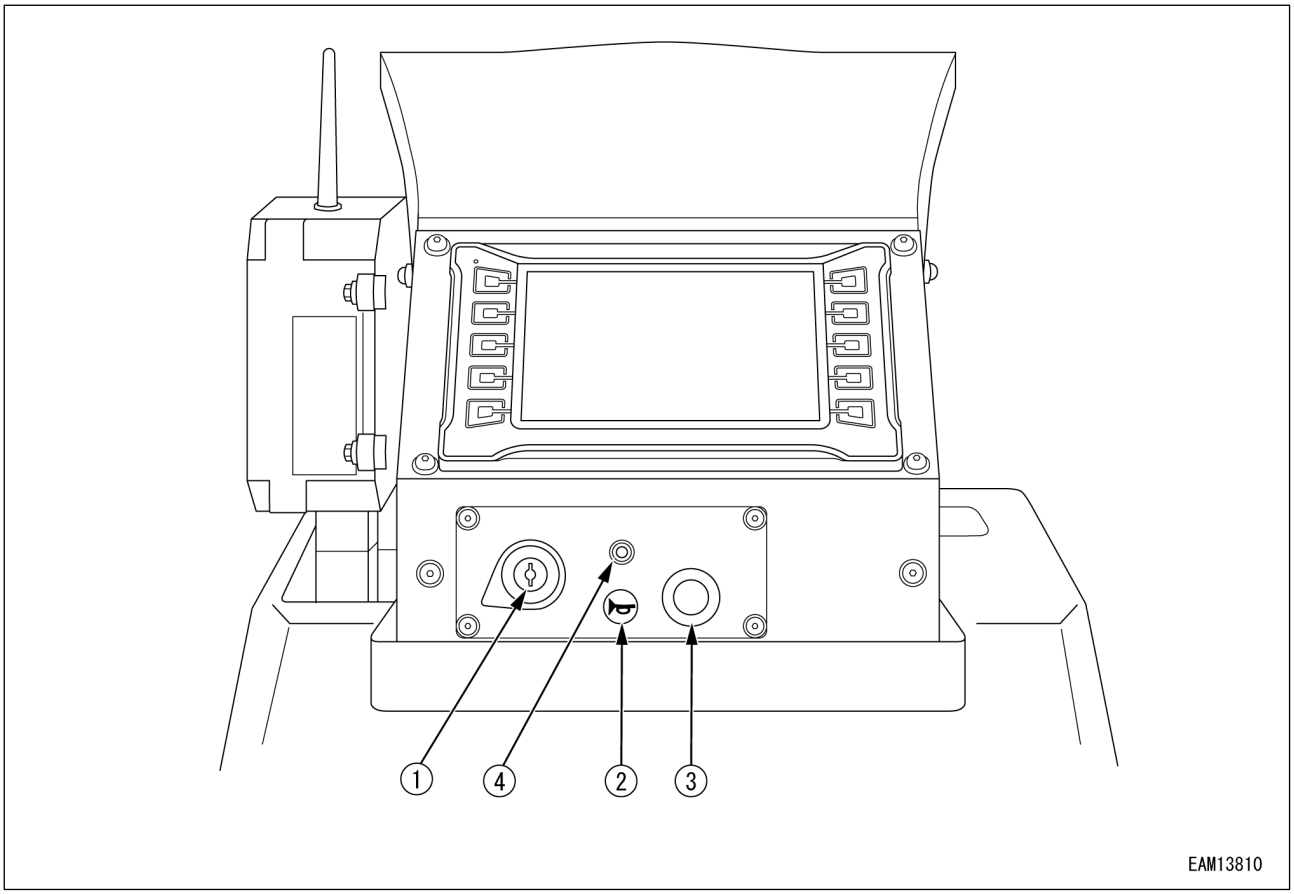
When the power supply control panel malfunction lamp has lit up, a fault has occurred in the control panel internals. Contact us or our sales service agency to request an inspection and repairs.

Notifies whether or not a fault has occurred in the control panel.

- Lit : A fault has occurred inside the control panel..
- Unlit : The control panel internals are operating normally.



4.1.3 Control section



(1) Starter switch
(2) Horn switch
(3) Emergency stop switch
(4) Preheating lamp
(engine specification / engine and electric specification)

4.1.3.1 Control section descriptions

[1] Starter switch (1)

⚠ CAUTION

When the job is finished, be sure to turn the starter switch to the OFF position.

This switch is used to start or stop the machine.

- OFF:

  The key can be inserted and removed, all the electrical system switches are turned off, and the machine is stopped.

- ON:

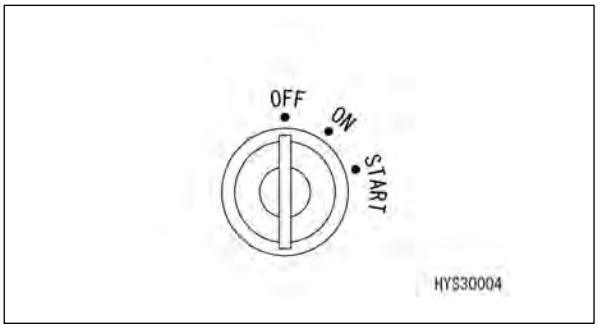
  Electric current flows through all the circuits. (engine specification / engine and electric specification)

- START:

  This is the position for starting the machine.

  Once the machine has started, let go of the key. The key will automatically return to the ON position.

☞ In the battery specification case, when the key is moved to the “START” position, electric current flows through all the circuits.

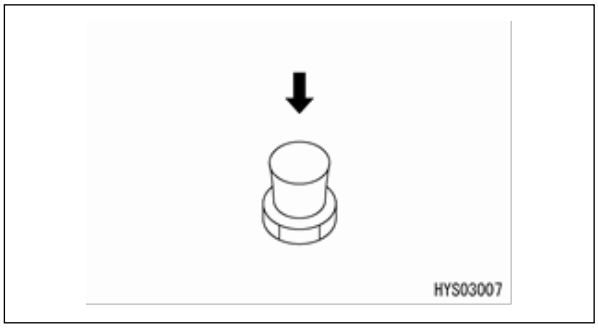


[2] Horn switch (2)

This switch is used to sound the horn.

- Sounding of the horn: press the switch.

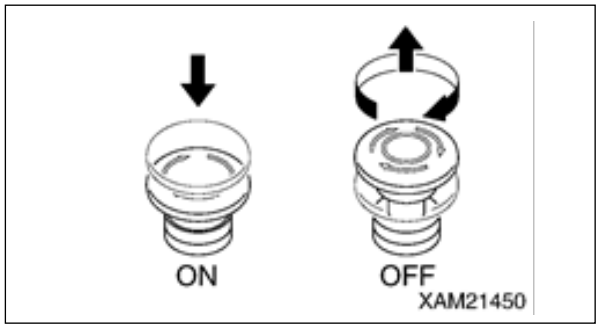
☞ The horn stops sounding when you stop pressing the switch.



[3] Emergency stop switch (3)

Press this switch to stop the engine or motor urgently when an anomaly occurs in the machine.

- ON: Press the switch. Pressing the switch stops the engine (engine specification / engine and electric specification) or the motor (battery specification).
- OFF: Turn the switch to the right (in the direction of the arrow on the right in the following diagram), and pull the switch toward you.
  The switch returns to its original position and the emergency stop state is canceled.

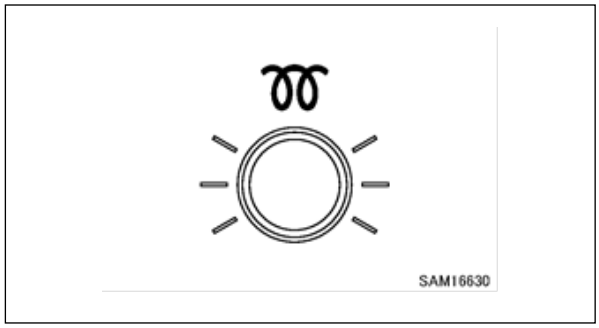


☞ When re-starting the engine (engine specification / engine and electric specification) or the motor (battery specification) after an emergency stop, first ensure you have returned the emergency stop switch to the OFF position, and only then start the machine.

[4] Preheating lamp (engine specification / engine and electric specification) (4)

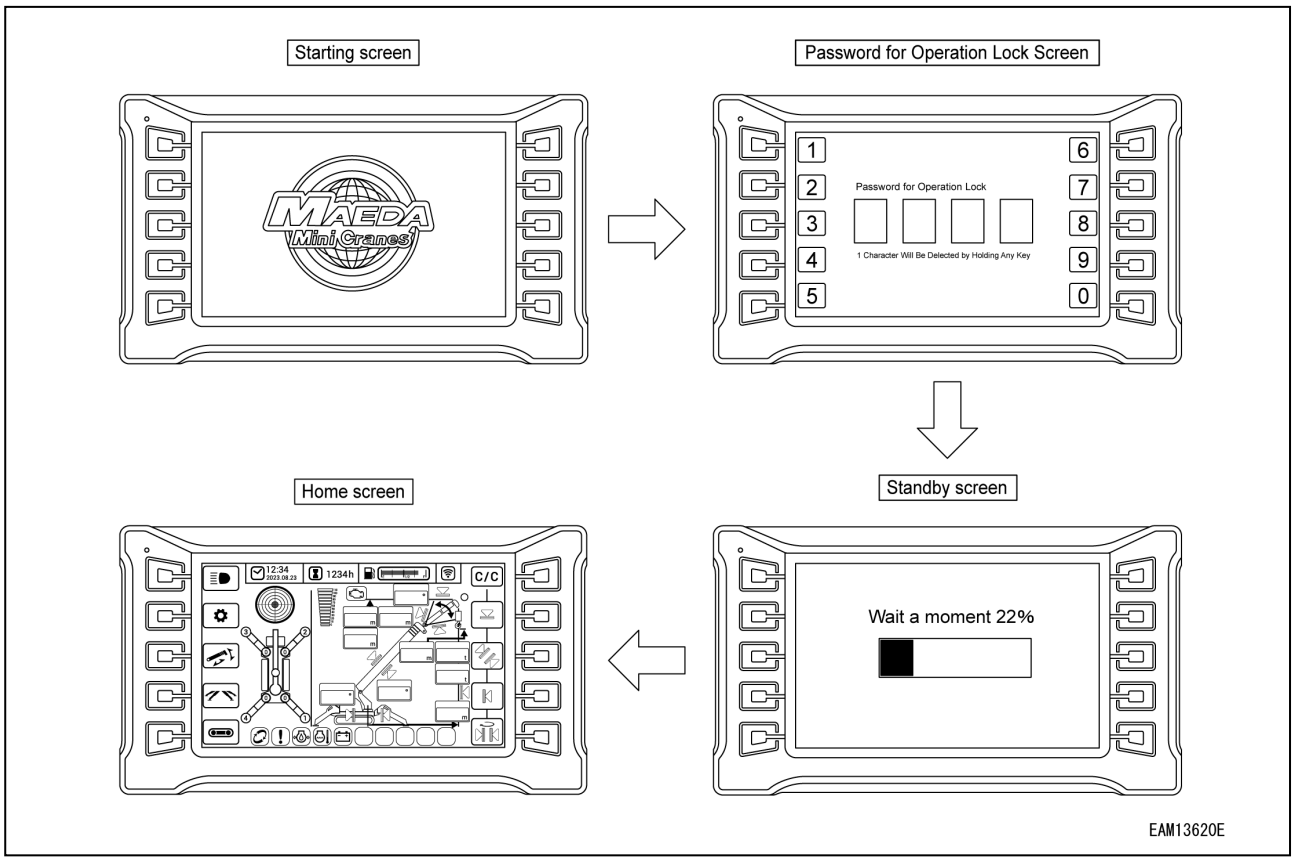
When the starter switch has been turned to the ON position, the lamp lights. Several seconds later, the lamp goes out to notify the user that the preheating has been completed.

☞ The time the lamp is lit varies depending on the temperature.



4.2 MONITOR

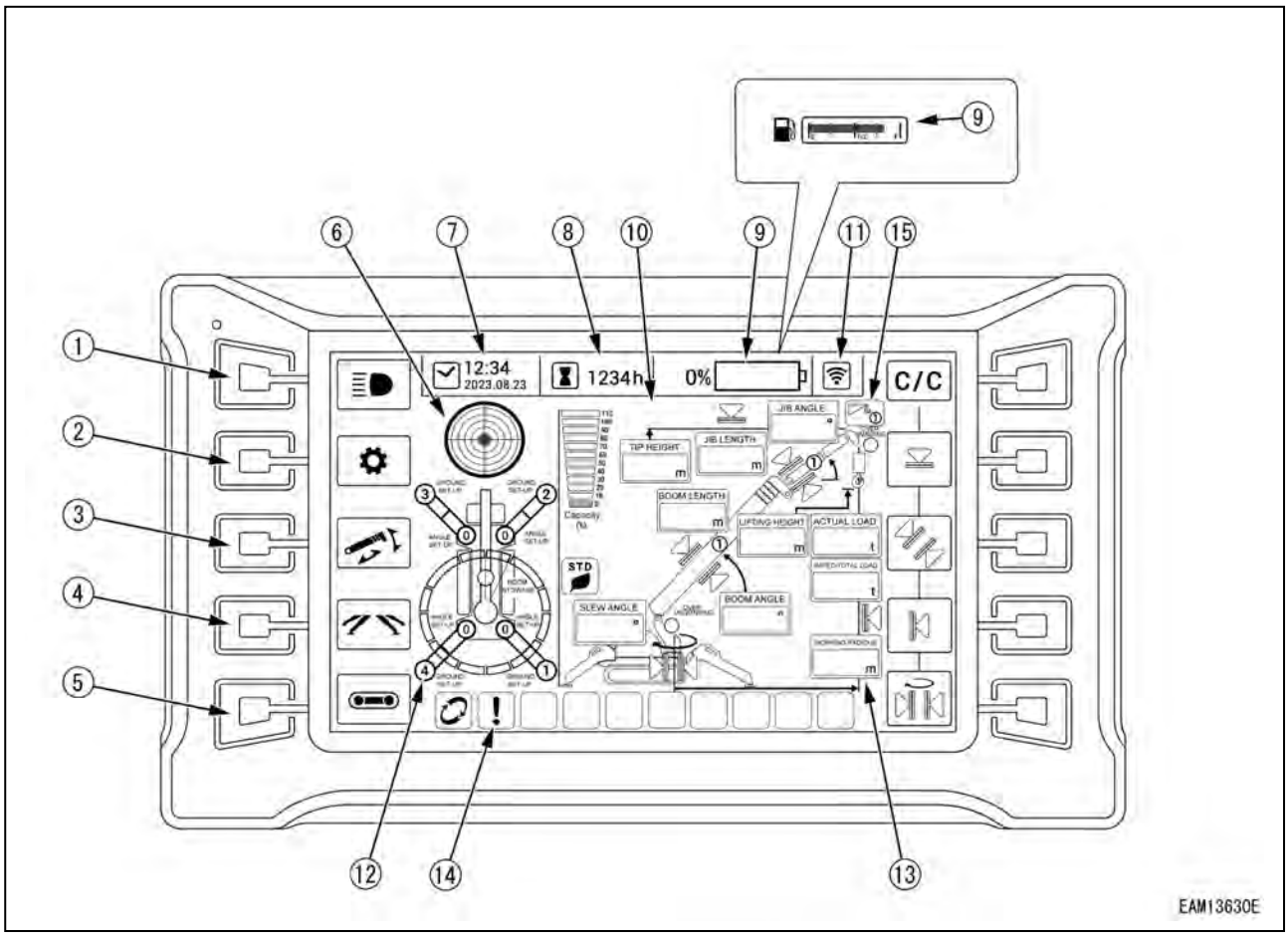
4.2.1 Start screen



- When the starter switch is turned to the ON position, the start screen is displayed.
- After the start screen is displayed, if the operation lock is set with password protection, the operation lock password screen is displayed.
- Next, the standby screen is displayed and the display switches to the home screen.

☞ When starting the machine, the battery voltage may suddenly fall depending on the temperature and battery state. In that case, the monitor display may temporarily turn off, but this is not a defect.

4.2.2 Home screen

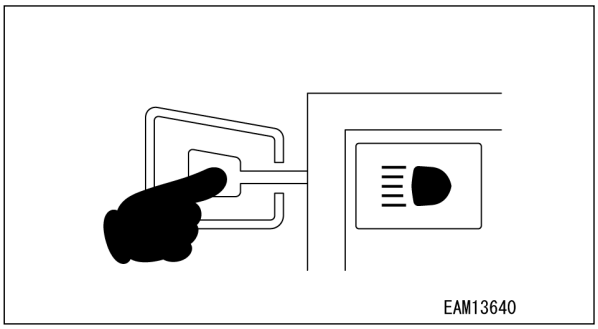


(1) Working light ON/OFF switch
(2) User mode switch
(3) Crane operation switch
(4) Outrigger operation switch
(5) Travel operation switch
(6) Level gauge
(7) Clock display
(8) Hour meter display
(9) Fuel gauge / battery level meter
(10) Engine / electric motor drive display (engine and electric specification)
(11) Radio controller connection display
(12) Outrigger status display
(13) Moment limiter status display
(14) Warning display
(15) Fixed hook display
(16) Eco mode display

[1] Working light ON/OFF switch (1)

Used to turn on the working light.

- Yellow light: the working light is “ON.”
- White light: the working light is “OFF.”

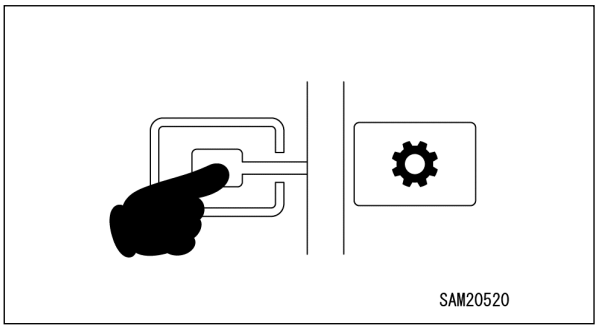


[2] User mode switch (2)

Used for user settings.

Press the switch to switch to user mode.

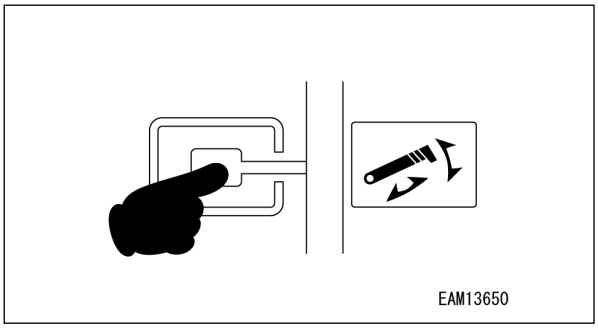
For details of the user mode, refer to section “4.2.3 User mode screen.”



[3] Crane operation switch (3)

Used when the radio controller cannot be used and the crane is operated from the monitor.

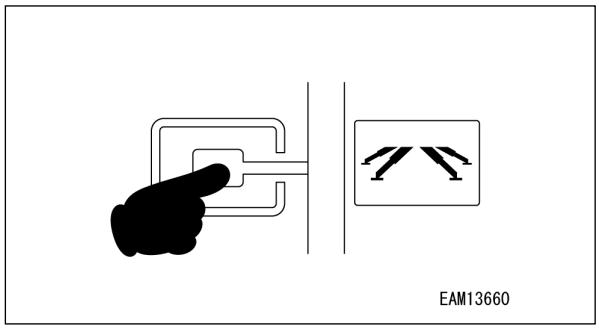
For details of how to perform the operation, refer to “5.12 EMERGENCY OPERATION.”



[4] Outrigger operation switch (4)

Used when the radio controller cannot be used and the outrigger is operated from the monitor.

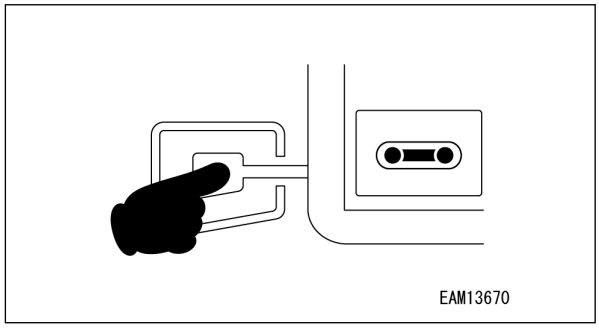
For details of how to perform the operation, refer to “5.12 EMERGENCY OPERATION.”



[5] Travel operation switch (5)

Used when the radio controller cannot be used and the travel operation is controlled from the monitor.

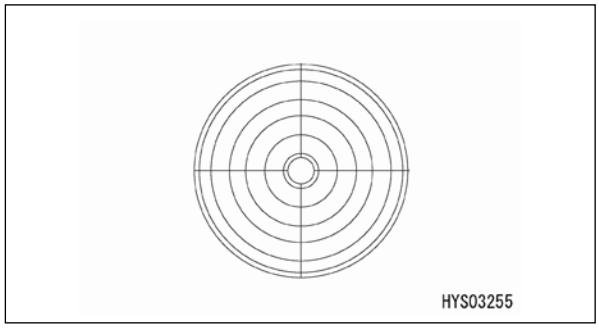
For details of how to perform the operation, refer to “5.12 EMERGENCY OPERATION.”



[6] Level gauge (6)

Displays the tilt status of the machine.

The position of the yellow bubble indicates the direction in which the machine is tilting.



[7] Clock display (7)

Displays the set time.

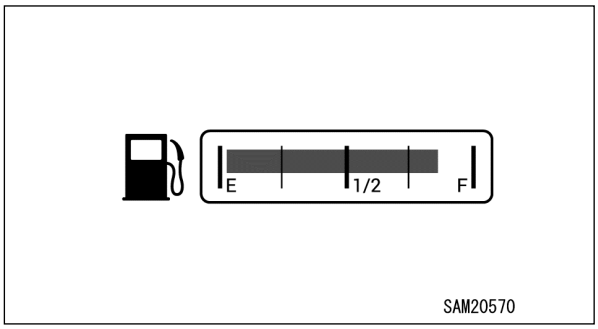
[8] Hour meter display (8)

Displays cumulative hours of operation.

[9] Fuel gauge / battery level meter (9)

[Engine specification / engine and electric specification]

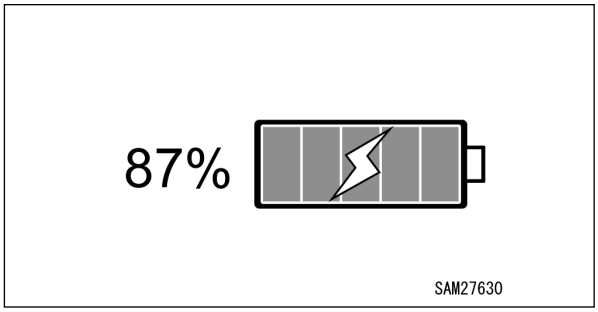
The fuel gauge displays the quantity of fuel in the fuel tank.

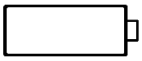
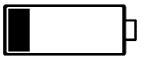


[Battery specification]

The battery level meter displays the charged level of the lithium-ion battery.

☞ The flash sign at the centre of the indicator appears only when the battery is being charged.



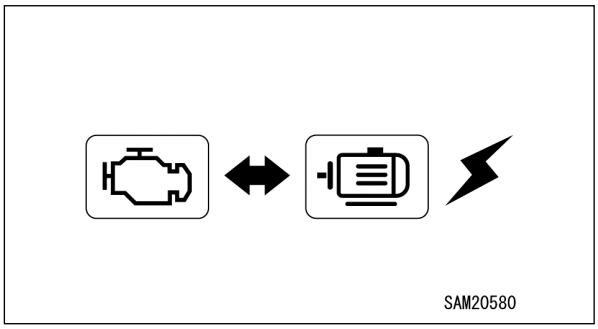
Remaining charge	Icon
0%	
1 to 20%	
21 to 40%	
41 to 60%	
61 to 80%	
81 to 100%	

- When the remaining charge is 1 to 10%, the battery icon blinks.
- When the battery level drops to 20% or less, the alarm buzzer emits two intermittent sounds at 30-second intervals.
- When the battery level drops to 10% or less, the alarm buzzer emits one intermittent sound at 30-second intervals.
- When the battery level drops to 0%, a battery charging request message is displayed and the alarm buzzer sounds.

[10] Engine / electric motor drive display (10) (engine and electric specification)

Displays the current drive condition of the machine.

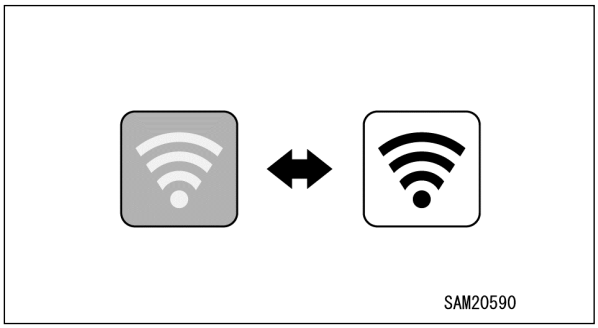
- Engine: engine mode
- Electric motor: electric drive mode



[11] Radio controller connection display (11)

Displays the current radio remote control system connection status.

- On: The radio remote control system is connected.
- Off: The radio remote control system is not connected.



[12] Outrigger status display (12)

Displays the current outrigger status.

For details of the display contents, refer to section “4.2.4 Outrigger status display screen.”

[13] Moment limiter status display (13)

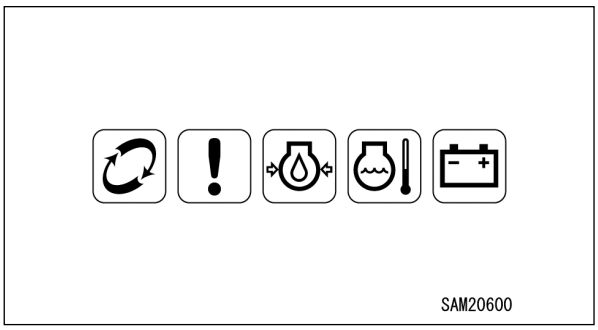
Displays the current moment limiter status.

For details of the display contents, refer to section “4.4.4 The moment limiter’s functionality.”

[14] Warning display (14)

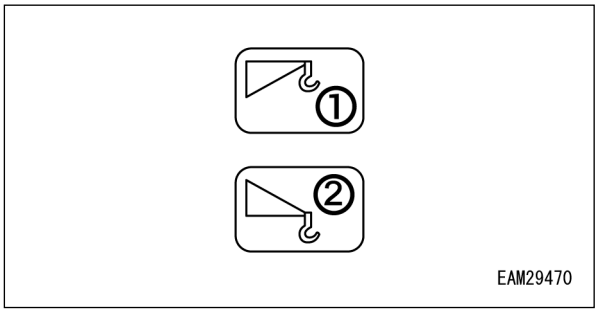
Displays illuminated warnings.

For details of the display contents, refer to section “6.16.1 Warning display.”



[15] Fixed hook display (15)

Displays the current status of the fixed hook when the fixed hook is being used.



[16] Eco mode display (16)

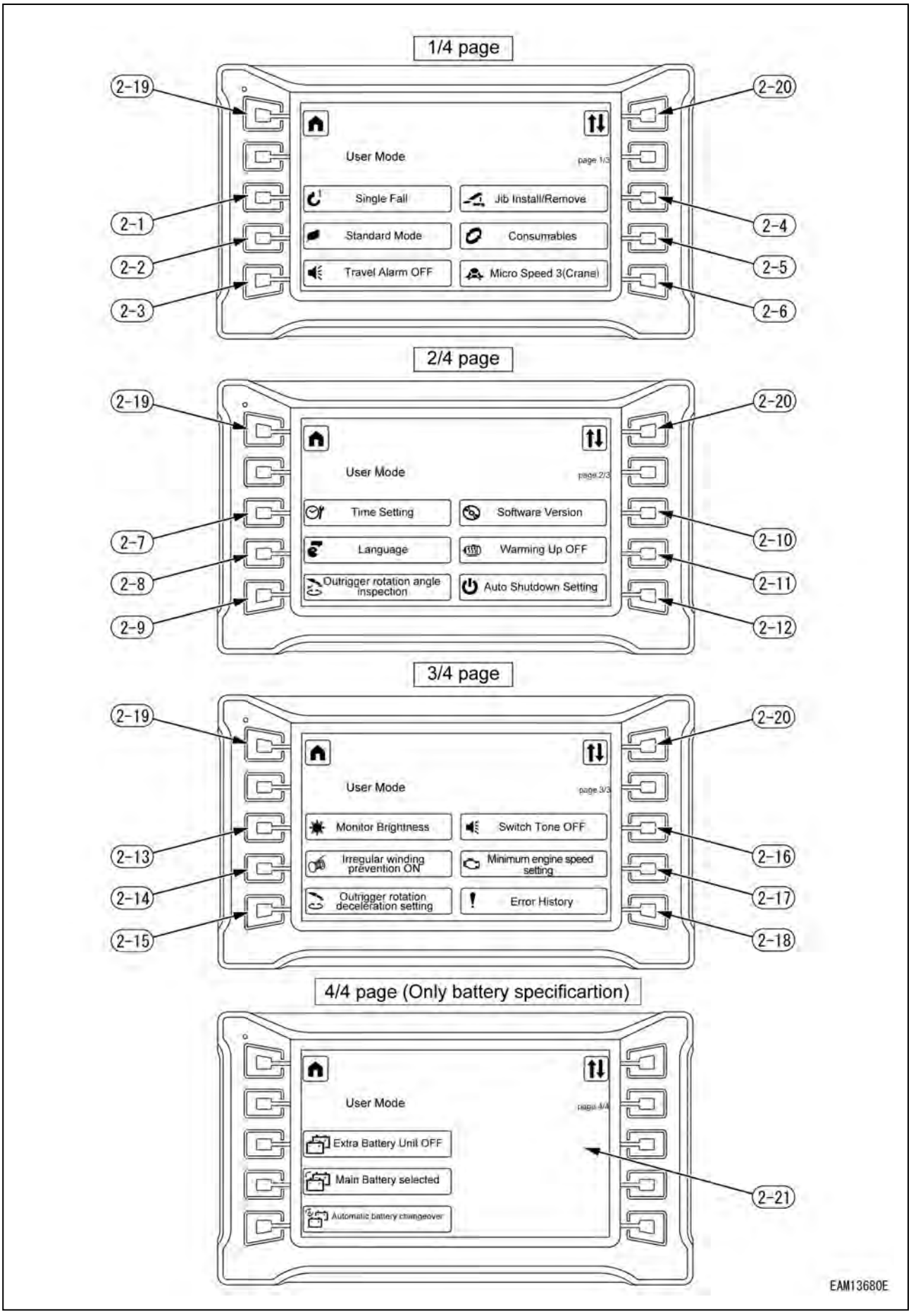
Displays the eco mode status currently set.

- STD : Standard mode
- ECO1 : Eco mode 1
- ECO2 : Eco mode 2

For details of the eco mode, refer to section “4.2.3 User mode screen [2] Select Eco mode.”

4.2.3 User mode screen

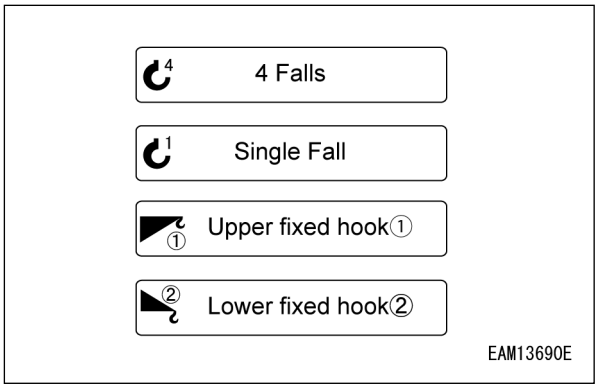
The user mode screen is displayed by pressing the user mode switch on the home screen.



(2-1) Number of falls change
(2-2) Eco setting selection
(2-3) Switch the travel alarm ON/OFF
(2-4) Jib Install/Remove switch
(2-5) Consumables display
(2-6) Set to micro speed 3
(2-7) Time setting
(2-8) Display language selection
(2-9) Inspect the outrigger rotation angle
(2-10) Display the software version
(2-11) Switch the warm-up operation ON/OFF (battery specification)
(2-12) Set the auto shutdown setting (battery specification)
(2-13) Adjust the monitor brightness
(2-14) Irregular winding prevention ON/OFF
(2-15) Inspect the outrigger rotation deceleration setting
(2-16) Switch tone ON/OFF
(2-17) Set the minimum engine speed (engine specification / engine and electric specification)
(2-18) Error history display
(2-19) Home switch
(2-20) Display page switching

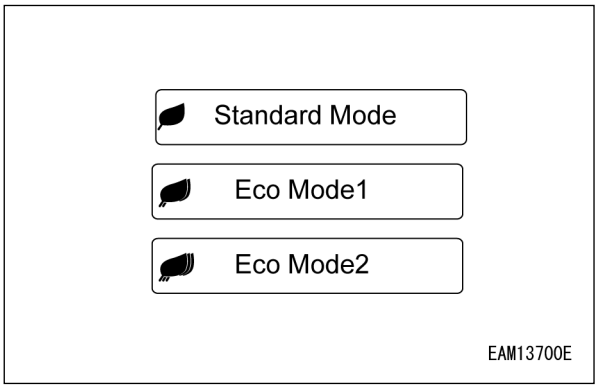
[1] Number of falls change (2-1)

This allows you to switch the hook.



[2] Eco setting selection (2-2)

The mode is switched every time the switch is pressed.



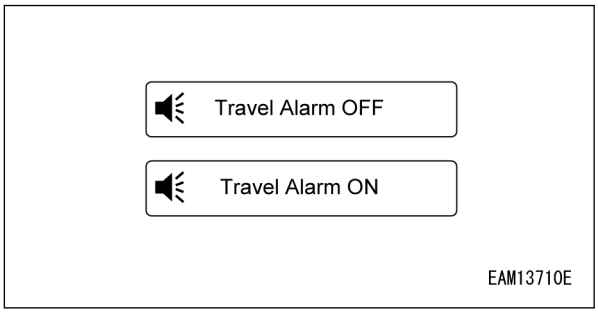
・Standard mode : does not limit the number of engine or motor speed. The machine can run at its maximum performance.

・Eco mode 1 : limits the number of engine or motor speed to a maximum for each operation. This mode limits the number of speed without changing the work speed during a single operation by balancing the workability and the battery consumption.

・Eco mode 2 : limits the number of engine or motor speed to the same maximum for all operations. This mode limits the maximum number of speed uniformly by allowing the work speed to drop during operation but keeping battery consumption to a minimum.

[3] Switch the travel alarm ON/OFF (2-3)

The travel alarm toggles between ON and OFF every time the switch is pressed.



・OFF : the alarm does not sound during travelling.

・ON : the alarm sounds during travelling.

[4] Jib Install/Remove switch (2-4)

This is used when installing or removing the jib.

For details of installing or removing the jib, refer to “5.9 CHANGING CRANE OPTIONS.”

[5] Consumables display (2-5)

You can check the time until the next replacement is required in the list of consumables.

The list of consumables can also be checked in “6.4.2 Consumables.”

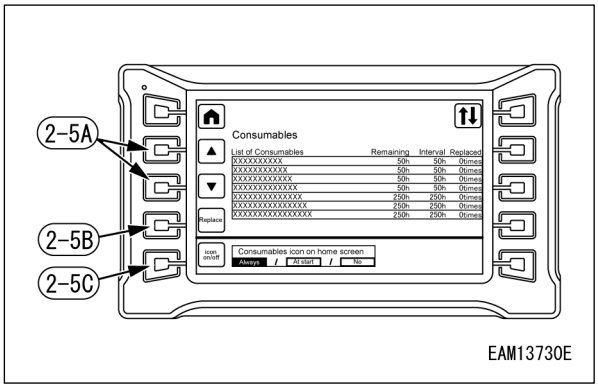
1. When a consumable has been changed, select the replaced consumable with the ▲ or ▼ adjustment switch (2-5A).

2. Once the consumable has been selected, long press the replacement switch (2-5B) and update the time that the consumable was replaced.

3. When this time has been updated, the replacement count is incremented by one, and the remaining time to the next due replacement is reset.

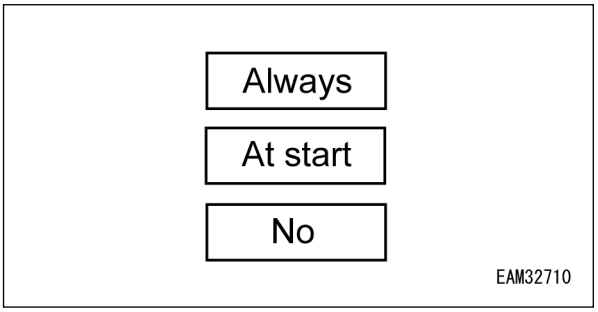
If the consumable icon display selection (2-5C) is selected all the time or when starting, yellow characters and an icon with a white outline on the home screen are displayed when the remaining time is 30 hours or 3 days, and red characters and a red-filled icon on the home screen are displayed when the remaining time is 0 hours or 0 days.

If used as is, not only does the machine suffer a negative impact, but also it may lead to danger, so replace the consumable promptly.



☞ It is recommended that the consumable icon display selection (2-5C) is always on.

- Always : when the replacement period is near or has passed, the consumable’s icon is always displayed on the home screen.
- At start : when the replacement period is near or has passed, the consumable’s icon is displayed only for 30 seconds after the home screen has started up.
- No : when the replacement period is near or has passed, the consumable’s icon is not displayed on the home screen.



[6] Set to micro speed 3 (2-6)

This allows you to configure the operating speed to the speed mode's micro speed 3.

If the remote control's lever is operated, the meter turns red and you can move it up or down to match the machine's operating speed.

While keeping an eye on the machine, if the radio controller's lever is held in place when the machine is at some arbitrary speed and the ✓ switch (2-6A) is pressed, the meter turns green and the settings are saved.

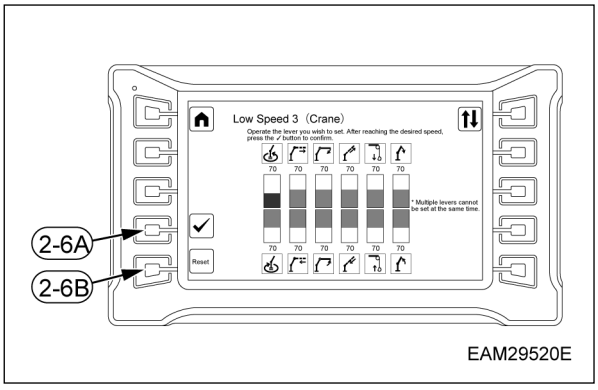
Pressing the reset switch (2-6B) returns the settings to their default configuration. The default figure is 70.

Whatever state the remote control's speed mode is in, the settings can be configured.

☞ The speed settings can only be configured to "micro speed 3."

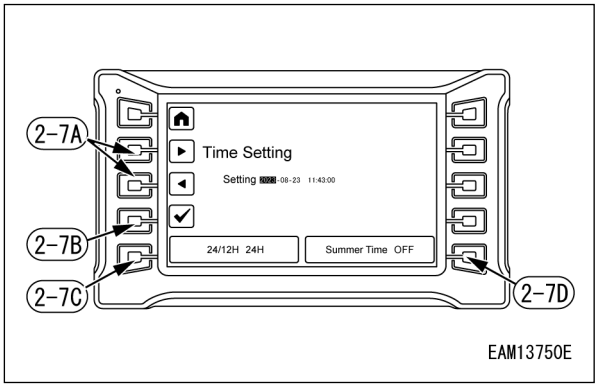
⚠ CAUTION

It is not possible to configure several levers at the same time.



[7] Time setting (2-7)

This allows you to set the time, the 24/12H display, and summertime ON/OFF.



[Clock setting]

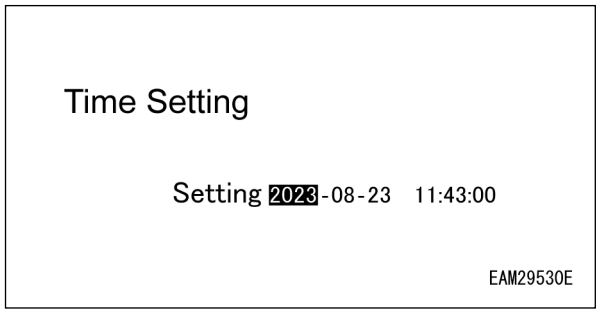
Select the date and time you want to set with the adjustment switches (2-7A) ▶ or ◀, and press the check mark (2-7B).

(The part with the white background is selected.)

If the characters are red, then they can be edited.

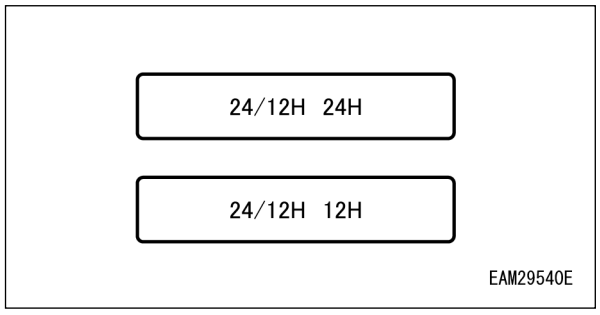
In this state, make the adjustment with the adjustment switches (2-7A) ▶ or ◀.

Finally, if the check mark (2-7B) is pressed, the edit is completed.



[24/12H display switching]

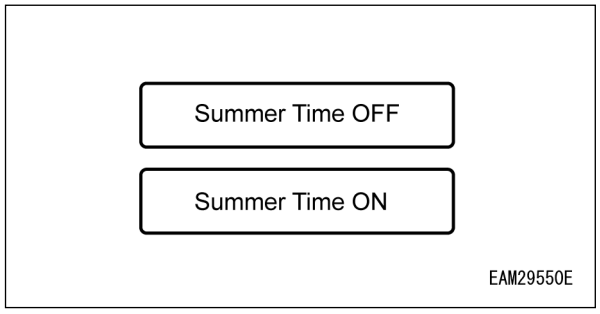
If the switch (2-7C) is pressed, the time display can be switched between 24-hour display and 12-hour display.



[Summertime ON/OFF switch]

If the switch (2-7D) is pressed, the summertime setting can be switched between ON and OFF.

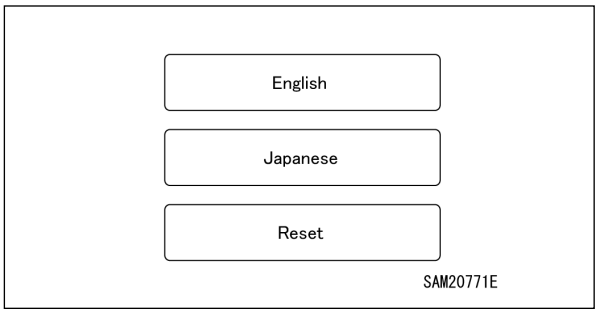
- ON : the time display shows the time one hour earlier.
- OFF : the set time is displayed.



[8] Display language selection (2-8)

Enables the user to switch or reset the display language.

- English : the display language is set to English.
- Japanese : the display language is set to Japanese.
- Reset : the default display language is set.



[9] Inspecting the outrigger rotation angle (2-9)

The user can inspect how much the outrigger rotation angle is out of alignment with the target value.

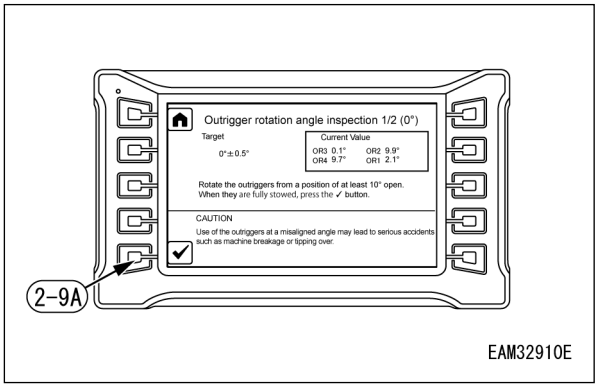
The inspection guidance “Inspect the rotation angle of the outriggers on Outrigger rotation angle inspection screen in user mode.” is displayed on the screen every 200 hours.

Perform the operation as instructed on the screen.

The inspection guidance will not be cleared until the inspection has successfully completed or until the rotation angle has been corrected.

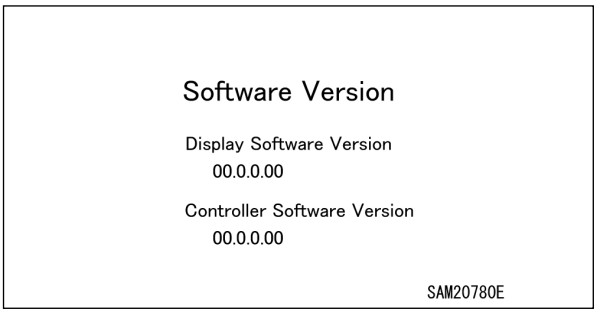
Press the check mark (2-9A) to display the results.

For details of how to conduct the inspection, refer to “6.13.6 [4] Inspecting the outrigger rotation angle.”



[10] Checking the software version (2-10)

The user can check the controller and monitor software versions.

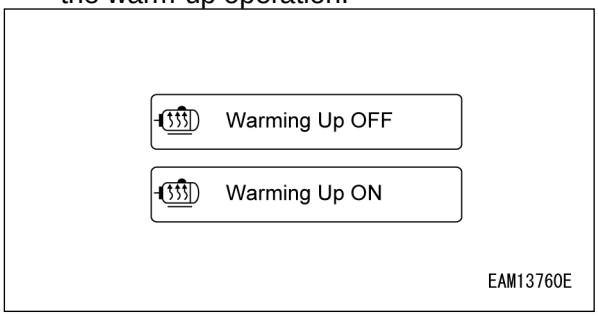


[11] Warm-up operation ON/OFF switching (battery specification) (2-11)

The user can switch the warm-up operation between ON and OFF.

- ON : When the starter switch is ON, the motor speed even in a non-operational state. This can be canceled by conducting one of the crane operation, the outrigger operation, or the travel operation.
- OFF : When the starter switch is OFF, the motor does not speed in a non-operational state. Operating the lever causes the motor to speed.

☞ In cold weather, it is difficult to warm up the equipment and hydraulic oil. Therefore, we recommend setting the warm-up operation to ON and starting the job only after the oil temperature has reached 45°C to 50°C in the warm-up operation.



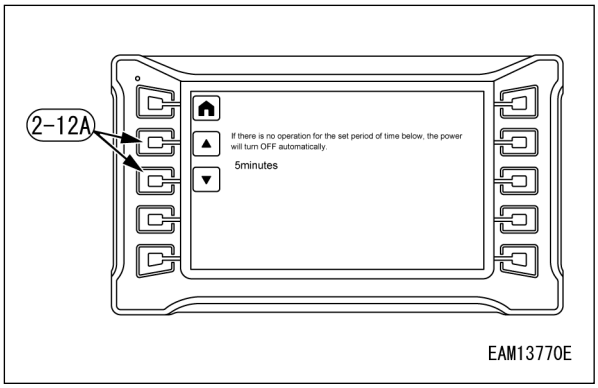
[12] Set the auto shutdown setting (battery specification) (2-12)

The user can set the duration in the non-operational state after which the power supply automatically turns off.

Make the adjustment with the adjustment switches (2-12A) ▲ or ▼.

The duration can be set in the range from 3 to 60 minutes. The duration set as default is 15 minutes.

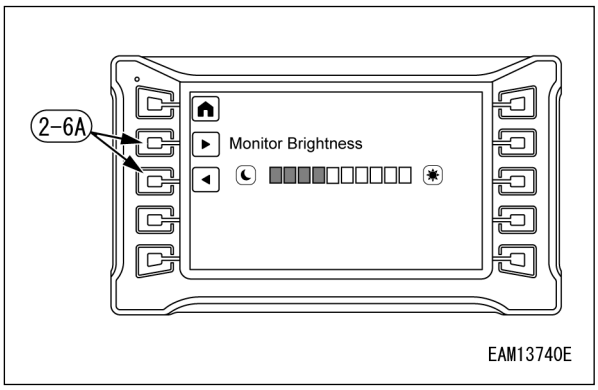
To recover from the automatic power OFF state, after turning the start switch OFF once, turn the starter switch to START again.



[13] Adjust the monitor brightness (2-13)

The user can adjust the monitor's brightness.

Make the adjustment with the adjustment switches (2-6A) ◄ or ►.



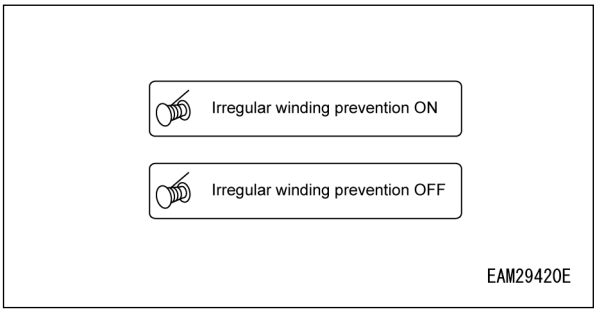
[14] Irregular winding prevention ON/OFF (2-14)

⚠ CAUTION

When this switch is ON, be aware that delays will occur in the winch's operation corresponding to the operation of the lever.

Pressing this switch alternates the winch's irregular winding prevention between ON and OFF.

- OFF : when you start or stop the hook block, its action is normal.
- ON : when you start or stop the hook block, its action is looser than normal.



[15] Inspect the outrigger rotation deceleration setting (2-15)

⚠ CAUTION

Make this setting after first checking that there are no people or objects in the outrigger's slewing range.

You can adjust the stopping accuracy that is applied when you stop the outrigger at the standard rotation angle during the slewing operation (other than when the radio controller's operation lever has been pulled down to the maximum).

Perform the outrigger slewing operation as instructed on the screen, and adjust so that the outrigger stops at the standard rotation angle when the lever is suddenly operated.

The value of the electric current can be raised or lowered with the adjustment switches (2-15A) ▲ or ▼.

If the electric current value is increased, the slewing action slows down; and if the electric current value is decreased, the slewing action speeds up.

If the outrigger moves suddenly and goes beyond the standard rotation angle (the outrigger angle set-up lamp lights up green), then press the adjustment switch ▲, and increase the figure.

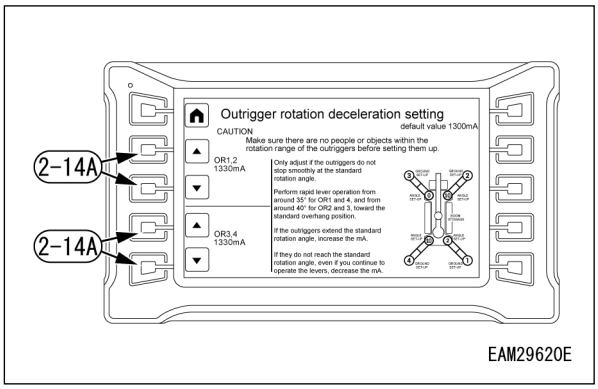
If the outrigger does not move despite continuing to push the operation lever, press the adjustment switch ▼ to decrease the figure.

The default electric current value: 1,300 mA

Settable range: 900 to 1,550 mA

☞ Only perform the adjustment when the outrigger has not stopped at the standard rotation angle.

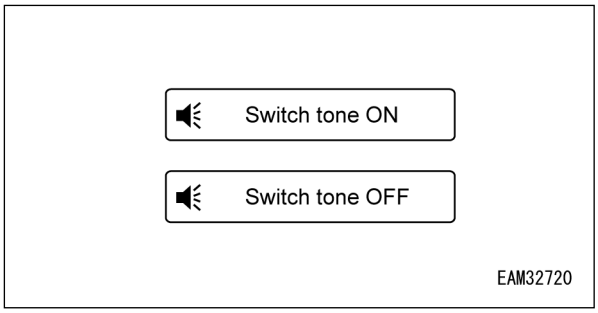
☞ While you are configuring the setting, the outrigger stops at the standard rotation angle even if you pull the lever fully (when the radio controller's operating lever is pulled down to the maximum).



[16] Switch tone ON/OFF (2-16)

The user can switch the switch operation sound ON/OFF.

- OFF : even if the switch is operated, the operation sound is not produced.
- ON : when the switch is operated, the operation sound is produced.



[17] Set the minimum engine speed (2-17)

The user can set the minimum engine speed.

The minimum speed in each mode can be raised or lowered with the adjustment switches (2-17A) ▲ or ▼.

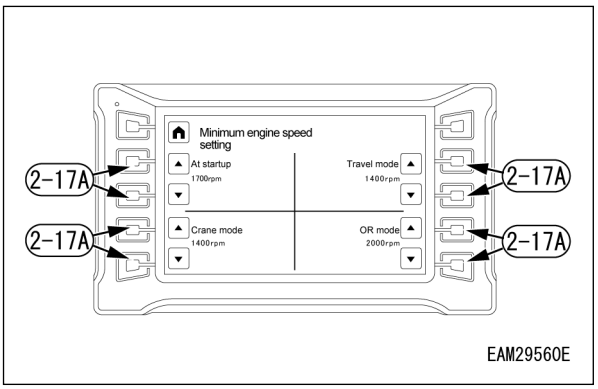
The default figures are as follows:

- Startup : 1,700 rpm
- Travel mode : 1,400 rpm
- Crane mode : 1,400 rpm
- Outrigger mode : 2,000 rpm

The settable range is as follows:

- Range common to all modes: 1,200 to 2,600 rpm

☞ If the engine is tending to stall, adjust the speed.

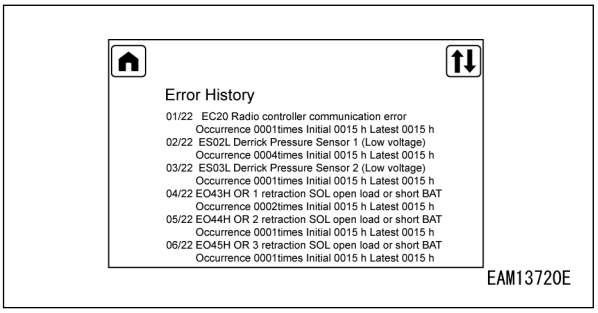


[18] Error history display (2-18)

The user can check currently occurring errors and errors that have occurred in the past.

- Characters displayed in red: currently occurring error
- Characters displayed in white: error that occurred in the past and is not currently occurring

For details of the error codes, refer to the section "6.16.3 Monitor error codes."



[19] Home switch (2-19)

- Short press : returns to the previous page
- Long press : returns to the home screen

☞ The home switch (2-15) functionality is the same on each confirmation screen and setting screen.

[20] Switch the display page (2-20)

Every time this button is pressed, the monitor view jumps to the next page.

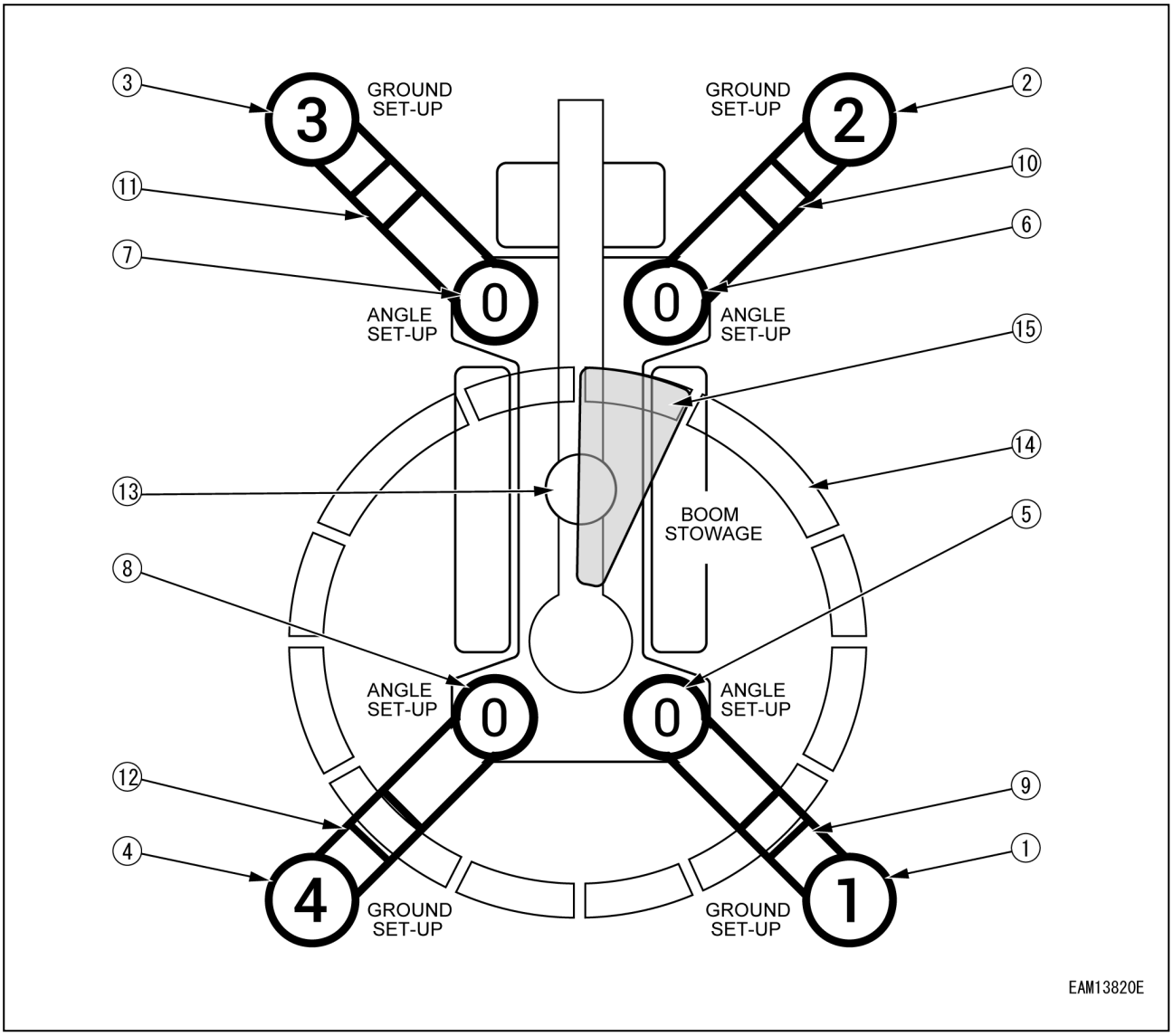
☞ The display page switching (2-20) functionality is the same on each confirmation screen and setting screen even if there are several pages.

[21] Extra Battery Unit (EBU), Main battery selected, Automatic battery changeover (battery specification) (2-21)

The user mode screen has 4 pages any for battery spec machine.

The items on the 4th page are any available when the EBU is attached.

4.2.4 Outrigger status display screen



(1) Outrigger ground set-up lamp 1
(2) Outrigger ground set-up lamp 2
(3) Outrigger ground set-up lamp 3
(4) Outrigger ground set-up lamp 4
(5) Outrigger angle set-up lamp 1
(6) Outrigger angle set-up lamp 2
(7) Outrigger angle set-up lamp 3
(8) Outrigger angle set-up lamp 4
(9) Outrigger extension lamp 1
(10) Outrigger extension lamp 2
(11) Outrigger extension lamp 3
(12) Outrigger extension lamp 4
(13) Boom and jib stowed lamp
(14) Working range status display
(15) Boom slewing position display

⚠ WARNING

- **Do not remove the detectors or disassemble them for repair. In addition, do not move the detection switches.**
- **If a collision with an object noticeably damages the detectors, be sure to confirm that the lamps in the outrigger display area still turn on and off and confirm the operation status for the crane interlock and outrigger interlock functions. If an anomaly has occurred, contact us or our sales service agency.**
- **When setting the outriggers, check that the position pins are securely inserted. The display of each lamp may be affected.**

[1] Outrigger ground set-up lamp 1 (1), Outrigger ground set-up lamp 2 (2), Outrigger ground set-up lamp 3 (3), Outrigger ground set-up lamp 4 (4)

The lamp lights up to notify that the outrigger is grounded.

The lamp light-up conditions are as follows:

[Green light]

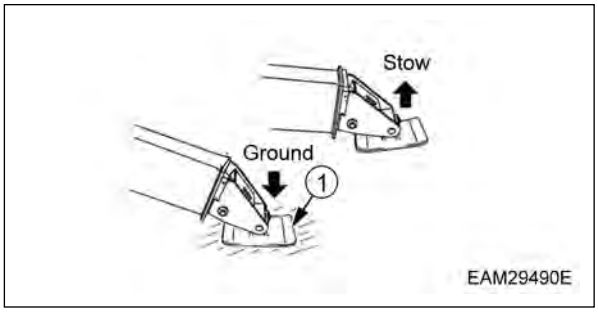
When the outrigger length is at its maximum and the equipment is grounded

[Yellow light]

When the outrigger length is not at its maximum and the equipment is grounded

[Red light]

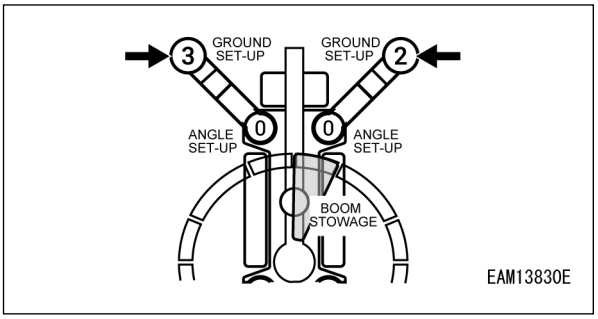
When the outrigger foot has risen (excluding when stowed)



[OFF]

When the outrigger length and, lifting and grounding angle are at the stowed values

The detector on the end of the outrigger detects whether or not the outrigger is grounded.



[2] Outrigger angle set-up lamp 1 (5), Outrigger angle set-up lamp 2 (6), Outrigger angle set-up lamp 3 (7), Outrigger angle set-up lamp 4 (8)

The lamp lights up to notify the operator of the status of the outrigger rotation angle.

The rotation angle (0° to 90°) is displayed as a figure within the lamp.

[Green light]

When the outrigger rotation angle is within ±1.5° of the standard rotation angle's tolerance.

［Green light blinking］

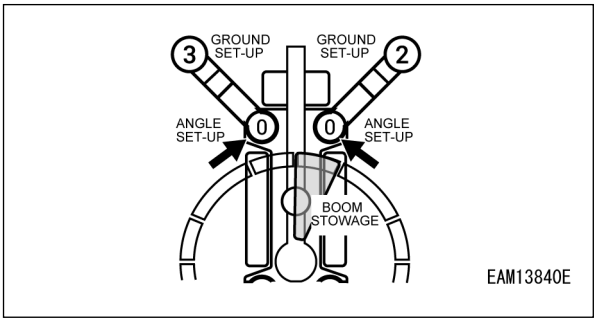
When the outrigger rotation angle is in the range from 1.5° greater than the standard rotation angle to within 5° of it.

[Yellow light]

When the outrigger rotation angle does not satisfy the conditions for the green light to be lit or blink.

[OFF]

When the outrigger length and, lifting and grounding angle correspond to the stowed state and the outrigger rotation angle corresponds to the stowed state



[3] Outrigger extension lamp 1 (9), Outrigger extension lamp 2 (10), Outrigger extension lamp 3 (11), Outrigger extension lamp 4 (12)

The lamps turn on and off in four stages to notify the operator of the state corresponding to the outrigger length.

[MAX Extension light]

When the outrigger length is at its maximum

[MID Extension light]

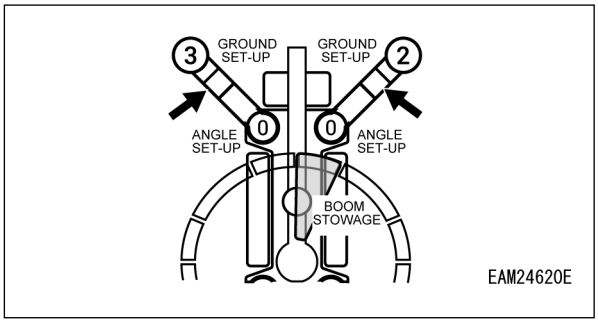
When the outrigger length has deviated even slightly from its maximum and until the second stage lamp turns off

[MIN Extension light]

When the outrigger length has deviated even slightly from the second stage and until it is at its minimum

[All lamps off]

When the outrigger is at its minimum and it is fully raised



[4] Boom and jib stowed lamp (13)

This lamp turns on to notify the operator that the boom and jib are stowed.

The boom and jib stowed lamp turns on depending on detections in the following three stowing positions:

[Boom slewing direction and stowage detection]

The equipment detects whether the boom has stopped in the slewing stowing position.

[Boom and jib horizontal stowage detection]

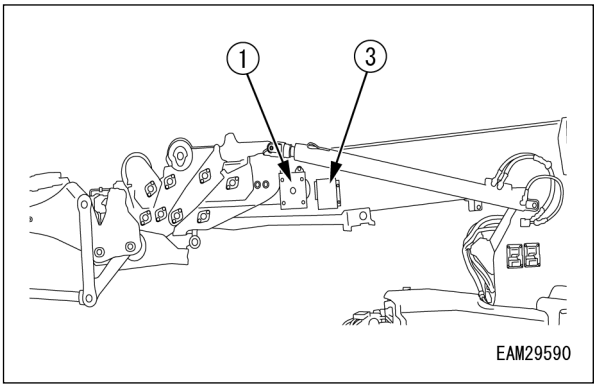
The equipment detects whether the boom and jib have stopped in the horizontal stowing position.

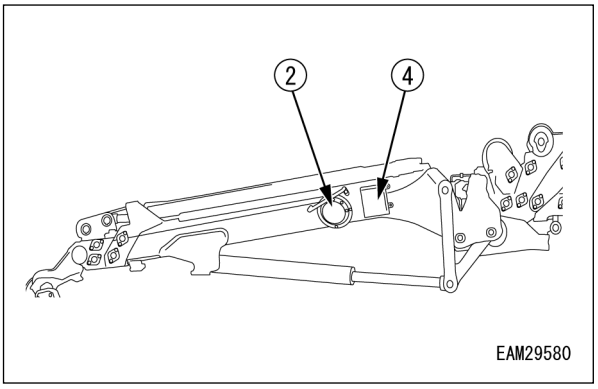
The boom angle sensor (1) and the jib angle sensor (2) are used to perform the detection.

[Boom and jib length and stowage detection]

The equipment detects whether the boom and jib are retracted into the stowed position.

The boom length sensor (3) and the jib length sensor (4) are used to perform the detection.





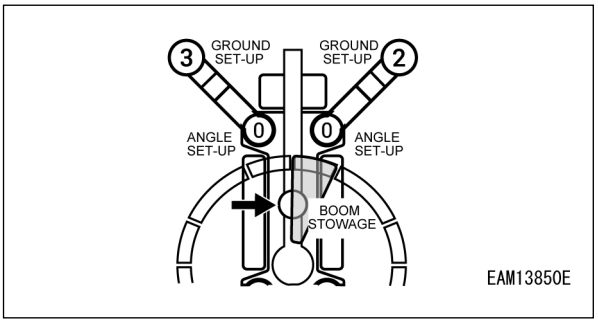
The lamp turns on under the following conditions:

[Green light]

When stowed equipment is simultaneously detected in all three stowing positions

[Red light]

When even one of the green light conditions is deviated from

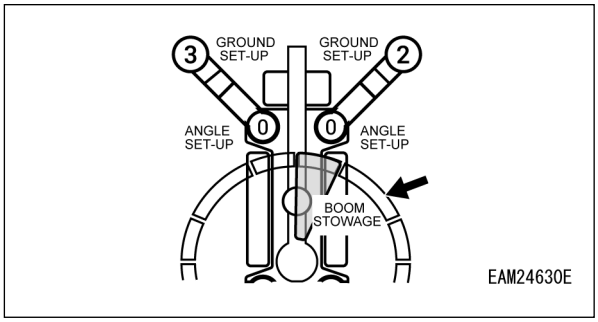


[5] Working range status display (14)

This displays the job range of the crane when in the outrigger extension status.

The lifting performance in the range of each job is displayed with a blue light, yellow light, orange light, and red light.

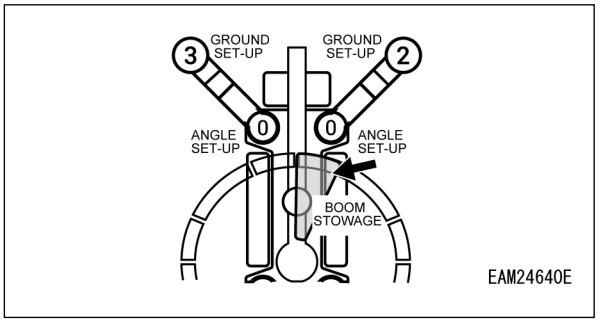
For details, refer to the section “5.7.2.2 Crane working areas for depending on outriggers setting conditions.”



[6] Boom slewing position display (15)

The current boom slewing position corresponding to the working range status display is displayed with the same color coding as the working range status display in a fan shape.

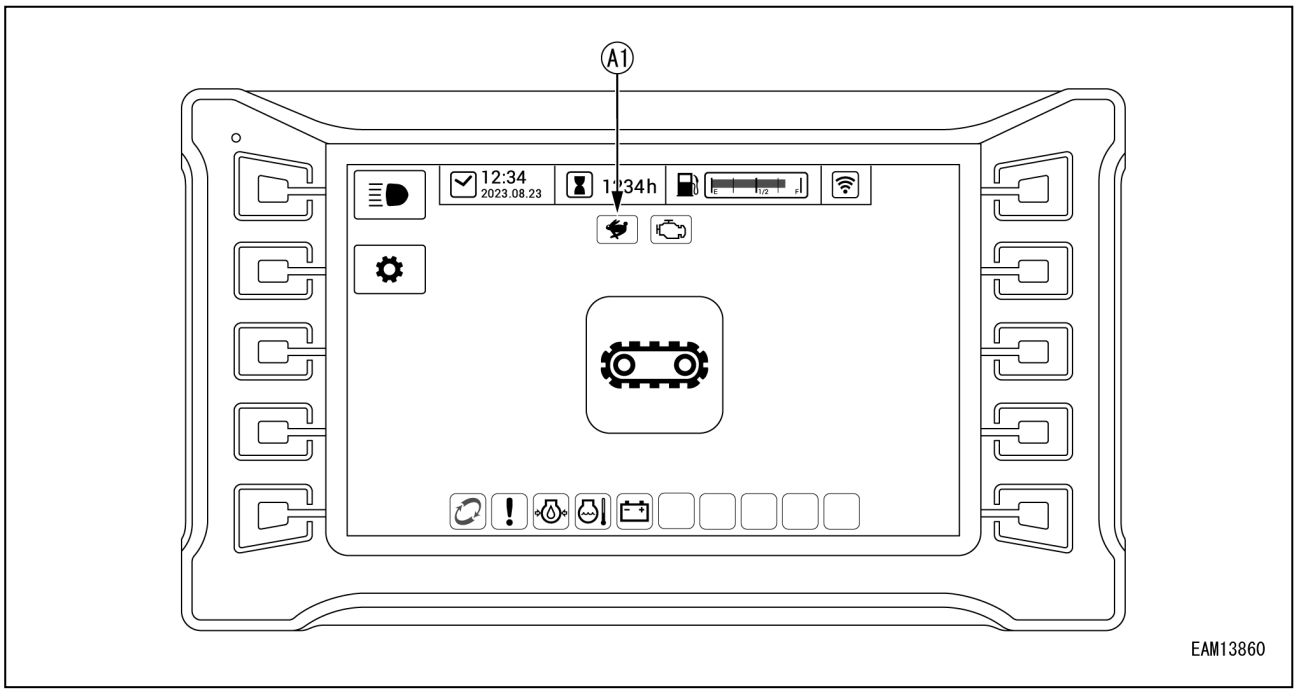
The light is always off on the outrigger in operation screen.



4.2.5 Screen during radio controller operation

4.2.5.1 Screen during travel operation

During the radio controlled travel operation, the screen display changes.

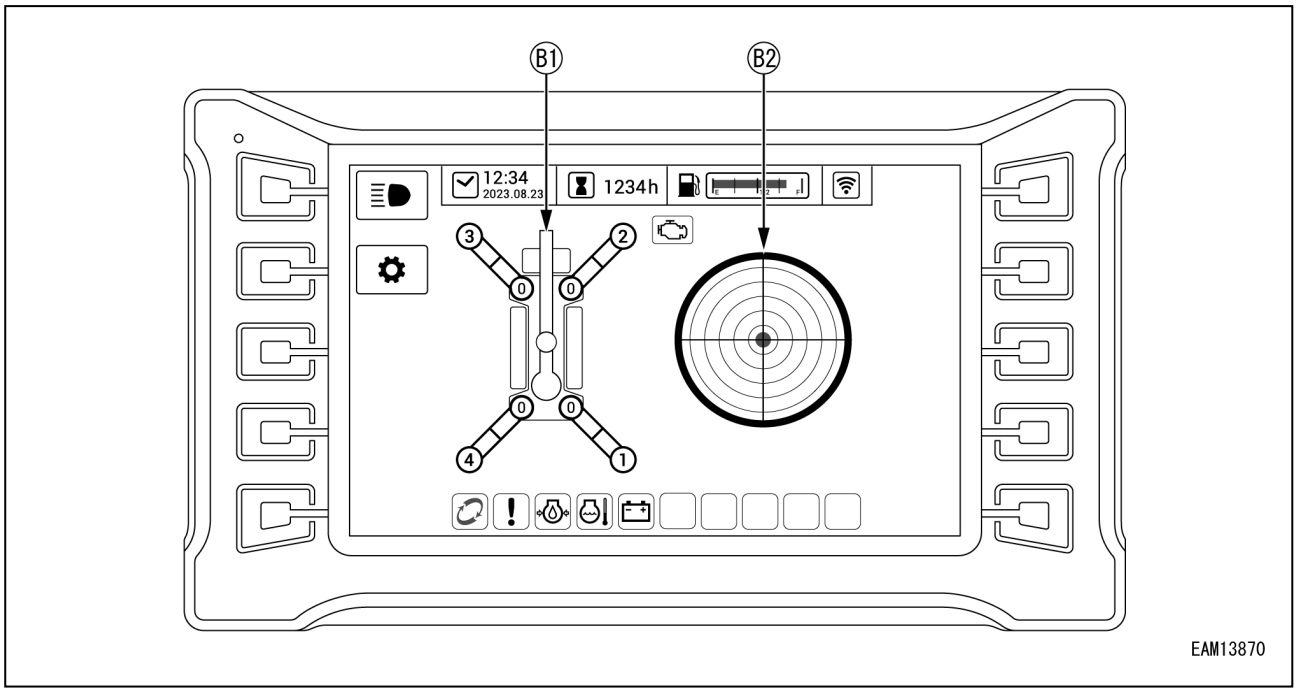


(A1) Travel speed display

☞ The home screen and common contents are omitted. Refer to the section “4.2.2 Home Screen.”

4.2.5.2 Screen during outrigger operation

The screen switches the display when the radio controller is operating the outrigger.



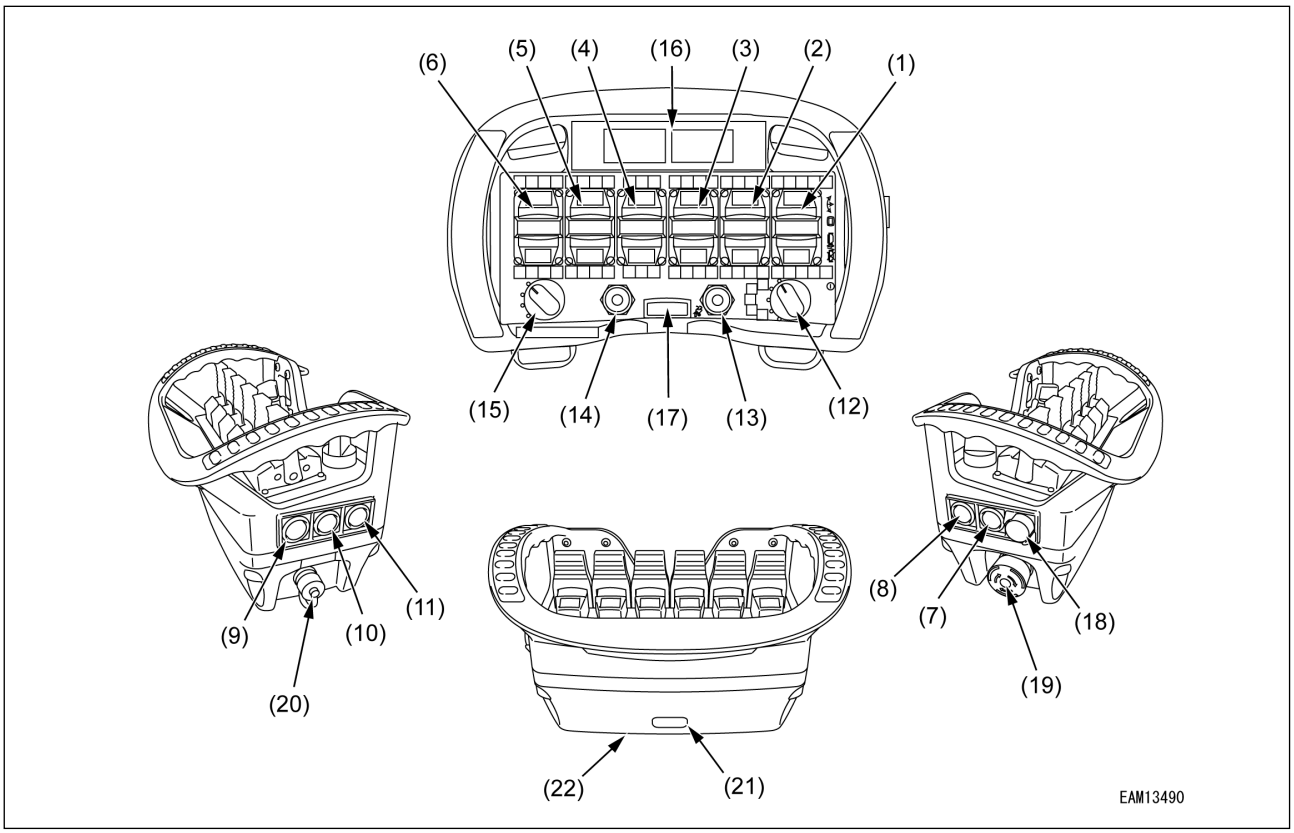
(B1) Outrigger status display

(B2) Level gauge

☞ The home screen and common contents are omitted. Refer to the section “4.2.2 Home Screen.”

4.3 REMOTE CONTROL

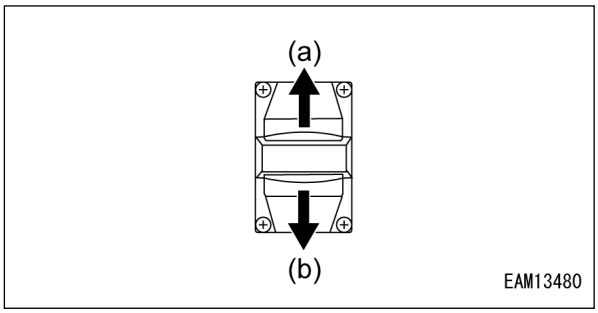
4.3.1 Transmitter



(1) S1 lever
(2) S2 lever
(3) S3 lever
(4) S4 lever
(5) S5 lever
(6) S6 lever
(7) Engine start/stop switch
(engine specification / engine and electric specification)
(8) Radio controller power supply switch
(9) Empty switch
(10) Boom and jib raising switch (overload)
(11) Horn switch
(12) Mode selector switch
(13) Hook stowing switch
(14) Travel speed selector switch
(15) Speed selector switch
(16) Display
(17) LED light (control panel)
(18) Display operation switch
(19) Emergency stop / remote control power OFF switch
(20) Radio controller connection port
(21) LED light (front)
(22) Battery

[1] S1 lever (1)

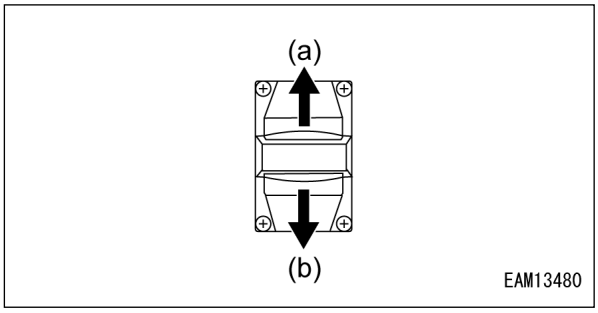
This operation lever is used in the following ways:



- In crane mode
  (a) lowering the boom
  (b) raising the boom
- In the outrigger lifting and grounding mode
  (a) No. 1 outrigger lifted
  (b) No. 1 outrigger grounded
- In the outrigger extension mode
  (a) No. 1 outrigger extends
  (b) No. 1 outrigger retracts
- In outrigger rotation mode
  (a) No. 1 outrigger rotation outward
  (b) No. 1 outrigger rotation inward
- In the crawler operation mode
  (a) Right crawler forwards
  (b) Right crawler backwards

[2] S2 lever (2)

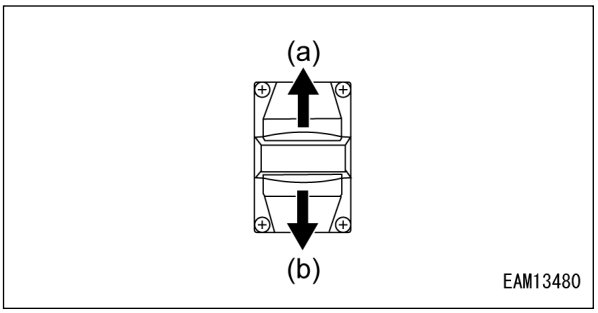
This operation lever is used in the following ways:



- In crane mode
  (a) Winch hoisting down
  (b) Winch hoisting up
- In the outrigger lifting and grounding mode
  (a) No. 2 outrigger lifted
  (b) No. 2 outrigger grounded
- In the outrigger extension mode
  (a) No. 2 outrigger extends
  (b) No. 2 outrigger retracts
- In outrigger rotation mode
  (a) No. 2 outrigger rotation outward
  (b) No. 2 outrigger rotation inward

[3] S3 lever (3)

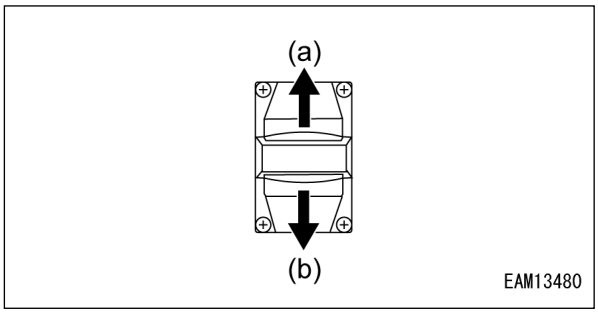
This operation lever is used in the following ways:



- In crane mode
  (a) extending the boom
  (b) retracting the boom
- In the outrigger lifting and grounding mode
  (a) Outriggers lifting simultaneous operation
  (b) Outriggers grounding simultaneous operation (auto leveling)
- In the outrigger extension mode
  (a) Outriggers extending simultaneous operation
  (b) Outriggers retracting simultaneous operation
- In the crawler operation mode
  (a) Variable gauge widening
  (b) Variable gauge retracting

[4] S4 lever (4)

This operation lever is used in the following ways:

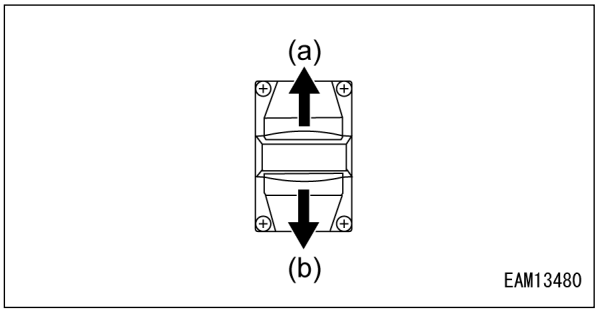


- In crane mode
  (a) Jib lowering
  (b) Jib raising
- In one of the outrigger lifting and grounding mode, the extension mode, or the rotation mode
  (a) Outriggers extending simultaneous operation (auto leveling)
  (b) Outriggers stowing simultaneous operation

☞ When extending or stowing the outriggers simultaneous operation using the S4 lever, the outrigger lifting and grounding action alone differs from when the action is performed by individual operation levers. Be aware that pushing the lever to the back causes the lowering action, while pulling the lever toward you causes the raising action.

[5] S5 lever (5)

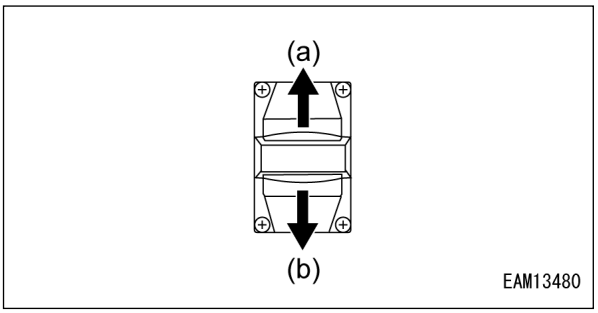
This operation lever is used in the following ways:



- In crane mode
  (a) Jib extension
  (b) Jib retraction
- In the outrigger lifting and grounding mode
  (a) No. 3 outrigger lifted
  (b) No. 3 outrigger grounded
- In the outrigger extension mode
  (a) No. 3 outrigger extends
  (b) No. 3 outrigger retracts
- In outrigger rotation mode
  (a) No. 3 outrigger rotation outward
  (b) No. 3 outrigger rotation inward

[6] S6 lever (6)

This operation lever is used in the following ways:



- In crane mode
  (a) boom counter-clockwise slewing
  (b) boom clockwise slewing
- In the outrigger lifting and grounding mode
  (a) No. 4 outrigger lifted
  (b) No. 4 outrigger grounded
- In the outrigger extension mode
  (a) No. 4 outrigger extends
  (b) No. 4 outrigger retracts
- In outrigger rotation mode
  (a) No. 4 outrigger rotation outward
  (b) No. 4 outrigger rotation inward
- In the crawler operation mode
  (a) Left crawler forwards
  (b) Left crawler backwards

[7] Start/stop engine switch (engine specification / engine and electric specification) (7)

- Engine specification
  This is used for the engine start and stop operations.
- Engine and electric specification
  Press this switch to start or stop the engine or electric motor.

This switch does not function in the battery specification case.

[8] Radio controller power supply switch (8)

This is used to turn on the transmitter's power supply.

[9] Empty switch (9)

This is not used in this machine.

[10] Boom and jib raising switch (overload) (10)

This can raise the boom when there is an overload.

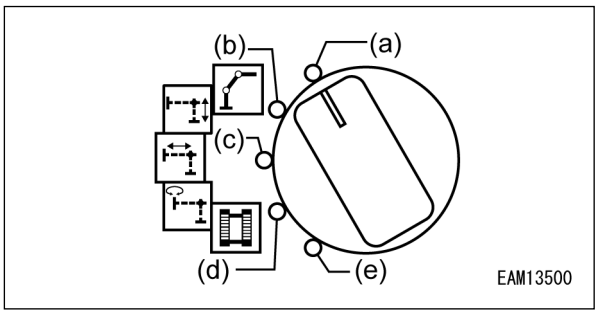
For details, refer to section "4.1.3 [4] Operation to recover from an automatic stop" or "4.1.3 [5] Operation to recover from an automatic stop"

[11] Horn switch (11)

This switch is used when sounding the horn. The horn sounds while the switch is being pressed.

[12] Mode selector switch (12)

This is used to switch between the crane, outrigger, and crawler operations.



(a) Crane mode
(b) Outrigger lifting and grounding mode
(c) Outrigger extension mode
(d) Outrigger rotation mode
(e) Crawler operation mode

[13] Hook stowing switch (13)

Press this switch to stow the hook block or to stow or extend the boom/jib.

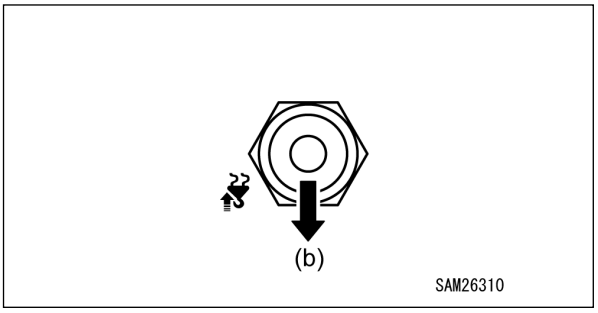
When stowing the hook block, while turning on the switch, hoist up the hook block very slowly at a low pressure with the S2 lever.

When lowering and stowing the boom/jib with the hook in a stowed state, perform the lowering operation while pressing this switch.

When raising the boom/jib from the stowed position when using a single-fall hook block, raise the jib and boom while pressing this switch.

In addition, this is also used for automatically retracting the crane.

☞ For details about stowing the crane, see "5.8.14 Stowing the crane."

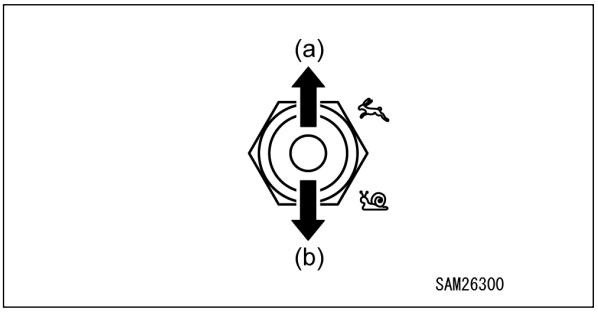


(b) Hook block stowing / automatic stowing ON

[14] Travel speed selector switch (14)

This is used when changing the speed when performing the travel operation.

Can switch between low speed and high speed.



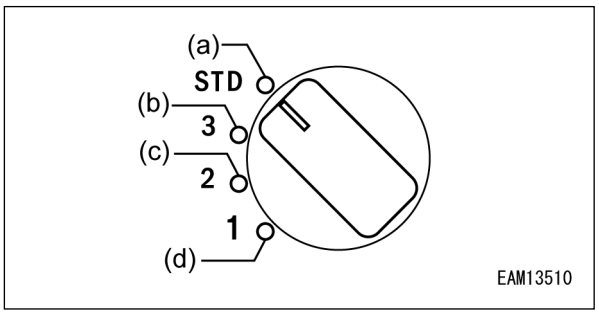
(a) High speed: the travel mode is switched to high speed.

(b) Low speed: the travel mode is switched to low speed.

[15] Speed selector switch (15)

This is used when changing the speed mode.

Can switch between STD (normal speed), micro speed 1, micro speed 2, and micro speed 3.



(a) STD (normal speed)

(b) Micro speed 3 (user setting)

(c) Micro speed 2

(d) Micro speed 1

☞ For details of the micro speed 3 settings, refer to “4.2.3 User mode screen.”

[16] Display (16)

Displays the status screen.

[17] LED light (control panel) (17)

This is the light for illuminating the control panel. The light is turned ON/OFF on the display.

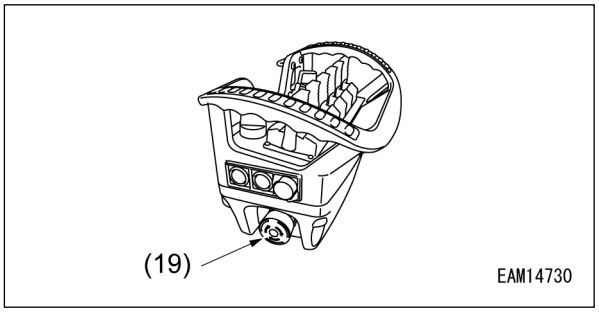
[18] Display operation switch (18)

This is used when operating the display.

[19] Emergency stop / radio controller power OFF switch (19)

Press this switch to stop the engine or the motor in an emergency. In addition, this is also used when the transmitter’s power supply is turned off.

Pressing this switch stops the engine or the motor and simultaneously turns off the transmitter.



[20] Radio controller connection port (20)

This is used when connecting the radio controller receiver with the radio controller cable.

☞ Even if the transmitter does not have a battery, by connecting with the radio controller, the crane can be controlled with the radio controller.

[21] LED light (front) (21)

This light illuminates in front of the machine.

The light is turned ON/OFF on the display.

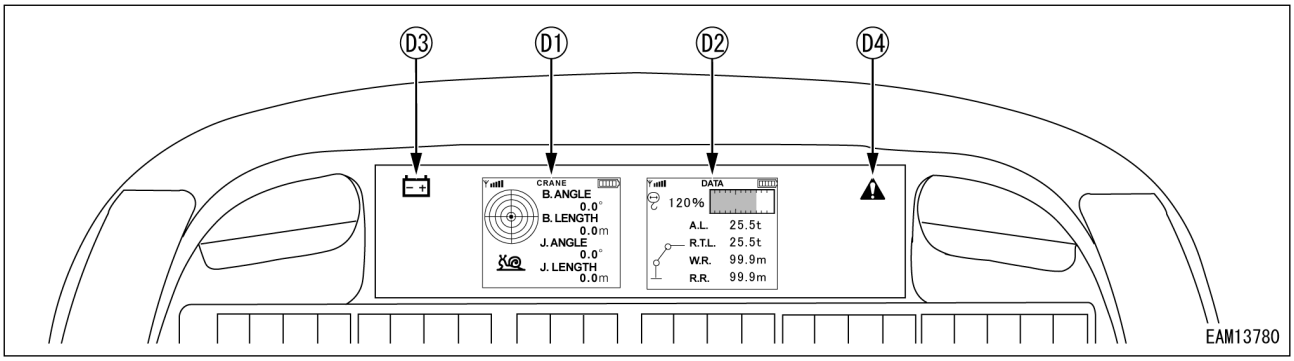
[22] Battery (22)

This is the power source for operating the transmitter.

When performing operations, be careful about the battery level.

4.3.2 Display

4.3.2.1 Display parts



(D1) Left display
(D2) Right display
(D3) Battery lamp
(D4) Warning lamp

[1] Left display (D1), Right display (D2)

These display the various statuses and menus.

The display is operated by the display operation switch.

[2] Battery lamp (D3)

This lamp blinks depending on the state of the transmitter's battery.

- Blinks green: the battery is in a normal state.
- Blinks red: the voltage is low or an anomaly has occurred.

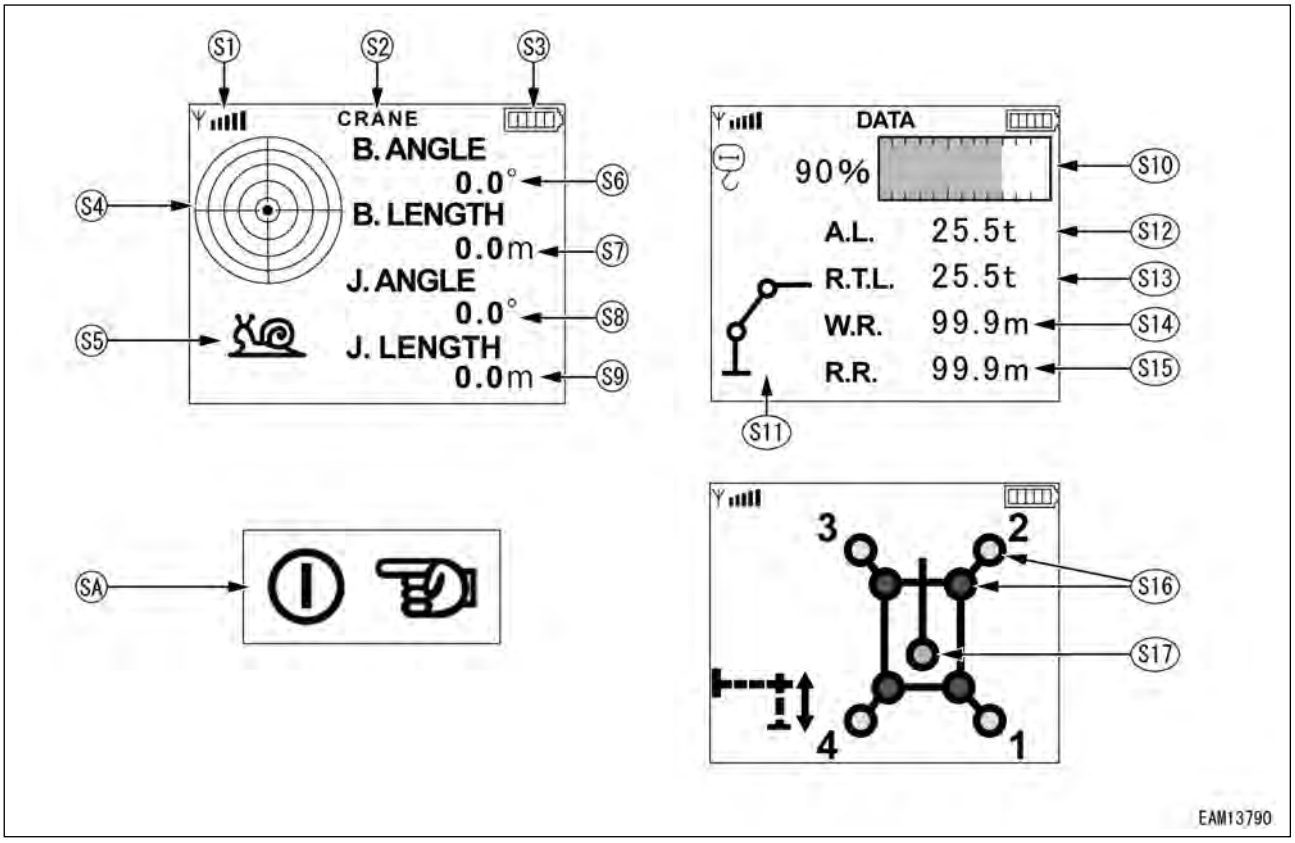
☞ When the transmitter starts or stops, the lamp lights up in red momentarily, but this is not an anomaly.
When red blinking continues, it is possible that the battery capacity is insufficient or there is bad connection. Charge the battery or re-install it, etc., and check the lamp's state again.

[3] Warning lamp (D4)

This lamp lights up when there is an anomaly in the radio controller main unit or when there is a radio controller communication.

☞ When the transmitter starts, the lamp lights up momentarily, but this is not an anomaly.

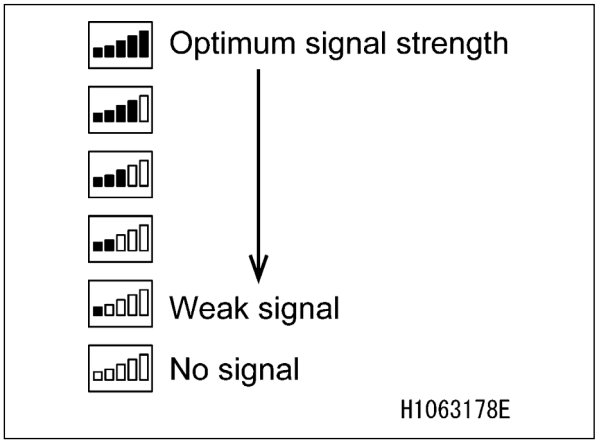
4.3.2.2 Status screen



(S1) Radio wave status
(S2) Mode status
(S3) Transmitter battery level
(S4) Level gauge
(S5) Travel speed low speed / high speed display
(S6) Boom angle display
(S7) Boom length display
(S8) Jib angle display
(S9) Jib length display
(S10) Load factor display
(S11) Mode display
(S12) Actual lode display
(S13) Rated total load display
(S14) Actual working radius display
(S15) Rated working radius display
(S16) Outrigger status display
(S17) Boom and jib stowing display
(SA) Start interlock display

[1] Radio wave status (S1)

Indicates the signal strength.



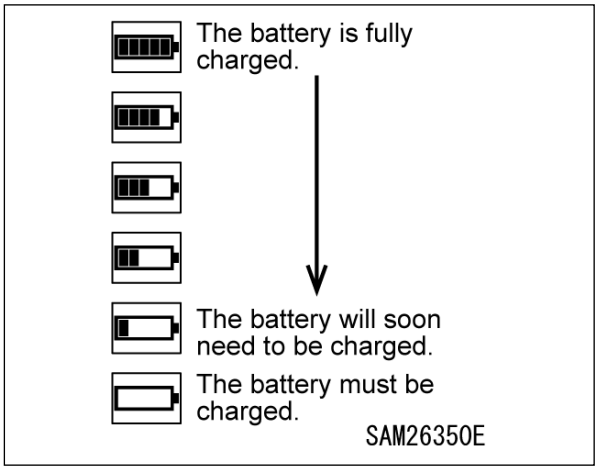
☞ Communication may be interrupted if the signal is indicated as weak. Check the work location and conditions to ensure sufficient signal strength.

[2] Mode status (S2)

Displays the current operation mode.

[3] Transmitter battery level (S3)

Indicates the battery level.



☞ An alarm sounds and the transmitter vibrates when it is running out of battery. The transmitter will shut down a few minutes after this.

[4] Level gauge (S4)

⚠ WARNING

The crane may tip-over if it is operated while tilted.

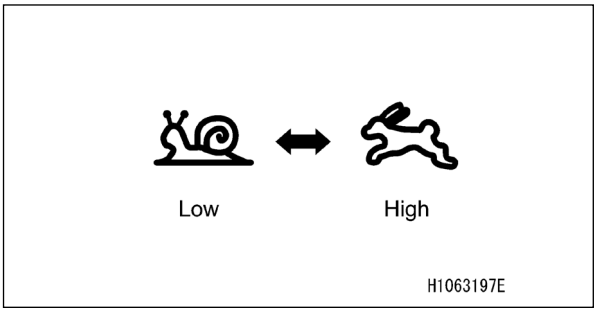
When operating the crane, be sure to check that the yellow ball is centred.

Indicates the machine tilt.

The position of the yellow ball indicates the inclination and direction of the machine.

[5] Travel speed low speed / high speed display (S5)

Displays the travel speed that has been selected - low speed (speed 1) or high speed (speed 2).



- Low speed: low speed is selected.
- High speed: high speed is selected.

[6] Boom angle display (S6)

During the crane job, the current boom angle is always displayed.

[7] Boom length display (S7)

During the crane job, the current boom length is always displayed.

[8] Jib angle display (S8)

During the crane job, the current jib angle is always displayed.

[9] Jib length display (S9)

During the crane job, the current jib length is always displayed.

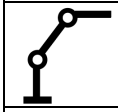
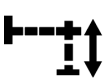
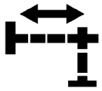
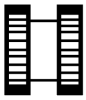
[10] Load factor display (S10)

The load's load factor status is displayed with a figure and an illuminated bar according to variations in the load factor.

Load factor display	Bar illumination
100% or more	Red
From 90% to less than 100%	Yellow
Less than 90%	Green

[11] Mode display (S11)

From the conditions set with each operation selector switch, the action actuated by the current operation's lever is displayed.

Display	Description
	[Crane mode] The crane operation is selected.
	[Outrigger lifting and grounding mode] The outrigger lifting and grounding operation is selected.
	[Outrigger extension mode] The outrigger extension operation is selected.
	[Outrigger rotation mode] The outrigger slewing operation is selected.
	[Crawler operation mode] The crawler operation is selected.

[12] Actual load display (S12)

This always displays the actual load of the hoisted load during crane jobs.

The actual load displays the mass of the total of the hoisted load + the lifting brackets, including the mass of the hook. When nothing is hoisted, if 0.0t to 0.2t is displayed, the display is working correctly. In the case of anything outside this range, contact us or our sales service agency.

- ☞ Based on the load detection structure, when the boom is raised or lowered, the figure in the actual load display changes. When the boom is raised, the figure for the actual load increases, but it this is not a malfunction.
- ☞ Even when the crane stops, if the load is swinging, then the figure for the actual load changes.
- ☞ When the jib is stowed, the correct value is not displayed, but this is not a fault.

[13] Rated total load display (S13)

This is calculated depending on conditions such as the number of wires hanging from the hook or the working radius, and the currently hoistable rated total load (hook mass + lifting bracket mass + hoisted load mass) is displayed.

[14] Actual working radius display (S14)

During the crane job, the current actual working radius is always displayed.

- ☞ The amount of deflection of the boom due to the load is not included.

[15] Rated working radius display (S15)

During the crane job, the current rated working radius is always displayed.

When the jib is mounted, this value is not used.

- ☞ For that reason, "0.0m" is always displayed when the jib is mounted, but this is not an anomaly.

[16] Outrigger status display (S16)

This displays the ground and extension state of each outrigger.

For details of the display conditions, refer to "4.2.4 [1] Outrigger ground set-up lamp" and "4.2.4 [2] Outrigger angle set-up lamp."

[17] Boom and jib stowing display (S17)

This indicates whether the boom and jib are stowed.

For details of the display conditions, refer to "4.2.4 [4] Boom and jib stowing lamp."

[18] Start interlock display (SA)

This is displayed in the state when the receiver and transmitter are communicating, but the crane operation is not possible.

Press the remote control switch and cancel the interlock.

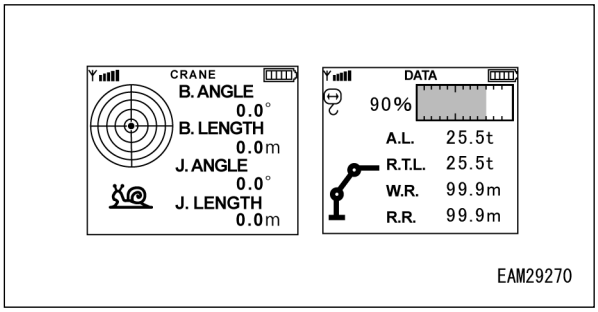
- ☞ Even during interlock, the engine can start and stop.
- ☞ When there is radio wave interference during the job, this also leads to the interlock state. Check the state of the radio waves and press the radio controller power supply switch.

4.3.2.3 Operations on the display

For how to start the transmitter, see
"5.3.1 Starting the transmitter."

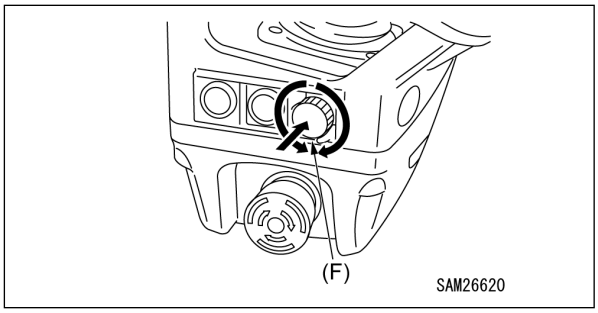
[1] Status screen

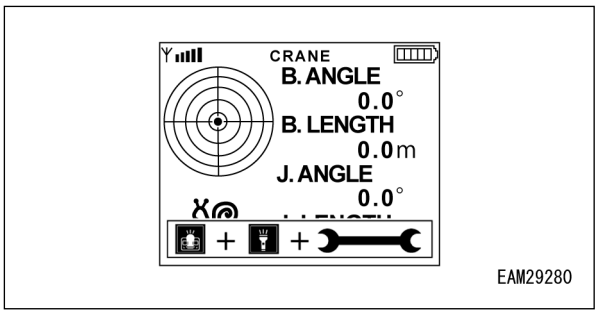
When you start the transmitter, the status screen is displayed normally.



☞ There is no item to operate in the status screen.

If you turn the display operation switch (F) while the status screen is displayed, a guidance for selecting the setting screen appears on the left-side display.



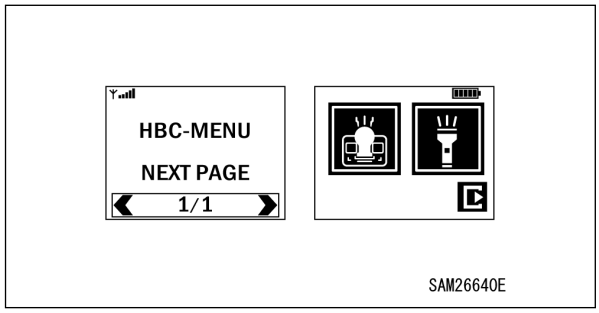


If you press the display operation switch (F) while the guidance is displayed, the setting screen appears on the display.

[2] Setting screen

When you start the transmitter, the status screen is displayed normally.

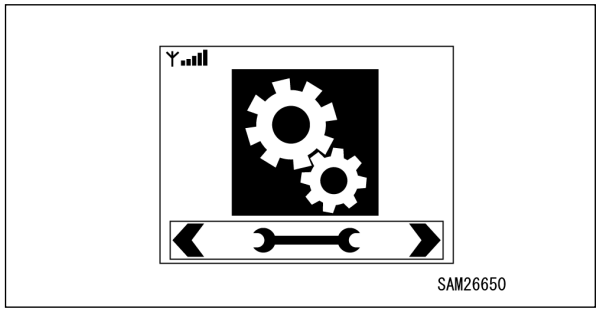
On the setting screen, you can select different menus by rotating the display operation switch (F).



(1) HBC menu
(2) Turning on/off the LED light (front)
(3) Turning on/off the LED light (control panel)
(4) Returning to the status screen

[3] HBC menu

Selecting the HBC menu and turning the display operation switch (F) displays a guidance for the HBC menu on the left-side display.



In this condition, pressing the display operation switch (F) displays the HBC menu.

[HBC menu]

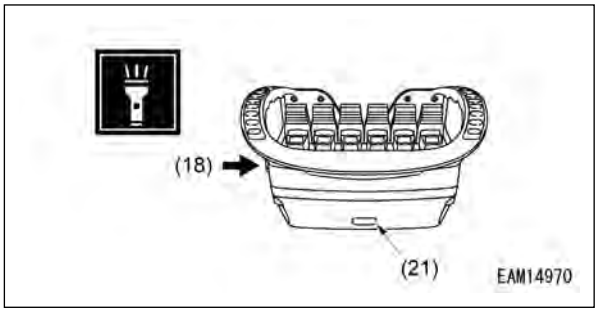
With the HBC menu, the left-side screen displays names and the right-side screen displays symbols. Make different settings and check different statuses with reference to the table below.

Symbol	Name	Description
	HBC Menu	This menu can configure system settings, connection settings, and security settings and can display various information.
	Warnings	This submenu can be used to display warnings.
	Information	This submenu can be used to display the system information.
	Service address	This menu item can be used to display the hotline phone number and email address of our service office.
	Working hours	This menu item can be used to display the current working hours.
	Software/config	This menu item can be used to display the currently installed software version and the current display configuration.
	Information text	This menu item can be used to display the currently entered information text.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Power info	This submenu can be used to display information about the remaining battery power.
	Battery level	This menu item can be used to display the current battery level.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Personalize	This submenu allows you to personalize the system settings.
	Language	This menu item allows you to choose the display language.
	Backlight	This menu item can be used to adjust the backlight brightness of the display.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Connections	This submenu allows you to configure connection settings.
	Display configuration	This menu item allows you to configure the connection to PC.
	RF connection	This menu item allows you to establish the HF interface.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Settings	This submenu allows you to configure device settings.
	Set information text	This menu item allows you to enter information texts.
	Master level	This menu item allows you to enable/disable the access to the master level.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Safety functions	This submenu allows you to configure security settings.
	Safety features	This menu item allows you to adjust the sensitivity for radiomatic® zero-g and radiomatic® shock-off, which are provided to enhance security features.
	inclination switch	This menu item allows you to configure the settings for radiomatic® inclination switch, which is provided to enhance security features.
	APO/AMO	This menu item allows you to configure APO/AMO for the security features.
	Manage PIN	This menu item allows you to change the PIN from the current PIN to a new PIN.
	Reset PIN	This menu item allows you to reset the current PIN.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Home	This soft key allows you to return to the main page of the customer menu.

[4] Turning on/off the LED light (front)

Selecting this item and pressing the display operation switch (18) lights up the front LED (21).

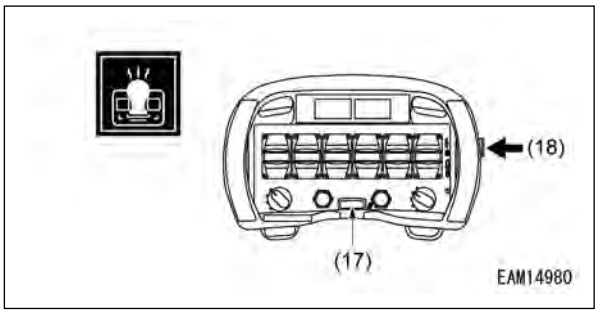
If you press the display operation switch when the LED is lit, the LED is turned off.



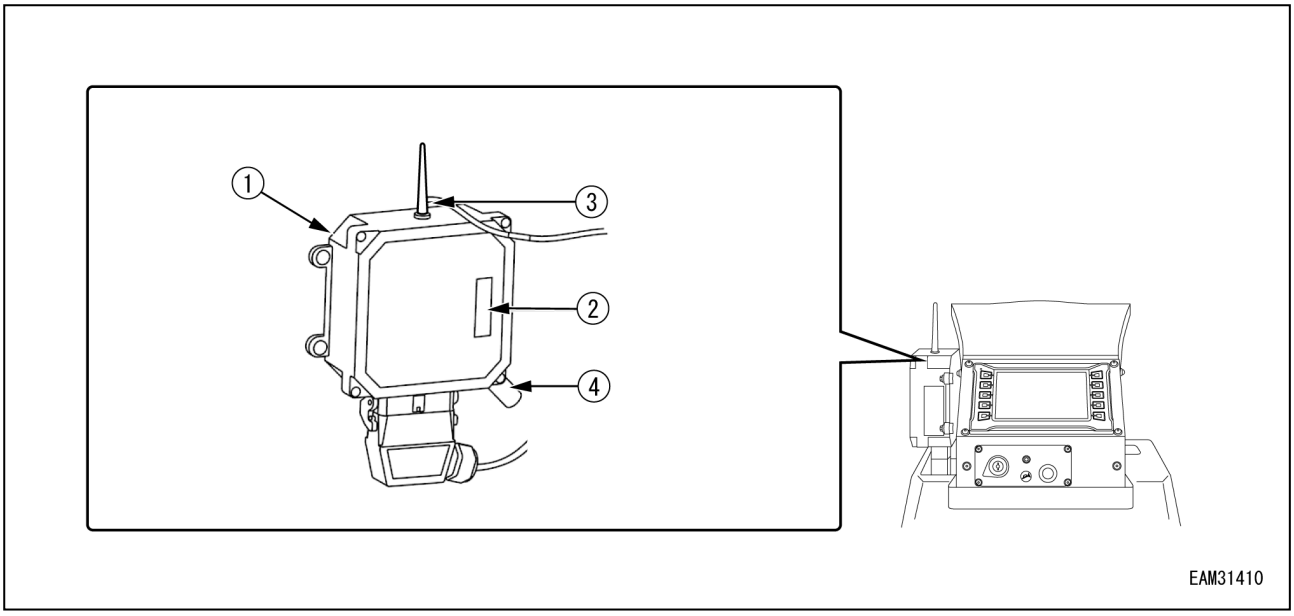
[5] Turning on/off the LED light (control panel)

Selecting this item and pressing the display operation switch (18) lights up the control panel LED (17).

If you press the display operation switch when the LED is lit, the LED is turned off.



4.3.3 Receiver



(1) Receiver
(2) LED Monitor
(3) Antenna
(4) Radio controller cable connection port

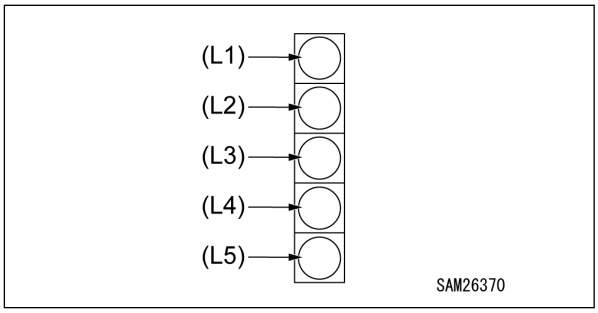
☞ The receiver is attached on the left side of the monitor part.

[1] Receiver (1)

This is the radio controller receiver's main unit.

[2] LED Monitor (2)

The communication status between the receiver and the transmitter is displayed by lighting or turning off the LEDs.



(L1) Receiver power supply (yellow)

- Lit: the receiver is powered on.
- Unlit: the receiver is not powered on.

(L2) Transmitter power supply (red)

- Lit: communication has not been established between the transmitter and the receiver.

(L3) Transmitter power supply (green)

- Lit: the remote control is in the emergency stop state.

(L4) Operation lever input (green)

- Lit: the operation lever has an input.
- Unlit: the operation lever does not have an input.

(L5) Data transmission (yellow)

- Lit: the receiver is transmitting data to the transmitter.
- Unlit: the receiver is not transmitting any data in particular.

☞ If the receiver power supply (L1) is not lit, then the other LEDs will not be lit.

☞ In a normal state, the transmitter power supply (L2) and the transmitter power supply (L3) are never lit simultaneously.

[3] Antenna (3)

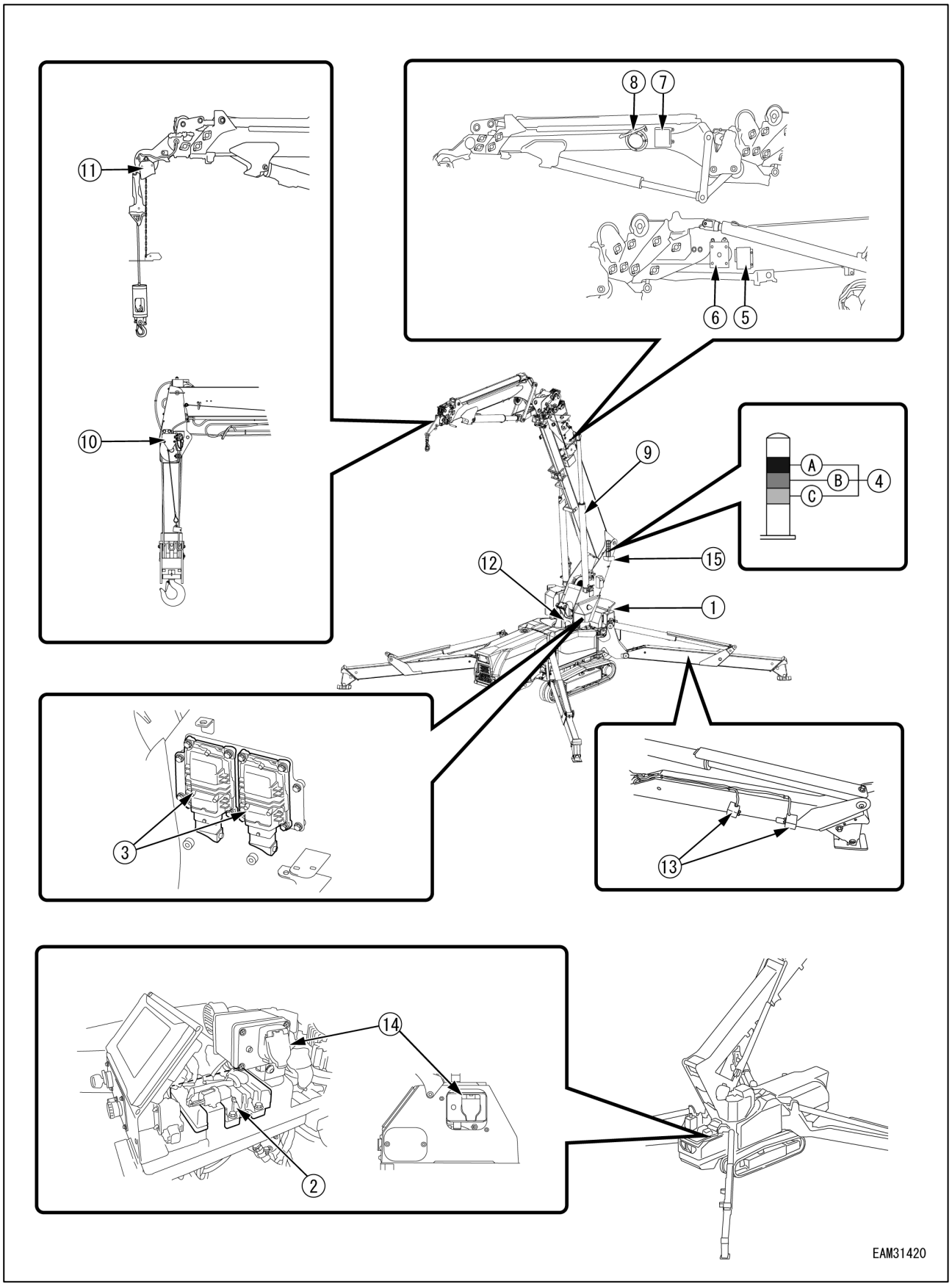
This is the receiving antenna.

[4] Radio controller connection port (4)

This is used when the transmitter and the receiver are connected with a radio controller cable.

4.4 MOMENT LIMITER (OVERLOAD PREVENTION DEVICE)

4.4.1 Moment limiter structure

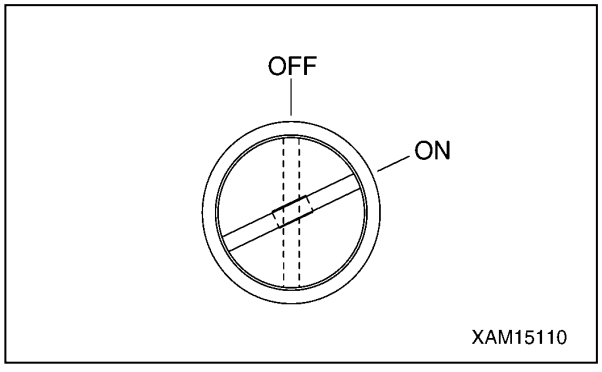


(1) Monitor
(2) Main controller
(3) Top controller (I/O unit) x 2
(4) Working status lamp
  (A) Red lamp (100% or more load factor warning lamp)
  (B) Yellow lamp (90% to less than 100% load factor forecast lamp)
  (C) Green lamp (less than 90% load factor actuation lamp)
(5) Boom length sensor
(6) Boom angle sensor
(7) Jib length sensor
(8) Jib angle sensor
(9) Pressure sensor (derricking cylinder part: two parts)
(10) Boom overwinding detector (when a 4-fall hook block is attached)
(11) Jib overwinding detector (when a single-fall hook block is attached)
(12) Over un-winding detector
(13) Outrigger status detection device
(14) Moment limiter override switch
(15) Alarm buzzer

4.4.2 Moment limiter operations

⚠ DANGER

- **Do not remove or disassemble for repair detectors such as the boom angle sensor, the boom length sensor, the jib angle sensor, the jib length sensor, or the pressure sensor. In addition, do not move the detectors from their original positions.**
- **When the detector hits an object and damage is discovered, be sure to check the automatic stop's operation status. If there is an anomaly with the automatic stop's operation status, be sure to repair it.**
- **If an anomaly has occurred other than during the load test, do not set the moment limiter override switch to ON (release). If the moment limiter override switch is set to the ON (release) position, the moment limiter functionality stops for three minutes. If the crane working is performed in this state, it may cause a serious accident leading to death or serious injury, such as the suspended load falling due to overloading, boom and jib damage, or the machine tipping-over. Furthermore, when the moment limiter override switch is set to the ON (release) position and the moment limiter functionality is stopped, the working status lamp blinks red and the alarm buzzer sounds intermittently to notify the user.**

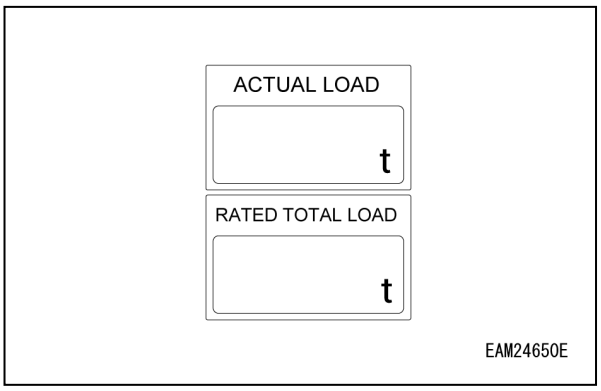


- **The crane slewing operation will not automatically stop even if the crane is overloaded. When the crane is overloaded, do not perform a slewing operation.**
- **When operating the boom or jib, if you have moved it close to the stop position, be sure to move it more slowly.**
  If you move the boom or jib too fast, the boom or jib may overshoot the stipulated stop position. This may result in a serious accident, such as the machine tipping-over, and could lead to death or serious injury.

The moment limiter is a device fitted to prevent suspended loads falling and boom and jib damage, the machine tipping-over, and so on, due to overloading.

Before conducting the crane working, be sure to inspect the moment limiter's operation and check that there is no anomaly.

4.4.2.1 Moment limiter mechanism



The moment limiter knows the boom's and jib's current posture due to the boom angle sensor, the jib angle sensor, the boom length sensor, and the jib length sensor; and, furthermore, by entering whether there are hooks and winches to be used, the rated total load of the current status is calculated.

Therefore, if a load is actually hoisted, the moment limiter calculates the "actual load" (the hoisted load) from the value of the pressure provided by the pressure sensor in the boom derricking cylinder part. The moment limiter performs a comparative calculation of the rated total load and the actual load (the hoisted load) calculated from the current posture, and if the result of the actual load / the rated total load is between 90% and less than 100%, then the preliminary alarm is issued.

If the calculation result is actual load / rated total load = 100% or more, then as well as the alarm being issued, the boom's dangerous operation is automatically stopped.

4.4.2.2 Moment limiter anomaly occurrence message display

The moment limiter displays an error code on the monitor's home screen and notifies the operator if an anomaly has occurred with the boom angle sensor, the boom length sensor, the jib angle sensor, the jib length sensor, and if the pressure sensor, or the wiring is disconnected, the connector deviated, etc.

When the moment limiter-related error codes have been displayed on the monitor, immediately cancel usage of the crane.

For details of the error code and the cause and treatment of the anomaly, refer to "6.16.3 Monitor error codes."

4.4.2.3 Outrigger extension detection

The detectors attached on each of the four outriggers respectively detect the outrigger's extension state, and the rated total load is changed to match the state.

4.4.3 Moment limiter operation and cancelling (recovery)

The moment limiter is device provided in case of emergencies. Operations that are over-trusting of the device, instead invite danger.

To avoid the crane stopping automatically, pay sufficient attention when operating.

The moment limiter is not measuring device.

4.4.3.1 Prohibited operations after an automatic stop

⚠ DANGER

After an automatic stop due to the crane overloading, according to the situation on site, it is forbidden to perform crane jobs that are dangerous operations. Refer to "4.4.3.2 Restoration operation from an automatic stop," and perform a suitable operation.
If a dangerous operation is performed, it is extremely dangerous since, for example, the machine may tip-over or the boom and jib may break.

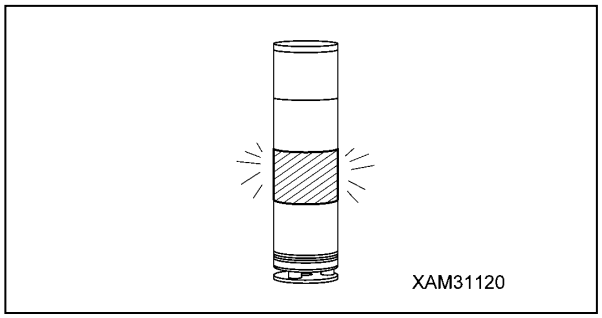
4.4.3.2 Recovery operation from an automatic stop

⚠ DANGER

Once an automatic stop has occurred, restoration is not possible unless the load factor is reduced to the safe area of less than 90% (working status lamp: green).
For a crane job with the moment limiter's load factor display at 90% or more, be sure to reduce the machine speed and perform a cautious operation.
If the crane job is performed with the machine set to a high speed, it is extremely dangerous. For example, the suspended load may swing and overload the machine, causing the machine to tip-over or the boom to break.

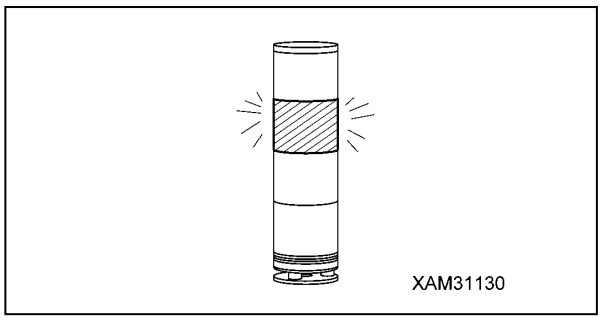
[1] When the load factor is “less than 90%”

If the hoisted load has a rated total load of less than 90%, the working status lamp is lit green indicating normal usage conditions.



[2] When the load factor is “from 90 to less than 100%”

If the hoisted load has a rated total load of 90% (forecast alert), the working status lamp changes color from green to yellow and the alarm sounds intermittently to notify the operator and people in the vicinity that the machine is near the rated total load.



[3] When the load factor is “100% or more.”

If the hoisted load has a rated total load exceeding 90% (forecast alert) and the crane job is further continued so that the hoisted load has a rated total load or 100% or more, the working status lamp changes color from yellow to red and the alarm sounds continuously, and the crane’s dangerous operation automatically stops.

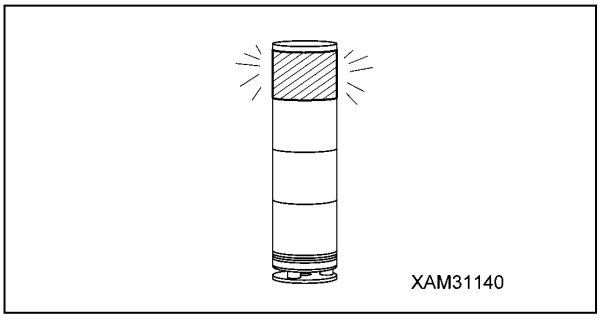
[When a fixed hook/a single-fall hook block is mounted (with the jib mounted)]

- Dangerous lateral crane motion

☞ For details of dangerous lateral crane motions, refer to section “4.4.3.2 [4] Operation to recover from an automatic stop (when a fixed hook/a single-fall hook block is mounted (with the jib mounted)).”

[when a 4-fall hook block is fitted (with the jib unmounted)]

- Hook block hoisting up
- Boom extension
- Boom lowering
- Boom raising



[4] Operation to recover from an automatic stop (when a fixed hook/a single-fall hook block is mounted)

Perform the following operation to recover from an overload that occurred during a slewing operation:

- The slewing operation when the automatic stop occurred in reverse

  The operations that are possible when an automatic stop has occurred during a slewing operation are as follows:

  Slewing operation: the slewing operation in the reverse slewing direction to that of the operation that stopped

  Boom/jib operation: refer to the following diagram.

Perform the following operation to recover from an overload that occurred during a crane operation:

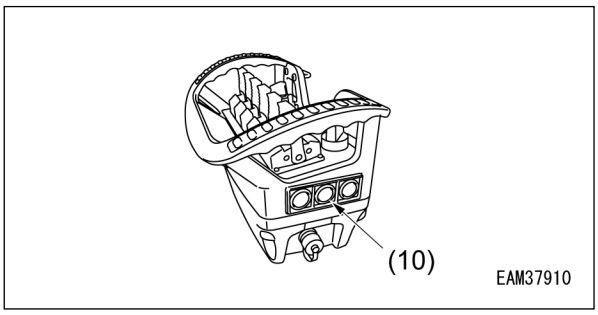
- Boom retraction operation
- Hook block hoisting down operation

If the above-mentioned operations cannot be performed, then, according to the on-site conditions, perform an operation that is safe.

☞ The safe motions are basically in the hook block hoisting down direction and in the direction in which the working radius shrinks. They are the motions in the directions of the white arrows shown in the following diagram.

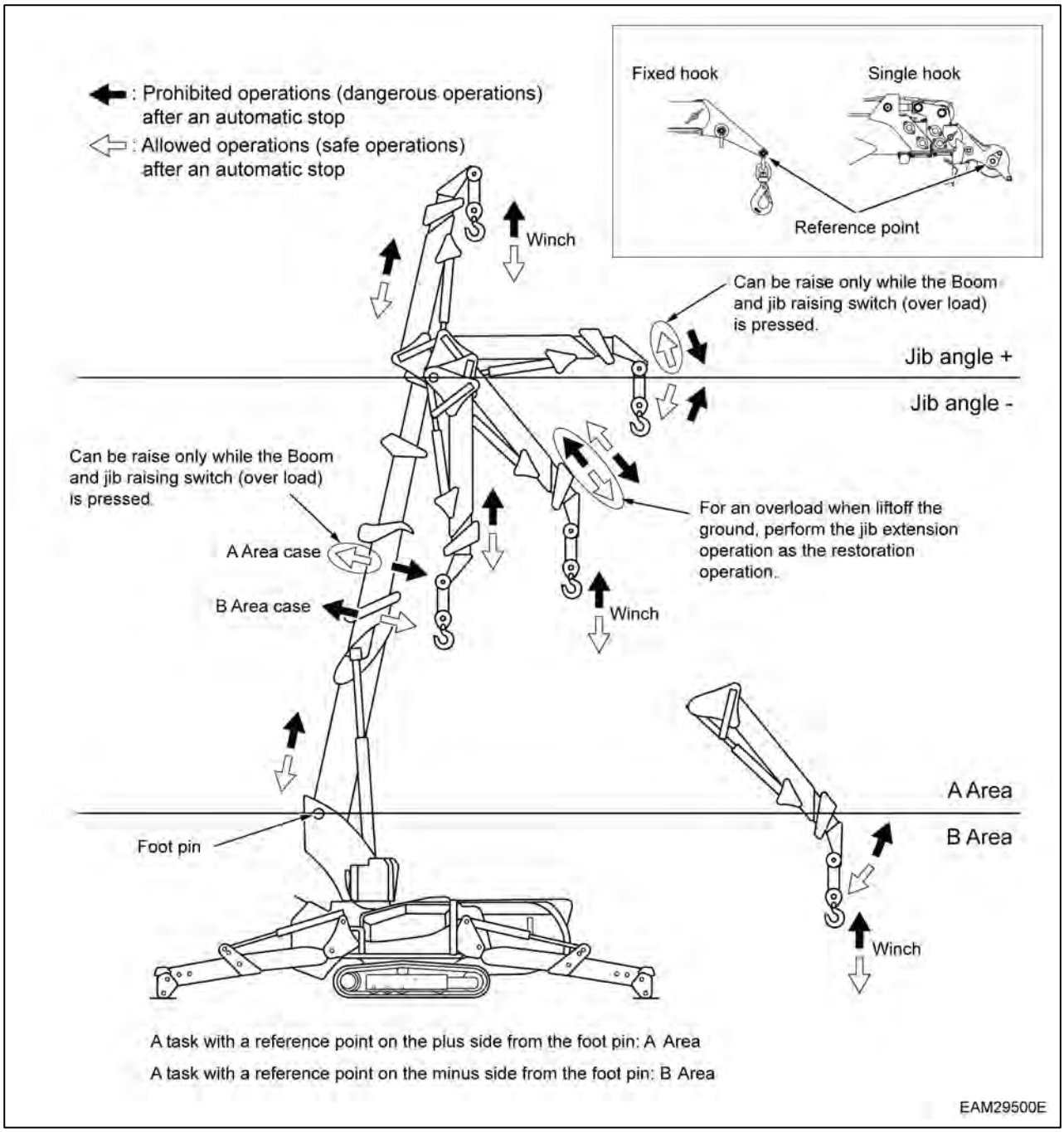
☞ The dangerous lateral motions are basically in the hook block hoisting up direction and the direction in which the working radius shrinks. They are the motions in the directions of the black arrows shown in the following diagram.

Recovery operation using boom and jib raising: If the boom and jib was stopped automatically, note that you can raise it only while depressing the (10) Boom and jib raising switch (overload).



⚠ DANGER

Use this switch only when the boom and jib has stopped automatically after entering the overload area.
Do not use this switch to lift loads off the ground under normal conditions. Using this switch to lift loads off the ground may damage the machine or cause toppling or other serious accidents.



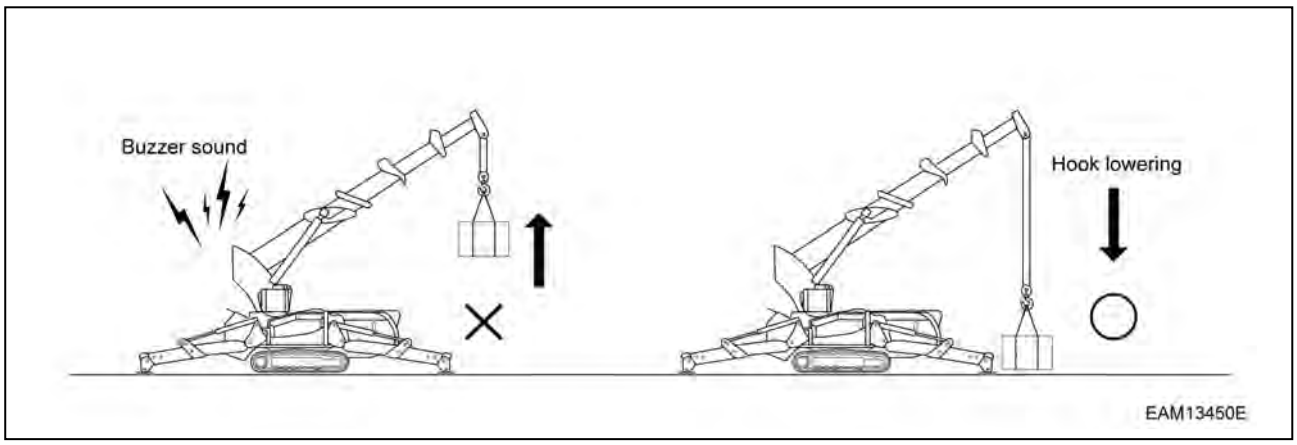
☞ The reference point is the shackle mounting part when the fixed hook is mounted, and the load sheave central part when the single-fall hook block is mounted.

[5] Operation to recover from an automatic stop (when a 4-fall hook block is mounted)

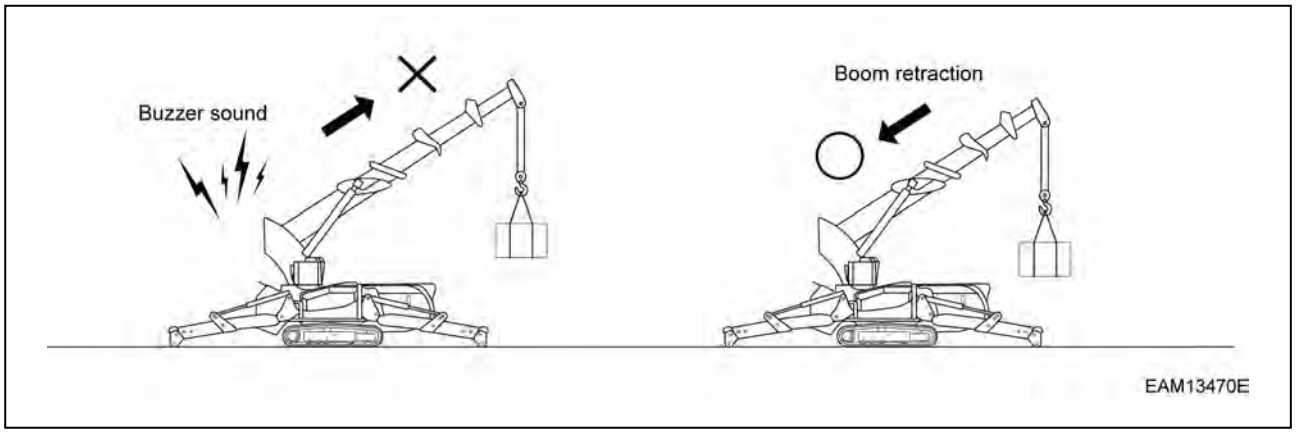
For the restoration operation from an overload, perform one of the following operations so that it is the reverse operation of the crane operation when the automatic stop occurred.

In addition, restoration is not possible unless the load factor is first reduced to the safe area of less than 90% (working status lamp: green).

1. Lower the hook and lower the hoisted load to the ground.

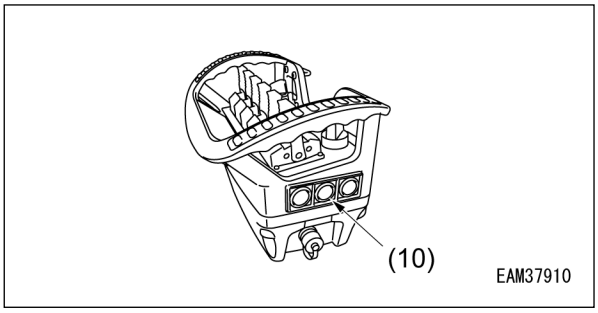


2. Perform a boom retract operation.



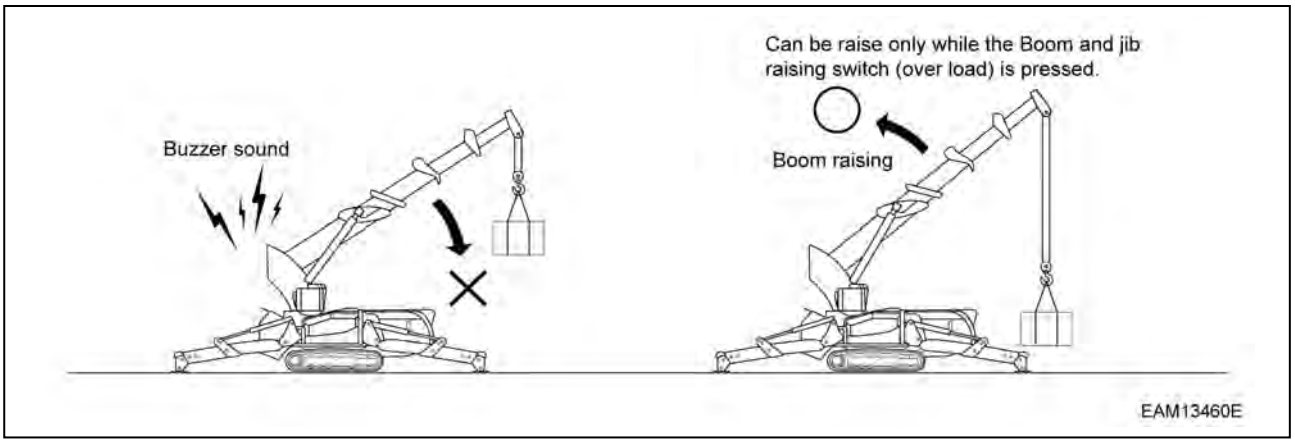
3. While pressing the transmitter's boom and jib raising switch (overload), perform the operation to raise the boom. Hoist down the lifted load so that it is in a low a position as possible.

Recovery operation using boom raising: If the boom was stopped automatically, note that you can raise it only while depressing the (10) Boom and jib raising switch (overload).



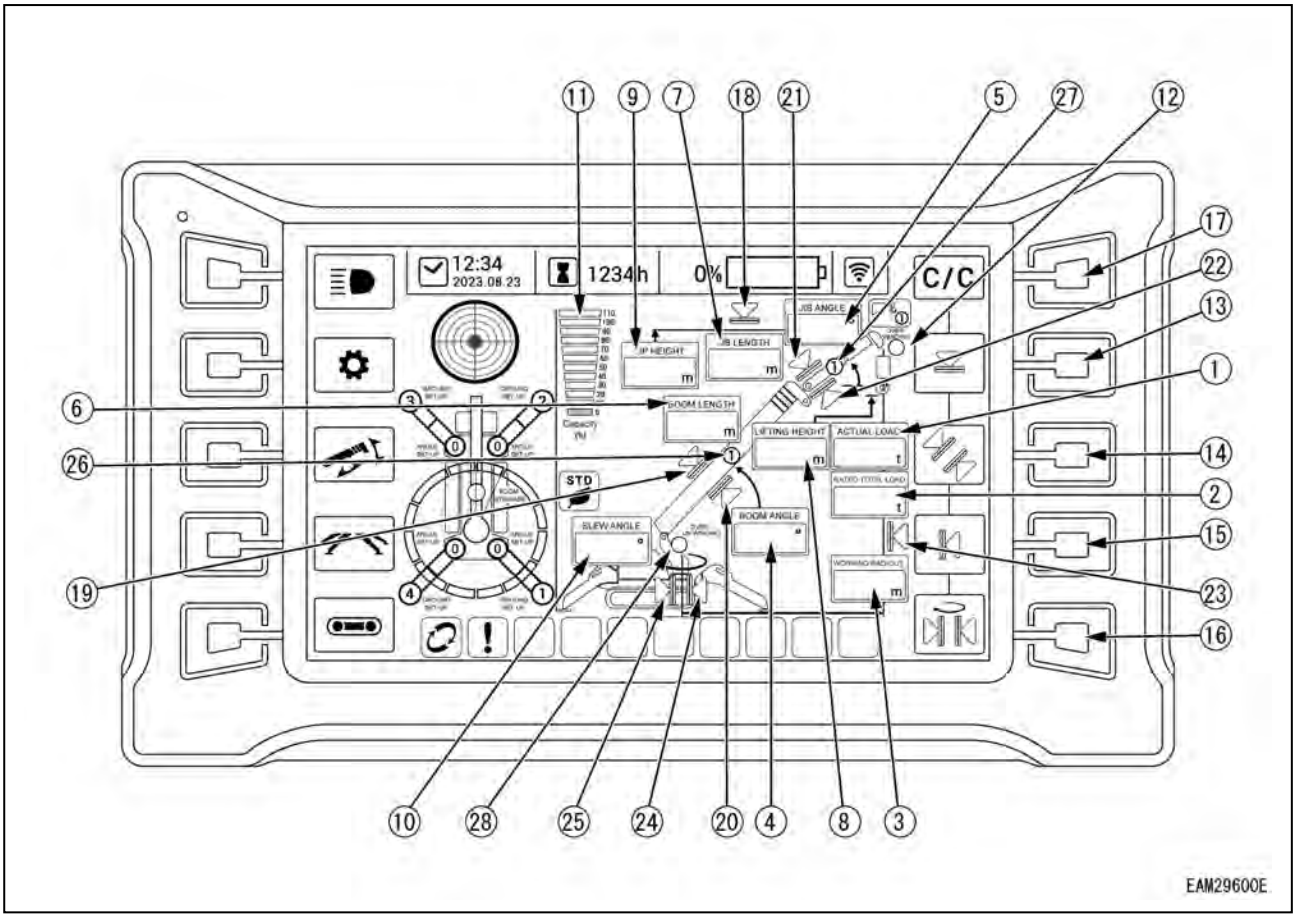
⚠ DANGER

Use this switch only when the boom has stopped automatically after entering the overload area during boom lowering or telescoping.
Do not use this switch to lift loads off the ground under normal conditions. Using this switch to lift loads off the ground may damage the machine or cause toppling or other serious accidents.



4.4.4 The moment limiter's functionality

4.4.4.1 Moment limiter display



(1) Actual load display
(2) Rated total load display
(3) Working radius display
(4) Boom angle display
(5) Jib angle display
(6) Boom length display
(7) Jib length display
(8) Lifting height display
(9) Tip height display
(10) Slewing angle display
(11) Load factor display
(12) Overwinding display
(13) Lifting height upper limit switch
(14) Boom/jib angle upper limit/lower limit switch
(15) Working radius upper limit switch
(16) Slewing angle limiter switch
(17) Setting confirmation / canceling switch
(18) Boom/jib height upper limit display
(19) Boom angle upper limit display
(20) Boom angle lower limit display
(21) Jib angle upper limit display
(22) Jib angle lower limit display
(23) Working radius upper limit display
(24) Right (clockwise) slewing angle limiter display
(25) Left (counterclockwise) slewing angle limiter display
(26) Display of the number of boom sections
(27) Display of the number of jib sections
(28) Over un-winding display

4.4.5 Description of each of the moment limiter displays

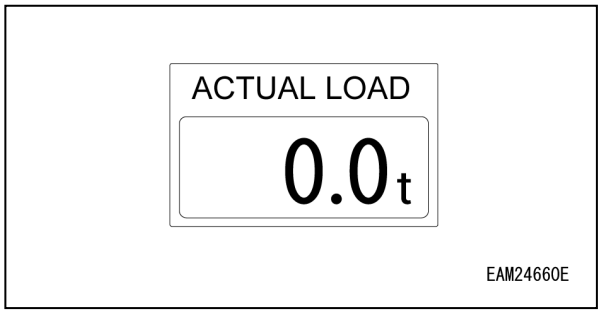
In each item, the number for the corresponding moment limiter display area is stated.

☞ When the jib is mounted, if the jib's raising angle is a forbidden work angle, the actual load, the load ratio, etc. are no longer displayed, but this is not an anomaly. Because the crane job is not possible, the actual load, the load ratio, etc. are not displayable.

[1] Actual load display (1)

Continually displays the actual load of the hoisted load during crane operations.

The actual load equals the total weight of the hook, hoisting attachment, and hoisted load. When no load is hoisted, it is normal that "0.0" to "0.2" is displayed. Contact us or our sales service agency if outside this range.



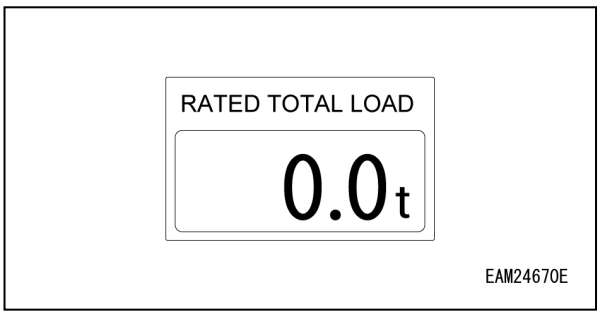
☞ Due to the structure of load detection, a numerical value of actual load display changes when the boom is raised and lowered. Although the numerical value of the actual load changes on a higher side when boom raising operation is performed, this is not a fault.

☞ When the crane stops, the numerical value of actual load display changes if there is slewing of load.

☞ When the jib angle is less than -91.5°, the figures are no longer displayed, but this is not an anomaly.

[2] Rated total load display (2)

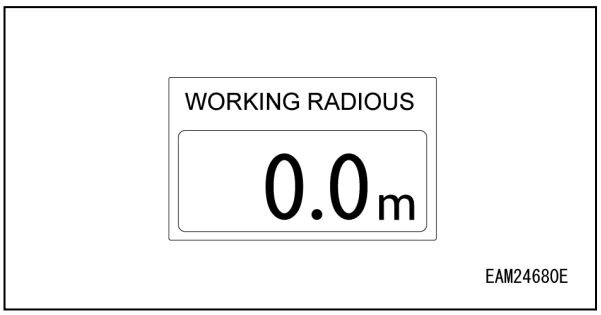
The rated total load (i.e. total weight of hook, hoisting attachment, and hoisted load) which the crane can currently hoist is displayed. It is calculated according to the conditions including the number of falls of the hook and the working radius.



[3] Working radius display (3)

The current working radius is continually displayed during crane operations.

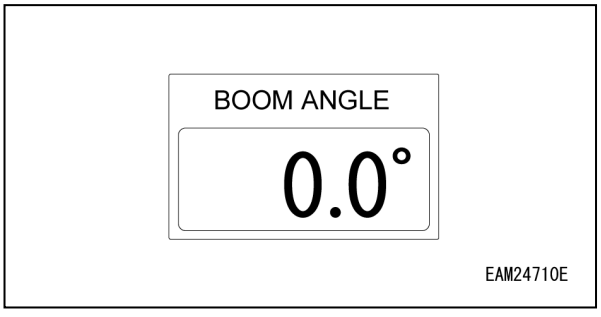
The working radius refers to the horizontal distance from the centre of slewing of the crane to the centre of the hook. The amount of deflection of the boom due to the load is not included.



[4] Boom angle display (4)

The current boom angle is continually displayed during crane operations.

The boom angle refers to the angle between the boom and horizontal line.

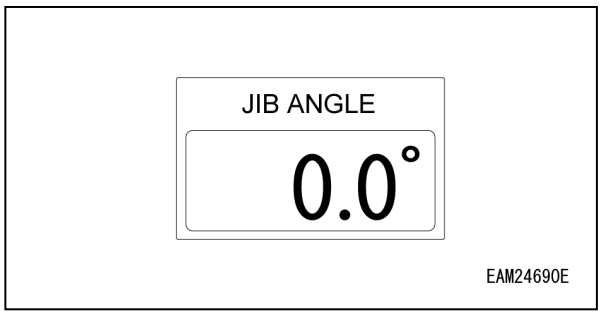


[5] Jib angle display (5)

The current boom jib is continually displayed during crane operations.

The jib angle refers to the angle between the boom and horizontal line.

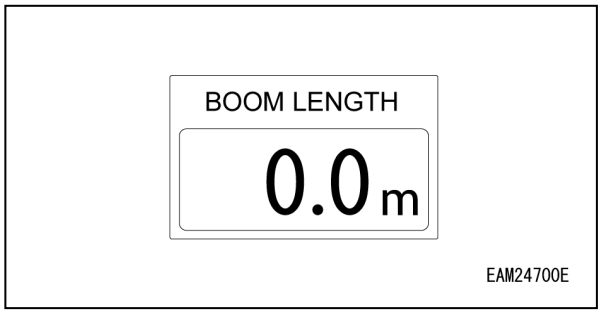
The jib angle even changes during a boom raising or lowering operation.



[6] Boom length display (6)

The current boom length is continually displayed during crane operations.

The boom length refers to the distance from the base pin of the boom to the sheave pin of the tip boom.

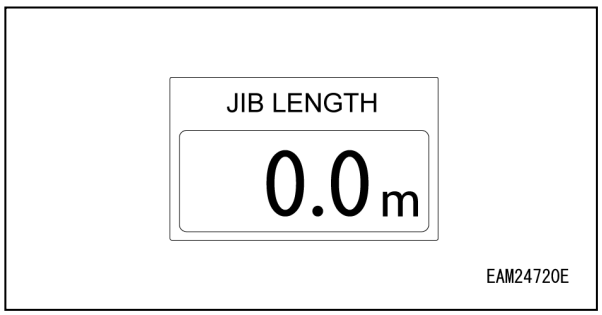


[7] Jib length display (7)

The current jib length is continually displayed during crane operations.

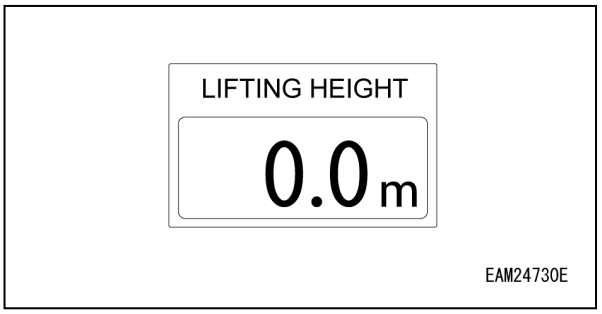
The jib length refers to the following distances:

- From the base pin of the jib to the center of the load sheave pin at the tip (single-fall hook block)
- From the base pin of the jib to the installation part of the shackle at the tip (fixed hook)



[8] Lifting height display (8)

The maximum lifting height for the current boom or jib state is continually displayed during crane operations.
The lifting height refers to the vertical distance from the ground to the tip of the hook.

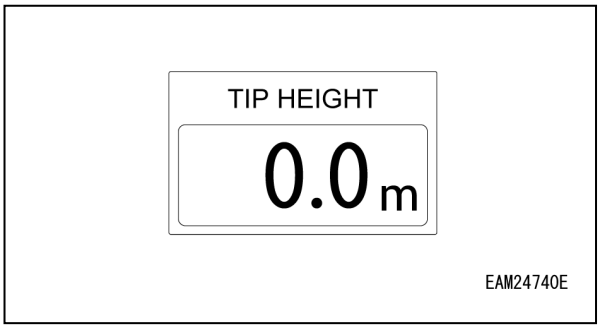


☞ The lifting height display is not a value expressing the current hook position. It indicates the lifting height when hoisting up the hook block up to the overwind detection state.

[9] Tip height display (9)

The current height to the tip of the boom or jib is continually displayed during crane operations.

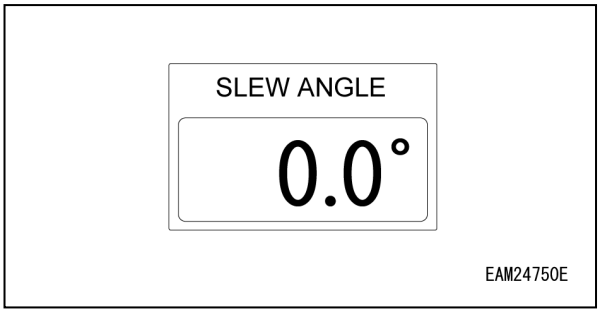
The boom/jib height refers to the vertical distance from the ground to the highest point of the boom or jib.



[10] Slewing angle display (10)

Displays the current slew angle when the crane is being operated.

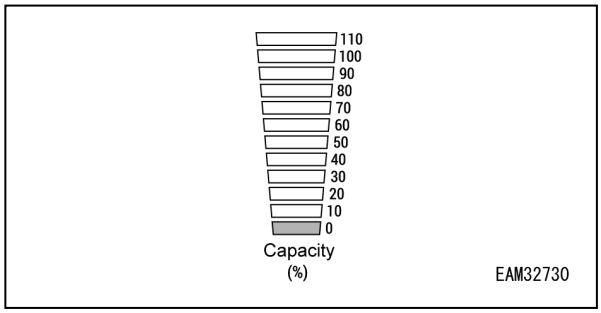
The slew angle refers to the angle through which the boom slews from the stowage position (0°).



[11] Load factor display (11)

The load factor state of the moment limiter load is illuminated on the bar according to the load factor change.

Load factor display 100 to 110 (load factor “100% or more”)	Red
Load factor display 90 (load factor “90 to less than 100%”)	Yellow
Load factor display 0 to 80 (load factor “less than 90%”)	Green

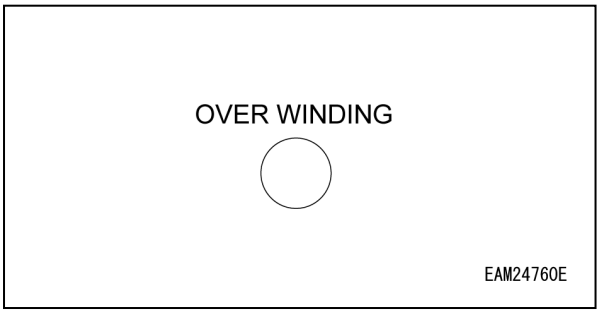


☞ When the jib angle is less than -91.5°, the load factor is no longer displayed, but this is not an anomaly.

[12] Overwinding display (12)

During a crane job, a red light blinks if the hook block is in an overwound state, and an overwinding warning is issued, then the hook block hoisting up, boom extension, and jib extension operations are automatically stopped.

In addition, during the hook block stowing operation, the red light blinks even when the hook block is in the stowed state, but this is not an anomaly.

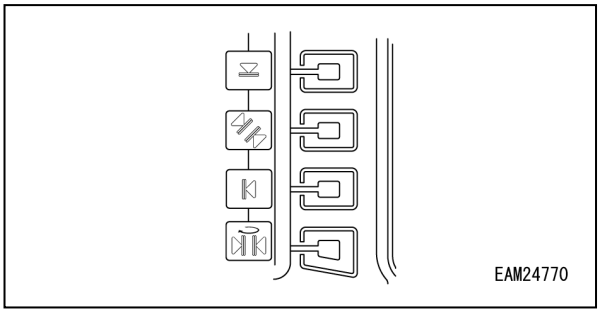


[13] Lifting height upper limit switch (13)
Boom/jib height upper limit display (18)
Boom/jib angle upper limit/lower limit switch (14)
Boom angle upper limit display (19)
Boom angle lower limit display (20)
Jib angle upper limit display (21)
Jib angle lower limit display (22)
Working radius upper limit switch (15)
Working radius upper limit display (23)
Slewing angle limiter switch (16)
Right (clockwise) slewing angle limiter display (24)
Left (counterclockwise) slewing angle limiter display (25)

Operating limits can be set in cases in which the operating range is restricted by moving the boom to the actual operating range limit to be set and holding down the corresponding switch.

Once configured, the display changes color from blue to orange.

If it is canceled, perform the long press again.

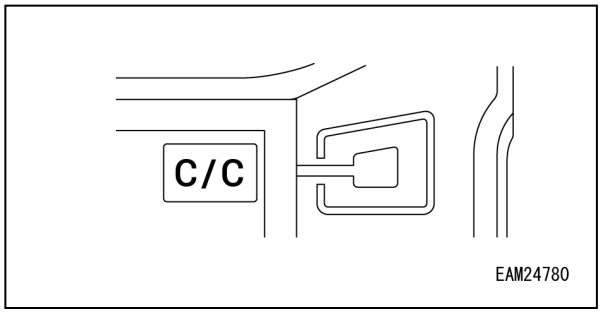


☞ Pressing the boom/jib angle upper limit/lower limit switch changes the locations to be regulated. For details, refer to “5.8.13.2 Setting/Cancelling the upper/lower limit of the angle of the boom or jib.”

[14] Setting confirmation / canceling switch (17)

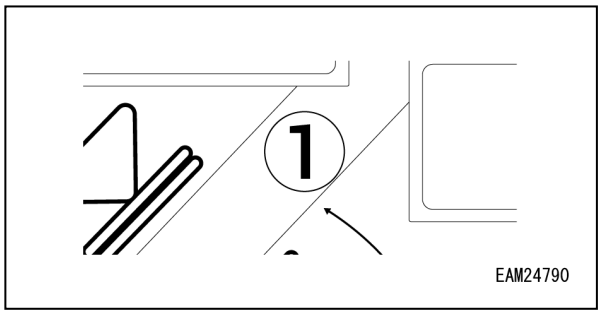
You can check the operating range limit currently set. Pressing the switch displays the setting for approximately 5 seconds.

You can clear all operating range limit settings. Hold down the switch to clear all settings.



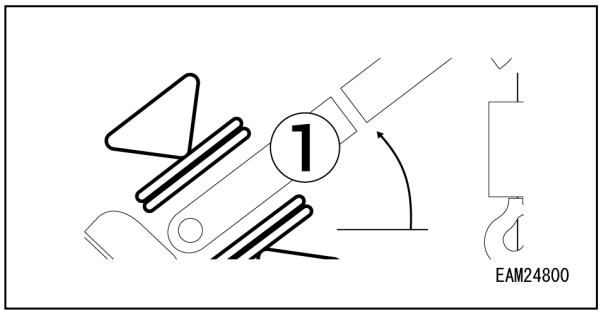
[15] Display of the number of boom sections (26)

Displays the current number of boom sections when the crane is being operated.



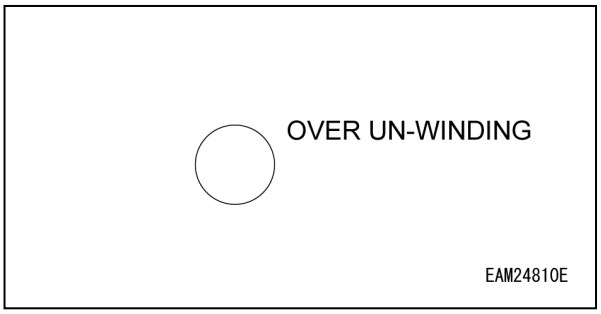
[16] Display of the number of jib sections (27)

Displays the current number of jib sections when the crane is being operated.



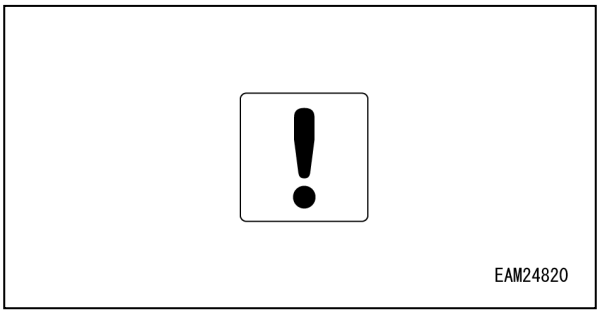
[17] Over un-winding display (28)

During the crane operations, if the hook block is wound down and the length of the wire wound out from the winch drum reaches its maximum, then the hoisting down operation is stopped and the light is lit red.

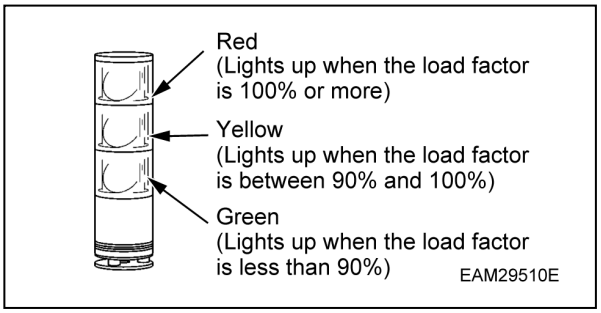


4.4.5.1 Moment limiter anomaly occurrence display

If anomalies, disconnections, etc. occur with the boom angle sensor, the jib angle sensor, the boom length sensor, the jib length sensor, or the pressure sensor, then the icon at the bottom left of the monitor lights up.



4.4.5.2 Overload alarm



A. Safe area

(the actual load is less than 90% of the rated total load)

- The working status lamp blinks green.

B. Forecast alarm

(the actual load is from 90% to less than 100% of the rated total load)

- The working status lamp blinks yellow.
- The alarm issues an intermittent “peee, peee” sound.

C. Limit alarm

(the actual load is 100% or more of the rated total load)

- The working status lamp blinks red.
- The alarm issues a continuous “peee” sound.
- The boom’s dangerous operations stop automatically.

D. Limit alarm automatic stop cancellation

When an automatic stop has occurred, promptly perform a restoration operation from the overload.

For details of restoration operations, refer to “4.4.3.2 Restoration operation from an automatic stop.”

4.4.5.3 Boom lower limit regulation

For the stability of the actual load display and to prevent interference, the boom lowering operation near the horizontal is automatically stopped.

4.4.5.4 Boom upper limit regulation

For stability of the actual load display, the boom raising operation in front of the boom derricking cylinder’s stroke end is automatically stopped.

The boom raising operation is automatically stopped depending on the boom length and hook block specification so that the hook block does not interfere with the boom and jib.

4.4.6 Moment limiter override switch

⚠ DANGER

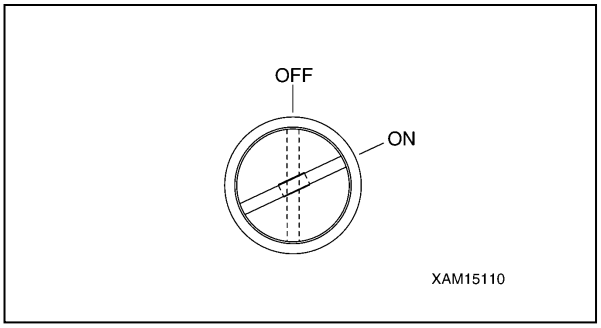
The moment limiter override switch is a function that disables the moment limiter function and each of the interlocks.
For 3 minutes after turning this switch ON, the moment limiter does not cause an automatic stop and the crane is in an extremely dangerous condition. If the crane job is continued in this condition, it may cause a serious accident, such as the suspended load falling, boom damage, or the machine tipping, which could lead to death or serious injury.
Only use this switch when the moment limiter is broken down or the crane is being load tested. During normal crane operations, take out the switch's key.
In particular, definitely do not use it any of the following ways.

- **When the load is hoisted, do not hoist up the hook block with this switch turned to ON.**
  Even if the weight of the load exceeds the rated total load, the moment limiter will not detect it. This may cause an accident such as the suspended load falling, the boom and jib breaking due to the winch wire rope snapping, or the machine tipping-over.
- **During the crane job, if it is detected that the moment limiter has exceeded the rated total load, after automatically stopping the operation, while this switch is set in the ON position, do not perform dangerous lateral operations. Doing so may cause the boom and jib to break or to tip-over, etc.**
- **When stowing the hook block, use the hook stowing switch. If the moment limiter override switch is used to perform an operation to hoist up the hook block, it may cause damage to the boom and jib or the hook block, cutting of the wire rope, the load to drop, etc.**

⚠ CAUTION

- **When the override switch is ON, the boom will lower to under 0° (level). When the boom angle is less than 0° (level) and the outriggers are stowed, the boom and outriggers will come into contact with each other, potentially causing damage to the machine.**
- **If you slew widely with the jib stowed, the jib and cover will come into contact with each other, causing possible damage.**

Only use the moment limiter override switch when the moment limiter has malfunctioned or the crane load test is being conducted.

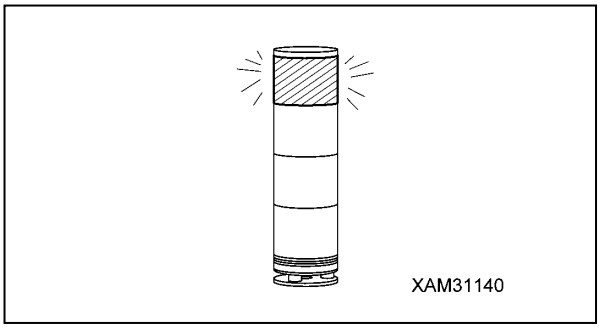


- ON (Override) : insert the key into the switch, and if it is turned to "ON" once, the moment limiter stop function is canceled.
- OFF (normal) : the key can be pulled out in this position.

☞ If the moment limiter function is canceled, the machine is in the following state.
- The working status lamp blinks red.
- The switch box LED lights up.
- The buzzer sounds intermittently.
- The speed of all machine operations is reduced.
- According to the battery specification, the motor speed at 1,700 rpm.

Once the switch is turned to ON, even if it is returned to the OFF position, if three minutes have not passed, the moment limiter stop function is in a canceled state.

However, depending on the machine status, these operations may vary.



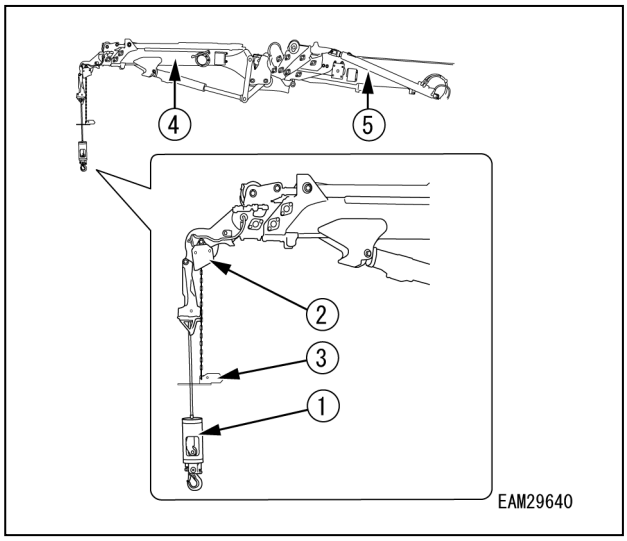
If the starter switch key is turned to OFF, the override function is also turned OFF (normal).

4.4.7 Overwinding detector

IMPORTANT

When hoisting the hook block, be careful about the space between the hook block and the boom or jib.
In addition, even if the boom or jib is extended, the hook block can be wound up. Always check the hook block's height when extending the boom or jib.

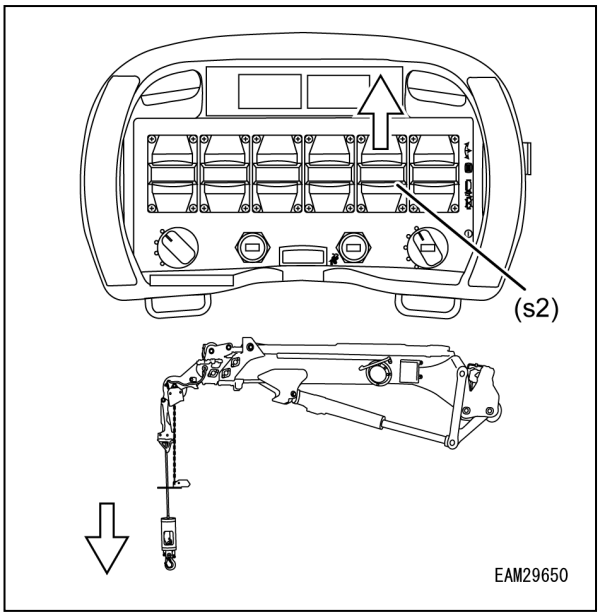
[When a single-fall hook block is mounted (with the jib mounted)]



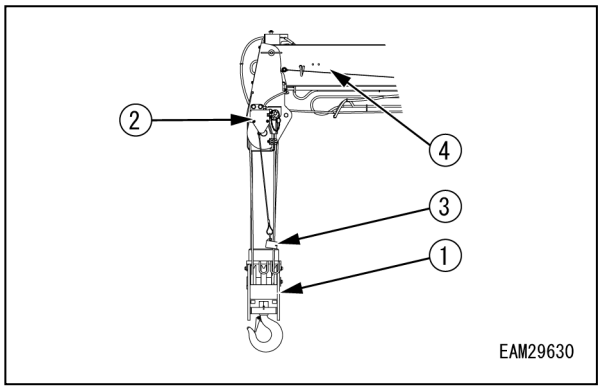
(1) Hook block
(2) Overwinding detector
(3) Weight
(4) Jib
(5) Boom

The overwinding detector automatically stops the hook block's (1) hoisting up and the jib's (4) and boom's (5) extension or raising operations if the hook block (1) is approaching the jib (4) tip and the weight (3) is pushed up, when the hook block (1) has been wound up, or when the jib (4) and boom (5) have been extended or when they have been raised. It also ensures any other operations are not possible. Only when the hook block hoisting up operation, the jib (4) and boom (5) extending and raising operations are performed, the buzzer is continuously sounded, and an overwinding warning is issued.

When the alert buzzer is sounded, immediately move the remote control S2 lever (s2) to the "winch hoist up" side (push to the back) and then lower the hook block (1).



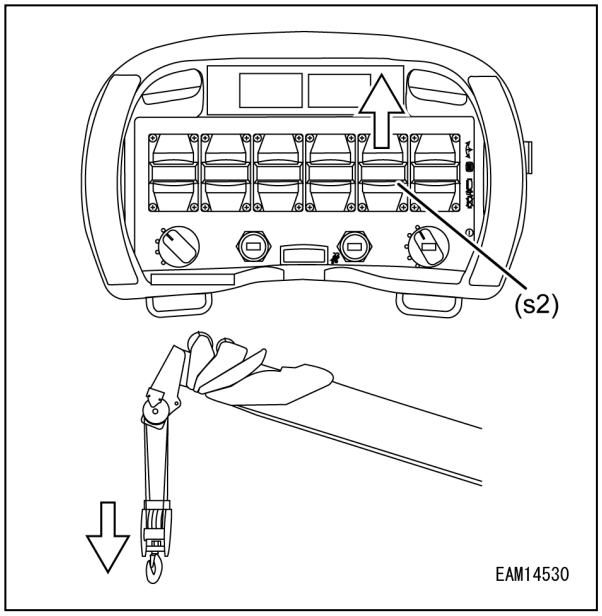
[When a 4-fall hook block is mounted (with the jib unmounted)]



(1) Hook block
(2) Overwinding detector
(3) Weight
(4) Boom

The overwinding detector automatically stops the hook block's (1) hoisting up, the boom's (4) raising, and the boom's (4) extension operations if the hook block (1) is approaching the boom (4) tip and the weight (3) is pushed up, when the hook block (1) has been wound up, or when the boom (4) has been raised or the boom (4) has been extended. It also ensures any other operations are not possible. Only when the hook block hoisting up, the boom (4) raising, or the boom extension operations are performed, the buzzer is continuously sounded, and an overwinding warning is issued.

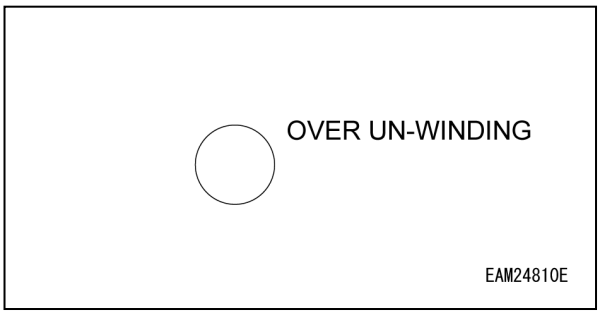
When the alert buzzer is sounded, immediately move the remote control S2 lever (s2) to the "winch hoist up" side (push to the back) and then lower the hook block (1).



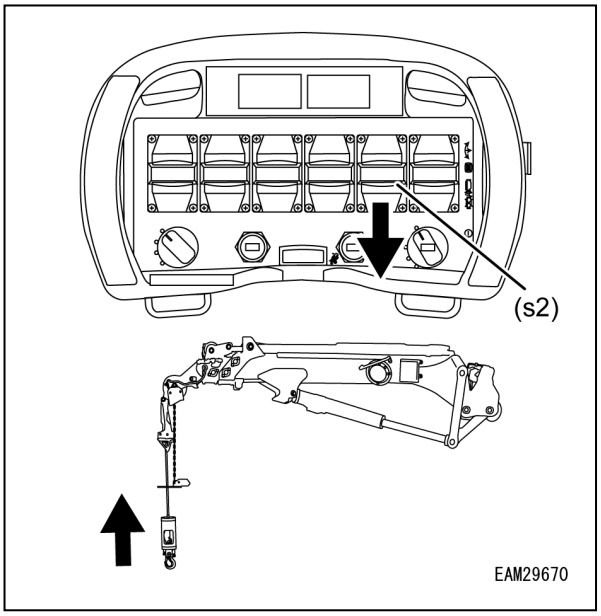
4.4.8 Over un-winding detector

If the hook block is hoisted down and there is less wire rope inside the winch drum, the device is in the following state:

- The monitor's over-lowering display is lit red.
- If the hook block hoisting down operation is performed, the alert buzzer will sound intermittently.
- The hook block hoisting down operation is automatically stopped.



When the hoisting down operation is stopped, immediately move the radio controller S2 lever to the "winch hoisting up" side, and hoist up the hook block.



4.5 OUTRIGGER- AND CRANE-RELATED SAFETY DEVICE

4.5.1 How the safety equipment works

The safety device possesses the interlock functionality as shown in the following table.

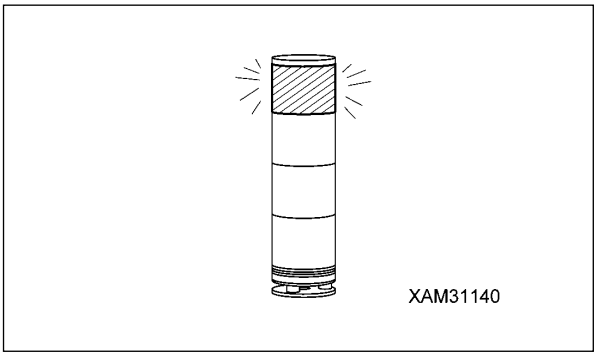
	Interlock function	Interlock function description
1	Outrigger interlock	If the boom and jib are not in a stowed state (boom and jib fully retracted, boom and jib maximally lowered, slewing stowed state), then the outriggers will not operate.
2	Crane interlock	If all four units of the outriggers are not set up in an extended state (extended and grounded), then the crane operations (telescoping, hoisting, lowering, derricking and slewing) are not possible. If the detection angle of the machine angle sensor cannot get down to less than 1.5°, then the crane operations cannot be performed.

IMPORTANT

- **After the outriggers have been set up in the extended state, if the radio controller's mode selector switch is set to the crane mode position, the crane operations are possible.**
  During the crane operations, even if one of the four outriggers is not securely set up, the working status lamp will blink to notify the user of this.
- **After the crane has been put in a stowed state, if the radio controller mode selector switch is set to the position "Outrigger lifting and grounding, extension, rotation mode," then the outrigger's setting operation and its stowing operation are possible.**
- **Even if the outriggers have been set up in an extended state, if the crane operations are not possible even when the radio controller mode selector switch is set in the "Crane mode" position, then each part of the outrigger safety devices may have defective adjustments or malfunctions.**
  In such an instance, please contact us or our sales service agency.
- **Even if the crane has been put in the stowed state, if the outriggers' setting operations and stowage operations are not possible, even if the remote control's mode selector switch is set to the position "Outrigger lifting and grounding, extension, rotation mode," then each part of the outrigger safety devices may have defective adjustments or malfunctions. In such an instance, please contact us or our sales service agency.**

4.5.2 Outrigger uninstalled warning lamp (working status lamp: red)

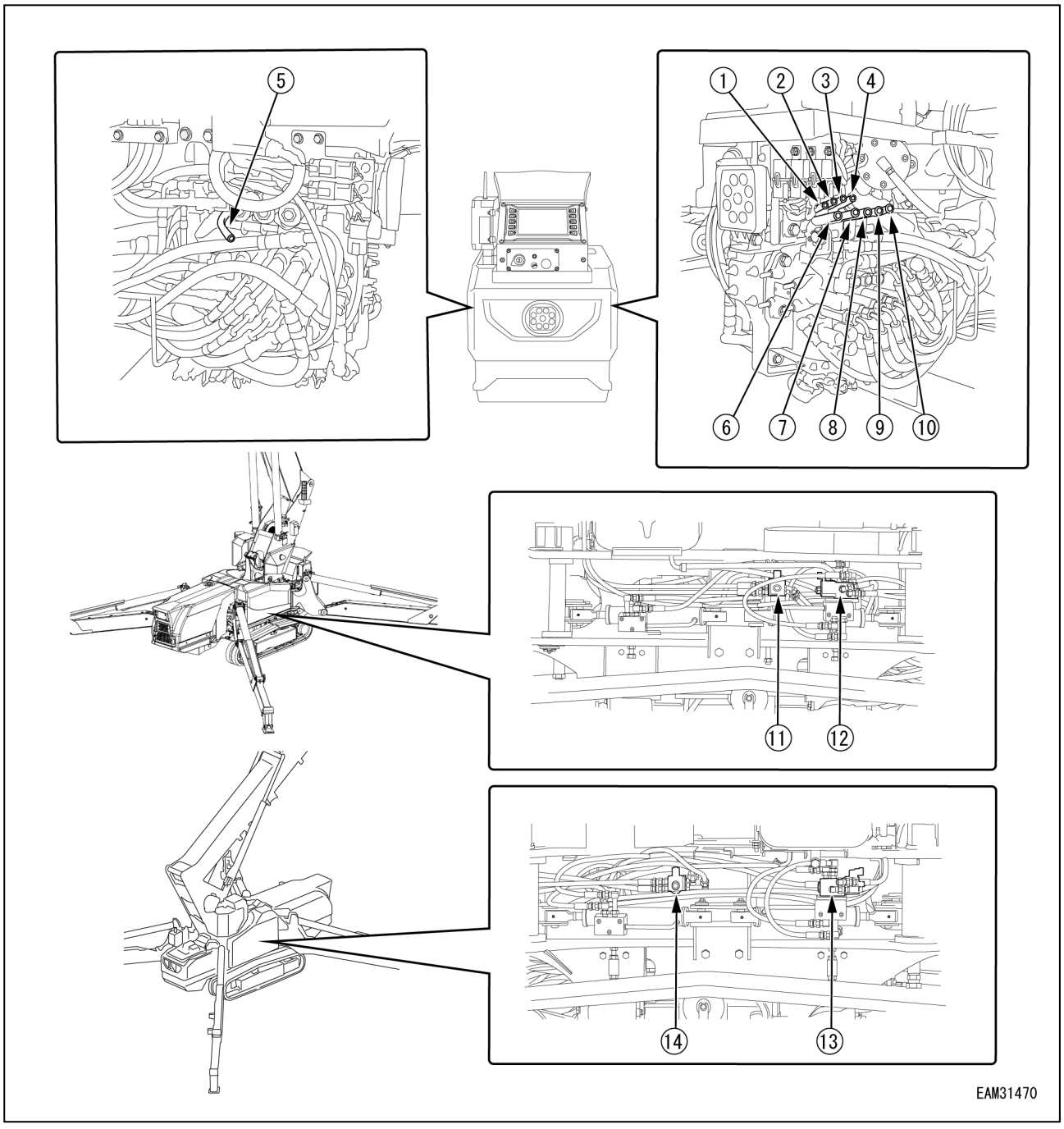
If even one of the four outriggers is not securely set up, the working status lamp will blink to notify the user of this.



☞ Even if all four outriggers are set up, if the machine tilt is large, then the working status lamp blinks red. In this instance, it is not possible to set the mode to the crane mode.

4.6 EMERGENCY CONTROL

4.6.1 Travel, outrigger operations



(1) Left crawler forward and backward lever
(2) No. 3 outrigger lifting and grounding lever
(3) No. 3 outrigger extension and rotation lever
(4) No. 4 outrigger lifting and grounding lever
(5) No. 4 outrigger extension and rotation lever
(6) No. 2 outrigger extension and rotation lever
(7) No. 2 outrigger lifting and grounding lever
(8) No. 1 outrigger extension and rotation lever
(9) No. 1 outrigger lifting and grounding lever
(10) Right crawler forward and backward lever
(11) No. 3 outrigger extension/rotation switching valve
(12) No. 4 outrigger extension/rotation switching valve
(13) No. 2 outrigger extension/rotation switching valve
(14) No. 1 outrigger extension/rotation switching valve

For details of the emergency operations, refer to section “5.12 EMERGENCY OPERATION.”

4.6.1.1 Description of each emergency control section

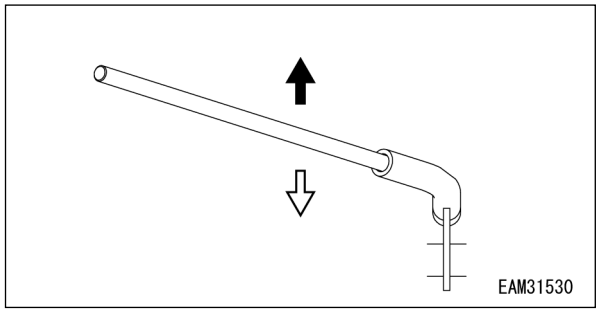
⚠ CAUTION

- **The up and down action of the emergency operation lever and the up and down action of the radio controlled lever are not necessarily aligned.**
- **Conduct the operation only after confirming the direction of the machine's action when the lever is moved up and down.**

[1] Left crawler forward and backward lever (1)

This is used when operating the left crawler.

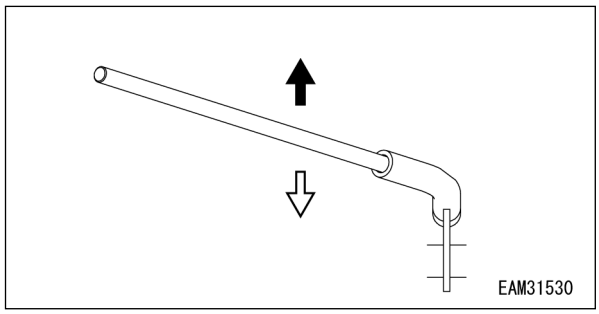
- Forward: push the lever down.
- Backward: pull the lever up.



[2] No. 3 outrigger lifting and grounding lever (2)

This is used when lifting and grounding the No. 3 outrigger.

- Lift: pull the lever up.
- Ground: push the lever down.

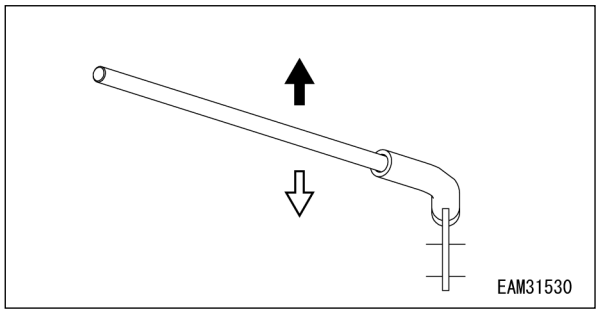


[3] No. 3 outrigger extension/rotation lever (3)

This is used when extension or rotation the No. 3 outrigger.

- Retract / rotation inward: pull the lever up.
- Extend / rotation outward: push the lever down.

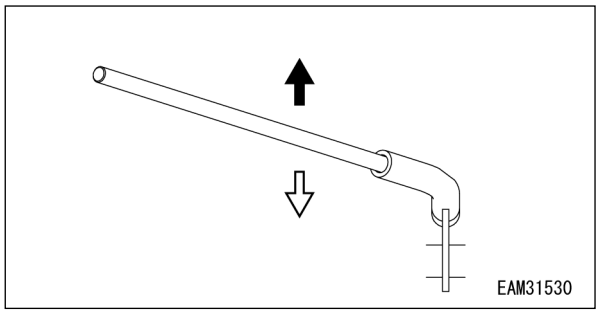
☞ When conducting the rotation operation, it is necessary to press the spool of the outrigger rotation/extension switch valve.



[4] No. 4 outrigger lifting and grounding lever (4)

This is used when lifting and grounding the No. 4 outrigger.

- Lift: pull the lever up.
- Ground: push the lever down.

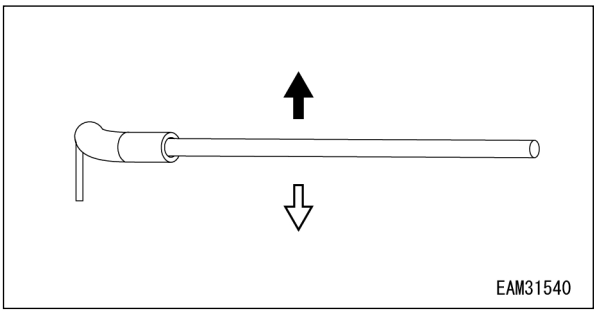


[5] No. 4 outrigger extension and rotation lever (5)

This is used when extension or rotation the No. 4 outrigger.

- Extend / rotation outward: pull the lever up.
- Retract / rotation inward: push the lever down.

☞ When conducting the rotation operation, it is necessary to press the spool of the outrigger extension/rotation switch valve.

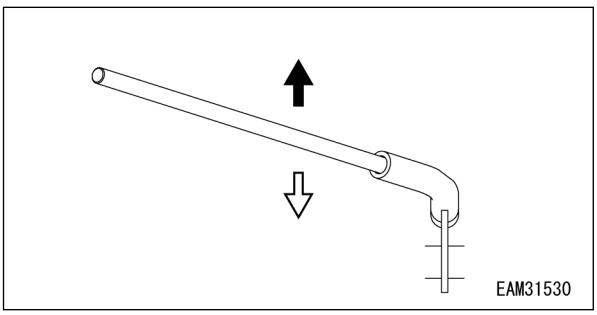


[6] No. 2 outrigger extension and rotation lever (6)

This is used when extension or rotation the No. 2 outrigger.

- Extend / rotation outward: pull the lever up.
- Retract / rotation inward: push the lever down.

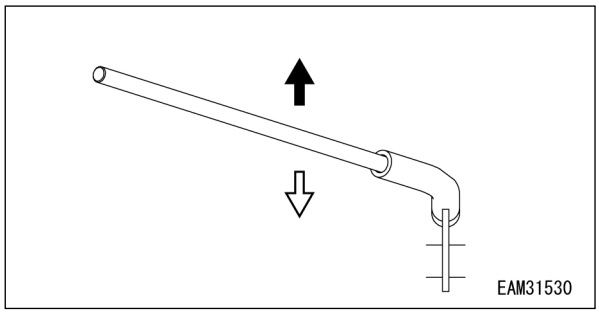
☞ When conducting the rotation operation, it is necessary to press the spool of the outrigger extension/rotation switch valve.



[7] No. 2 outrigger lifting and grounding lever (7)

This is used when lifting and grounding the No. 2 outrigger.

- Lift: pull the lever up.
- Ground: push the lever down.

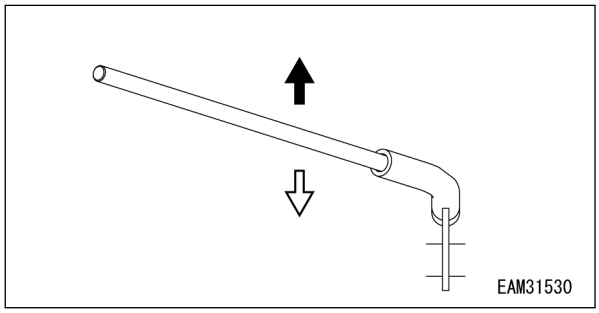


[8] No. 1 outrigger extension and rotation lever (8)

This is used when extension or rotation the No. 1 outrigger.

- Extend / rotation outward: pull the lever up.
- Retract / rotation inward: push the lever down.

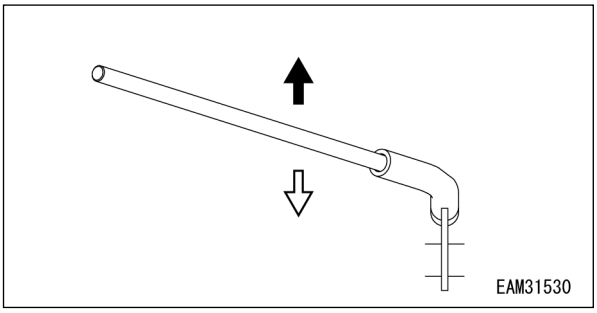
☞ When conducting the rotation operation, it is necessary to press the spool of the outrigger extension/rotation switch valve.



[9] No. 1 outrigger lifting and grounding lever (9)

This is used when lifting and grounding the No. 1 outrigger.

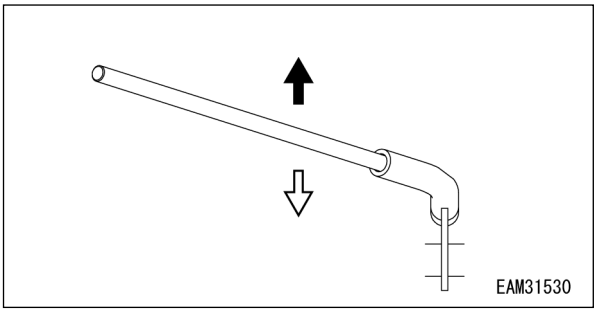
- Lift: pull the lever up.
- Ground: push the lever down.



[10] Right crawler forward and backward lever (10)

This is used when operating the right crawler.

- Forward: pull the lever up.
- Backward: push the lever down.

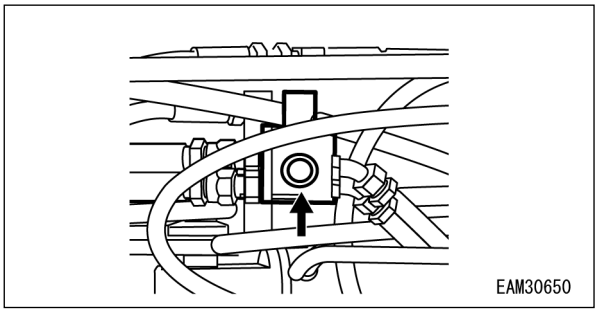


[11] Outrigger extension/rotation switching valves (11) (12) (13) (14)

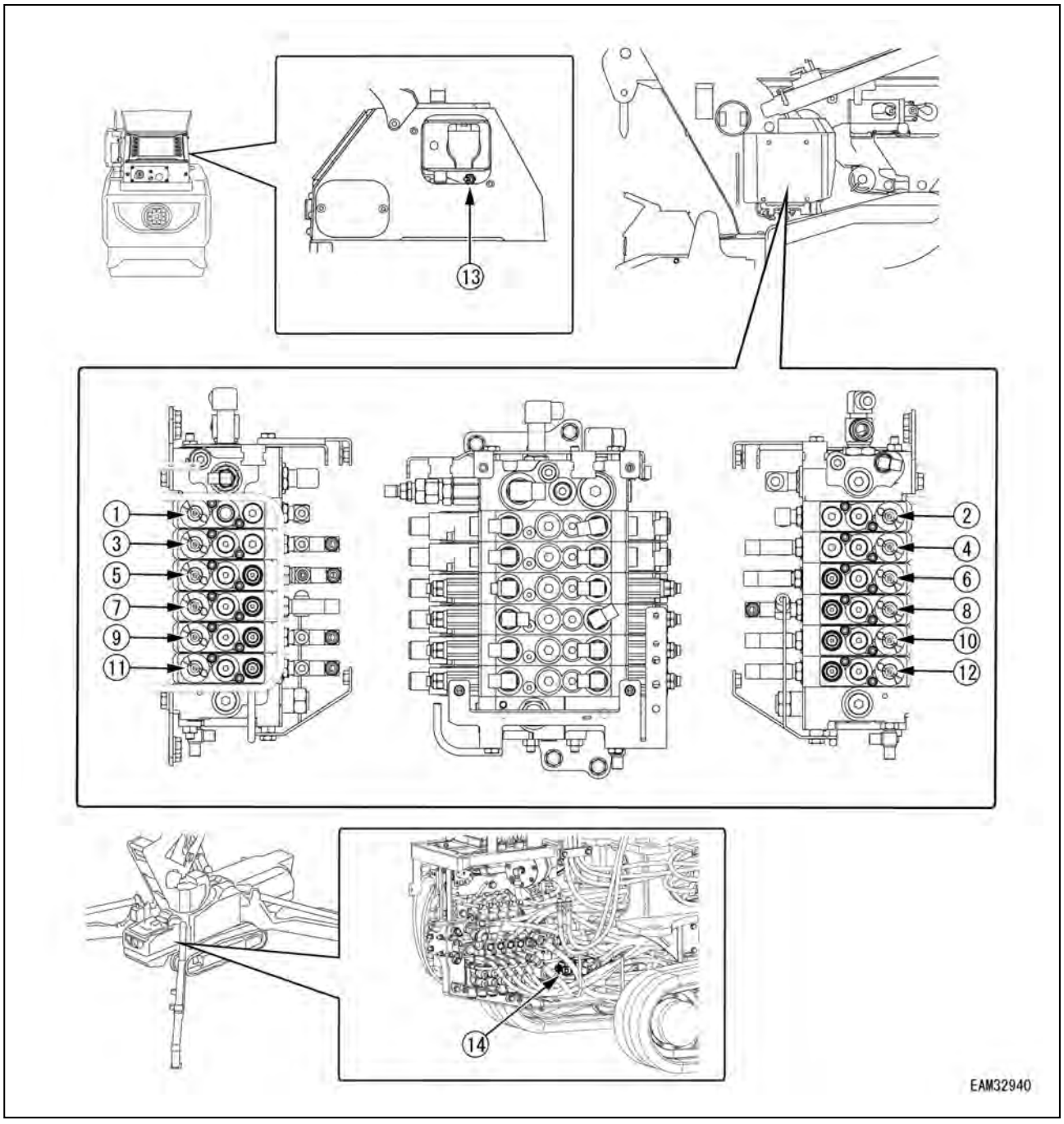
⚠ WARNING

- **The valves switch only while the spools are being pressed. Since operating a lever and operating a valve is a two-person job, the two operators should signal each other, and so on, to conduct the operations safely.**
- **Sudden operations may lead to a serious accident.**

The valves are switched depending on whether the extension action of each outrigger extension/rotation lever is being performed, or whether the rotation action is being performed. The normal state is the extension action state.



4.6.2 Crane operation

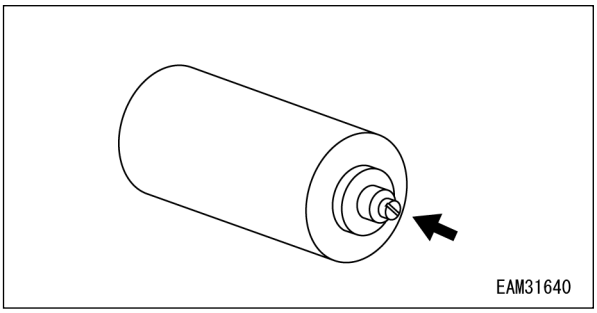


(1) Counterclockwise slewing / variable gauge widening control valve
(2) Clockwise slewing / variable gauge reducing control valve
(3) Jib extension control valve
(4) Jib retraction control valve
(5) Jib lowering control valve
(6) Jib raising control valve
(7) Boom lowering control valve
(8) Boom raising control valve
(9) Boom extension control valve
(10) Boom retraction control valve
(11) Winch hoisting down control valve
(12) Winch hoisting up control valve
(13) Slewing break release toggle switch
(14) Crane slewing / variable gauge switching valve

For details of the emergency operations, refer to section “5.12 EMERGENCY OPERATION.”

4.6.2.1 Description of each emergency control section

By pressing each control valve, the operation corresponding to each control valve's action can be performed.



[1] Counterclockwise slewing / variable gauge widening control valve (1)

⚠ CAUTION

When performing a slewing operation, be careful that the crane does not catch the surrounding covers, etc.

By pressing the valve with the slewing break release toggle switch (13) in the ON state, the crane's counterclockwise slewing operation can be performed.

☞ While switching the crane slewing / variable gauge switching valve (14), the variable gauge can be widened by pressing the valve.

[2] Clockwise slewing / variable gauge reducing control valve (2)

⚠ CAUTION

When performing a slewing operation, be careful that the crane does not catch the surrounding covers, etc.

By pressing the valve with the slewing break release toggle switch (13) in the ON state, the crane's clockwise slewing operation can be performed.

☞ While switching the crane slewing / variable gauge switching valve (14), the variable gauge can be reduced by pressing the valve.

[3] Jib extension control valve (3)

By pressing the valve, the jib's extension operation can be performed.

[4] Jib retraction control valve (4)

By pressing the valve, the jib's retraction operation can be performed.

[5] Jib lowering control valve (5)

By pressing the valve, the jib's lowering operation can be performed.

[6] Jib raising control valve (6)

By pressing the valve, the jib's raising operation can be performed.

[7] Boom lowering control valve (7)

By pressing the valve, the boom's lowering operation can be performed.

[8] Boom raising control valve (8)

By pressing the valve, the boom's raising operation can be performed.

[9] Boom extension control valve (9)

By pressing the valve, the boom's extension operation can be performed.

[10] Boom retraction control valve (10)

By pressing the valve, the boom's retraction operation can be performed.

[11] Winch hoisting down control valve (11)

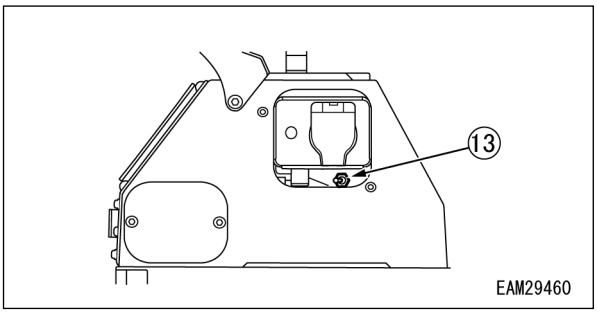
By pressing the valve, the winch's hoisting down operation can be performed.

[12] Winch hoisting up control valve (12)

By pressing the valve, the winch's hoisting up operation can be performed.

[13] Slewing break release toggle switch (13)

While the toggle switch is in the ON state, the emergency slewing operation's break is released.

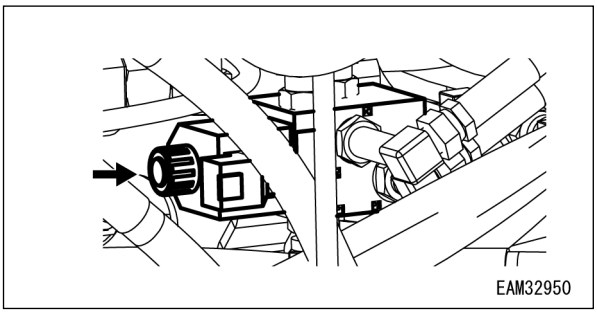


[14] Crane slewing / variable gauge switching valve (14)

⚠ WARNING

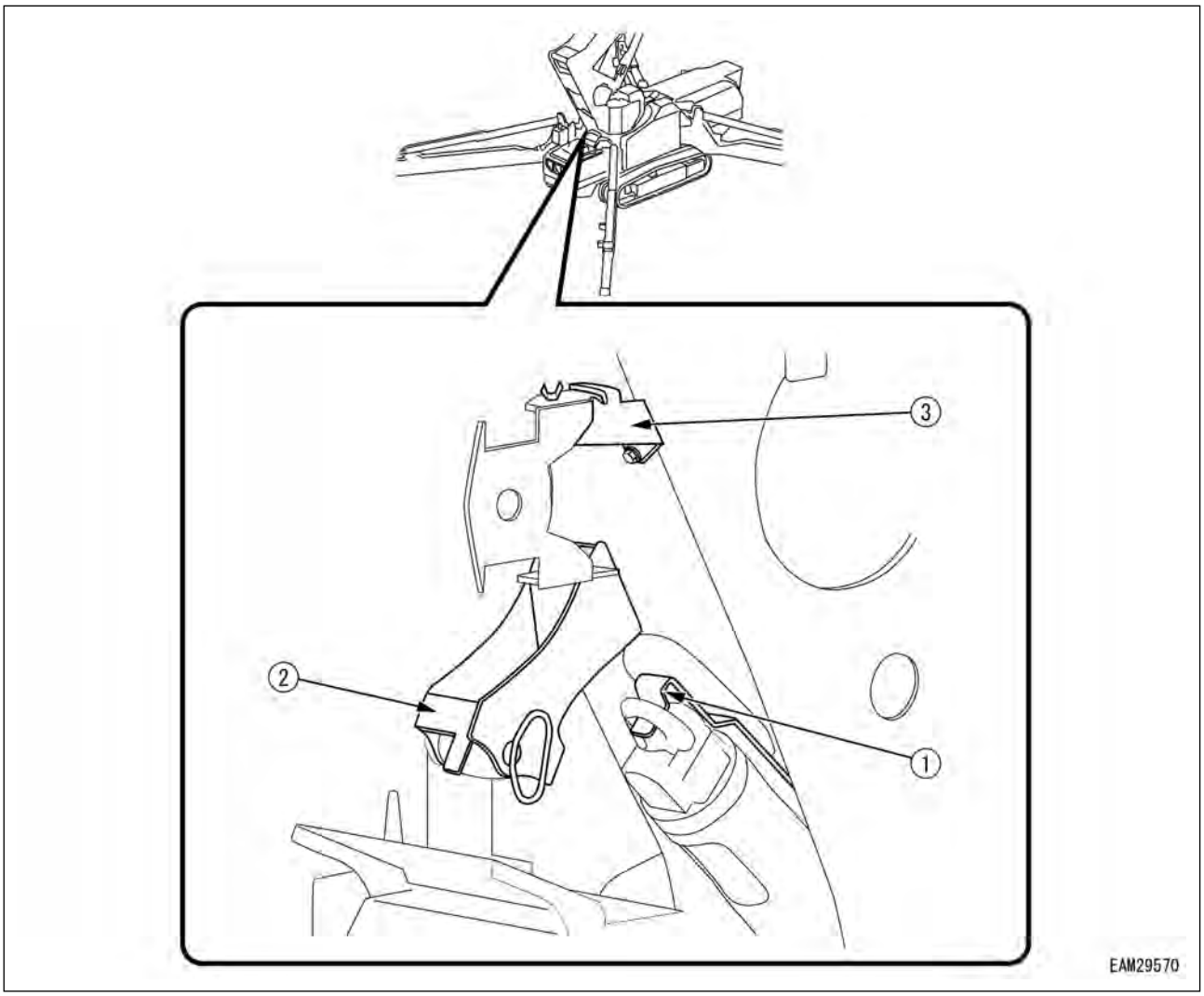
- **Valves can be switched only when the spool is pressed. Since this is a two-person job requiring a control valve operator and a switching valve operator, the operators should ensure safe performance of the operation by signaling to each other or by other means.**
- **Careless operation may lead to a serious accident.**

This valve switches between performing the crane slewing action of the counterclockwise (or clockwise) slewing / variable gauge widening (or reducing) control valve and performing the variable gauge action. In the normal state, the crane slewing action is performed.



4.7 OPTIONS

4.7.1 Stowage bracket



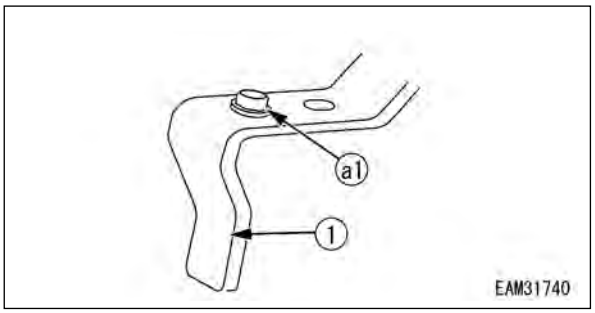
(1) Single-fall hook block stowage bracket
(2) Fixed hook / jib winch head stowage bracket
(3) Protective weight stowage bracket

[1] Single-fall hook block stowage bracket (1)

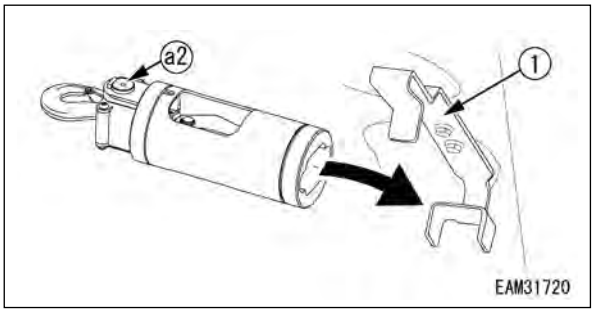
This bracket can stow a single-fall hook block.

The stowing procedure is as follows:

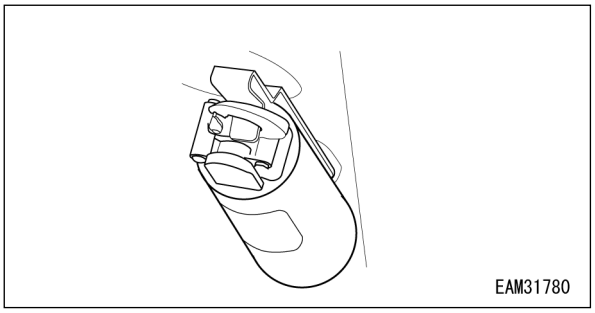
1. Remove the hexagonal sems bolt (a1) that is fixed to the top of the stowage bracket (1).



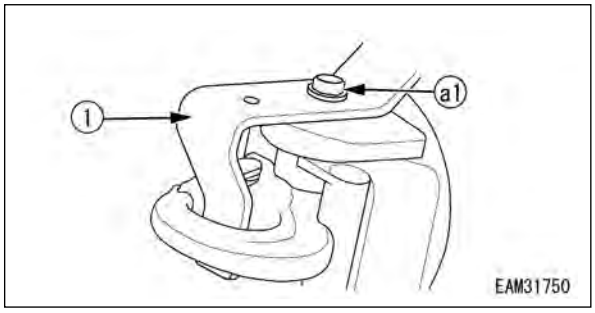
2. Align and fit the single-fall hook block to the stowage bracket (1) so that the hook side comes up.
When this happens, make sure that the M8 tap (a2) is on the stowage bracket side (top surface).



3. Align and fit the single-fall hook block so that the stowage bracket fits inside the hook.



4. Align the stowage bracket (1) and the M8 tap (a2), and fix them with the hexagonal sems bolt (a1).

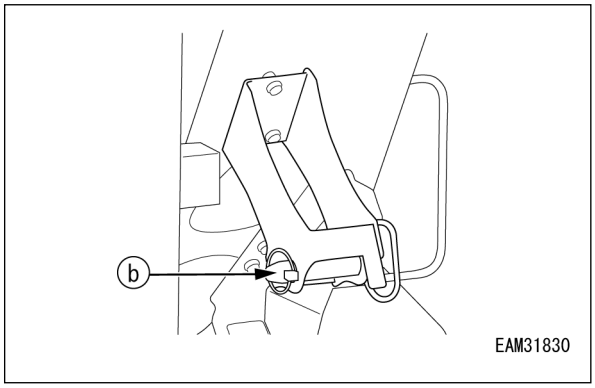


[2] Fixed hook / jib winch head stowage bracket (2)

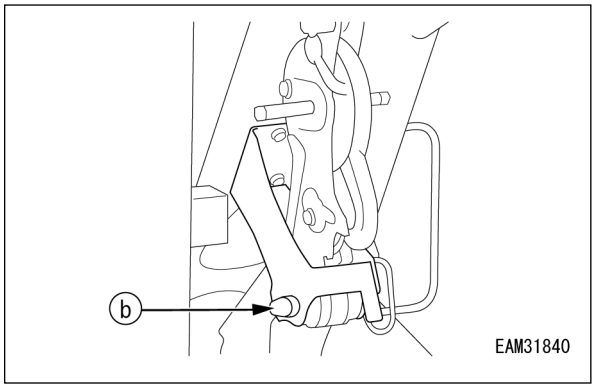
This bracket allows you to stow the fixed hook and the jib winch head.

The stowing procedure is as follows:

1. Remove the position pin (b) inserted into the stowage bracket.



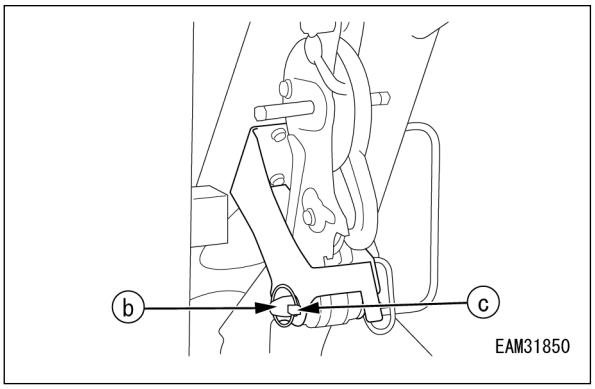
2. Fit the fixed hook or jib winch head into the stowage bracket, check that it aligns with the pin hole position, and insert the position pin (b).



3. After inserting the position pin (b), lock it securely with the linchpin (c).

⚠ WARNING

- **Do not insert a finger into the pin hole in any circumstances.**
- **Align the pin with the hole position by sight.**



[3] Protective weight stowage bracket (3)

This bracket can stow the protective weight.

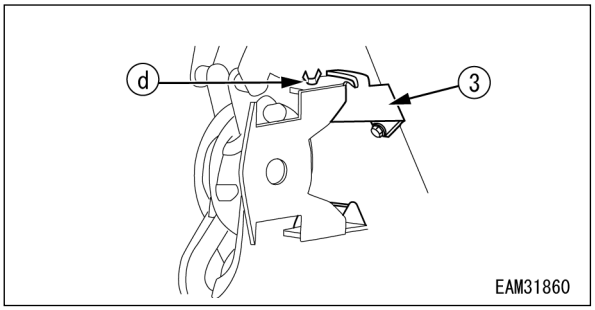
The stowing procedure is as follows:

1. Remove the wing nut and bolt (d) that are attached to the stowage bracket.

2. Hang the side of the protective weight on the stowage bracket (3) and align it to the bolt's pass-through hole.

3. Fix the stowage bracket and the protective weight with the wing nut and the bolt (d).

4. Slew the boom and confirm that the protective chain does not caught round the radio controller antenna, etc.



Chapter 5
OPERATION

5.1 PRECAUTIONS ON WORK SITE

Surveying and preparing the work site

There are many hazards in the work site that may cause a serious injury. Check the following points before you start operation to confirm that the work site is safe.

- Be careful when you work near a thatched roof, dry leaves, or dry grass because they easily catch fire.
- Check the ground and road surface of the work site to find the best manner to work there. Do not work at a place that has a danger of mudslides or rock falls.
- If the ground of the work site is sloping, level it out before you start work.
- When you work on a road, deploy a guide or set up a fence with an “Off Limits” sign to ensure the safety of vehicles and pedestrians passing by.
- Set up an “Off Limits” sign, and take a measure to keep people off the work site. Approaching the machine in operation may cause a serious injury or death by being severely hit or pinched.
- When you drive the machine along shallow water or soft ground, check its conditions beforehand such as the depth of water, flow speed, ground condition, and ground shape to avoid points that are problematic for the operation or driving.
- Do not drive or operate the machine near a cliff, road shoulder, or deep ditch because the ground may be loose. The ground may collapse by the weight and vibration of the machine, ending up with the machine tipping-over or dropping. Special caution is required after rain, blasting, and an earthquake because the ground is fragile after them.
- Ground on an embankment or near a trench may collapse by the weight and vibration of the machine, ending up with the machine tipping-over or dropping. Make the ground solid and safe before starting work.

Securing the visibility

When you travel or operate the machine with bad visibility, you cannot find obstacles near by or the work site condition, leading to a serious injury.

Strictly observe the following when you drive or operate the machine in bad visibility.

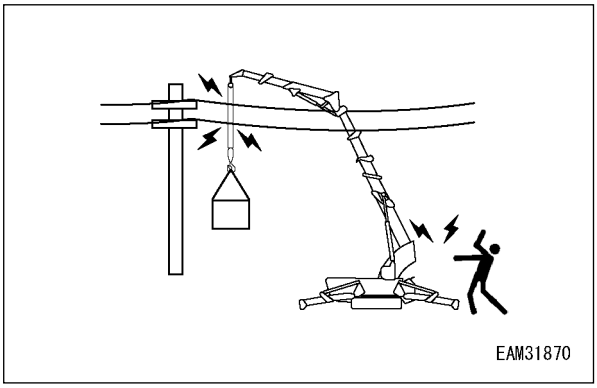
- If you cannot secure good visibility, deploy a guide as necessary. In that case, make sure that only one guide provides cues.
- In a dark location, light up the working light attached on the machine and use additional lighting apparatuses as necessary to brighten the work site.
- Suspend the operation if visibility is bad due to fog, snow, rain, or other reasons.

Reviewing cues from the guide and posted signs

- Set up signs to mark a weak road shoulder and soft ground.
  The driver should pay attention to signs and follow directions from the guide.
- All workers should understand the meanings of all cues and signs.

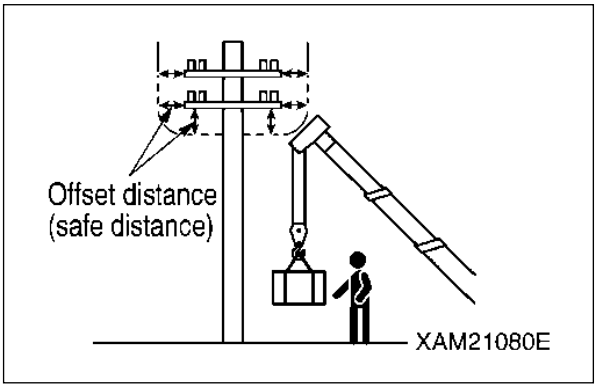
Beware of overhead electric wires

- Do not have the machine contact an overhead electric wire.
  If the electric wire is a high-voltage line, just contacting it may cause an electric shock.



- Slinging operators are particularly at risk of accidents involving electrical shock. Strictly observe the following to prevent an accident.
  - Before starting an operation in a work site where the boom, jib, or wire rope may contact an electric wire, hold a meeting with the power company or confirm that measures stipulated by the relevant laws (deploying a supervisor, setting a covering tube or sign board on the electric wire, etc.) have been taken.

- Wear a rubber sole shoes and rubber gloves, and be careful so that parts of your body not protected by rubber or other materials do not touch the wire rope or machine body.
- Deploy a guide for the supervision of the operation so that the boom, jib, wire rope, or machine body do not get too close to an electric wire. Agree on signs of emergency or other situations beforehand.
- Inquire the power company about the voltage of the electric wire at the work site.
- Secure distances indicated below between the electric wire and the boom, jib, and the machine body.



	Voltage of electric wire	Minimum safety distance
Low voltage (distribution line)	100･200 V	2 m
	6,600 V	2 m
Special voltage (transmission line)	22,000 V	3 m
	66,000 V	4 m
	154,000 V	5 m
	187,000 V	6 m
	275,000 V	7 m
	500,000 V	11 m

Actions to be taken at an electrification accident

In case of an electrification accident, do not panic but calm yourself down, and take the following steps.

1. Informing

Immediately inform the power company or a related administration company to have them stop transmission and provide directions on the emergency treatment.

2. Evacuating people from the area around the machine

Evacuate people including workers who are in the area around the machine to prevent secondary accident.

If there is a worker who had an electric shock from the electrified machine by holding the slinging rope or guiding rope, have the worker escape alone without help.

Never try to help the worker. Helping the worker may cause a secondary electric shock.

3. Emergency treatment

In an emergency situation with a worker who had an electric shock from the electrified machine, take the following steps.

(1) If you can operate the machine, promptly operate the machine to drive the machine body away from the area that is causing electricity contact or electrification. At that time, pay attention to the transmission/ distribution line because it may be broken.

(2) Make the machine completely escape the electrification cause, confirm that the machine is not electrified, rescue the worker who had an electric shock, and take the worker to a hospital immediately.

4. Treatment after accident

Do not use the machine again without repair after an accident. It poses a risk of an unexpected accident or failure.
Contact us or our sales and service agent for repair.

Precautions on crane operation in an area of high radio output

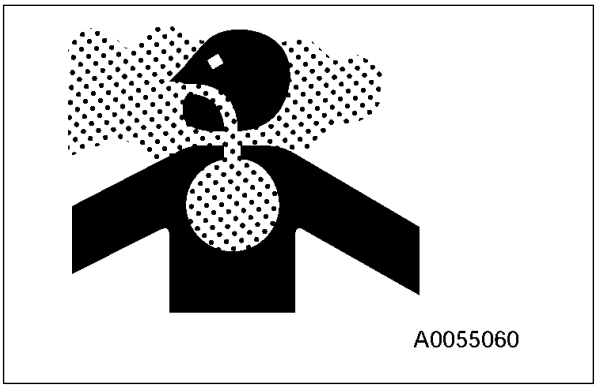
It is very dangerous to use a crane near a high radio output device such as a radar and a television/radio antenna because the radio wave causes induced current in the crane structure. Also, it may cause malfunction in mechatronics.

For an operation in such a location, install a grounding wire between the machine body and the ground. Slinging workers should wear rubber boots and rubber gloves because otherwise they may have an electric shock when they touch a hook or wire.

Beware of asbestos dust

Inhaling asbestos dust may cause lung cancer. This machine does not contain asbestos, but walls and ceilings of a building in the work site main contain asbestos. Also, pay attention to the following points when you handle materials that possibly contain asbestos.

- Wear a specified dust-proof mask as necessary.
- Do not use compressed air for cleaning.
- Before you clean the work site, spray water to prevent scattering of asbestos dust.
- When you operate the machine in a work site that may have asbestos dust, be sure to stay upwind of the site.
- Do not let unauthorized personnel approach the work site.
- Observe the specified rules of the work site and environmental standards.

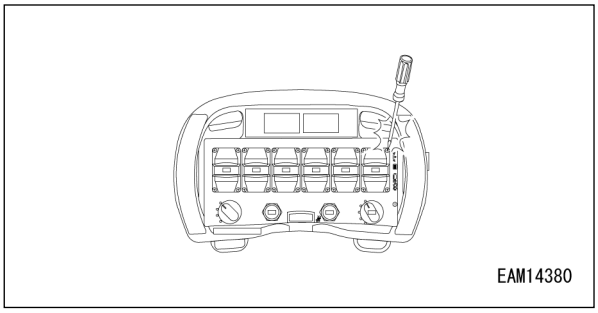


5.2 PREPARING FOR USING RADIO CONTROLLER

5.2.1 Precautions on handling of radio controller

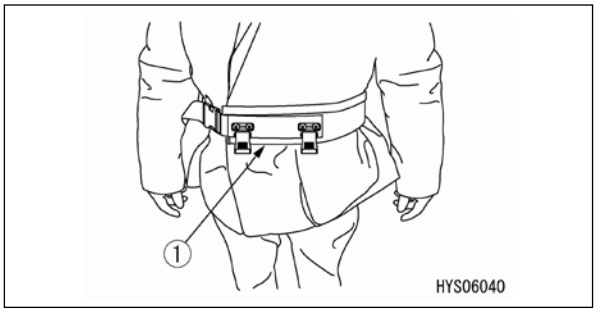
Do not modify the radio controller

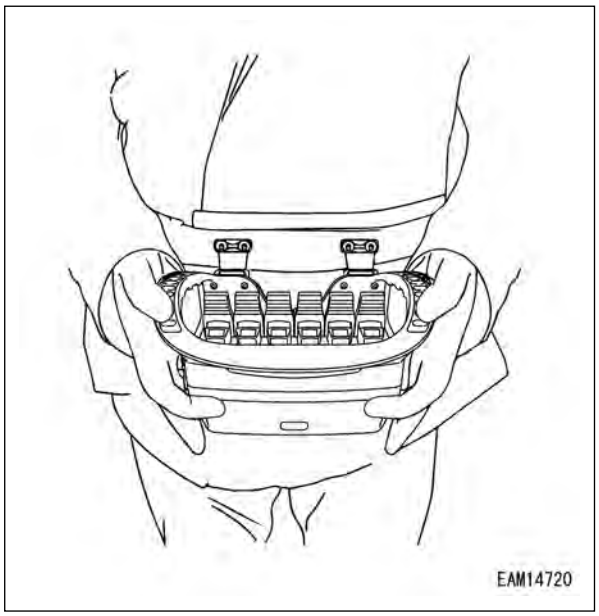
Never disassemble or modify the transmitter, receiver, or accessories. It may cause an electric shock or fire.



Holding the transmitter

See the following figures for the handling of the transmitter. To prevent the transmitter from dropping, wear a waist belt (1) around your body, and attach the transmitter on the waist belt (1). Use your finger to operate the operation levers and switches. Hold the transmitter by gripping the grip firmly.





Be sure to use your fingers and thumbs to operate the operation levers and switches. Do not point them with a sharp-pointed tool for operation. Doing so may form a hole on the transmitter to allow water to seep, leading to failure or malfunction and eventually to a serious accident.

Never wash the transmitter with water

Wipe the transmitter to keep it always clean. Oil or mud adhering to the transmitter makes its surface slippery, and causes an inadvertent mistake in operation leading to a serious accident.

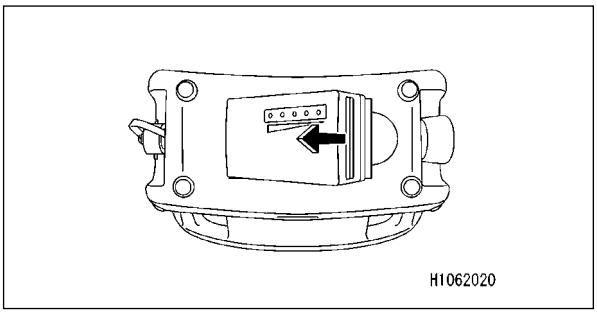
Never use high-pressure washing or water to clean the transmitter or receiver. Doing so allows water to seep inside the device, leading to failure or malfunction and eventually to an electric shock or serious accident.

To clean the transmitter or receiver, wipe off dirt with a cloth soaked with water or diluted neutral detergent. Do not use alkaline detergent, alcohol, or sprayed detergent. Using them may cause damage on the resin of the device.

Do not allow an object or water to enter inside the device

Do not allow a metal object, inflammable object, or water to enter the radio controller battery cabinet of the transmitter or inside the opening of the charger.

Do not connect or insert a metal object to the radio controller battery cabinet of the transmitter or a terminal inside the opening of the charger. It may cause an electric shock or fire.

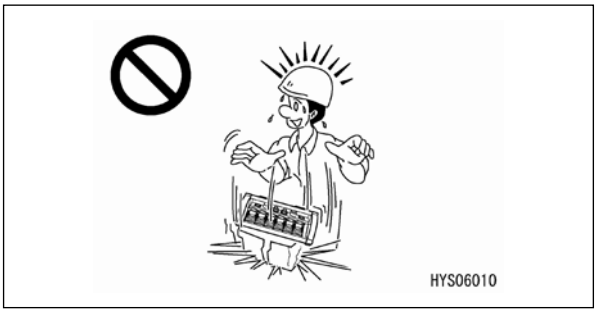


Do not give an impact on the transmitter

When you use the transmitter, be sure to wear a waist belt to prevent the transmitter from dropping during operation. Engage the lock of the waist belt until you hear a click.

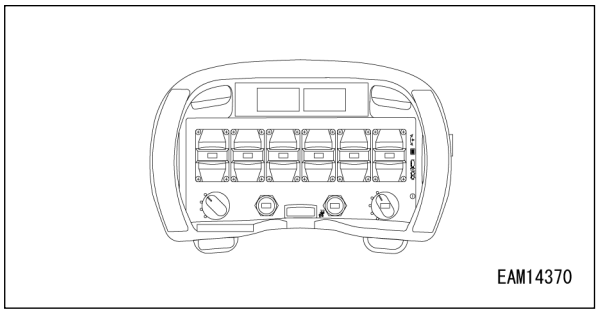
Do not give a strong impact on the transmitter by bumping or other ways. Doing so damages the case or devices inside, leading to failure or malfunction and eventually to an electric shock or serious accident.

In case that the transmitter is damaged, remove the battery from the transmitter, and contact us or our sales and service agent for repair. Using a damaged transmitter causes malfunction, leading to an electric shock or serious accident.



Precautions on the environment of using the radio controller

Do not use the radio controller in a place that has a danger of explosion.



Precautions on handling of the transmitter in cold weather

Do not use the transmitter in a place where the temperature changes rapidly, the temperature is extremely low (-20˚C or lower), or cold wind blows directly. A rapid temperature change causes condensation inside the transmitter, leading to failure or malfunction and eventually to a serious accident.

When you use the machine in winter, make warm-up operation well enough before driving the machine or operating the crane. In winter, the temperatures of the engine oil (for engine specification and engine and electric specification) and hydraulic oil are low and their viscosities are high, so that there is sometimes an operation lag in the travelling unit and hydraulic unit.

Avoid the following places for the stowage of the transmitter. In such places, the transmitter case may deform or discolor, or internal devices may fail or malfunction causing a serious accident.

- Place exposed to extremely cold air or direct cold wind
- Place exposed to direct sunlight
- Place in front of the exhaust vent of a machine
- Place near a heater
- Place with high humidity

Temporary stowage of the transmitter when there is a problem

When a problem has occurred with the machine and you temporarily stow it for maintenance, handle the situation as follows and notify everyone in the work site that usage is forbidden due to malfunction.

- Put a “Do not use” sign.
  On the sign, state the problem details, the person responsible for stowage, contact details, and the stowage period.
- Remove the radio controller battery.
- Never use the broken radio controller.

Multiple-operation prohibited

Do not operate the crane simultaneously from the radio controller and on the machine.

Although the operation on the machine is disabled during the use of the radio controller, the crane may be unexpectedly actuated to cause a serious accident.

Checking the operation switch setting

Before operating the machine, confirm that the operation switch is set to the intended operation. With a wrong setting of the operation switch, the crane may tip-over or contact an object with an unexpected behavior, leading to a serious accident.

Action to be taken in an emergency

In an emergency or when there is a smallest problem in the area of machine operation, immediately push the emergency stop switch to stop the transmitter.

Pay attention to the fuel/battery level

Even when you are operating the machine from the radio controller, frequently check the fuel/battery level when performing a working to ensure that the fuel/battery does not run out.

Precautions before finishing operation

Do not abandon the transmitter with its power turned on.

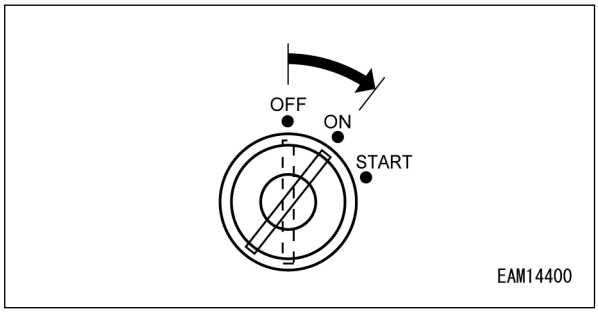
If the transmitter is abandoned while powered, the operation lever or a switch may be unintentionally touched to cause the crane to tip-over or contact an object, leading to a serious accident.
Be sure to power off the transmitter before you move from the radio controller or when you finish work.

5.2.2 Preparation for machine body

Important

After you finish operation from the radio controller, be sure to turn the starter switch to OFF.
If you leave it ON, the battery of the machine body will run out.

Before you use the radio controller, insert the key in the starter switch of the machine body and turn it to the ON position.



☞ Power is not supplied to the receiver unless the starter switch is at the ON position.

5.3 STARTING AND STOPPING THE TRANSMITTER

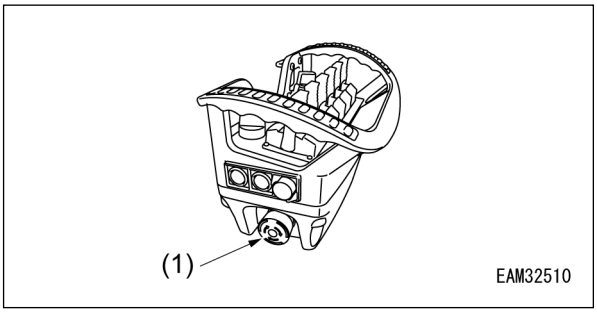
Important

To operate the crane from the radio controller, you need to press the power switch of the radio controller three times.

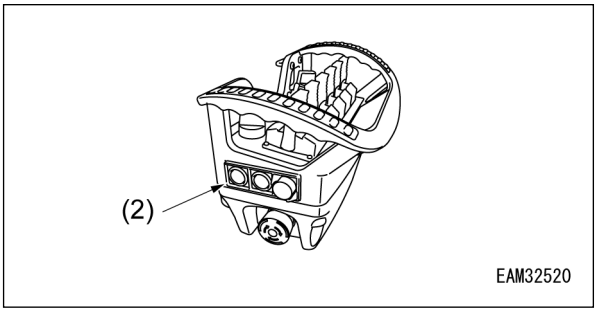
5.3.1 Starting the transmitter

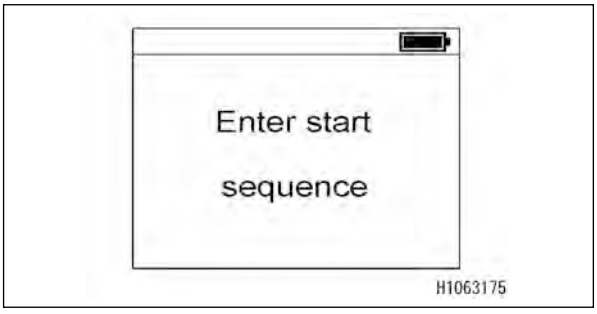
Power on the transmitter in the following steps:

1. Confirm that the Emergency Stop / Radio Controller Power OFF switch (1) of the radio controller is at the OFF position.



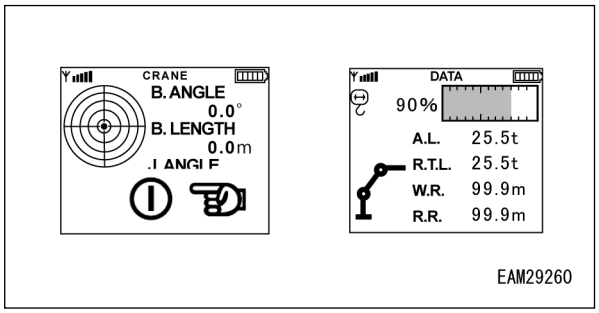
2. Press the power switch of the radio controller (2) once, and confirm that the power status displayed in the top-left corner of the left-side display is flashing in green. “Enter start sequence” that is displayed on the right-side display indicates that the radio controller is ready to be powered on.





3. Long-press the power switch (2) of the radio controller while it is ready to be powered on. The status screen appears on the display.

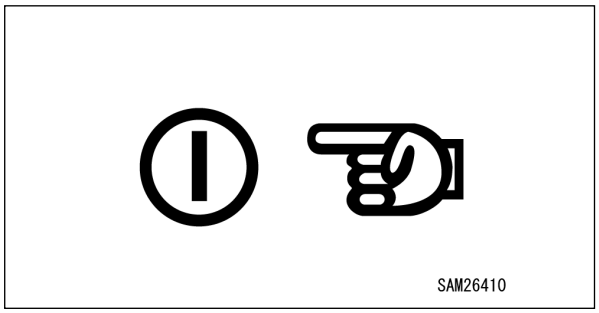
☞ When this screen is displayed, the radio controller is still in the start interlock state.



☞ The power is turned off if you make the following operation when the radio controller is ready to be powered on.
- Press the power switch (2) of the radio controller.
- Wait for six seconds or longer with no operation.

☞ If the radio controller is not powered on, check the following:
- Whether the radio controller battery is charged enough.
- Whether the Emergency Stop / Radio Controller Power OFF switch is pressed.

☞ In the start interlock state, the following screen is flashing. In this state, you can start the engine but cannot operate the crane.

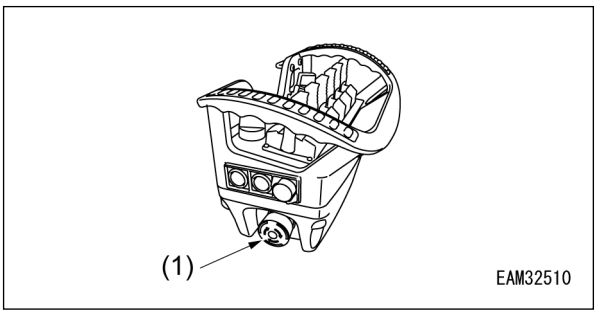


4. Press the power switch (2) of the radio controller again while the status screen is displayed.
   The crane becomes operable if the start interlock state is disengaged.

☞ The start interlock state also takes place when the radio communication is disconnected during operation.

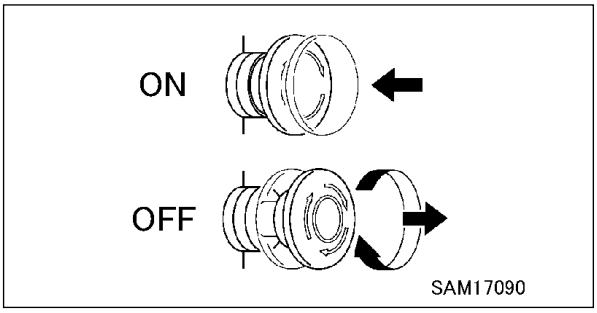
5.3.2 Stopping the transmitter

To power off the transmitter, press the Emergency Stop / Radio Controller Power OFF switch (1).



☞ The button also functions as the Emergency Stop switch, so if you press it when the machine is in operation, the machine also stops.

☞ To power on the transmitter, power it on after turning the Emergency Stop / Radio Controller Power OFF switch (1) clockwise to return it to the original position.



Important

The transmitter is automatically powered off if no operation input is detected for 15 minutes. The transmitter is automatically turned off, but do not abandon the transmitter after work. Be sure to press the Emergency Stop / Radio Controller Power OFF switch to power off the transmitter.
If the transmitter is automatically turned off during the startup of the machine, the monitor displays the same screen as when the emergency stop switch is pressed. But this is not a fault.

5.4 STARTING THE MACHINE

5.4.1 Precautions when starting the machine

Checkup and adjustment before starting the machine

Make the following checkups before starting the work of the day. Neglecting these checkups may cause a serious injury.

- Be sure to make checkup before starting work with reference to “6.11.1 Inspection before starting the job [engine specification / engine and electric specification / battery specification].”
- Confirm that meters work properly and operation levers are at the neutral position.

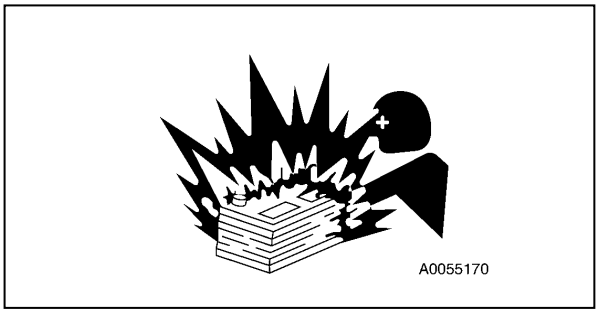
Repair any problem that you found in the checkup above.

Precautions before starting the machine

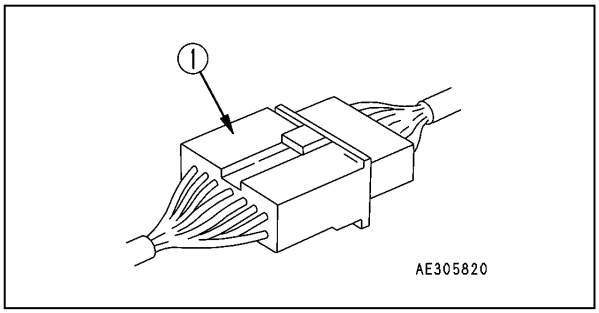
- Before starting the machine, confirm that there are no people around, above, or below the machine and there are no people or obstacles in the area of the boom rotation radius.
- Confirm that operation levers are at the neutral position.
- Before starting the machine, sound the horn for warning.
- Do not start the machine by shorting the starter circuit. It may result in fire.

Precautions at the time of cold weather

- Remove snow from around the rotating gear, boom, and winch, defrost them, and then check their operation before starting work.
- When the battery is frozen, do not recharge it or start the machine by a different power source. The battery may catch fire and explode. Before you charge the battery or start the machine by a different power source, thaw the battery liquid and confirm that there is no problem such as battery liquid leakage.



- After finishing work, check the wire harness, connector (1), switches, and sensor for any water drops, snow, or mud. If there is any such substance adhering, wipe it off before putting the cover. If water penetrates and freezes, the machine may malfunction at the next time you use it, causing an unexpected accident.



5.4.2 Starting the machine (engine specification / engine and electric specification)

⚠ DANGER

Never replenish fuel (gas oil) while the engine is in operation.
When replenishing fuel, be sure to stop the engine.

⚠ WARNING

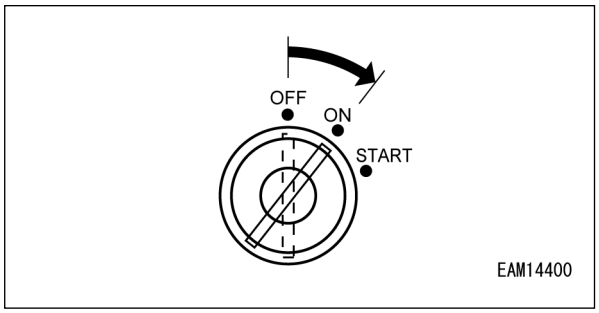
Exhaust gas is harmful. When you start the engine in an enclosed narrow space, pay careful attention to ventilation.

Important

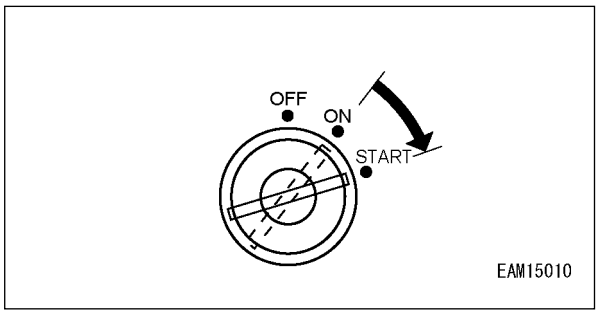
- **Do not rotate the starter for five seconds or longer. Doing so accelerates discharging from the battery.**
- **If you fail in starting, wait for one minute or longer before trying it again.**
- **If the machine runs out of fuel, wait until fuel is replenished through the feed pump, and then start the machine.**
- **Before starting the engine, confirm that the fuel lever of the water separator pot is at the upright (open) position.**
- **Confirm that the power switch of the radio controller is at the OFF position.**
- **If you make starting operation in cold weather or other conditions that require engine warm-up, engine warm-up starts automatically. Make starting operation again after confirming that the pre-heating lamp becomes off.**

5.4.2.1 Starting the machine

1. Insert the key in the starter switch, turn it to the ON position, and keep the ON position until the pre-heating lamp goes off.

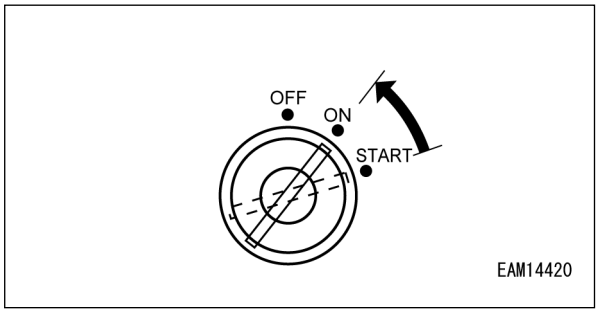


2. When the pre-heating lamp goes off, turn the key to the START position to start the engine or motor.



☞ With the motor-driven model, you can start the motor before the pre-heating lamp goes off.

3. When the machine starts, take your hand off the key.
   The key automatically returns to the ON position.

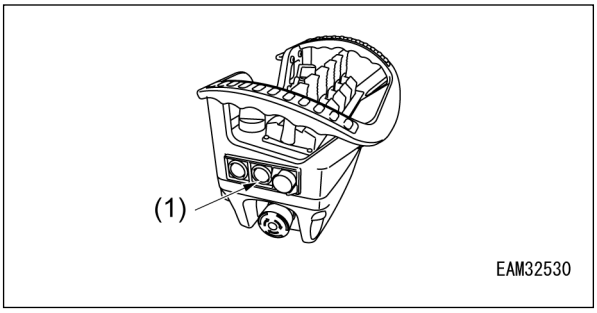


5.4.2.2 Starting by radio controller

1. Confirm that the starter switch of the machine body is at the ON position.

☞ If the starter switch of the machine body is at the OFF position, the machine does not start by the radio controller.

2. When the machine is stopped, pressing the Engine Start/Stop Switch (1) starts the engine.



☞ Press and hold the Engine Start/Stop Switch (1) until the machine starts.

5.4.3 Starting the machine (battery specification)

⚠ WARNING

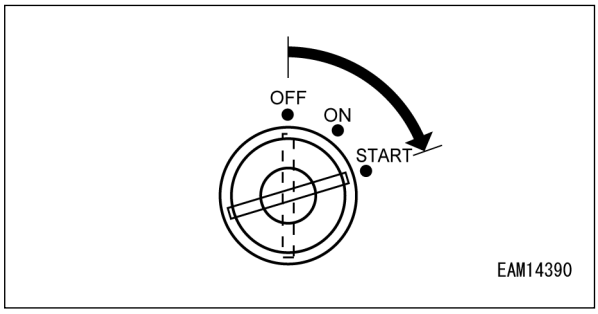
Before starting the machine, check the area around the machine for any people or obstacles.

Important

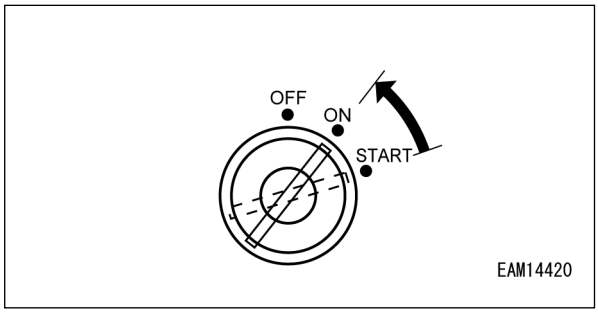
- **Confirm that the power switch of the radio controller is at the OFF position.**
- **After putting the starter switch to the START position, it takes some time until the machine starts. This is characteristic of the battery specification and is not a fault.**
- **If the machine does not start, check the charging status of the lithium-ion battery and the condition of the disconnect switch.**
- **After the machine starts, the motor does not revolve unless you drive the machine or operate an outrigger or the crane. To confirm that the machine has started, start the monitor.**
- **You can use the machine while the lithium-ion battery is recharged.**

5.4.3.1 Starting the machine

1. Insert the key in the starter switch, and turn it to the START position.



2. When the machine starts, take your hand off the key.
   The key automatically returns to the ON position.



5.5 OPERATION AND PRECAUTIONS AFTER THE MACHINE STARTS

⚠ WARNING

- **If there is any problem such as an emergency stop or abnormal operation, immediately turn the starter switch OFF to stop the machine.**
- **Do not operate the machine while the hydraulic oil is still cold and do not drive the lever too vigorously.**
  Make a warm-up operation of the hydraulic unit.
- **If you operate the machine without enough warm-up operation of the hydraulic unit, the machine does not respond promptly to operation levers and may not behave as you expect.**
  Be sure to make warm-up operation of the hydraulic unit. Especially in cold weather, make warm-up operation of the hydraulic unit well enough.

Important

- **There are two types of warm-up operation: warm-up operation of the engine and warm-up operation of the hydraulic unit. Also, the way of warm-up operation varies depending on the environment condition. Make a warm-up operation as described in this manual for different cases.**
- **A warm-up operation of the engine alone does not warm the hydraulic unit. So, make a warm-up operation separately for the hydraulic unit.**
- **By making a warm-up operation of the hydraulic unit, you can warm the hydraulic oil and circulate it around all operation circuits. Be sure to make a warm-up operation of the hydraulic unit.**

5.5.1 Warm-up operation and operation checkup (engine specification / engine and electric specification)

Important

Do not accelerate the engine rapidly until the warm-up operation finishes.

1. After starting the engine, idle it for about five minutes.
2. Confirm that there is no abnormality in the color of the exhaust, sound, and vibration of the engine. Repair the relevant parts if there is any abnormality.

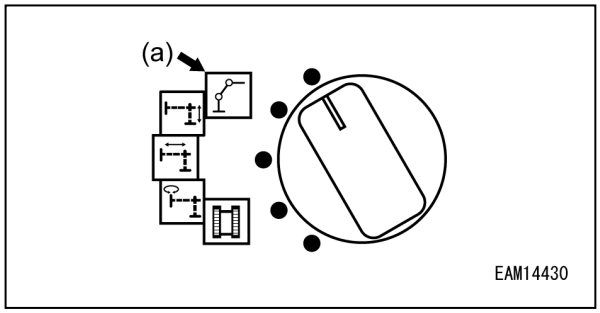
5.5.2 Warm-up operation of hydraulic unit and operation checkup

⚠ WARNING

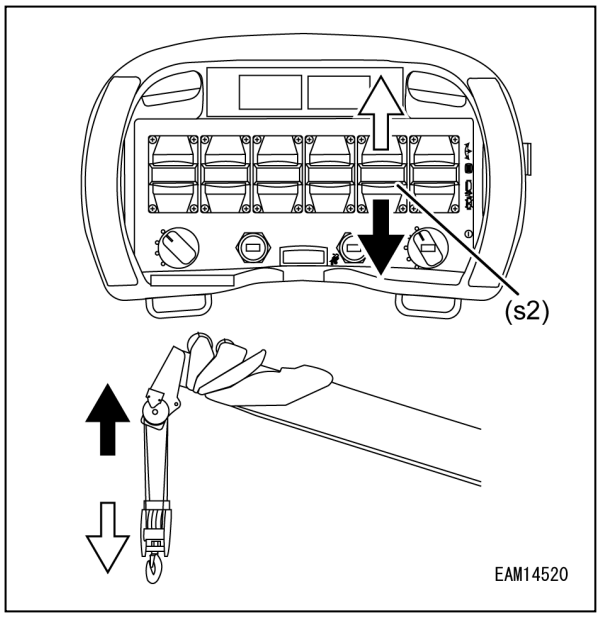
- **When you start a warm-up operation of the hydraulic unit, check the area around the machine for any people or obstacles, and then sound the horn before starting a warm-up operation.**
- **The warm-up operation of the hydraulic unit is required not only for the pump-to-cylinder circuit and the pump-to-motor circuit, but also for operation circuits.**
  In a warm-up operation, it is not enough to operate just one cylinder, one motor, or in one direction. You should operate the crane, turn the machine, and drive the machine in all ways and directions.

1. Make a warm-up operation of the engine. (engine specification)
2. Set outriggers with reference to “5.7.3 Setting the outriggers.”

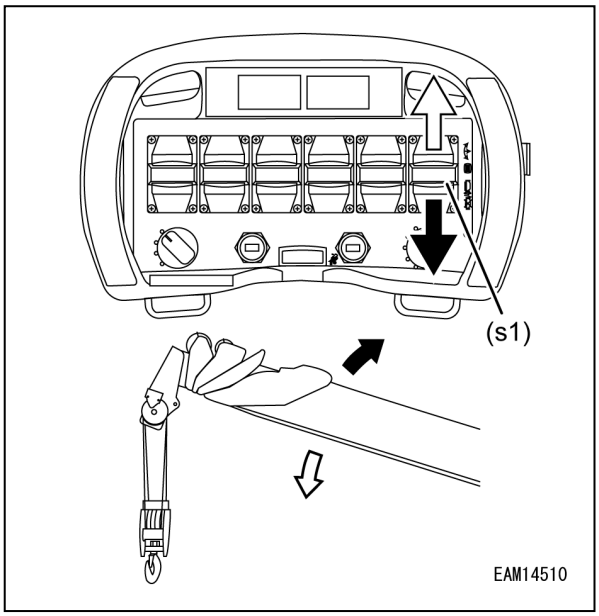
3. Set the mode switch to “crane operation (a).”



4. Move the S2 lever (s2) back and forth slowly to lift and lower the hook block. (When using the winch)
   Confirm that the hoisting up/down operation smoothly, the hook block stops immediately when you set the S2 lever (s2) to the neutral position, and the winch drum does not make wind irregularly.
   Repair the relevant parts if there is any abnormality.

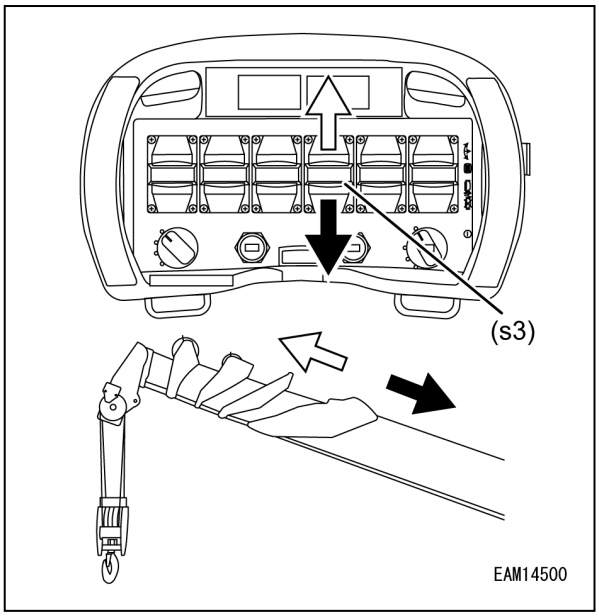


5. Move the S1 lever (s1) slowly to raise and lower the boom until the main boom derricking cylinder comes to the stroke end.
   Check the machine behavior in this operation to see if there is any abnormality.
   Repair the relevant parts if there is any abnormality.



☞ When you raise the boom by the S1 lever (s1), the hook block moves upward. If the alarm buzzer of the overwinding detector sounds when raising the main boom, immediately set the S1 lever (s1) to the neutral position to stop the raising of the boom.

6. Move the S3 lever (s3) slowly to extend and retract the boom to the stroke end.
   Check the machine behavior in this operation to see if there is any abnormality.
   Repair the relevant parts if there is any abnormality.

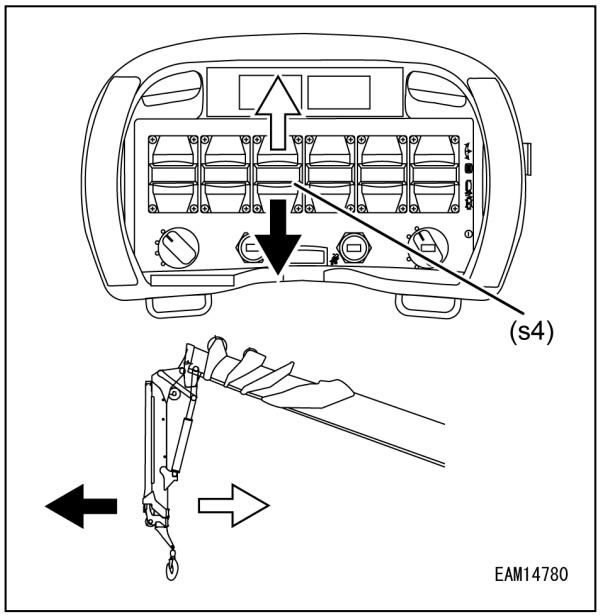


☞ When the boom is extended and retracted, the hook block is lifted or lowered. Operate the winch simultaneously to adjust the height of the hook block.

☞ When the boom is extended, the hook block is lifted. If the alarm buzzer of the over-winding detector sounds when the main

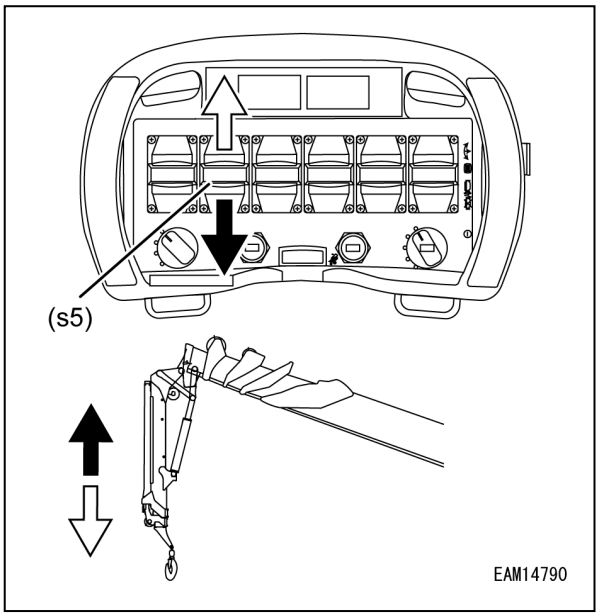
boom is extended, immediately set the operation lever to the neutral position to stop the extension of the boom.

7. Move the S4 lever (s4) slowly to raise and lower the jib until the derricking cylinder comes to the stroke end. (when using the jib)
   Check the machine behavior in this operation for any abnormality. Repair the relevant parts if there is any abnormality.



☞ When you raise the jib by the S4 lever (s4), the hook block moves upward. If the alarm buzzer of the overwinding detector sounds when raising the jib, immediately set the S4 lever (s4) to the neutral position to stop the raising of the jib.

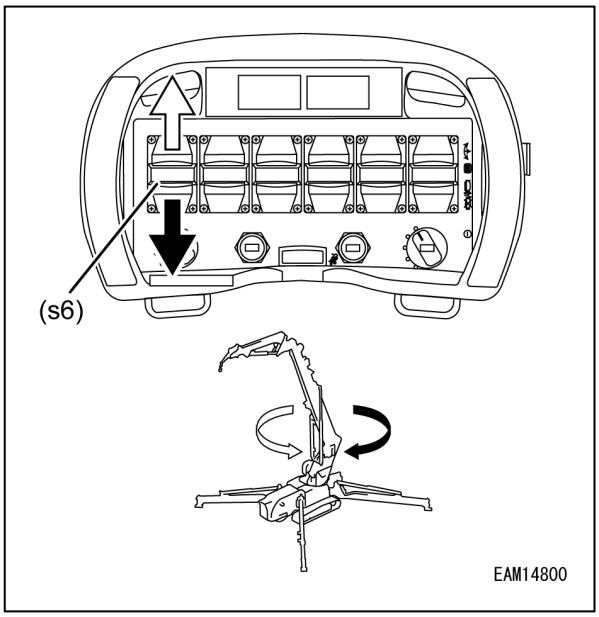
8. Move the S5 lever (s5) slowly to extend and retract the jib to the stroke end. (when using the jib)
   Check the machine behavior in this operation for any abnormality. Repair the relevant parts if there is any abnormality.



☞ When the jib is extended and retracted, the hook block is lifted and lowered. Operate the winch simultaneously to adjust the height of the hook block.

☞ When the jib is extended, the hook block is lifted. If the alarm buzzer of the overwinding detector sounds when the jib is extended, immediately set the operation lever to the neutral position to stop the extension of the jib.

9. Move the S6 lever (s6) slowly to slew the crane 360 degrees or more clockwise and counterclockwise.
   Confirm that the crane slews smoothly 360 degrees or more clockwise and counterclockwise and it stops immediately when you set the rotation lever to the neutral position. Repair the relevant parts if there is any abnormality.



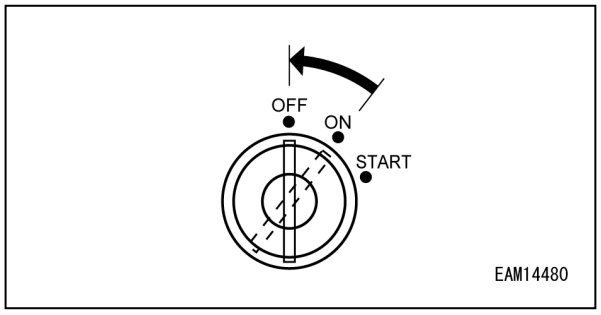
5.5.3 Stopping the machine (engine specification / engine and electric specification)

Important

- **Stopping the engine before it cools down enough may shorten the service life of different parts of the engine. Do not stop the engine suddenly other than in emergency situation.**
- **If the engine is overheated, do not stop the engine suddenly.**
- **Slow down the engine to cool it down gradually, and then stop the engine.**
- **Confirm that the power switch of the radio controller is at the OFF position.**
- **After stopping the engine, check the starter switch to confirm that it is not left at the ON position. If it is left ON, the battery of the machine will go flat.**

5.5.3.1 Stopping the machine

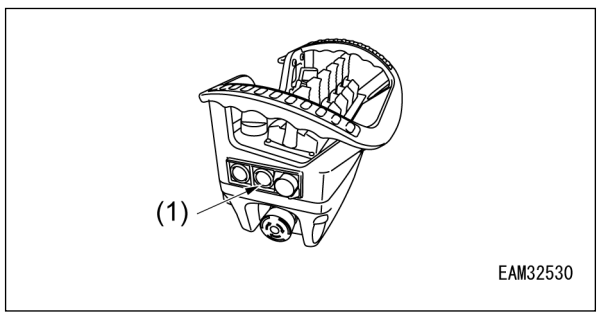
1. Idle the engine for about five minutes.
2. Turn the key of the starter switch to the OFF position. The machine stops.



3. Pull out the key of the starter switch.

5.5.3.2 Stopping by radio controller

1. When the machine is in operation, pressing the Engine Start/Stop switch (1) of the transmitter stops the machine.



☞ Press and hold the Engine Start/Stop Switch (1) until the machine stops.

☞ You can also stop the engine by pressing the Emergency Power / Radio Controller Power OFF Switch of the transmitter. When you finish using the machine, turn the key of the starter switch to the OFF position.

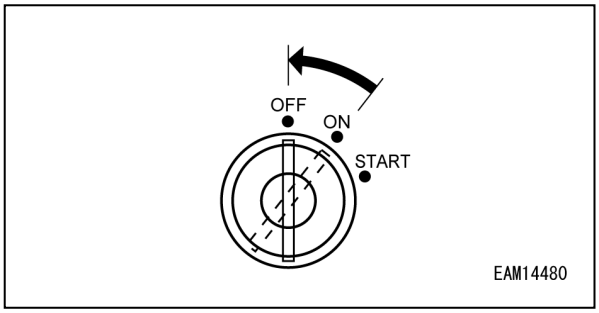
5.5.4 Stopping the machine (battery specification)

Important

- **Confirm that the power switch of the radio controller is at the OFF position.**
- **Check the starter switch to confirm that it is not left at the ON position. If it is left ON, the battery of the machine will go flat.**

5.5.4.1 Stopping the machine

1. Turn the key of the starter switch to the OFF position. The machine stops.
2. Pull out the key of the starter switch.



5.6 OPERATING THE MACHINE

5.6.1 Precautions on the travelling of the machine

⚠ WARNING

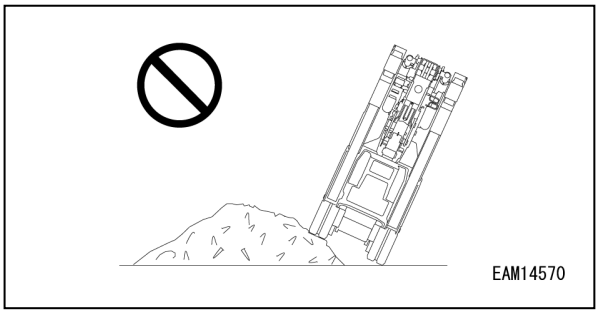
Failure to adhere to these precautions when travelling may result in serious personal injury.

5.6.1.1 Precautions when you drive the machine

Travelling over obstructions such as boulders or tree stumps may subject the machine (especially the undercarriage) to impact and damage it.

Try to avoid travelling over obstructions where possible, either by avoiding or removing the obstructions.

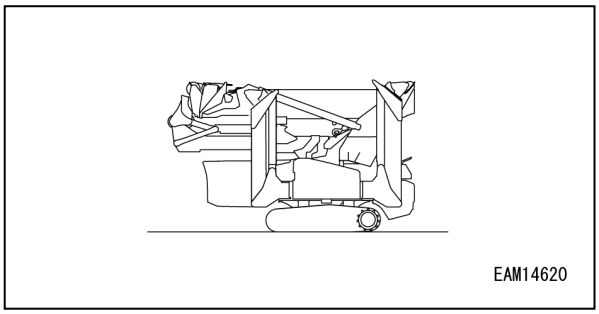
If you cannot avoid travelling over obstructions, be sure to drive the machine in its “travelling posture” to lower its centre of gravity and reduce speed as much as possible so that the machine can ride over obstructions under the centre of its crawler tracks.



☞ For the travelling posture of the machine, see “5.6.2 Travelling posture of machine.”

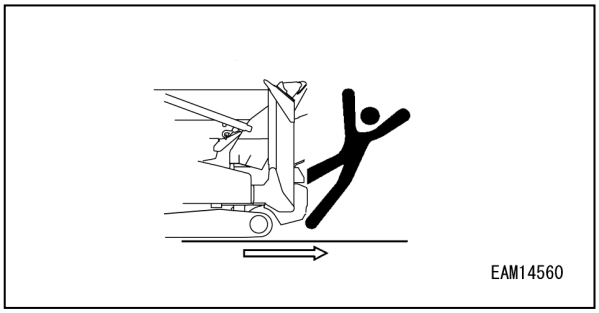
Always observe the following points to prevent serious injuries or fatal accidents when moving the machine:

- Arrange the machine in its "travelling posture" as shown in the figure.
  Do not drive the machine without retracting the boom, jib, hook block, or outriggers.



  - Never drive the machine with the boom extended or with a load lifted. Such travelling results in the tipping-over of the machine causing a serious injury.
  - Do not use the machine for an unintended purpose such as putting an object on the machine to convey it.

- If there are people around the machine, they may be hit or caught by the machine, leading to a serious injury.
  Strictly observe the following before driving the machine.
  - Before driving the machine, check the area around again for any people or obstacles.



  - Before starting to move, be sure to sound the horn to warn people in the vicinity.
  - When travelling, check that the travelling alarm sounds normally.

- Do not look sideways while travelling, as this is dangerous.
- Do not speed, start moving/stopping/slewing suddenly, or swerve, as this is dangerous.
- When travelling, keep an adequate distance from people, structures, and other machines to prevent collisions.
- When travelling on rough terrain, keep the vehicle speed low to avoid toppling, and also avoid any abrupt change of direction.
  Otherwise, the machine may lose balance and damage the machine or nearby objects.
- When travelling on a bridge or crossing over a structure, check that it can withstand the machine weight beforehand.
- When operating the machine where height is restricted (such as in a tunnel, in a building, or

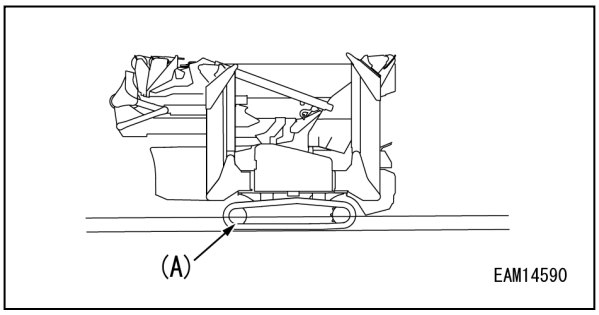
under an overpass or cables), pay close attention to prevent the machine and crane from coming into contact with surrounding structures and operate the machine slowly.

- Maintain a travel speed that matches walking speed.
- When you drive the machine backward, pay special attention to the ground. Slow down the machine, and drive the machine carefully so as not to be caught by an object, bump, or dip on the ground.
- If you find an abnormality (sound, vibration, smell, meter abnormality, fuel leak, water leak, oil leak, etc.) of the machine during operation, immediately move to a safe place and stop the machine, and then investigate the machine to find the cause.
- Do not make a sudden change of the travelling direction. Otherwise, the machine will lose balance or break a structure nearby or the machine itself.

5.6.1.2 Permissible water depth

⚠ CAUTION

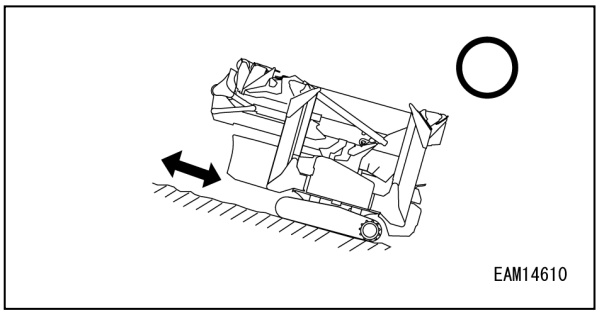
When you drive the machine through a shallow stream or a water-covered area, investigate beforehand the land condition, the depth of water, and the speed of the stream. Do not exceed the permissible water depth (center of (A)), and drive the machine slowly without rippling the water.
Permissible water depth:
approximately 160 mm



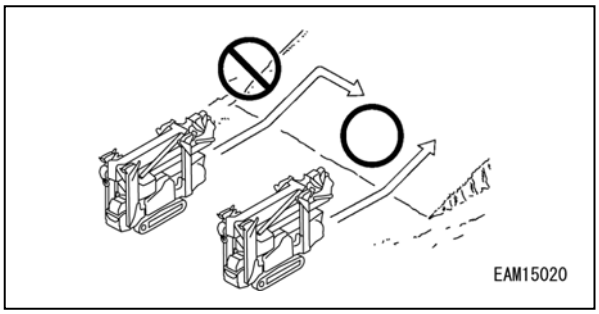
5.6.1.3 Precautions when travelling on slopes

⚠ WARNING

- **The machine reacts sharply to driving operations when it travels along a slope. So, set the travelling speed switch to “Slow", pay attention to the left-right balance, and drive very carefully.**
- **Be careful of tipping-over and slipping when travelling on slopes.**
- **When the machine is inclined at 10 degrees or more when travelling on a slope, the inclination alarm activates and the buzzer sounds. If the inclination becomes 15 degrees or more, the alarm sounds. However, the machine easily becomes unstable on a slope of 15 degrees or more. If the buzzer sounds, stop travelling any further, move to a safe location, and take a different route.**
- **When you drive the machine on a slope, do not stand on the lower side of the machine, and keep a safe distance from the machine.**

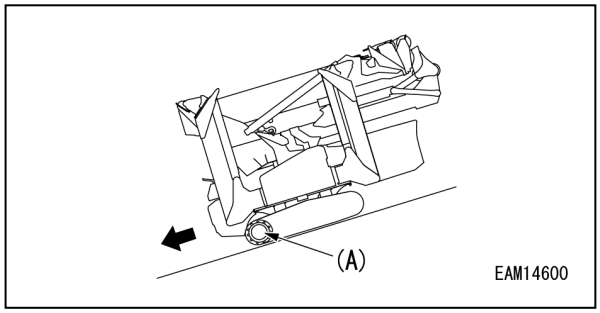


- **When you drive the machine on a slope of 10 degrees or more, drive forward to climb up and drive backward to climb down. Always keep the machine facing upward. If you drive backward to climb up or drive forward to climb down, the machine becomes unstable and may tip-over or skid sideways.**
- **When travelling on a slope, drive the machine perpendicular to the incline and never change direction or travel transversely. Travel safely, for instance by travelling back down to level ground and taking an alternate route.**



- **Always ensure that the machine can be stopped at any time if it slips or becomes unstable.**

When climbing down a steep slope, set the travel speed switch to “Slow”, and keep the travelling speed low.
When climbing down a slope of 10 degrees or more, orient the sprocket (A) to the lower side of the slope, and drive the machine very slowly in the posture shown in the figure, paying attention to the left-right balance.



☞ Climb down a slope orienting the sprocket (A) to the lower side of the slope. If you climb down a slope orienting the sprocket (A) to the higher side of the slope, the crawler track loosens more easily to cause pitch skipping.

[Braking when climbing down]

The brake actuates automatically when you set the travel lever to the neutral position.

[When the engine or motor stops]

If the engine or motor stops when the machine climbs up a slope, set the travel lever to the neutral position, set the starter switch to the OFF position to stop the machine, and then set the starter switch to the START position again to start the machine.

5.6.1.4 Precautions when driving or operating the machine

Checkup before operation

Omitting the inspections after starting the machine may result in delays in discovering machine abnormalities as well as personal injury or machine damage. Inspection should be carried out in a clear area. No unauthorized persons should be allowed to approach the machine.

- Check the operating and travelling condition of the machine and confirm that the machine is in the travelling posture.
- Inspect for machine sounds, vibration, heat, odour, instrument errors, air leaks, oil leaks, fuel leaks, water leaks, and other issues. Pay particular attention to fuel leaks.
- Always repair any abnormalities found. Attempting to use the machine without servicing may result in unexpected personal injury and/or machine failures.

Beware of tipping-over on unstable ground

Always observe the following points to prevent serious injuries or fatal accidents when travelling over unstable ground for unavoidable reasons:

- Do not travel into areas with soft ground. Otherwise, the machine may become stuck.
- Where possible, avoid travelling close to unstable ground near cliffs, road shoulders, and deep trenches.
  There is a risk of the machine toppling or falling if the ground gives way due to the weight or vibration of the machine. Particular caution is necessary after rain, use of explosives, or earthquakes, as the ground will be unstable.
- Where possible, avoid travelling close to unstable ground on embankments or excavated trenches.
  There is a risk of the machine tilting if the ground gives way due to the weight or vibration of the machine.

Precautions on operation in snowy and icy cold weather

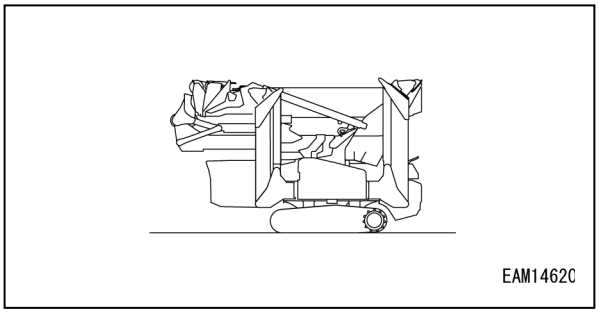
Always observe the following points to prevent serious injuries or fatal accidents when travelling over snow-covered ground or frozen roads for unavoidable reasons:

- Travel as slowly as possible and avoid sudden starts, stops, or turns when travelling on snow or frozen surfaces. There is a risk of slipping even on slight inclines. Travelling up and down slopes is especially dangerous due to the risk of slipping.
- Take care on frozen ground, as it tends to soften as the temperature rises, causing a risk of the machine toppling or becoming stuck.
- There is a risk of the machine toppling or becoming buried if driven into deep snow. Be careful when travelling away from road shoulders or into snow drifts.
- Take care when travelling on snow, as there is a danger of toppling and collision if road shoulders or other structures are hidden by snow.
- Do not directly touch metal surfaces with your hands or fingers in cold conditions.
  Touching metal surfaces of the machine in freezing conditions may result in skin freezing to the metal surface.

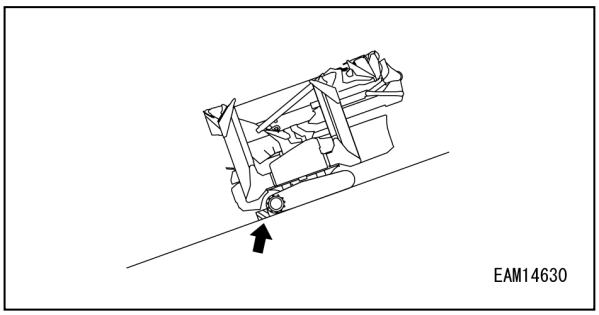
- Remove snow or ice build-up on the machine, as this may make the safety nameplates hard to read. Snow or ice on the boom in particular should be completely removed, as there is a risk of it falling off and hurting someone.

Precautions when you park the machine

- When parking, select a location with flat and solid ground.
- When parking, select a location without a risk of landslide, rock fall, or flooding.
- When parking, arrange the machine in its "travelling posture" as shown in the figure.



  - When you park the machine, fix the hook block at the retracted position. (When the winch is used)
- Strictly observe the following points as well when stopping the machine on a slope for unavoidable reasons:
  - Make sure the boom is facing uphill.
  - Chock the machine with blocks to prevent it from moving.



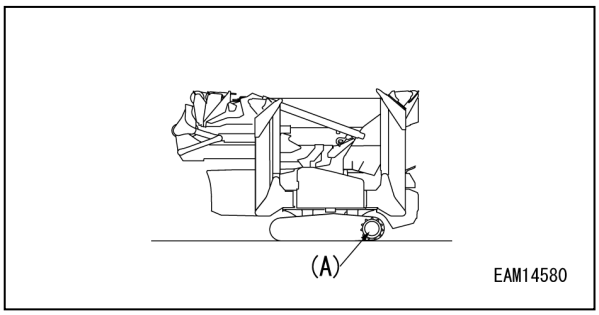
- When parking on the street, always provide safety precautions, such as clearly placed flags, protection barriers, lighting and caution notices, that do not interfere with traffic.
- When you leave the machine, remove the starter key and put it in the specified stowage so that other people do not operate the machine without permission.
- When it is raining, put up the cover so that water does not get inside the boom.

5.6.2 Travelling posture of machine

⚠ WARNING

- **Unless the machine is travelling through a horizontal narrow space, extend the variable gauge to the maximum width.**
- **When you move the machine without riding on it, set the machine to the travelling posture, in which the boom, jib, and hook block are stowed.**
- **This machine is prohibited to run on public roads by the Road Traffic Act.**
- **Do not use the machine for an unintended purpose such as putting an object on the machine to convey it.**

When you move the machine, set the machine to the travelling posture as shown in the figure.



- Fully retract the boom.
- Set the boom to the level position.
- Fully retract the jib. (when the jib is used)
- Fully lower the jib. (when the jib is used)
- Set the hook block in the stowage position at the tip of the boom or jib. (When the winch is used)
- The sprocket (A) is on the back side.
- Adjust the variable gauge in accordance with the road width. (Set the variable gauge to the maximum width if not travelling through a narrow space.)

☞ For details of the operation of stowing the hook block, see “5.8.14 Stowing the crane.”

☞ For details of the operation of stowing the outriggers, see “5.7.4 Stowing the outriggers.”

☞ For details of the operation of extending and retracting the variable gauge, see “5.6.3 Operating the variable gauge.”

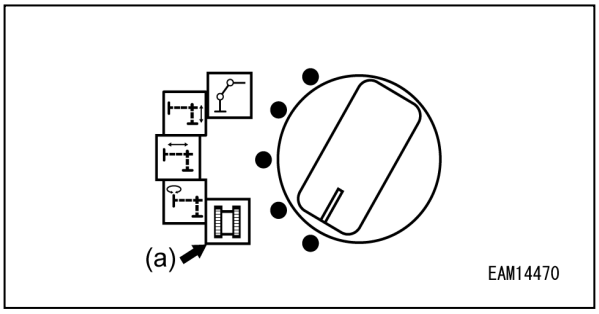
5.6.3 Operating the variable gauge

⚠ WARNING

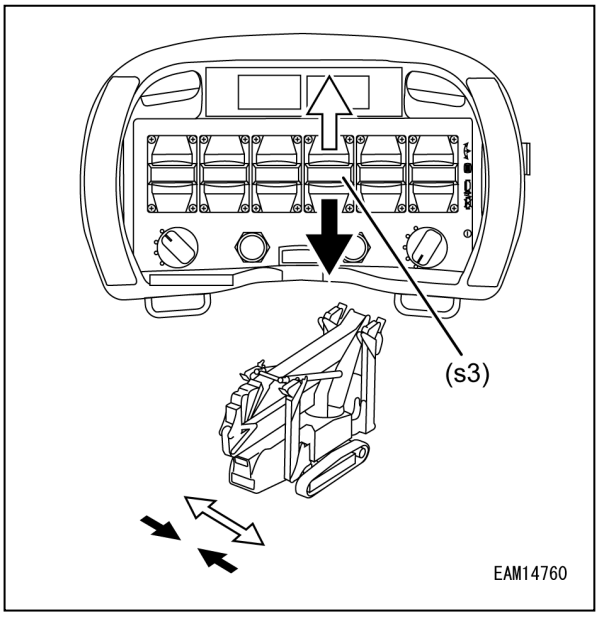
- **Unless the machine is travelling through a narrow space, extend the variable gauge to the maximum width.**
- **Do not operate the variable gauge on a slope because the machine may lose balance.**
- **Be sure to operate the variable gauge on firm level ground.**

☞ You cannot select only the left or right crawler for changing the gauge width. The first crawler to move may be the left crawler or the right crawler depending on the road condition. This different is not a fault. Secure an enough space around when you operate the variable gauge.

1. Set the mode switch to “crawler operation (a).”



2. Operate the S3 lever (s3) as follows:



- Widening: Push the lever forward.
- Narrowing: Pull the lever toward you.

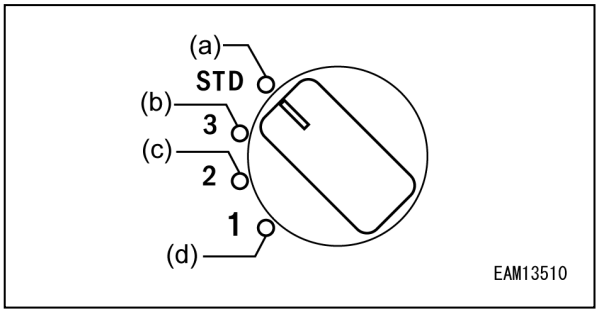
5.6.4 Starting (forward or backward) and stopping the machine

⚠ WARNING

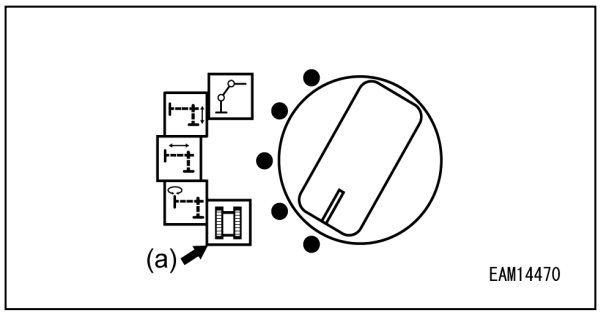
- **Do not allow anyone near the machine.**
- **Clear the route of any obstructions. Especially, before you drive the machine backward, check the way for any bump or ditch that may obstruct the machine, and condition the road surface.**
- **Check for safety in the vicinity of the machine, and sound the horn before starting to move the machine.**
- **When you start the machine, move the operation lever slowly and check the travelling speed of the machine. Especially, when you drive the machine backward, do not accelerate the machine too quickly. Doing so may cause a serious accident.**
- **If the vision is blocked in the travelling direction so that you cannot confirm the safety, stop the machine for a while to check the safety in the travelling direction, and then start the machine again. Deploy a guide as necessary depending on the condition of the work site.**

☞ If the machine does not move in the normal travelling speed in cold weather, make warm-up operation well enough. If the machine does not move in the normal travelling speed due to sand and mud adhering to the crawler, remove them.

☞ Very slow travelling is possible by selecting 1(d) to 3(b) of the speed selector switch. The travelling speed is the same for 1(d) to 3(b).



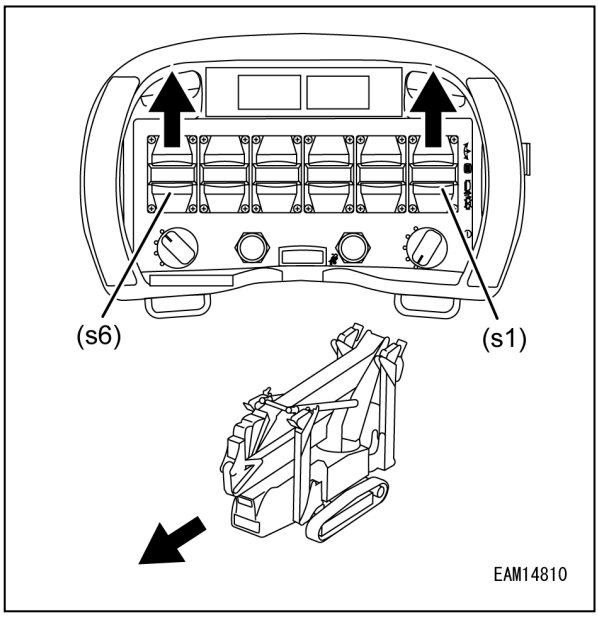
1. Set the mode switch to “crawler operation (a).”



2. Operate the machine using operation levers of the transmitter as follows.

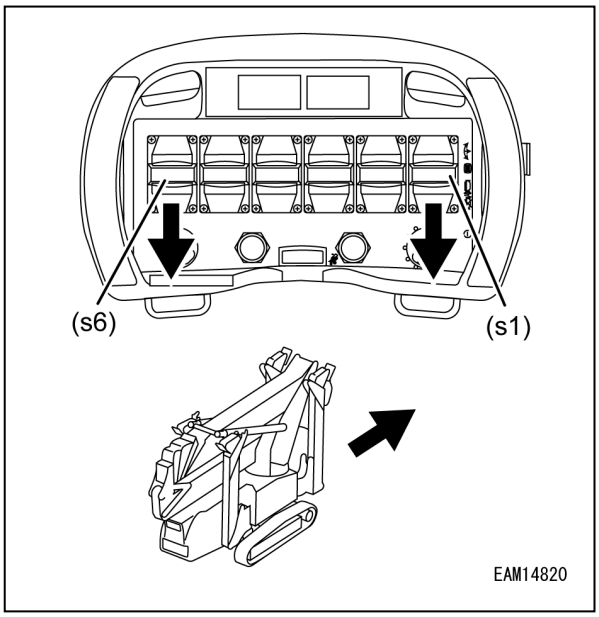
5.6.4.1 Moving forward

1. Operate the left and right levers simultaneously. Push the S1 lever (s1) and S6 lever (s6) forward slowly to start the machine.
   The machine tends to waver when it has just started, so pay attention to the left-right balance.



5.6.4.2 Moving backward

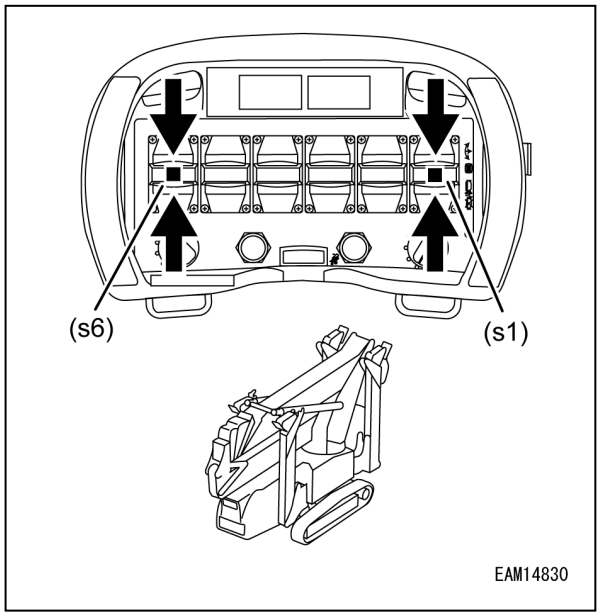
1. Operate the left and right levers simultaneously. Pull the S1 lever (s1) and S6 lever (s6) toward you slowly to start the machine.
   The machine tends to be unstable when it has just started to travel, so pay attention to the left-right balance.



5.6.4.3 Stops

Do not make a sudden stop, and secure good margins of time and space when you stop the machine.

- Release the S1 lever (s1) and the S6 lever (s6) to return them to the neutral position. The brake automatically actuates to stop the machine.
  The machine tends to be unstable just before it stops travelling, so pay attention to the left-right balance.

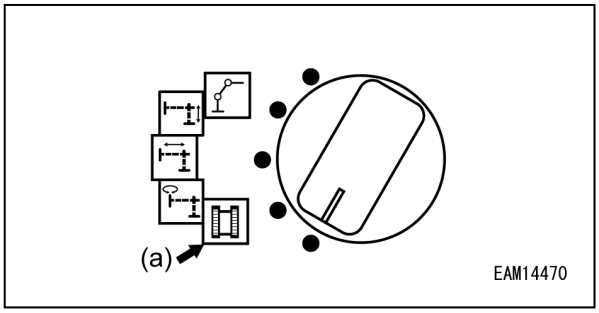


5.6.5 Changing the travelling direction of the machine

⚠ WARNING

- **A sudden change of direction when travelling at a high speed and an unnecessary spin turn not only damage the rubber tracks or hydraulic units but also pose the danger of crashing against an object.**
- **When you make a spin turn, do it after stopping the machine once.**
- **Do not change the travelling direction on a slop because the machine may skid. Especially, be careful when the machine is travelling on soft ground or clay soil.**

1. Set the mode switch to “crawler operation (a).”



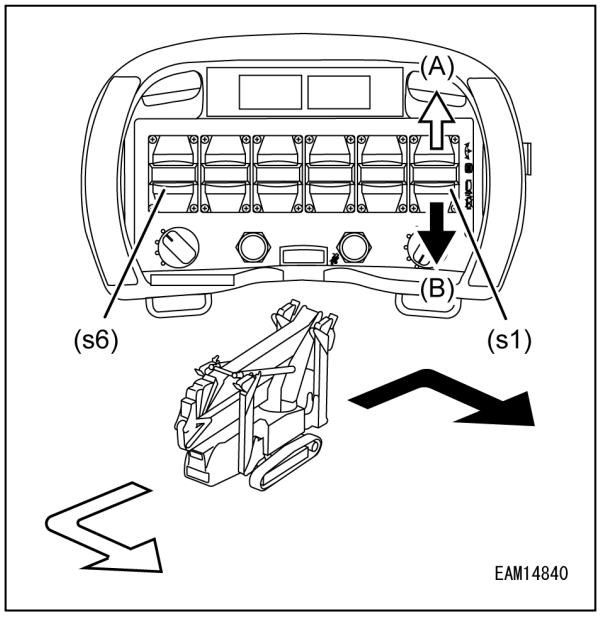
2. Change the travelling direction using levers of the transmitter.
   Do not make a sudden change of the travelling direction whenever possible. Especially, when you make a spin turn, do it after stopping the machine once.
   Operate the machine using two operation levers as follows.

5.6.5.1 Changing the machine orientation when the machine is stopped

To turn left, push the S1 lever (s1) forward (A) to turn left while moving forward or pull the S1 lever (s1) toward you (B) to turn left while moving backward.

(A): Left turn in forward direction

(B): Left turn in backward direction



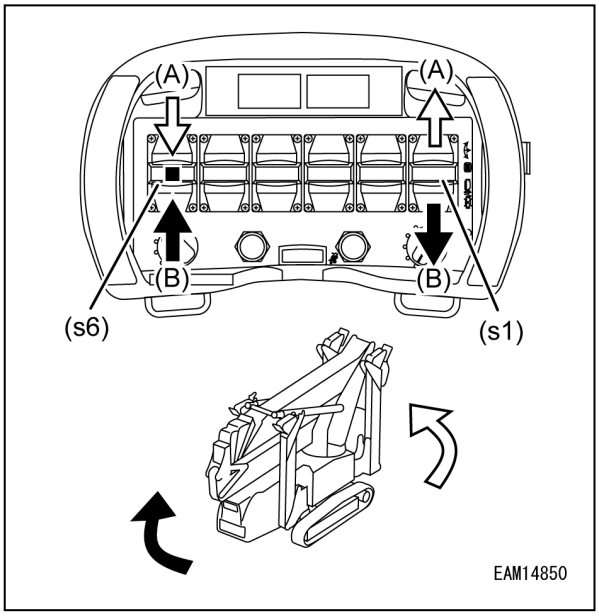
☞ To turn right, press the S6 lever forward to turn right while moving forward or press the S6 lever backward to turn right while moving backward.

5.6.5.2 Changing the travelling direction when travelling straight

To turn left when the machine is travelling straight, return the S6 lever (s6) to the neutral position (B) while holding the S1 lever (s1).

(A): Left turn in forward direction

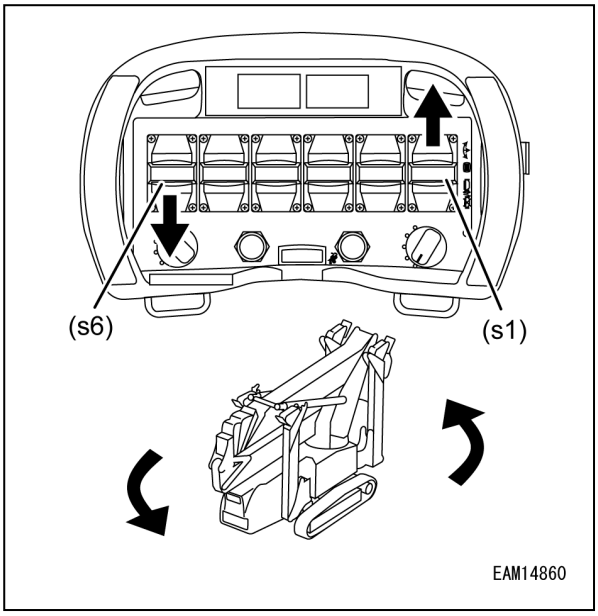
(B): Left turn in backward direction



☞ To turn right when the machine is travelling straight, return the S1 lever (s1) to the neutral position (B) while holding the S6 lever (s6).

5.6.5.3 Making a spin turn on the spot

To make a counterclockwise spin turn, pull the S6 lever (s6) toward you and push the S1 lever (s1) forward.

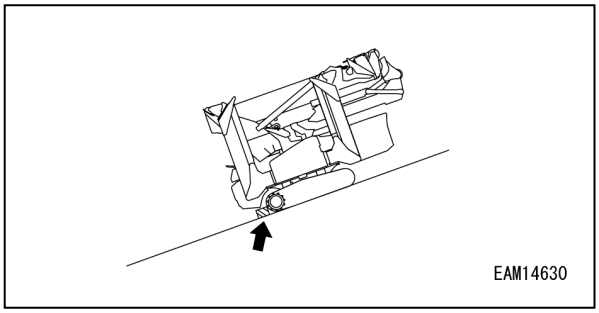


☞ To make a clockwise spin turn, pull the S1 lever (s1) toward and push the S6 lever (s6) forward.

5.6.6 Parking the machine

⚠ WARNING

- **Select a place of level and hard ground as the parking space of the machine. When you inevitably park the machine on a slope, orient the boom to the upside and set blocks so that the machine does not move.**



- **If someone touches an operation lever of the transmitter inadvertently while the machine is active, the machine may move suddenly to cause a serious accident.**
- **When you leave the machine, be sure to stop the machine and pull out the key of the starter switch.**

1. Stop the travelling of the machine.
   For how to stop the travelling of the machine, see “5.6.4 Starting (forward or backward) and stopping the machine.”
2. Stop the machine.
   For how to stop the machine, see “5.5.3 Stopping the machine (engine specification / engine and electric specification)” or “5.5.4 Stopping the machine (battery specification).”

5.7 OPERATING THE OUTRIGGERS

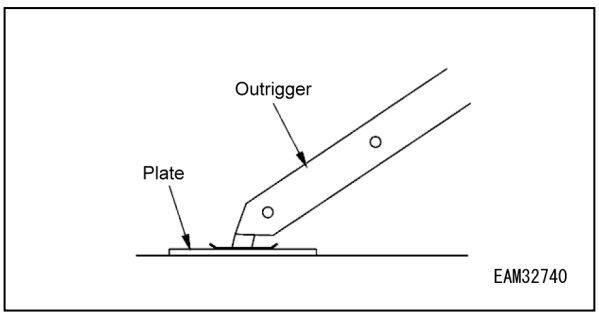
5.7.1 Precautions when operating the outriggers

- Check the safety of the area around the machine before moving outriggers.
- When you move an outrigger, do not touch it because you may be caught.
- Confirm that the operation levers of the transmitter move smoothly, and they return to the neutral position when you release them.
- When you fully lay an operation lever of the transmitter, it hits the stopper and stops. Do not move the operation lever further after it hits the stopper. Doing so causes failure or malfunction, leading to a serious accident.
- When you operate an outrigger, set the mode switch to the outrigger operation mode for derricking, telescoping, and slewing the outriggers. If the mode switch is set to the crane operation mode or the crawler operation mode, it is very dangerous because the crane moves contrary to your expectation.
- Before you operate an outrigger, be sure to stow the crane. If the boom is standing or lifting a load, it may result in a serious accident such as the tipping-over of the machine.

5.7.2 Precautions when setting the outriggers

Set the crane on horizontal and hard ground

- Be sure to set the outriggers on horizontal, stable, and hard ground.
  If you operate the crane without setting the outriggers, the machine may tip-over.
- Before operating the crane, be sure to set all outriggers.
- Do not set the outriggers on soft ground that has the danger of collapse or that is near a road shoulder or a trench.
  When setting the outriggers on soft ground for unavoidable reasons, set a plate of an enough size and strength under the supporting pad of each outrigger and strengthen the ground.



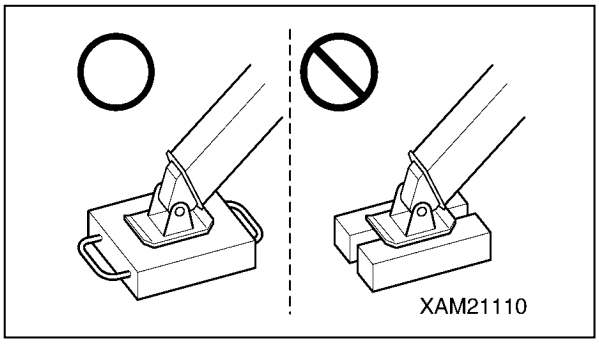
Reinforcing the ground

If you set the outriggers on soft ground as described below, the outrigger foots sink into ground, causing the machine to tip-over.

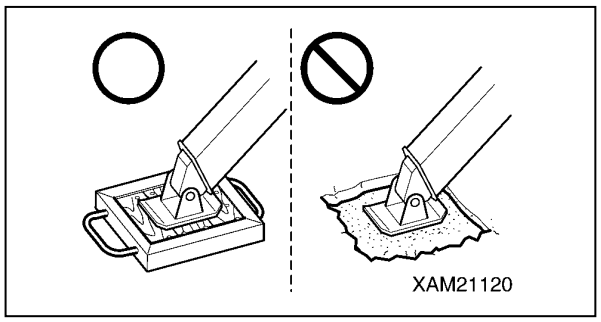
- Road with tentative pavement (tentative asphalt or thin concrete)
- Cobbled road
- Land that was dug and then filled
- Landfill
- Road shoulder and point near a hole such as a trench
- Deteriorated pavement
- Pavement that looks solid but whose soil underneath is soft and has a void due to water erosion
- Slope

- On soft ground, set a pad of an enough size and strength under the outrigger foot, and reinforce the ground.
- When you inevitably set the outriggers near a road shoulder, reinforce the ground to prevent the road shoulder from collapsing.
- When you work on a slope, level the ground under the rubber tracks and the all outrigger foot before setting the outriggers.
  If you set the outriggers without horizontalizing the ground, an outrigger may slip or the machine may tip-over causing a serious accident.
- Do not use the crane if you cannot reinforce the ground or there is the risk that outriggers will still sink even if you reinforced the ground.

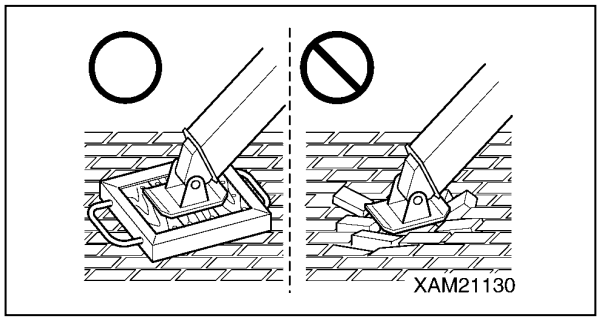
Setting stable pads



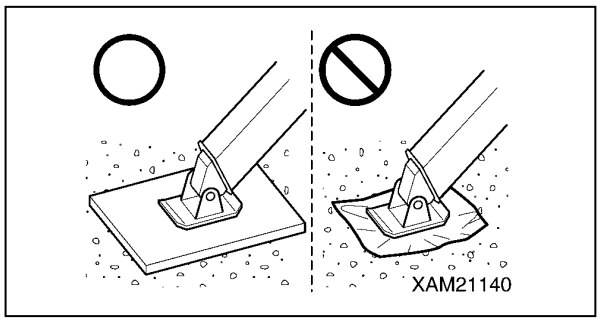
Road with tentative pavement



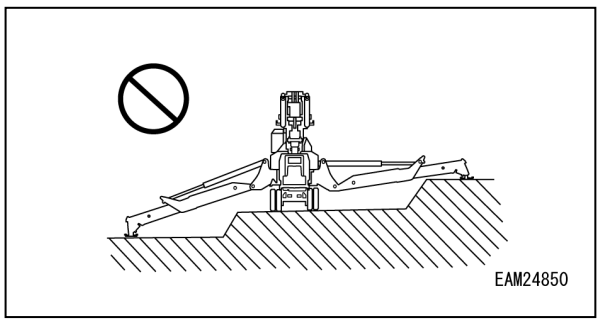
Cobbled road



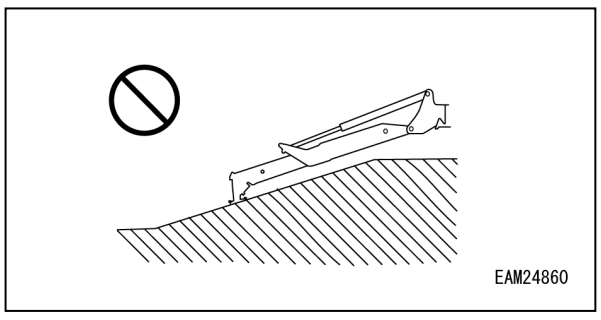
Landfill, etc.



Slope



Slope

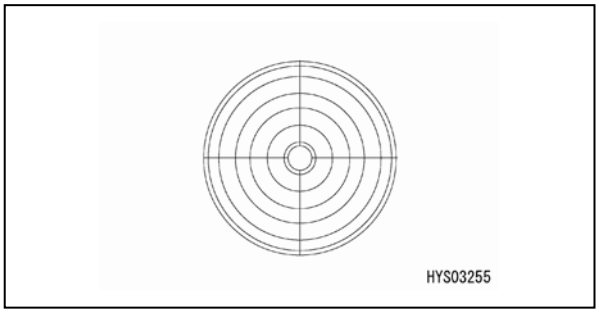


Precautions when setting the outriggers

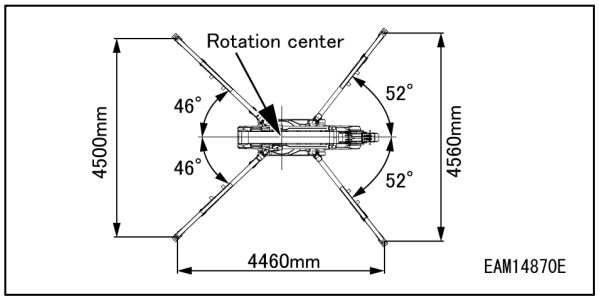
Strictly observe the following to prevent serious injury and fatal accidents when you set the outriggers.

- Keep people away when you set the outriggers.
  People nearby may be involved in a serious accident; for example, their feet may be caught by the outrigger foot.

- When you operate outriggers, make sure that the moment limiter override switch is OFF.
- When you set outriggers, set the machine in the level position accurately with reference to the level gauge. Keep the machine level during the use of the crane checking the level gauge.

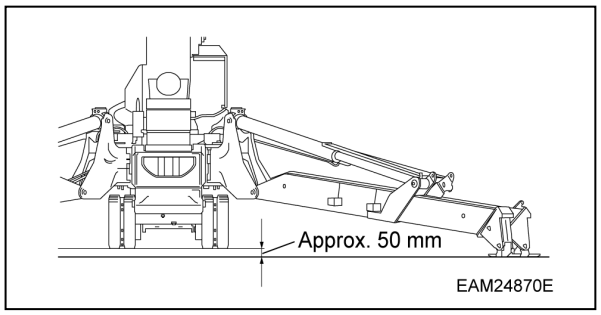


- As a rule, set the outriggers to the OR MAX extension at STD rotation angle.
  If the outriggers are unavoidably set up in a state other than the OR MAX extension at STD rotation angle, be sure to perform the working according to the working range status display on the monitor.



- Set the outriggers so that the rubber track on the left side is lifted to 50 mm above the ground.

- Confirm that all outriggers are standing on the ground steadily.



☞ Even if the outriggers are extended to the maximum, stability is low on uneven ground if one of the outriggers stands on a level lower than the bottom surface of a crawler by 50 mm or more. In such a case, observe the rated total load of the OR MID or MIN extension at STD rotation angle.

5.7.2.1 Modes of outrigger setting

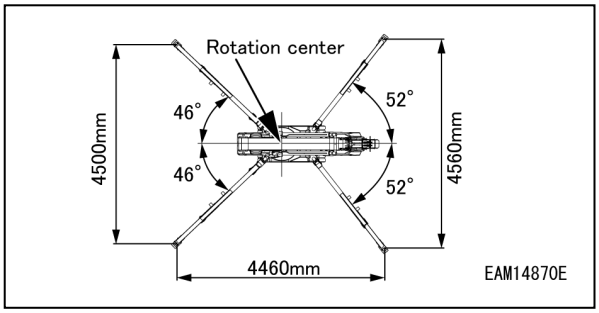
⚠ WARNING

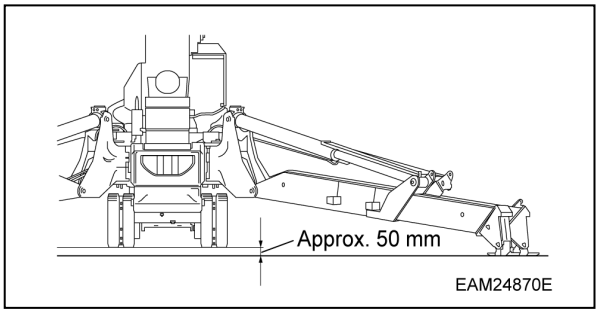
- **Before operating the crane, be sure to extend all outriggers.**
  Do not use the crane without setting the outriggers.
  The machine may tip-over causing a serious injury.
- **When you extend outriggers, set the machine in the level position checking the level gauge.**
  If the machine inclination becomes 3 degrees or more, the alarm buzzer sounds.
  The alarm buzzer stops when you return the machine to the level position.
- **When performing a working in a state other than the outrigger MAX extension state at standard rotation angle, view the load chart value that follows the monitor's working range status display.**
  If you use the machine with a wrong load value, the machine may tip-over. So, pay careful attention to such an area.
- **When a lifted load rotates, the stability will change depending on the rotation direction, so pay careful attention to this when performing a working.**

The figure on the right illustrates the outrigger MAX extension state at standard rotation angle shown at the top of the RTL chart.

The outriggers are in the outrigger MID extension condition when the extension of the inner box is reduced even if only slightly.

When the rotation angle deviates from the tolerance of the standard rotation angle, ground the outriggers firmly with reference to "5.7.3 Setting the outriggers."





The outriggers are in a multi-angle condition when not in the conditions shown in the figure above. Follow the monitor's working range status display.

☞ Conditions of the outrigger MAX extension

(1) Set the outrigger rotation angle to the standard rotation angle.
Outriggers No.1 and No.4: 46 degrees (tolerance: ±1.5 degrees)
Outriggers No.2 and No.3: 52 degrees (tolerance: ±1.5 degrees)

(2) Extend the inner boxes of all outriggers to the maximum length.

(3) Set all outriggers on a level surface.

(4) Set the height of the crawlers to approximately 50 mm.

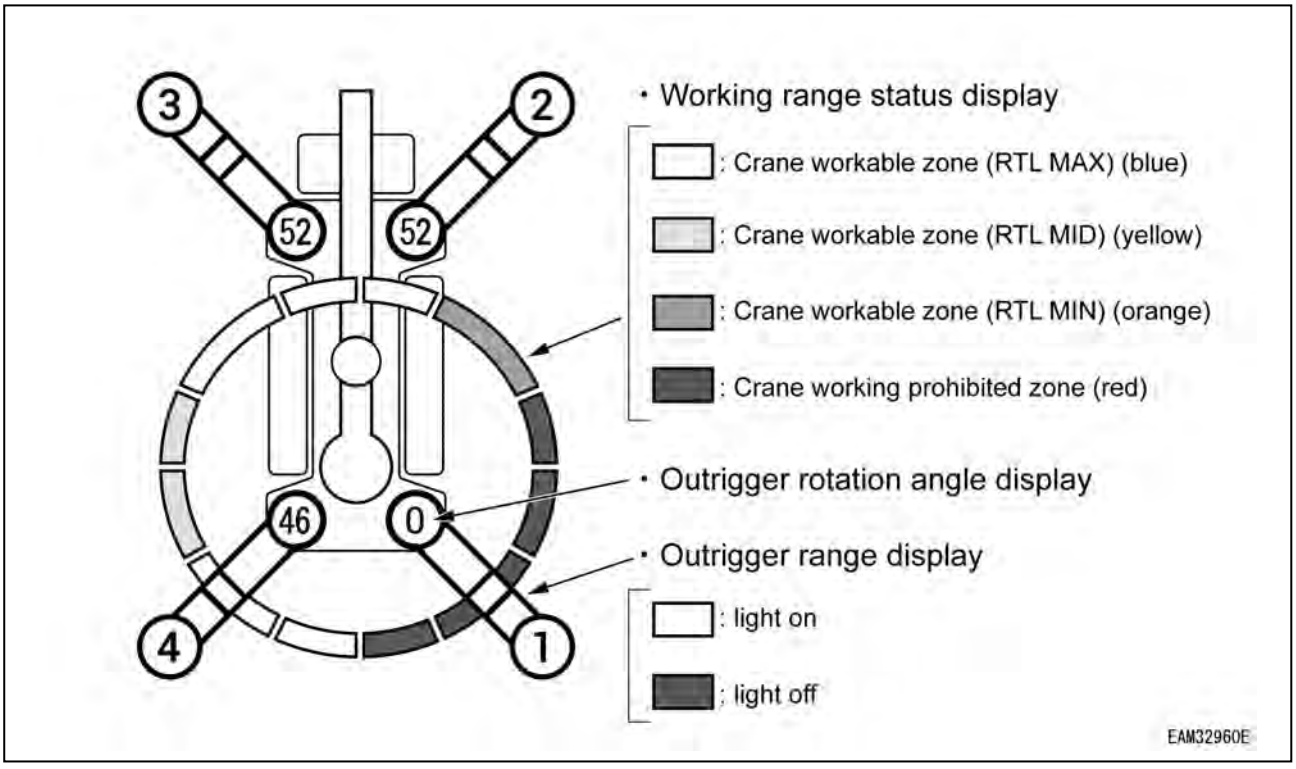
☞ Check the height of the crawlers by the crawler on the left of the machine.

These conditions define the maximum extension of outriggers.

5.7.2.2 Crane working areas depending on Outrigger setting conditions

⚠ WARNING

- **The figure below shows the working areas of the crane for depending on outriggers setting conditions.**
  If you operate the crane in the crane working prohibited zone, the machine may tip-over causing a serious injury.
  Never operate the crane within the crane working prohibited zone.
- **If even one of the outriggers is not at the OR MAX extension at STD rotation angle, perform the working at the RTL chart value according to the monitor's working range status display.**
  For details, see the section of "5.7.2.4 Allowable slewing angles and the applied rated total load depending on the outrigger setting conditions."
- **The machine is not stable in some extension outrigger setting conditions. Pay careful attention during operation keeping the working radius small.**
- **The working area and load lifting capacity of the crane vary a lot depending on the outriggers condition. Before using the crane, be sure to check the working area and lifting capacity on the monitor.**
  If you use the crane to lift a load exceeding the rated load, the machine may tip-over causing a serious injury.



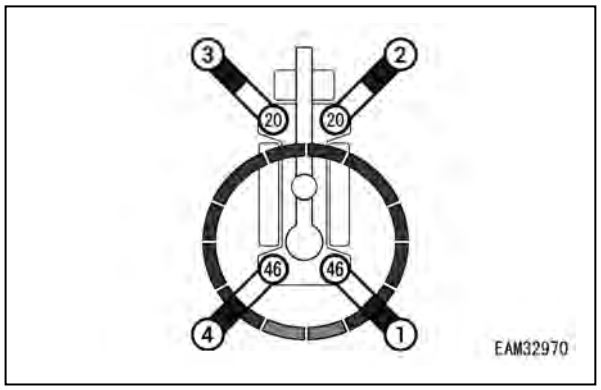
[When the boom stowage position is in the crane working prohibited zone]

In this case, you can perform the boom slewing and lowering operation in the crane working prohibited zone if all of the following conditions are met:

Conditions under which rotation is possible in the crane working prohibited zone

- No load
- The boom is fully retracted.
- Boom angle of 60 degrees or more
- Jib stowed state

The outrigger conditions are as follows.



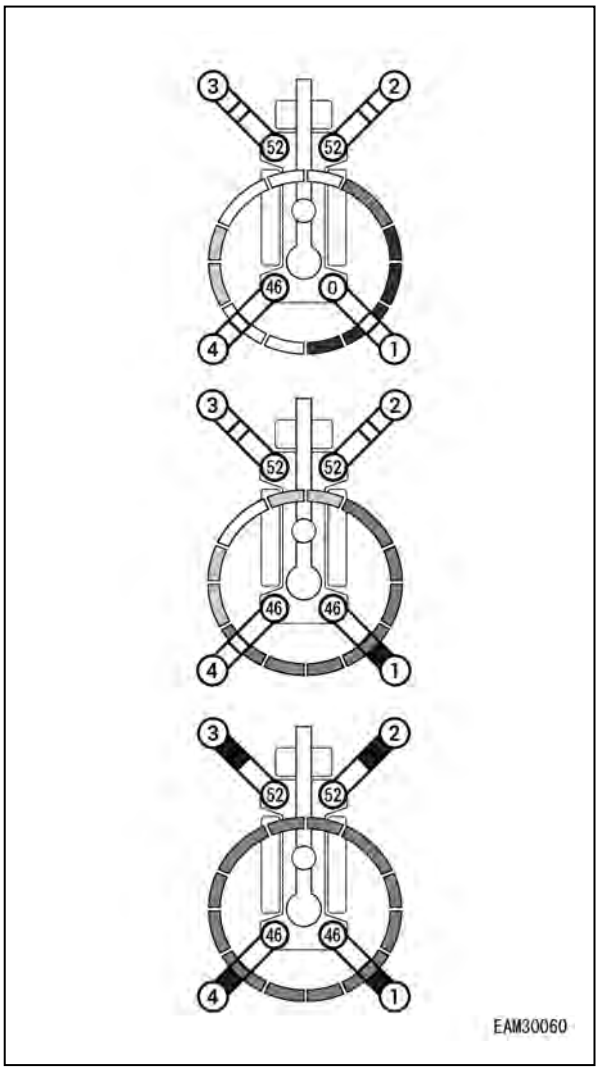
- No. 1 and No. 2 outriggers side: either the No.1 or No.2 outriggers are extended at an angle of 15 degrees or more
- No. 3 and No. 4 outriggers side: either the No.3 or No.4 outriggers are extended at an angle of 15 degrees or more
- No. 1 and No. 4 outriggers side: either the No.1 or No.4 outriggers are extended at an angle of 75 degrees or less
- No. 2 and No. 3 outriggers side: no restrictions

Conditions under which the boom lowering action in the slewing and stowing positions is possible

- No load
- The boom is fully retracted.
- Boom stowing position (the position in which the post's lower section and the machine's eye mark overlap)
- Jib stowed state

5.7.2.3 Reading the RTL charts for different outrigger setting

If even one of the outriggers is not extended to the OR MAX extension at STD rotation angle, the rated total load for the OR MAX extension at STD rotation angle in all directions cannot be lifted.



5.7.2.4 Allowable slewing angles and the applied rated total load depending on the outrigger setting conditions

⚠ WARNING

In the crane workable zone (RTL MID) or the crane workable zone (RTL MIN), never use a RTL Chart that is higher than the applicable load range. The machine may tip-over causing a serious injury.

⚠ CAUTION

Before using the crane, check the actual setting condition of the outriggers, the allowable slewing angle displayed in the monitor, and the rated total load.

The allowable slewing angle and the rated total load vary greatly depending on the extension outrigger setting conditions.

There are the extension outrigger setting conditions.

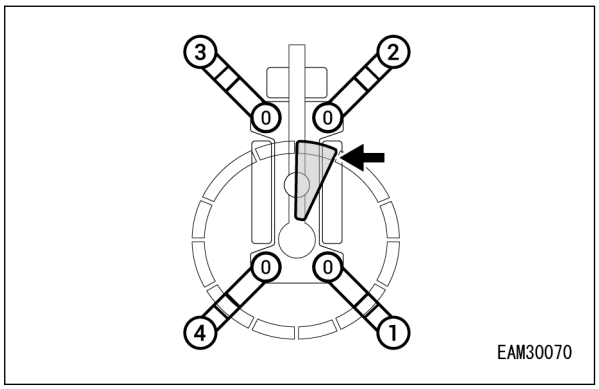
1. Outrigger rotation angle

- STD: Standard rotation angle
  Outriggers No.1 and No.4: 46 degrees ±1.5 degrees
  Outriggers No.2 and No.3: 52 degrees ±1.5 degrees
- 0 degree: Parallel to the front-back line of the machine
- 90 degrees: Vertical to the front-back line of the machine

2. Outrigger extension range

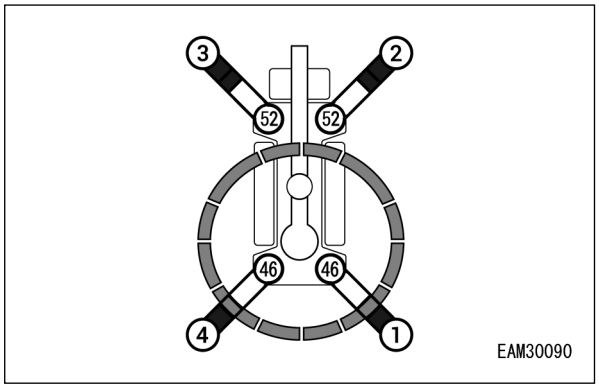
- MAX: Outriggers inner box are extended to the maximum.
- MID: The range from which the outriggers are shortened even slightly from their fully extended position to the MID mark position.
- MIN: The range from which the outriggers are shortened even slightly from the MID mark position to the fully retracted position.

The current rotation angle of the boom is displayed along a ring shape.

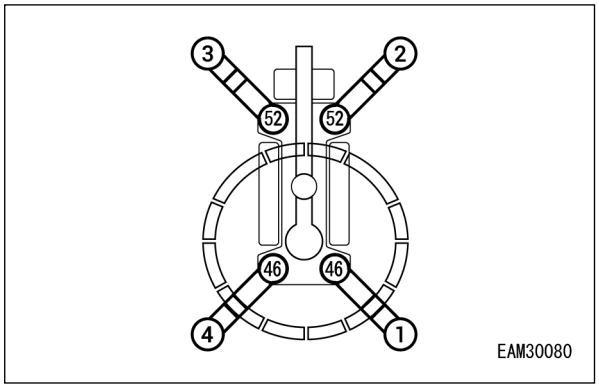


[When 360-degree operation with the same rated total load is allowable]

When all outriggers are extended at the standard rotation angle and the same length, 360-degree crane operation is allowable with the same rated total load.



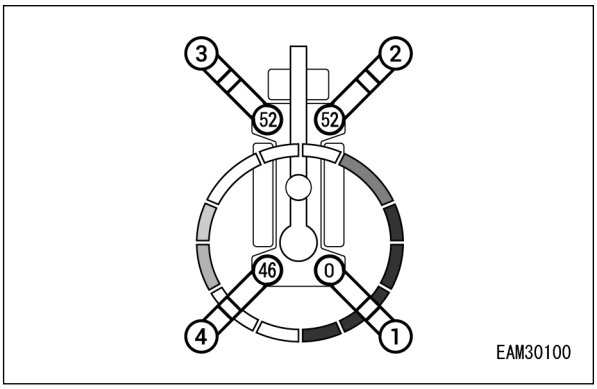
In addition, if all outriggers are extended to the maximum, crane operation is allowable with the RTL charts of the OR MAX extension at STD rotation angle.



[Allowable slewing angle and the applied RTL chart depending on the outrigger rotation angle]

If one of the outriggers is set up at a rotation angle other than the standard rotation angle, there will be a range of lower capacity or a non-operable range on the sides of that outrigger. The lifting capacity decreases also in the adjacent range.

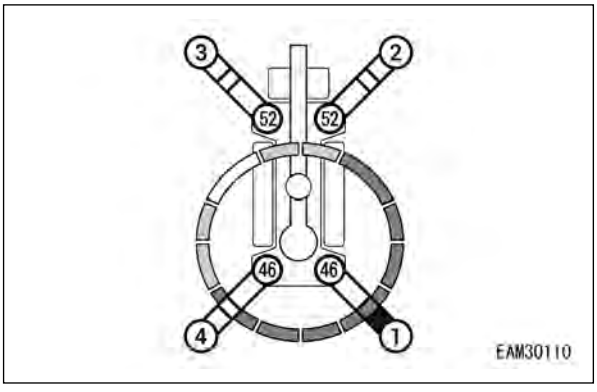
In this case, be aware that the lifting capacity may become low in the lateral direction of the machine even if two adjacent outriggers are set to the MAX extension at STD rotation angle.



[Applied RTL chart depending on the outrigger extension range]

If one of the outriggers is set up at an extension range other than maximum, the lifting capacity on the side of the outrigger decreases.

The lifting capacity becomes lower if the extension range is shortened from the maximum to the medium, and from the medium to the minimum.

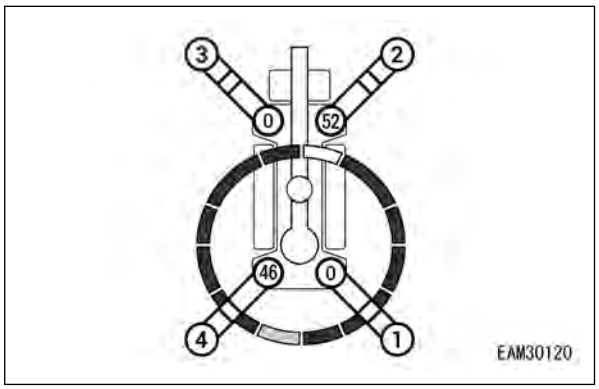


[Cases when lifting is possible even if two adjacent outriggers are not set to OR MAX extension at STD rotation angle]

In some cases, this machine can operate even if adjacent front and back outriggers or adjacent left and right outriggers are not set to the OR MAX extension at STD rotation angle.

Example: All outriggers are extended to MAX.
Rotation angle:
Outriggers No.2 and No.4: STD
Outriggers No.1 and No.3: 0 degree

When you operate the machine, pay cross attention to the allowable slewing angle and the RTL Chart on the monitor to confirm if the operation is possible.



[Special case of outrigger setting]

⚠ WARNING

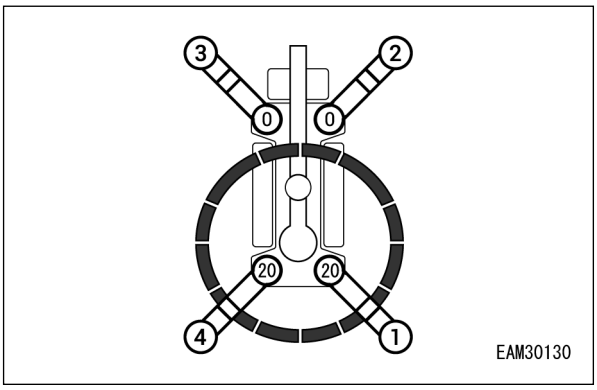
In this special case, never operate the crane violating the conditions indicated below. The machine may tip-over causing a serious injury.

When outriggers No.1 and No.4 are set at 15 degrees or more, and outriggers No.2 and No.3 set at 20 degrees or less, the monitor's working range status display shows 360-degree crane working prohibited zone, crane operation is possible only under the following conditions.

- Allowable slewing angle: 0 to 6 degree or 354 to 360 degrees
- Boom raising angle of 45 degrees or less
- Lifting height of 3.6 m or less
- Working radius of 8.5 m or less
- Only the RTL chart for OR MIN extension at STD rotation angle is available

Important

When the 4-fall hook block in attached only half of the lifting capacity RTL chart in the OR MIN extension at STD rotation angle



5.7.2.5 When outrigger has moved during operation

During crane operation, if an outrigger has moved from the tolerance range of the standard rotation angle by less than ±5 degrees, the machine reduces the upper limit of the rated load to a safe value.

Outrigger lamps on the monitor and the display of the radio controller flash in green

☞ If you want to operate the crane with the capacity indicated in the original RTL Chart, stop the operation, set the outrigger again, and then start operation.

☞ This restriction is applied only in the case when the outrigger has moved during operation.
If an outrigger is set deviating from the tolerance range of the standard rotation angle by less than ±5 degrees before starting operation, the outrigger is out of the standard rotation angle.

5.7.3 Setting the outriggers

⚠ WARNING

- **When you operate outriggers, do not touch them. Your hand may be caught in a hole or gap of an outrigger.**
- **Keep people away when you set the outriggers.**
  People nearby may be involved in a serious accident; for example, they may be caught between an outrigger and the machine body.
- **Keep your hands and fingers away from spaces around moving parts when you set the outriggers.**
  You may be involved in a serious accident, with your hand or finger caught.
- **If the machine inclines 3 degrees or more when you set outriggers, the fall alarm buzzer sounds. Be sure to check the level gauge when you operate levers S1 to S6 in order to maintain the horizontal position and keep the buzzer silent.**
- **When outriggers are set up, do not telescope them. Outriggers may be damaged by excessive force.**
- **When setting the outriggers, if the machine is not level or if any of the outriggers are unstable, adjust them so that the machine is level and all four outriggers are firmly grounded.**

⚠ CAUTION

To find the approximate height of the machine, check the height of the crawler on the left of the machine.

☞ When you set the outrigger mode (derricking, telescoping, slewing) during operation from the radio controller, the working status lamp flashes red and alarm buzzer sounds intermittently to notify the outrigger mode (ground, extension, rotation).

☞ When an outrigger stops at the standard rotation angle, the alarm buzzer beeps.
To set the outriggers to the standard rotation angle, operate each of all four outriggers by the lever until the buzzer beeps.

5.7.3.1 Setting outriggers by automatic set-up using S4 lever

⚠ WARNING

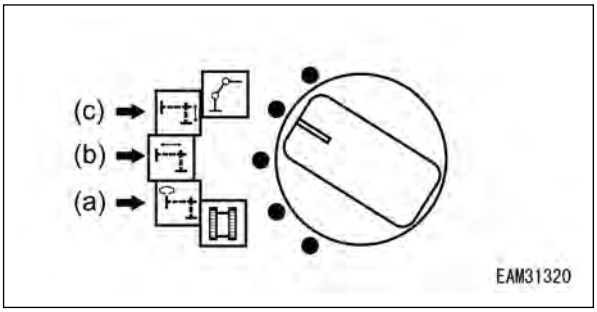
Secure enough space around the machine to allow the outriggers to be extended to the maximum.
If you do not secure enough space, people nearby may be involved in a serious accident such as being caught by an outrigger.

⚠ CAUTION

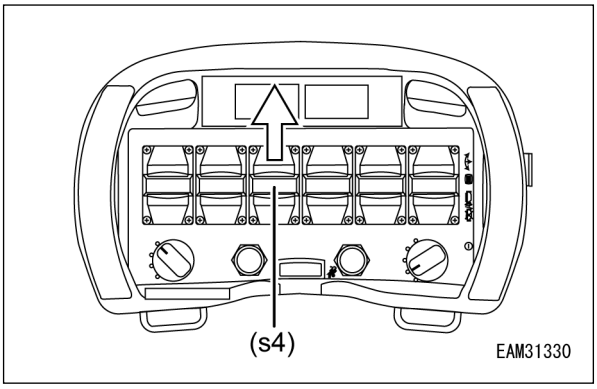
This section explains how to set outriggers with OR MAX extension at STD rotation angle.

☞ When you make automatic operation by the S4 lever, outriggers stop rotation at the standard rotation angle even with full-lever operation (push or pull the lever to the end of the stroke).

1. Change the mode switch to outrigger mode (a), (b), or (c).

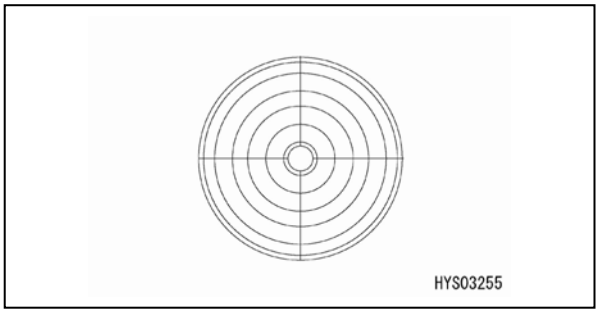


2. Push the S4 (s4) lever of the transmitter forward.
   While you keep the lever pushed forward, the four outriggers move in the following steps:



   1. The four outriggers rotate to the standard rotation angle.
   2. After rotation, the four outriggers extend to the maximum.
   3. After extending to the maximum, the four outriggers are fully grounded until they touch the ground.
   4. After the four outriggers touch the ground, they lift the machine and bring it to a level position (auto).

3. When the left-side crawler is lifted up to a height of approximately 50 mm, return the S4 lever to the neutral position once the yellow ball in the standard device table is in the middle.



4. If the machine is not level, or if any of the outriggers are unstable, operate the S4 lever or S1, S2, S3, S5, or S6 lever to make fine adjustments, and adjust the machine so that it is level and all four outriggers are firmly grounded.
5. After finishing the setting of the outriggers, return all levers to the neutral position.

5.7.3.2 Setting each outrigger individually

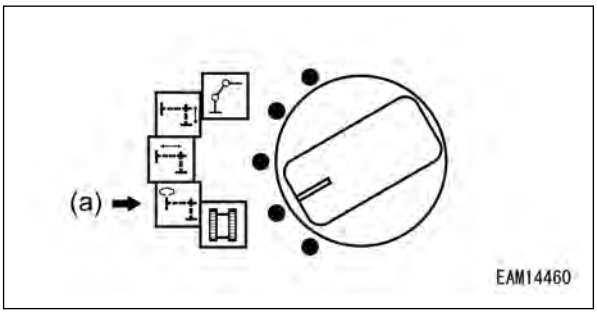
⚠ WARNING

- **Do as follows to lift the machine using levers S1, S2, S5 or S6.**
  There are four outriggers. Do not use a wrong one when you use one of the levers S1, S2, S5 or S6. Check the outrigger numbers on the outrigger display area of the monitor and the number plates sticked on the outriggers. A wrong operation may cause a serious accident.
- **When you operate only two outriggers simultaneously, operate the two outriggers at the front (outriggers No.2 and No.3) or the two outriggers at the back (outriggers No.1 and No.4). If you operate two levers of the left-side outriggers or right-side outriggers simultaneously, the two outriggers on one side move too rapidly causing the machine to tip-over.**
- **Operate levers S1, S2, S5 or S6 so as to extend four outriggers little by little equally. If two outriggers on one side are extended too rapidly, the machine may tip-over.**

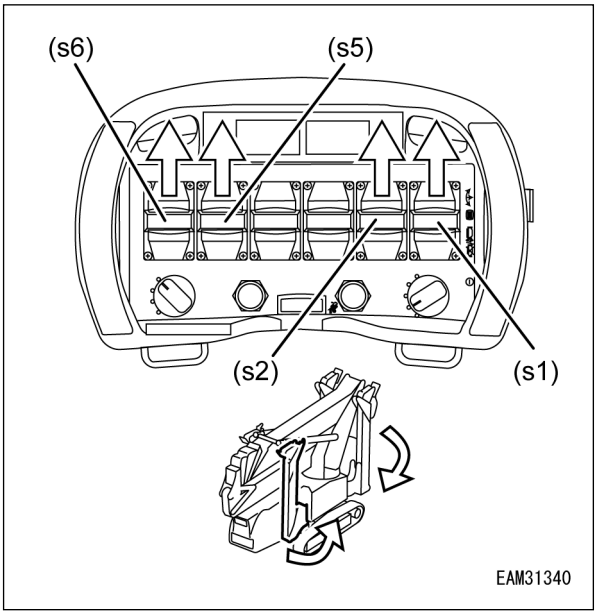
☞ While you are controlling the rotation angles of outriggers, pushing the lever a little (not full-lever) stops the outriggers at the standard rotation angle. To set the outriggers exceeding the standard rotation angle, push the lever further.
When you lay the lever to the maximum (full-lever), the outriggers do not stop at the standard rotation angle but they slew.

☞ When the outriggers have been extended and set up at an angle other than that of the OR MAX extension at STD rotation angle, perform the working with reference to the capacity in each rotation direction and according to the monitor's working range status display.

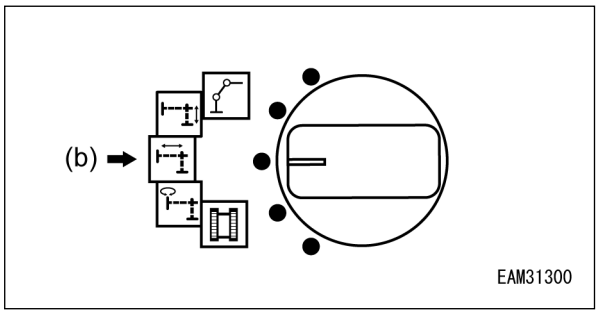
1. Check the number plates of levers S1, S2, S5, and S6 to find the one for the target outrigger.
2. Change the mode switch position to "outrigger rotation (c)."



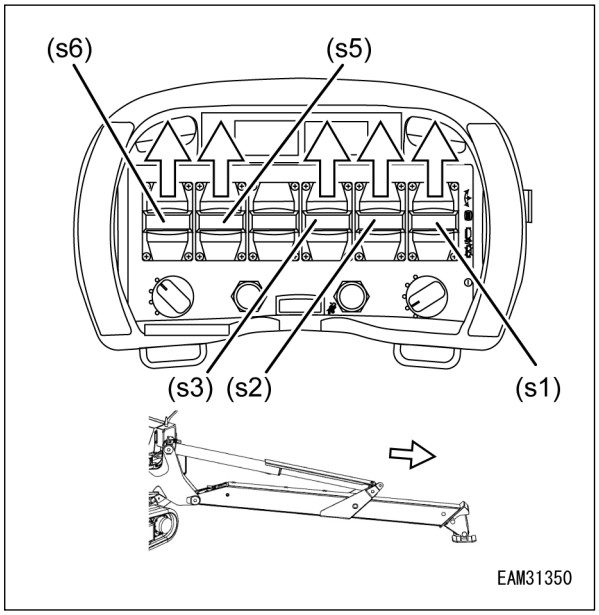
3. Out of levers S1 (s1), S2 (s2), S5 (s5), and S6 (s6), push forward the lever of the target outrigger to rotate it to the desired angle.



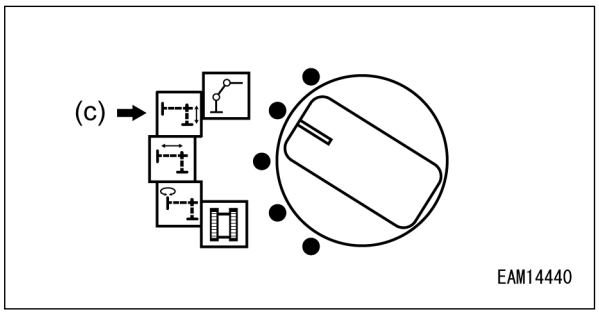
4. Change the mode switch position to "outrigger telescoping (b)."



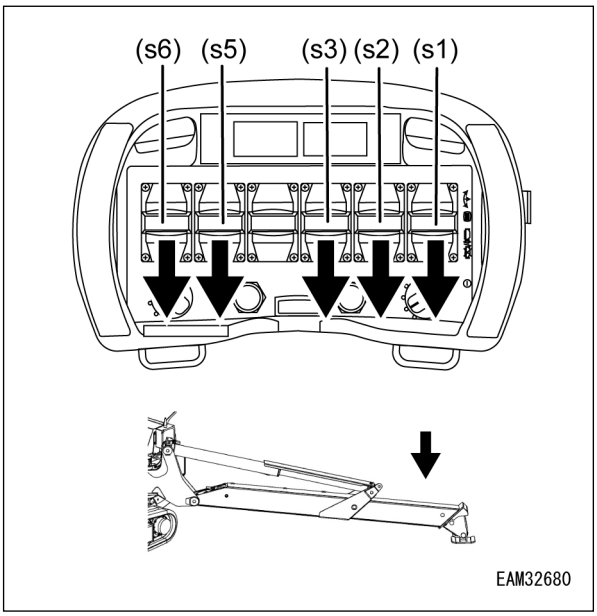
5. Out of levers S1 (s1), S2 (s2), S5 (s5), S6 (s6), and S3 (s3), push forward the lever of the target outrigger to extend it to the desired angle.



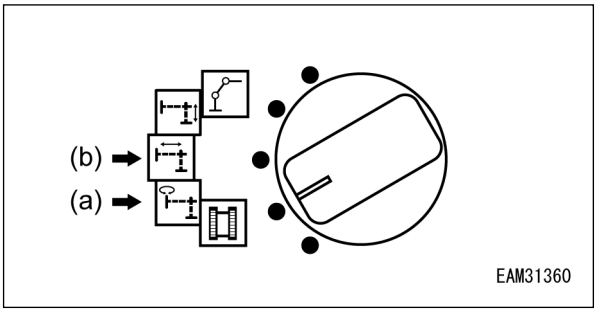
6. Change the mode switch position to "outrigger ground (c)."



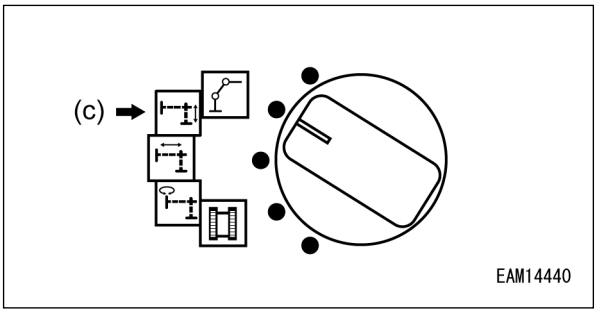
7. Out of levers S1 (s1), S2 (s2), S5 (s5), S6 (s6), and S3 (s3), pull the lever of the target outrigger to be extended toward you until just before the outrigger foot touches the ground.



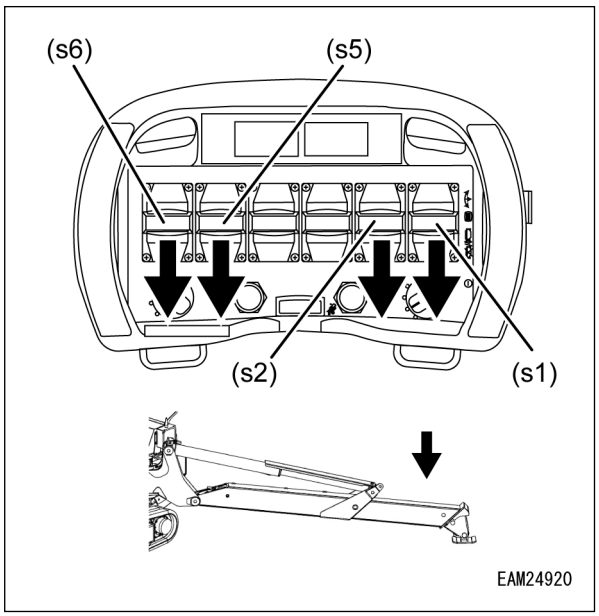
8. Change the mode switch position to “outrigger rotation (a)” or “outrigger extension” to fine-adjust the angle or length of the outrigger.



9. Change the mode switch position to “outrigger ground (c).”

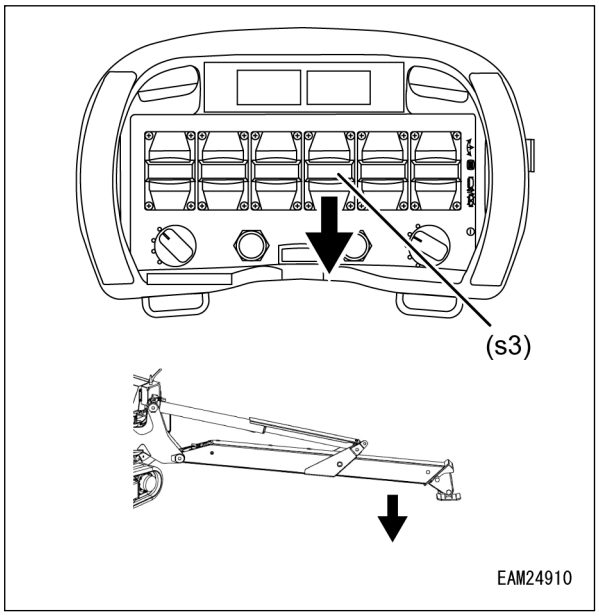


10. Using levers S1 (s1), S2 (s2), S5 (s5), and S6 (s6), ground the four outriggers evenly.

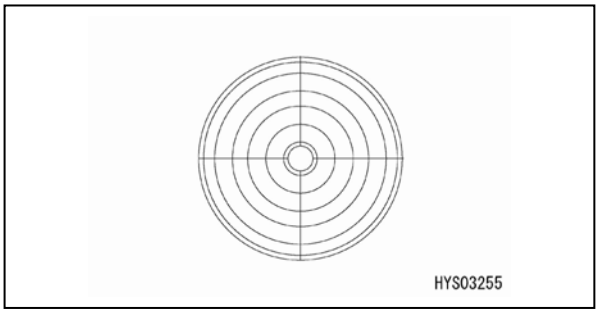


11. Pull lever S3 (s3) toward you to raise the machine by the outriggers.

☞ From this state, even if the S4 lever is pushed forward instead of the S3 lever, the same action is possible.



12. Lift up the left-side crawler to a height of approximately 50 mm while it is automatically kept level (auto leveling), and return the S3 lever to the neutral position once the yellow ball in the standard device table is in the middle.



13. If the machine is not level, or if any of the outriggers are unstable, operate the S3 lever or S1, S2, S3, S5, or S6 lever to make fine adjustments, and adjust the machine so that it is level and all four outriggers are firmly grounded.
14. After finishing the setting of the outriggers, return all operation levers to the neutral position.

5.7.4 Stowing the outriggers

⚠ WARNING

- **When you operate outriggers, do not touch them. Your hand may be caught in a hole or gap of an outrigger.**
- **Keep people out when you stow the outriggers.**
  People nearby may be involved in a serious accident; for example, they may be caught between an outrigger and the machine body.
- **Check underneath the rubber tracks for any object when you stow the outriggers.**
  An object may cause the tipping-over of the machine when you stow outriggers, leading to a serious accident.
- **Keep your hands and fingers away from spaces around moving parts when you stow the outriggers.**
  You may be involved in a serious accident, with your hand or finger caught.
- **Secure an enough space around the machine when you stow the outriggers.**
  If you do not secure an enough space, people nearby may be involved in a serious accident such as being caught between an outrigger and the machine.
- **Check the eye mark at the foot of the post to confirm that the boom is in the stowed position. If the stowing position is misaligned, the boom and outriggers may interfere and damage each other.**

Important

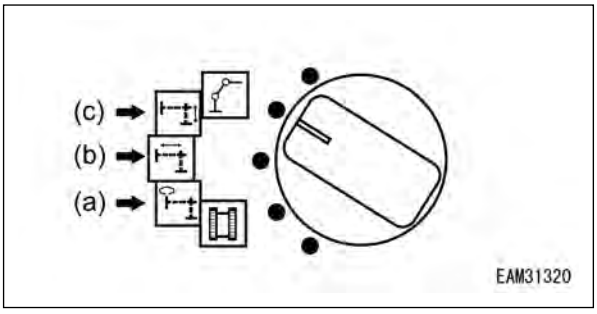
- **Before operating outriggers, be sure to stow the jib and the boom of the crane. (Fully lower the jib and boom or set them to the slewed stowing position.) In other conditions, the outrigger interlock prevents the operation of outriggers.**

5.7.4.1 Stowing outriggers automatically using S4 lever

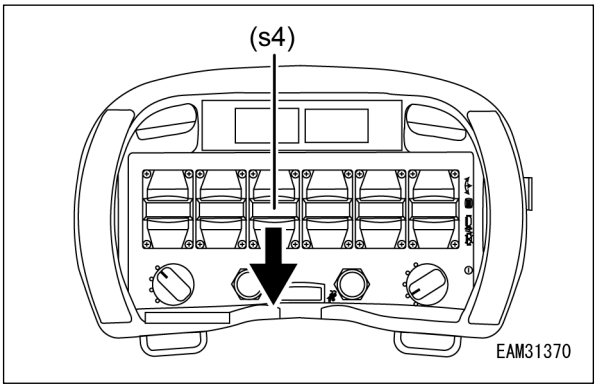
⚠ WARNING

Only perform automatic stowing with the S4 lever on level ground.

1. Change the mode switch to outrigger mode (a), (b), or (c).



2. Pull the S4 (s4) lever of the transmitter toward you.
   While you keep the lever pushed forward, the four outriggers move in the following steps:



   1. The four outriggers raise a little.
   2. The four outriggers retract and raise.
   3. After the four outriggers retract and raise to the maximum, they rotate.
   4. The four outriggers rotate to the stowed position.

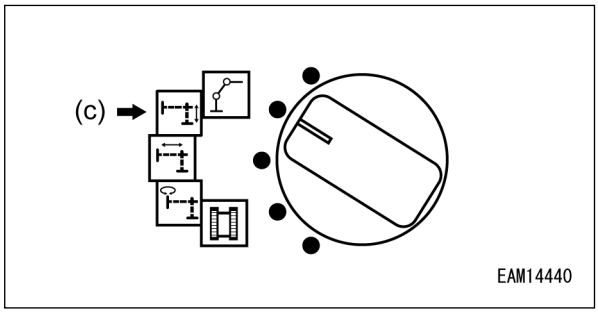
3. After the outriggers are stowed, return the S4 lever to the neutral position.

5.7.4.2 Stowing each outrigger individually

⚠ WARNING

- **There are four outriggers. Be careful not to use a wrong outrigger switch.**
  Check the outrigger numbers indicated on the operation levers of the transmitter and the number plates sticked on the outriggers.
  A wrong operation may cause a serious accident.
- **When you operate only two outriggers simultaneously, operate the two outriggers at the front (outriggers No.2 and No.3) or the two outriggers at the back (outriggers No.1 and No.4). If you operate two switches of the left-side outriggers or right-side outriggers simultaneously, the two outriggers on one side moves rapidly causing the machine to tip-over.**
- **To lower the machine on to the ground when the crawlers are lifted, operate the outrigger switches so as to lower four outriggers little by little equally.**
  Operating only two outriggers on the left or right makes the machine unstable, causing it to tip-over.

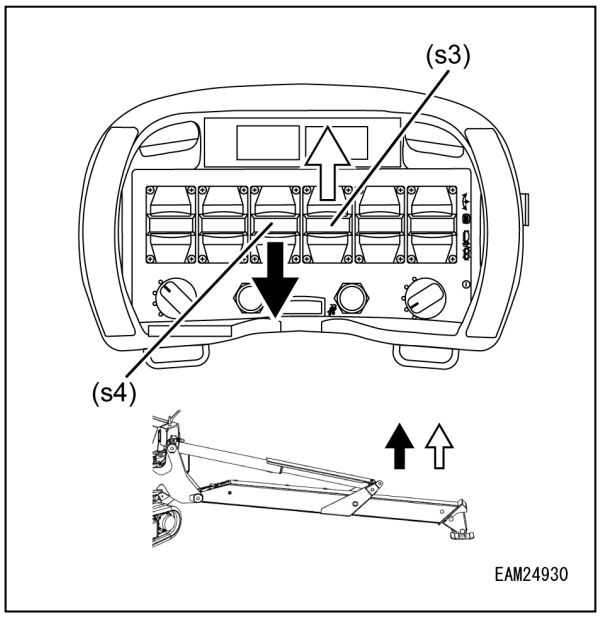
1. Change the mode switch position to “outrigger ground (c).”



2. Lower the machine to the ground using lever S3, S1, S2, S5, or S6.

[Firm level ground]

1. On firm level ground, push the S3 lever (s3) forward. The four outriggers raise simultaneously to lower the machine. Keep this lever position until the rubber tracks fully touch the ground.
In this way, you can safely lower the machine on to the ground.



[Different grounding levels of four outriggers]

☞ At a location where the ground-touching heights of the four outriggers are different, use the individual operation levers to lower the machine slowly until the rubber tracks touch the ground.

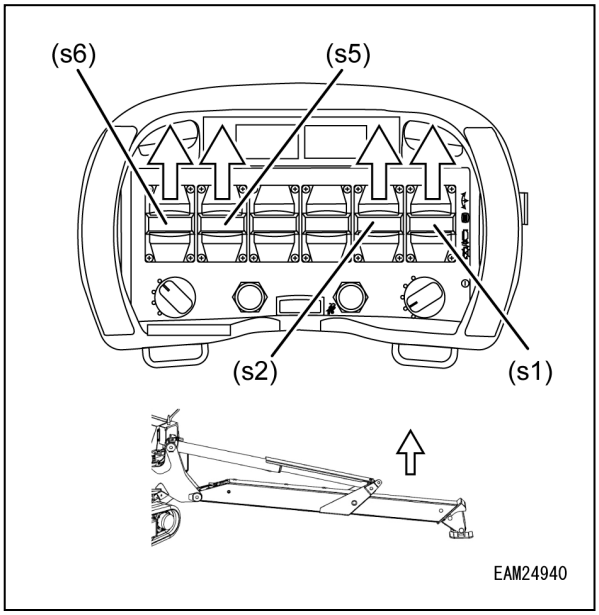
1. Check the number plates of levers S1 (s1), S2 (s2), S5 (s5), and S6 (s6) to find the one for the target outrigger.

2. Out of levers S1 (s1), S2 (s2), S5 (s5), and S6 (s6), push one or two levers forward simultaneously.

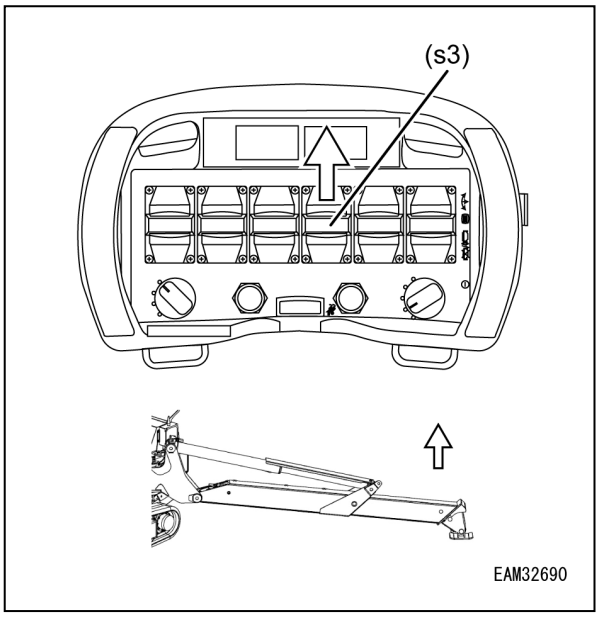
3. When the outrigger starts rising to lower the machine, return the lever to the neutral position once.

4. Operate the rest of levers among S1 (s1), S2 (s2), S5 (s5), and S6 (s6) in the same way to lower the machine while keeping it as level as possible, and then, after finishing the operation of the outrigger, return the lever to the neutral position.

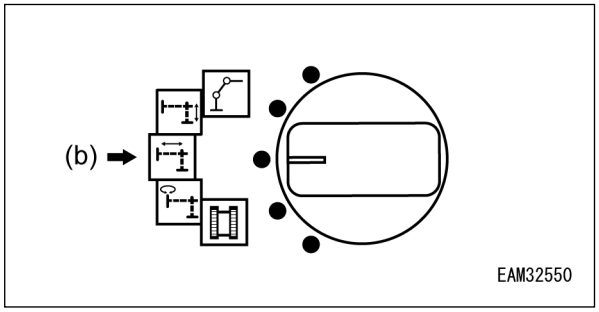
5. Repeat this operation to lower the machine gradually until the rubber tracks land on the ground completely.



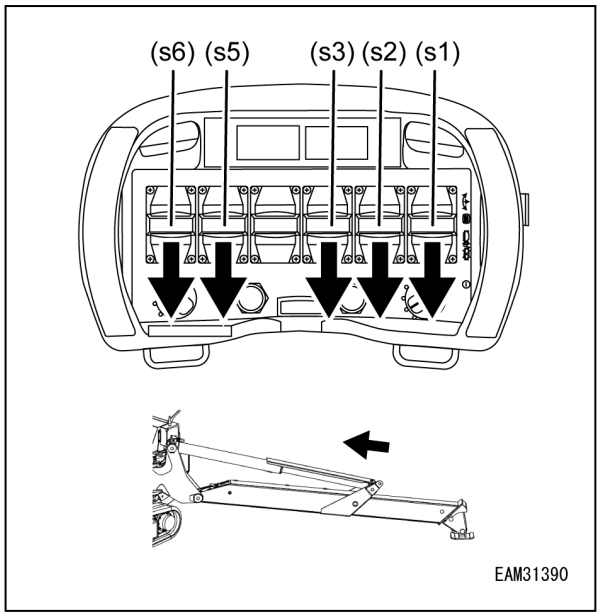
3. After the left and right rubber tracks land on the ground completely, push the S3 lever (s3) forward.
After the four outriggers raise to the maximum, return the S3 lever (3) to the neutral position.



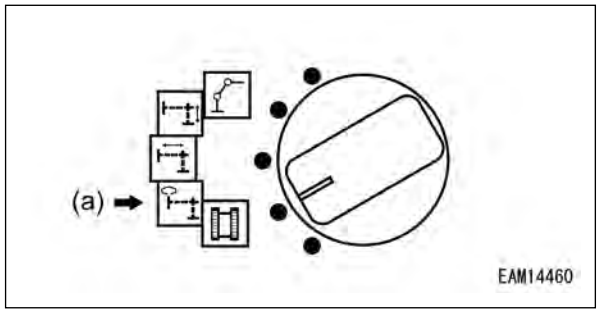
4. Change the mode switch position to “outrigger extension (b).”



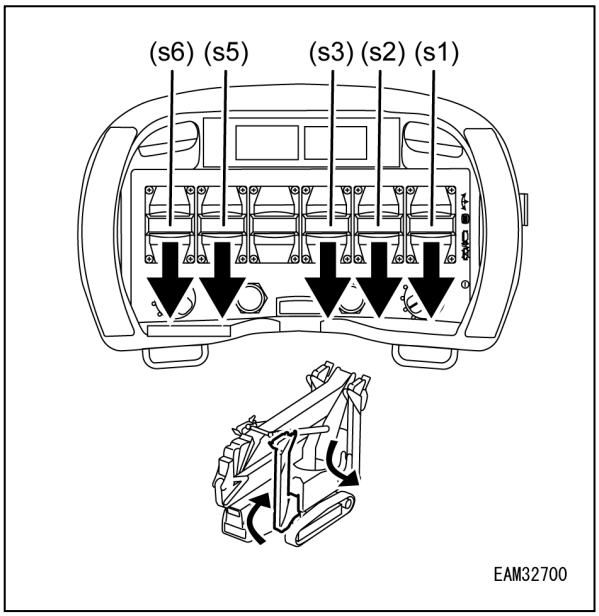
5. Pull lever S3 (s3), S1 (s1), S2 (s2), S5 (s5), or S6 (s6) backward.
   After the outrigger retracts to the maximum, return the lever to the neutral position.



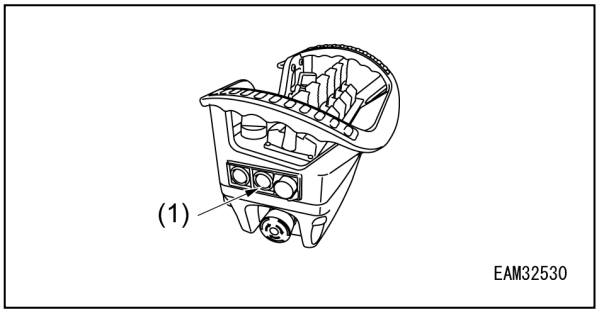
6. Change the mode switch position to "outrigger rotation (a)."



7. Pull lever S3 (s3), S1 (s1), S2 (s2), S5 (s5), or S6 (s6) toward you.
   After the outrigger has been rotated to the stowed position, return the lever to the neutral position.



8. When you finish using the machine after stowing the outriggers, do as follows:
   - Engine specification / Engine and electric specification
     Make idle operation for five minutes, and then turn the key switch OFF or press the Engine Start/Stop Switch (1) of the transmitter. The machine stops.
     Then, turn the key switch OFF.
   - Battery specification
     Turn the key switch OFF.



5.8 OPERATING THE CRANE

5.8.1 Precautions before operating the crane

⚠ WARNING

- **Neglecting these precautions before operation may cause a serious injury.**
- **In addition to these, also refer to the precautions provided in "Chapter 2 SAFETY."**

Be sure to perform the working with the machine in a level state.
The moment limiter calculates the moment assuming that the machine stands horizontally. If you operate the machine without setting it horizontally, precautions and alarms are not issued even if the moment approaches the dangerous range.

- Set the moment limiter accurately commensurate with the crane operation. The moment limiter calculates the moment based on the specification that has been set. A setting different from the actual operation may break the wire rope or damage the boom, causing a serious injury.

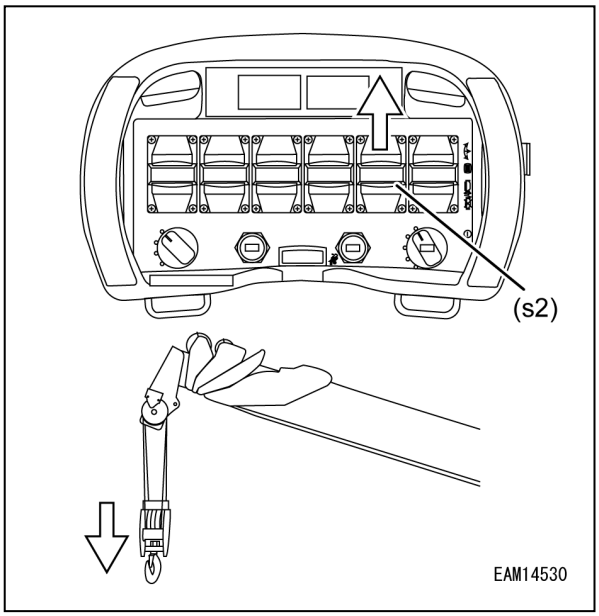
Example of wrong setting:

- Number of wire ropes used in the actual operation: 1 (single-fall hook)
- Number of wire ropes in the user setting: 4 (4-fall hook)

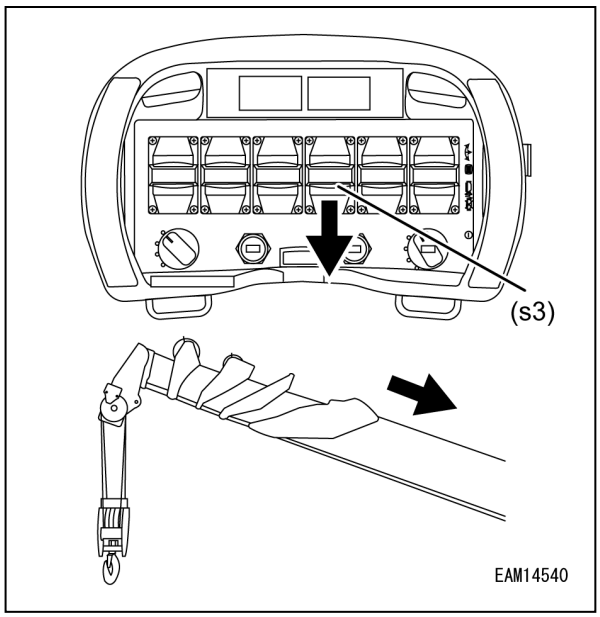
In the above case, the moment limiter calculates the load based on 4-fall hook, so that it does not issue a precaution or alarm even if the wire rope is nearly overloaded.

Therefore, the wire rope may break when the load exceeds the rated total load for single-fall hook.

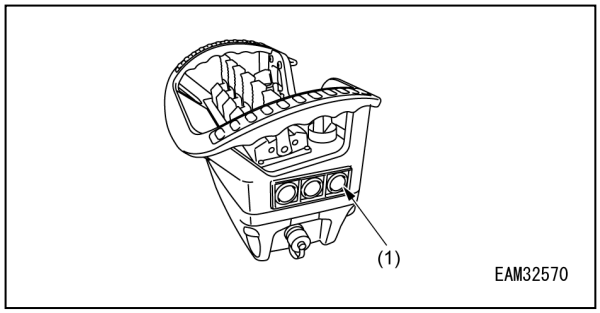
- If you hoist the hook block too high, overwinding detector trips to sound the alarm buzzer and stop the operation.
  If the alarm buzzer sounds, immediately release and return the S2 lever (s2) to the neutral position to stop winding.
  After that, set the S2 lever (s2) to the unwinding position (by pushing it forward) to lower the hook block.



- If you extend the boom or jib too far, the hook block is lifted to trip the overwinding detector, which sounds the alarm buzzer and stops operation.
  If the alarm buzzer sounds, immediately release and return the S3 lever (s3) to the neutral position to stop the extension of the boom.
  After that, set the S3 lever (s3) to the retracting position (by pulling it toward you) to retract the boom.



- While you are raising the boom or jib, the overwinding detector may trip to sound the alarm buzzer and stop operation. When the alarm buzzer sounds, immediately set the lever to the neutral position to stop raising.
- When you want to notify people around of danger while operating the crane, push the horn switch (1) to sound the horn.



5.8.2 Precautions and prohibitions while operating the crane

Checkup before starting operation

Confirm that safety devices and the crane work normally.

- Operate each operation lever and switch without a load to confirm they work normally. Repair problems if there are any.
- Confirm that safety devices such as the moment limiter (overload prevention device) and the overwinding detector work normally.

Precautions on monitor handling

- Use/stow the monitor under the following ranges of ambient temperature.
  Operating temperature: -30 to 60°C
  Avoid direct sunlight so that the temperature of the monitor body does not exceed the above range.
- Avoid locations with strong acid or alkaline atmosphere as much as possible. Otherwise, unexpected failures may occur.
- Do not apply impact to the monitor body for instance by colliding with an object.
  Such attempt may damage the case and may result in failures and improper operations.
- Do not push the panel sheet of the monitor body using excessive force, or push with a sharp object such as a tip of a screwdriver. Such actions can damage the panel sheet and may result in failures and improper operations.
- Do not disassemble the monitor body. Damage inside the unit may result in failures and improper operations.

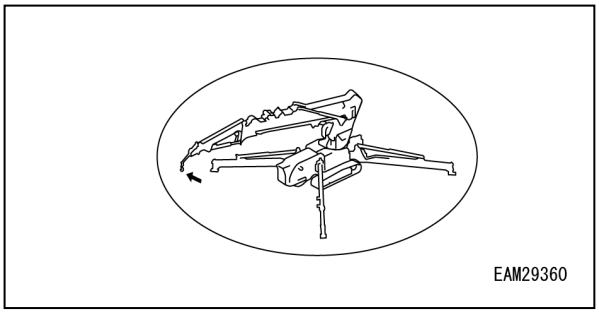
Precautions on moment limiter setting

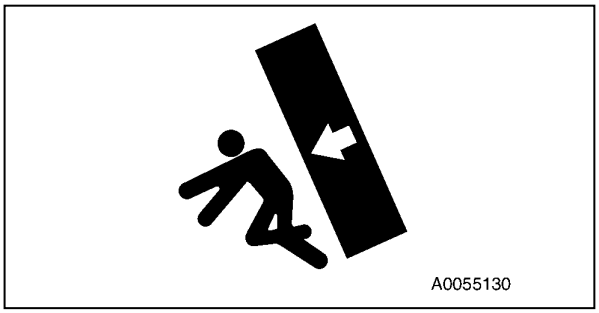
- The moment limiter calculates the moment assuming that the machine stands horizontally. If you operate the crane without setting the machine horizontally, precautions and alarms are not issued even if the load rises close to the rated total load. Be sure to check the inclination of the machine using the level gauge.
- When using the crane, confirm that the boom angle, boom length, jib angle, jib length, and actual load are displayed correctly in accordance with the crane operation. Using it with incorrect display may result in the tip-over or damage of the machine, leading to a serious injury.

- When using the crane, confirm that the moment limiter settings of the number of falls selection and jib head coincide with the actual condition of the crane. Using it with a wrong setting results in the breakage of a wire rope or tipping-over of the machine, leading to a serious injury.

Always exchange and follow signals and cues to take action

- When working with the crane in a team, decide in advance who will lead the team and what signals and cues to be exchanged, and follow the leader's cues while performing the work.
- When somebody needs to work or stand in any area that is difficult to see from the operator position, the operator must control the crane very carefully by following signals and cues from the leader.
- When you operate the crane, you may be hit by the slewing boom or other slewing objects above, or your arm or finger may be caught in an opening of a moving part of a derricking cylinder.
  The operator and operation leader should check that nobody is inside the working radius before operating the crane.





Precautions at the time of cold weather

- Remove snow from around the rotating gear, boom cable bearer, and winch, defrost them, and then check their operation before starting work.
- Check the operation of the brake of the winch.
- If you operate the machine without enough warm-up operation, the machine does not respond promptly to operation levers and may not behave as you expect. Be sure to make warm-up operation. Especially in cold weather, make warm-up operation well enough.
  For details of warm-up operation, see "5.5 OPERATION AND PRECAUTIONS AFTER THE MACHINE STARTS."
- Do not speed up the engine just after starting it. (engine specification / engine and electric specification)
- It is dangerous if there is snow in the working area of the crane because the grounded load may fall down or worker in the area may tumble. Remove snow well before operating the crane.
- In cold weather, confirm that the load to be lifted are not clinging to the ground or other object by freezing. It is dangerous to lift a load without knowing that they are clinging to the ground or other object by freezing.
- After finishing work, check the wire harness, connector, switches, and sensor for any water drops, snow, or mud. If there is any adhering, wipe it off and put a cover. If water penetrates them and freezes, the machine may malfunction at the next time you use it, resulting in an unexpected situation.

Pay attention to weather

- When there is lightning, stop the crane operation, unload the load promptly, and stow the boom and jib because they may be struck by lightning.
- Wind blowing on the lifted load is dangerous because the lifted load sways to make the machine unstable. If the load sways with wind, unload it immediately and stow the boom.
- If the maximum momentary wind speed becomes 10 m/s or above, stop the crane operation, unload the load promptly, and stow the boom and jib.
- Even if the maximum momentary wind speed is less than 10 m/s, the effect of wind becomes larger with a larger lifted load, a higher position of the lifted load, and a longer extension of the boom and jib. So, take sufficient care when carrying out workings.

- Be careful of wind when the boom or jib is extended long because the wire rope is more affected by wind. Pay careful attention to wind around a high-rise building because the wind speed sometimes rises when it blows through a building.
- When lifting a load such as an iron panel having a large area of receiving wind, a blast on the front, back, or a side of the boom or jib may cause the tipping-over of the machine or damage on the boom. So, take sufficient care when carrying out workings.
- When the boom and jib are raised higher, a blast on the front of the boom may cause the boom to fall backward. So, take sufficient care in the operation.
- In case of an earthquake, stop the operation until the earthquake ends.
- The table below describes the effects of wind in different wind speeds. Wind speeds (m/s) in weather reports are averages over 10 minutes at a point of 10 m above the ground.

Wind power	Wind speed (m/s)	Condition on the ground
0	Less than 0.3	Smoke rises vertically.
1	From 0.3 to 1.6	Smoke wavers.
2	From 1.6 to 3.4	You feel wind on the face.
3	From 3.4 to 5.5	Leaves and smallest branches move constantly.
4	From 5.5 to 8.0	A cloud of dust rises and paper sheets fly. Small branches sway.
5	From 8.0 to 10.8	Shrubs with leaves start to sway. The pond surface ripples.
6	From 10.8 to 13.9	Large branches sway. Electric wires make sounds. Difficult to use an umbrella.
7	From 13.9 to 17.2	The whole tree sways. Difficult to walk against the wind.
8	From 17.2 to 20.8	Small branches break. Cannot walk against the wind.
9	From 20.8 to 24.5	Causes minor damage on houses. Roof tiles fall off.
10	From 24.5 to 28.5	Trees fall. Causes major damage on houses.
11	From 28.5 to 32.7	Causes a wide range of damage.

Cautions when slinging and lifting a load

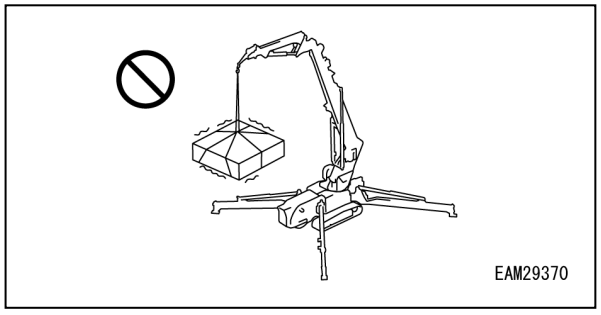
- Before lifting a load, check the points listed below. Trying to hoist a load without performing these checks may result in serious injury due to the load falling off or collapsing.
  - Observe the values in the RTL chart.
  - Make sure that the load is hoisted at its center of weight.
  - Check that the hook block wire rope hangs straight down.
  - As soon as the load leaves the ground, stop hoisting it once to check that the load is stably balanced.
- Before hoisting a lifted load, check that the stopper of the sling wire rope at the hook block is correctly engaged. If the sling wire stopper is not engaged, the wire rope may come off the hook block and cause the load to fall down, possibly resulting in serious accident.
- If the angle of the wire rope is large when lifting a load, the wire rope may be under greater stress even when lifting the same amount of weight. This increases wire rope shearing or tearing risks. Sling the load very carefully to avoid severely stressing the wire ropes.
- Do not try to lift multiple loads at the same time.
  Doing so may result in serious accidents, for example when part of the sling hits the other load or the machine loses balance and collapses due to swaying loads.
  Do not lift multiple loads at the same time even if they are within the rated total load.
- Lifting a long load involves risks because it is unstable when slung.
  When you sling such a load, stabilize it by using a harness and suspend it in the vertical attitude, or by setting ropes at both ends of the load.

Precautions on handling of wire ropes

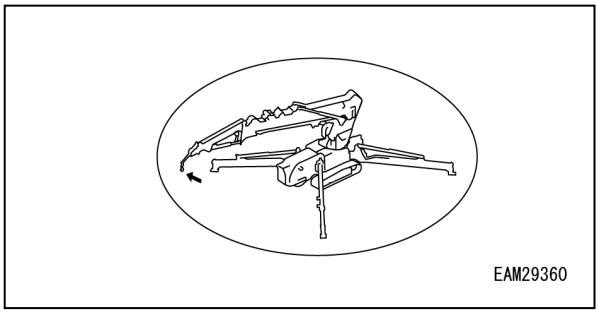
- Wire ropes deteriorate over time. So, check the condition of the wire rope every time before starting an operation. If it is deteriorated to the level that requires replacement according to the replacement guideline, replace it immediately.
  For the replacement guideline, see “6.12.2 [1] Wire rope replacement criteria.”
  At the same time, also check the sheaves of the boom, the tip of the jib, and the hook block. Damage on sheaves accelerates the deterioration of the wire rope.
- Use the wire ropes that we recommend.
- With other wire ropes, breakage or protruding of strands may cause injury.
  When you work with a wire rope, be sure to wear leather gloves.

Precautions while operating the crane

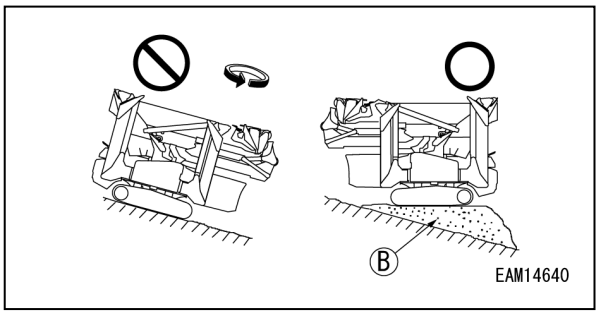
- Do not turn off the moment limiter (overload prevention device).
- Before starting the crane operation, confirm that the moment limiter override switch is in the OFF (normal) position.
  Do not operate the crane with the moment limiter override switch being ON (override).
  It is only during the checkup and maintenance that you can set the moment limiter override switch at the ON (override) position.
- Pay attention to the display and alarms of the moment limiter (overload prevention device) during operation.
- A force exceeding the machine capacity may cause a serious accident or fault such as tipping-over and breakage. Operate the crane based on the RTL chart.



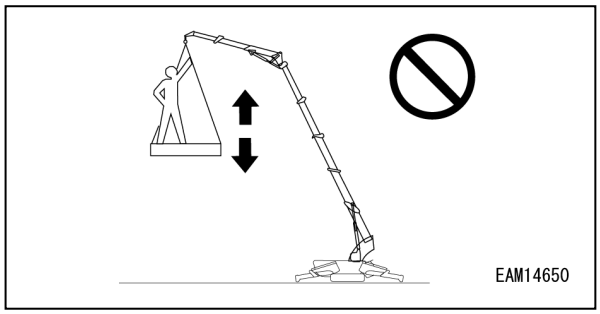
- When you operate the crane, decide who will lead the team and follow the leader’s instructions while performing the operation. Follow the leader's instructions about the way and steps of the operation. Determine the forms of cues, and follow the determined cues.
- There are risks or falling and contacting of the load, so keep people out from the range of the working radius and the area around the load. Otherwise, there is a risk of serious injury.
  Also, consider that the working radius increases when a load is lifted due to the deflection of the boom.



- It is dangerous to operate the crane in a location or weather of bad visibility.
  In a dark place, use the working light or other lighting apparatus to keep the site luminous.
  Suspend the operation if visibility is bad due to a bad weather condition (rain, fog, snow, or other reasons), and wait until the weather recovers.
- Operating the crane on a slope may result in the tipping-over of the machine. Prohibit such an operation basically.
  If you operate the machine on a slope without setting the machine horizontally, the moment limiter (overload prevention device) does not work accurately and also sudden force on the machine may result in the falling or damage of the machine.
  If you inevitably operate the machine on a slope, establish a level and flat base by embankment (B) to prevent falling before setting the machine.
  Be sure to check that the machine stands horizontally using the level gauge.



- Do not use the crane for a purpose other than its main purpose such as lifting and lowering a worker.



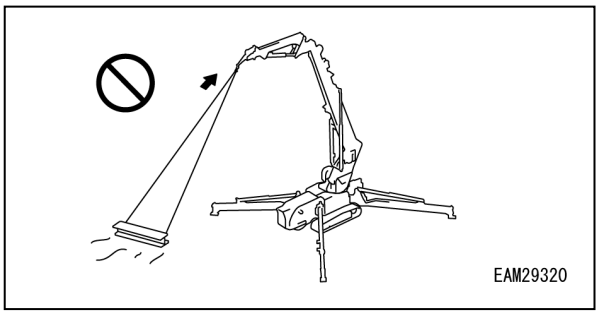
- When the machine is overloaded during operation, lay the S2 lever forward to unwind the winch to lower the load.
  Do not raise or lay down the boom or jib too fast. Doing so may result in a serious accident by the tipping-over of the machine.
- The volume of hydraulic oil in cylinders changes with the change of the temperature. If you leave a load lifted, the oil temperature and oil volume drop over time to cause the boom angle, jib angle, and boom length to become smaller.
  In such a case, derrick the boom, telescope the boom, derrick the jib, or telescope the jib as necessary for correction.
- Do not leave the machine with a load lifted.
- Lift the hook block to the top when it is not used.
  Otherwise, workers around loads may bump the empty hook block.
- Do not basically use the machine to suspend a vibration generation attachment such as a vibratory hammer. The vibration of the attachment may damage the winch or other sections of the machine.

Pay attention to hydraulic oil temperature

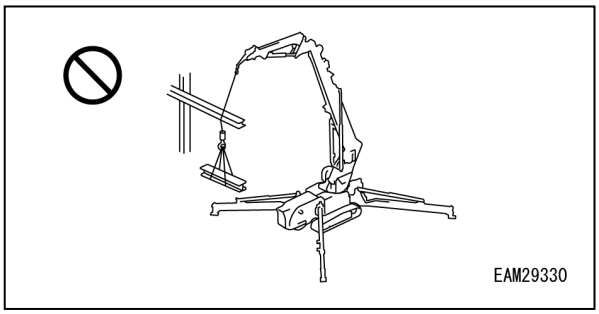
If you continue to use the machine with the hydraulic oil temperature higher than 80˚C, the high-pressure hoses or seals may be damaged by heat to get people burned by the spurting of hydraulic oil.
If an alarm is displayed, suspend the operation until the alarm disappears.
Pay special attention when you repeat the hoisting and lowering of the hook with a high hydraulic pressure or when you operate the crane while driving the accelerator because the hydraulic oil temperature easily rises.

Precautions when operating the winch

- Use a hook appropriate for the weight of the load and the appropriate number of fall sections for the boom lengths.
- Keep workers out from the area under the load.
- When you hoist a load, be sure to stop hoisting for a while when the load leaves the ground. Confirm the stability of the load and the safety of the load weight before you continue with lifting the load.
- Do not draw the load sideways, do not pull the load toward the machine, and do not lift the load in an inclined attitude. Making such an operation not only causes the crane to tip-over and damages the machine with excessive force but also it is dangerous. Position the hook straight above the gravity center of the load.



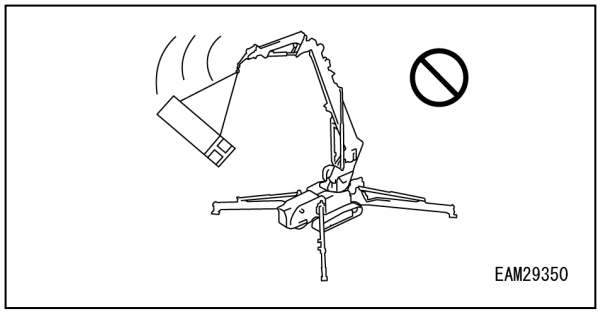
- If you hoist the hook too high, it may bump the boom or jib to break the wire rope, resulting in the drop of the hook block and a serious accident. Pay careful attention so as not to lift the hook block too high.
- When you hoist a load, be careful not to have the wire rope contact an object such as a tree or iron frame.
  If the wire rope tangles with an object, do not lift the load forcibly. Untangle the wire rope first, and the lift the load.



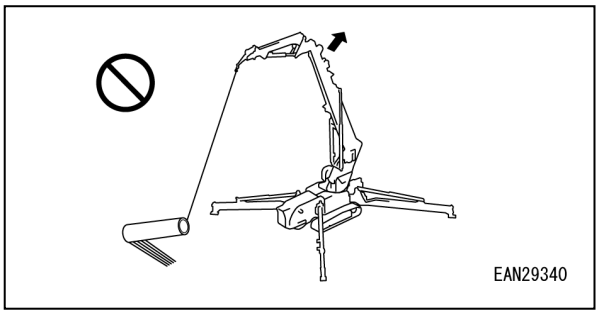
- When the wire rope winds irregular around the winch drum, do not use it without correcting the irregular winding. Irregular winding not only damages the wire rope and shortens its life but also may cause the wire rope to break, leading to a serious accident.
  Prevent irregular winding of the wire rope by observing the following precautions:
  - Do not let the hook block touch the ground by unwinding the winch.
- When you decelerate the winch from a high-speed winding, return the operation lever slowly. If you return the operation lever quickly when the winch is running fast, the hook jumps with the deceleration shock to cause irregular winding.
- If the hook block rotates to twist the wire rope, resolve the twist completely before starting operation.
  For details, see the section of “6.12.2 [4] Correcting twisted wire rope.”

Precautions when operating the boom or jib

- Operate the crane operation lever and slewing operation lever as slowly as possible.
  Fast operation of a lever is dangerous especially when the crane is lifting a load because it sways the load to give a strong impact on the machine, resulting in damage on the crane or the tipping-over of the machine.



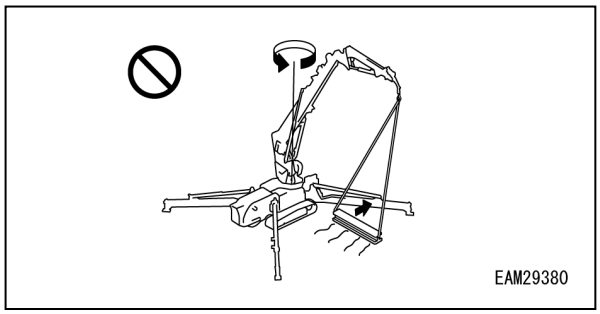
- When the boom is laid down, its working radius increases and the amount of load that can be lifted becomes smaller. When you operate the machine while derricking the boom, pay careful attention of the mass (weight) of the load so as not to cause overload on the boom when it is laid down to the maximum.
- It is prohibited to draw the load sideways or pull the load toward the machine by derricking and telescoping the boom and jib. Never make such an operation.



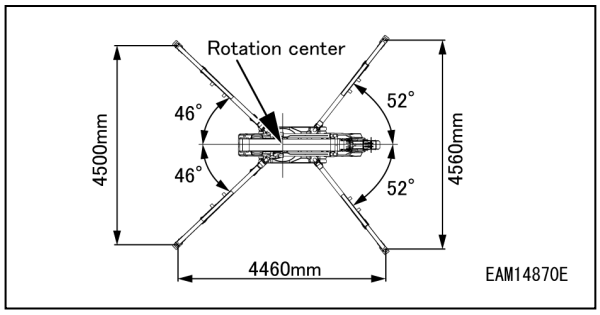
- When you telescope the boom, pay attention to the hook block being lifted or lowered.
- With the boom extended, its working radius increases and the rated total load that can be suspended becomes smaller. When you operate the machine while extending and retracting the boom, pay careful attention to the mass of the load so as not to cause overload on the boom when it is extended to the maximum.
- When you raise (upward) the jib from the vertical (downward) orientation, its working radius increases and the rated total load that can be lifted becomes smaller. When you operate the machine while raising and lowering the jib, pay careful attention of the mass (weight) of the load so as not to cause overload on the jib when it is in the horizontal orientation.
- When you operate the machine while derricking the jib, pay careful attention of the mass (weight) of the load so as not to cause overload on the jib when it is in the horizontal orientation.
- Do not use the jib with its orientation more inside than the vertical (downward) orientation.

Precautions on slewing operation

- Before slewing the crane, check the safety of the area around and sound the horn.
- When the angle of the boom and jib is low, be careful not to have the boom or jib hit the operator or the machine body.
- It is prohibited to slew the crane for the purpose of pulling the load toward the machine or pulling the load to raise it. Never make such an operation.



- When you rotate the crane 360 degrees with a load lifted, be sure to set the outriggers in the standard rotation angles as shown in the figure. Even if the outriggers are extended to the maximum, pay careful attention because the machine is not stable in the lateral direction.



- Depending on the extension condition of the outriggers, the boom or jib may hit an outrigger during slewing operation, resulting in damage on the crane or the tipping-over of the machine.
  When slewing the crane, be careful not to have the boom or jib hit an outrigger.

Combined use of multiple machines is prohibited under normal circumstances

It is prohibited under normal circumstances to use two or more cranes to lift one load.
Combined use of multiple machines is very dangerous because the gravity center is offset, leading to the tipping-over of the machine, dropping of the load, and damage on the boom or jib.
If you must make such an operation for unavoidable reasons, make an operation plan under the customer-side responsibility, have enough discussion, communicate the method and procedure of the operation to the workers, and then conduct the operation carefully under direct instructions of the leader.
Also, observe the following precautions:

- Use cranes of the same model.
- Select machines of enough capacity for the load.
- Make sure that only one person sends cues.
- Basically, operate only one crane at a time, and do not slew cranes.
- Name one veteran as the leader responsible for slinging.

Precautions on a work site involving underground operation

- When you wind the wire rope in an underground operation, make sure that the wire rope remains winding on the winch drum three rounds or more.
- Send cues without fail.
- Especially, operate the crane carefully.

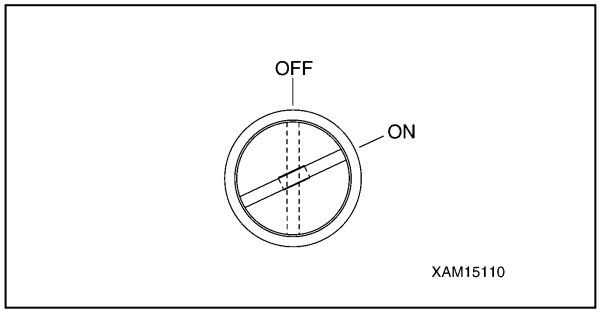
5.8.3 Things to do before using the crane

Important

- **Be careful not to lower the hook block so low that it lies on the ground. It may cause irregular winding on the winch drum due to loosening of the winch wire.**
- **When you loosen the hook block from its normal stowing position, the hook block may sway and touch devices around to damage them. Pay careful attention on the area around the hook block.**

Perform the following before using the crane.

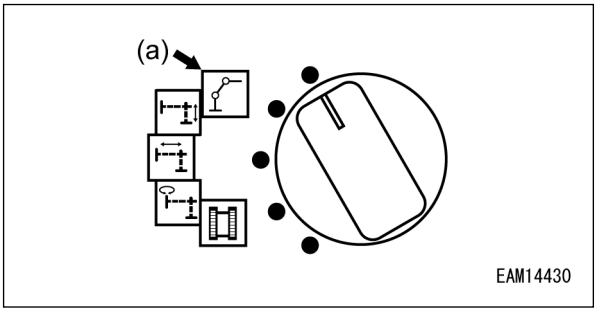
1. Confirm that the moment limiter override switch is OFF. The safety device is kept actuated if the override switch is ON.



☞ If you set the moment limiter override switch at the ON (override) position, the moment limiter stops functioning for three minutes.

☞ If the moment limiter override switch is at the ON (override) position, the working status lamp flashes red and the alarm buzzer sounds intermittently to notify the condition.

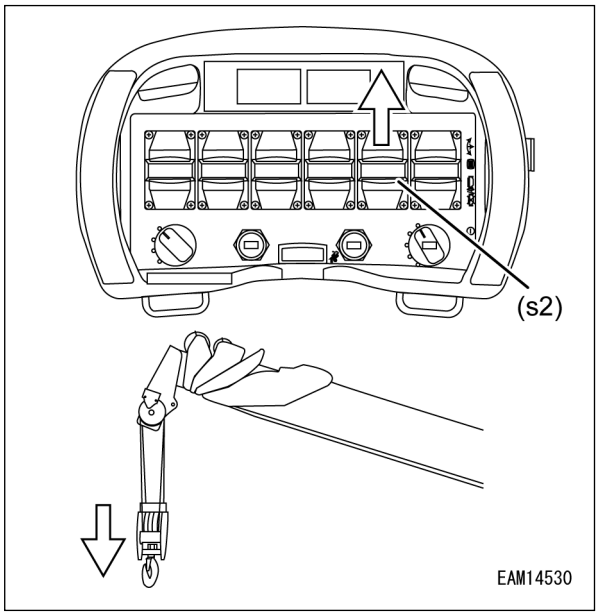
2. Set the mode switch to “crane operation (a).”



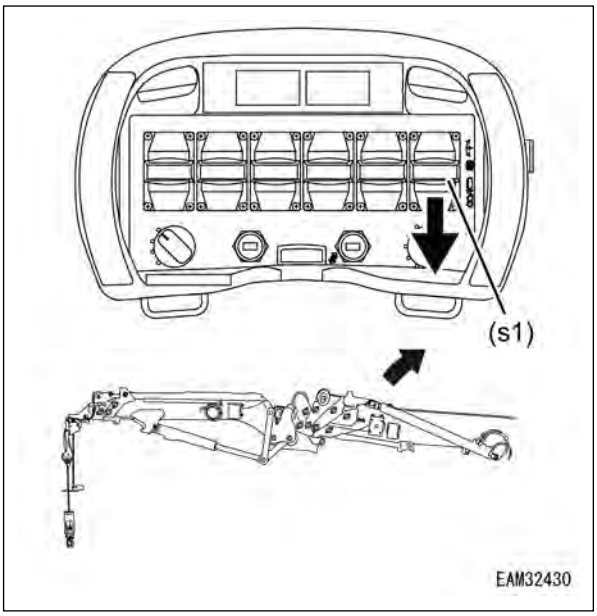
5.8.4 Work posture of the crane

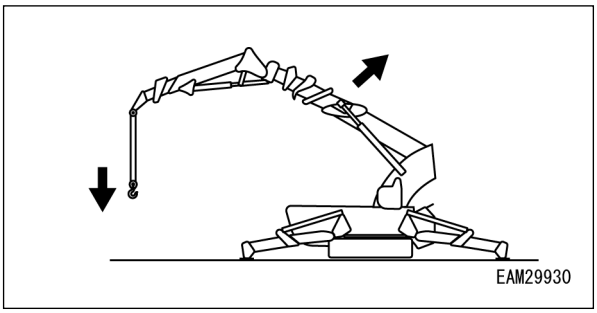
When you start the operation of the crane after finishing “5.8.3 Things to do before using the crane,” set the crane in the work posture as follows.

1. Push the S2 lever (s2) forward to unwind the winch so that the hook block is lowered to the height just above the ground.



2. Pull the S1 lever (s1) toward you to raise the boom to an angle at which the hook block is not lifted too high and does not contact the ground.





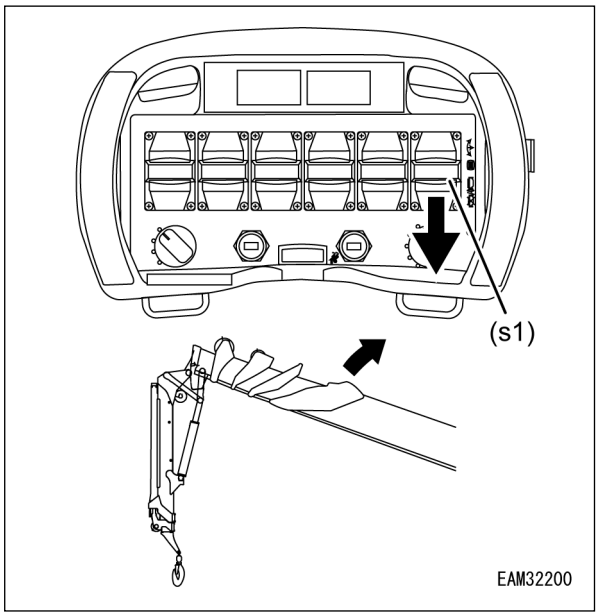
5.8.5 Setting up the jib

5.8.5.1 Jib—Fixed hook specification

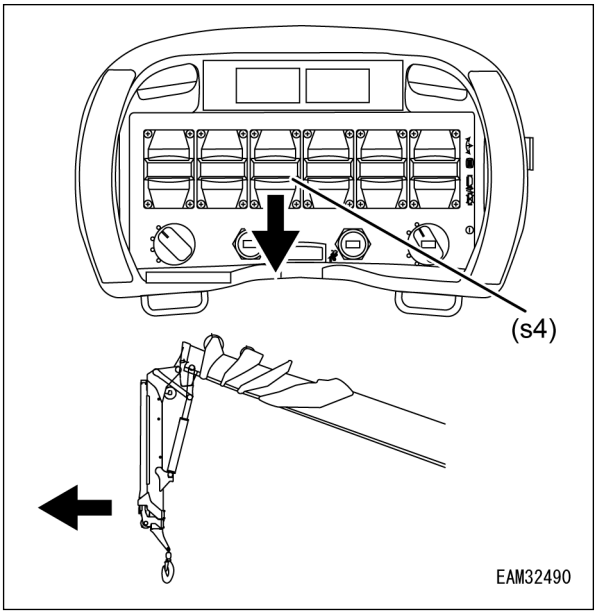
Important

- **If the boom angle is lower than 40 degrees when the jib angle is lower than -91.5 degrees, you cannot extend the jib because you cannot extend or raise the jib and cannot extend the boom.**
- **When you raise the boom from the stowed position, the boom and jib retract and the jib is lowered for a short time to prevent declining, but this is not a fault.**
  For safety, do not touch the boom during operation.

1. Pull lever S1 (s1) toward you to raise the boom to 40 degrees or above.



2. Pull lever S4 (s4) toward you to raise the jib to -90 degrees or above.



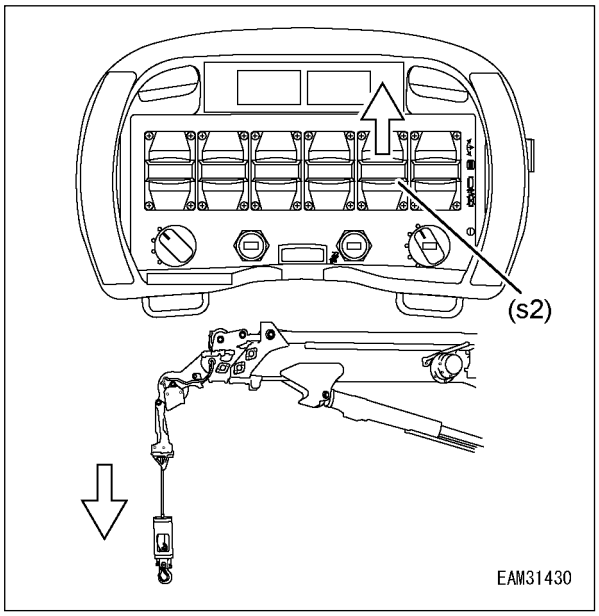
☞ If the jib angle is less than -91.5 degrees, it is in the inoperable range.
In that case, raise the jib to -91.5 degrees or more.

5.8.5.2 Jib—Single-fall hook block specification

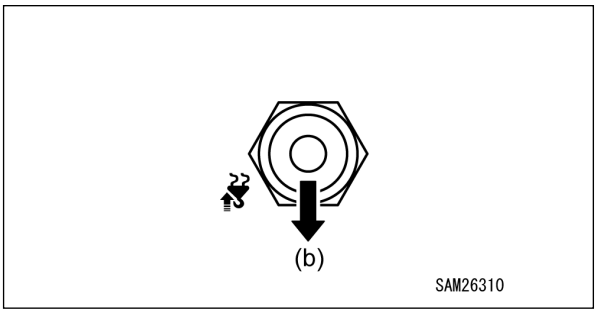
⚠ WARNING

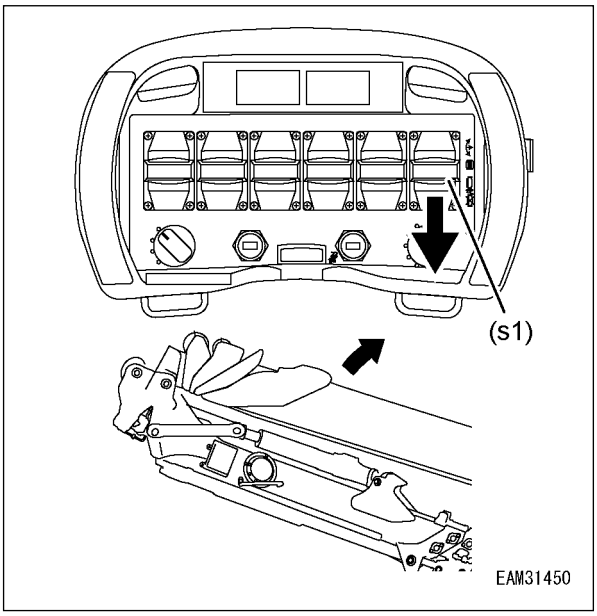
- **If you raise the boom without drawing out the single-fall hook block, it may not only cause wire breakage due to over-winding and damage on devices around due to disengagement of the hook block but also may result in a serious injury.**

1. Push the S2 lever (s2) forward, and pull the single-fall hook block by hand to draw out the wire slowly about one or two meters.



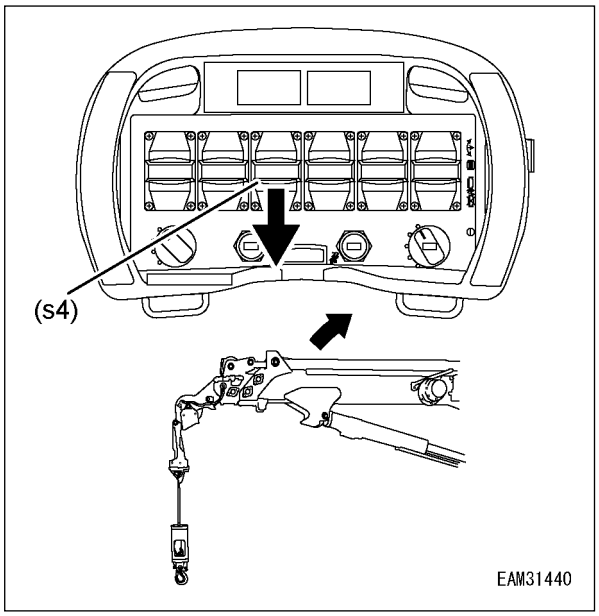
2. Keep holding the hook block, and while pull the hook stowing switch toward you (b), Pull the S1 lever (s1) toward you to raise the boom to an angle of 50 degrees or more. At this time, watch the chain of the protection weight to make sure that it does not get caught by an object around.





☞ If the boom is lowered during the procedure 2 job, be careful since the single-fall hook block can hoist up.

3. Keep holding the hook block, and while pulling the hook stowing switch toward you, pull the S4 lever (s4) toward you to raise the jib slowly to an angle near -90 degrees.



☞ If the jib angle is less than -91.5 degrees, it is in the inoperable range. In that case, raise the jib to -91.5 degrees or more.

4. Lower the hook block carefully so that the hook block, stowing cam, and protection weight do not touch the machine body.

⚠ CAUTION

Be careful not to have the hook block touch the ground. It may cause irregular winding on the winch drum due to loosening of the winch wire.

Important

- **If the boom angle is lower than 50 degrees when the jib angle is lower than -91.5 degrees, you cannot extend the jib because you cannot extend or raise the jib, extend the boom, or wind up the winch.**
- **When you raise the boom from the stowed position, the boom and jib retract and the jib is lowered for a short time to prevent declining, but this is not a fault.**
  For safety, do not touch the boom during operation.

5.8.5.3 Setting up the jib in the lateral direction of the machine

⚠ WARNING

- **Do not extend the jib outside the operable range. The machine may tip-over to cause a serious injury.**
- **The smaller the boom angle is, the larger the working radius becomes. So, pay attention to the area around the machine during operation.**

Important

Slewing operation is not possible from the stowed posture. Before slew the boom, raise it to 15 degrees or more.

The jib can also be extended in the lateral direction of the machine.

The basic operation is basically the same as the case when a fixed hook or single-fall hook block is used.

Operation is possible in the following conditions:

- Slew angle: 80–85 degrees or 275–280 degrees
- Boom raised angle:
  When a fixed hook is attached:
  20 degrees or more
  When a single-fall hook block is attached:
  25 degrees or more

5.8.6 Hoist Up/Down the hook block

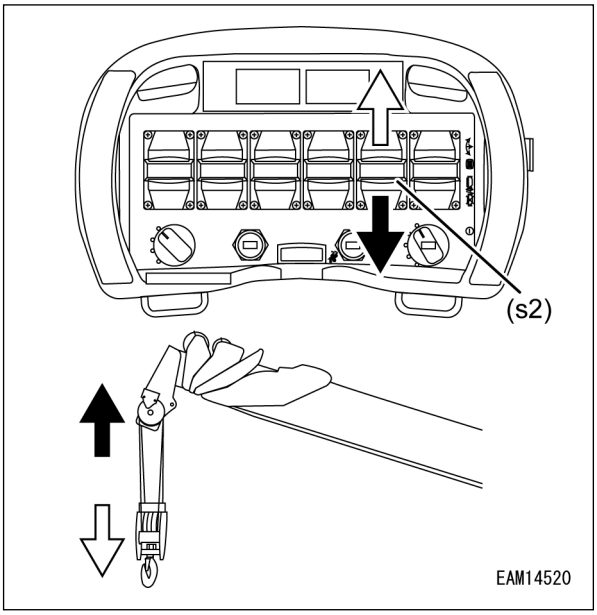
⚠ WARNING

- **When you lift a load, it moves forward a little due to the deflection of the boom. Pay attention to workers such as the slinging worker in the area.**
- **If you lift the hook block too high, overwinding detector detects over-winding to sound the alarm buzzer intermittently. When the alarm buzzer sounds, immediately set the operation lever to the neutral position to stop winding.**
- **When you keep the hook at a low position for a long time during an underground working or other situations, make sure that the wire rope remains winding on the winch drum three rounds or more.**

Important

- **Be careful not to lower the hook block so low as lies on the ground. It may cause irregular winding of the winch drum.**
- **When you stop the operation of the winch, do not return the lever to the neutral position quickly. The wire rope sags and it may cause irregular winding of the winch drum.**

Operate the S2 lever (s2) as follows:



- Lowering: Push the lever forward.
- Neutral: Release the lever. The lever returns to the neutral position and the raising/lowering of the hook block stops.
- Hoisting: Pull the lever toward you.

⚠ CAUTION

When a single-fall hook block is used, a quick operation may cause irregular winding of the wire if the boom/jib is driven by a high hydraulic pressure or the angle of the boom/jib is large. When you operate the crane, operate it carefully without a quick movement.

5.8.7 Derricking the boom

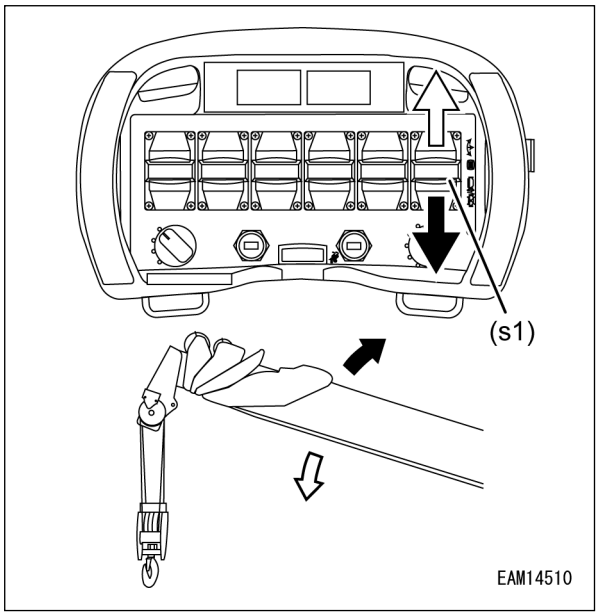
⚠ WARNING

- **It is prohibited to use the derricking operation of the boom to draw the load sideways or pull the load to raise it.**
- **With the boom lowered, its working radius increases and the rated total load becomes smaller. The working radius may increase also by the raising operation depending on the position of the jib tip.**

  When you operate the machine while derricking the boom, pay careful attention of the mass (weight) of the load so as not to cause overload on the boom when it is laid down to the maximum.
- **Depending on the situation, the load or jib bumps the machine when you lay down the boom to cause damage or tipping-over of the machine.**

  When you lower the main boom, be careful not to have the jib hit the machine.

Operate the S1 lever (s1) as follows:



- Lowering: Push the lever forward.
- Neutral: Release the lever. The lever returns to the neutral position and the derricking of the boom stops.
- Raising: Pull the lever toward you.

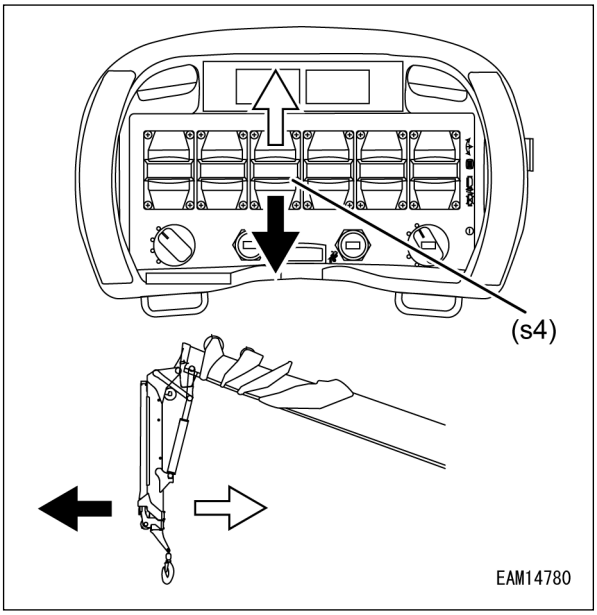
☞ The boom derricking speed drops when the boom lengthens, but this is for safe operation and is not a fault.

5.8.8 Derricking the jib

⚠ WARNING

- **It is prohibited to use the derricking operation of the jib to draw the load sideways or pull the load to raise it.**
- **When you orient the jib toward the level position, its working radius increases and the rated total load reduces.**
  When you operate the machine while derricking the jib, pay careful attention of the mass (weight) of the load so as not to cause overload on the jib when it is in the horizontal orientation. If the jib orientation is lower than the level position, the raising operation also increases the radius and reduces the rated total load.
- **Depending on the situation, the load or jib bumps the machine when you lay down the jib, causing damage or tipping-over of the machine.**
  When you lower the main boom, be careful not to have the jib hit the machine.

Operate the S4 lever (s4) as follows:



- Lowering: Push the lever forward.
- Neutral: Release the lever. The lever returns to the neutral position and the derricking of the jib stops.
- Raising: Pull the lever toward you.

☞ Make derricking operations of the jib as slowly as possible, setting the speed selection rotary switch to micro speed mode.

☞ When the fixed hook is attched, if the oil temperature has become high, for example, it may not be possible to raise the load of the RTL chart with the jib. In that case, after setting the desired jib angle with no load, lift up the load by raising and extending the boom.
However, at this time, refer to the section “5.8.2 Precautions and prohibitions while operating the crane” and be careful to avoid side pulling, pulling near, and diagonal lifting.

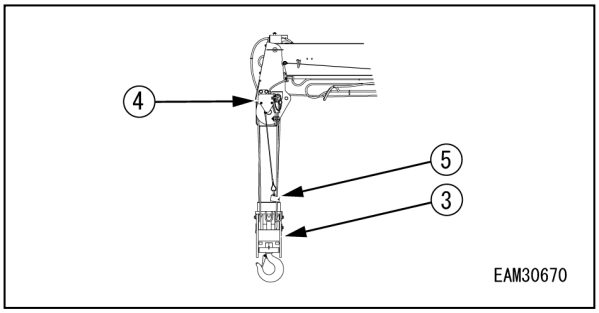
5.8.9 Telescoping the boom

⚠ WARNING

- **It is prohibited to draw the load sideways or pull the load toward the machine by telescoping the boom.**
- **With the boom extended, its working radius increases and the rated total load that can be suspended becomes smaller.**
  When you operate the machine while extending and retracting the boom, pay careful attention to the mass (weight) of the load so as not to cause overload on the boom when it is extended to the maximum.
- **When the boom is extended, the hook block is lifted.**
  If the alarm buzzer of the overwinding detector sounds when the boom is extended, immediately set the boom extension/retracting lever to the neutral position to stop the extension of the boom.

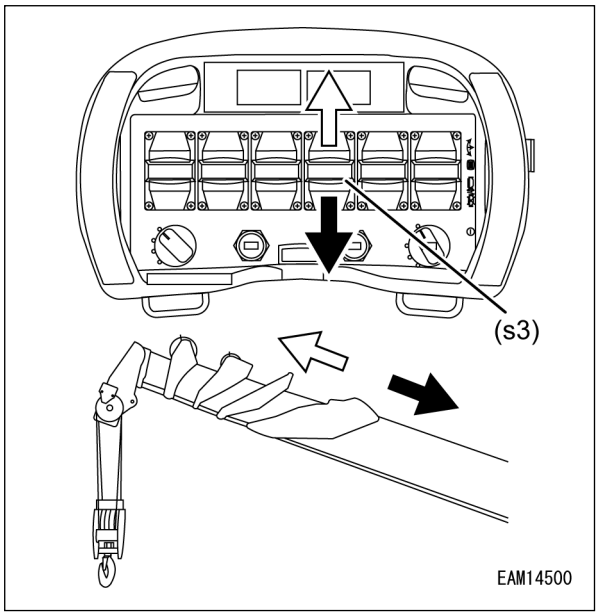
Important

- **When the boom is extended and retracted, the hook block is lifted or lowered. Operate the winch simultaneously to adjust the height of the hook block.**
- **If you leave the boom extended for a long time, the boom retracts a little due to a temperature change of the hydraulic oil. In such a case, extend the boom as necessary.**
- **When the main boom extends to the point at which the hook block (3) pushes the weight (5) of the overwinding detector (4) upward, the extension of the main boom stops. In this condition, the boom does not extend any more even if you make the extension operation.**
  In such a case, retract the boom or lower the hook block by unwinding.



- **When a load is hoisted, the boom retracts a little if it is not fully retracted. This happens due to the weight of the load, and is not a fault. When the load is released from this condition, the boom extends a little. Secure an enough space around so that the tip of the boom does not bump the ceiling or other objects.**

Operate the S3 lever (s3) as follows:



- Extending: Push the lever forward.
- Neutral: Release the lever. The lever returns to the neutral position and the extending/retracting of the boom stops.
- Retracting: Pull the lever toward you.

☞ When the boom extends, the 2nd-5th sections also extend at the same time. When the boom retracts, the 2nd-5th sections also retract at the same time.

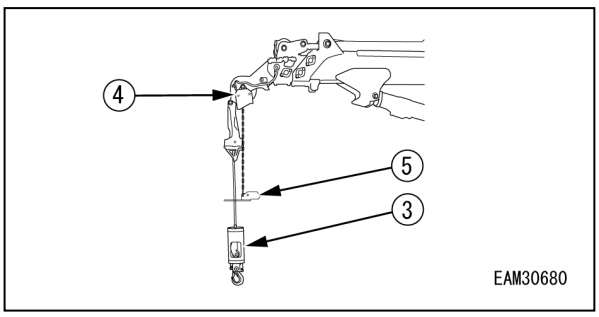
5.8.10 Telescoping the jib

⚠ WARNING

- **It is prohibited to draw the load sideways or pull the load toward the machine by telescoping the jib. When you lift a load, be sure to lift it by the raising operation of the hook block.**
- **When the jib is extended, the hook block is lifted.**
  If the alarm buzzer of the overwinding detector sounds when the jib is extended, immediately set the jib extension/retracting lever to the neutral position to stop the extension of the jib.
- **Except when the jib is directed directly downward, if the jib is extended, its working radius increases and the rated total load that can be lifted becomes smaller. When you operate the machine while extending and retracting the jib, pay careful attention of the mass (weight) of the load so as not to cause overload on the jib when it is extended to the maximum.**

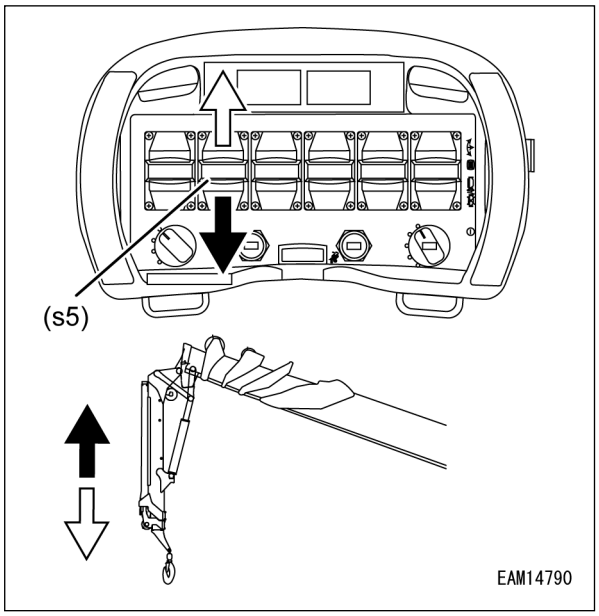
Important

- **When the jib is extended or retracted, the hook block is lifted or lowered. Operate the winch simultaneously to adjust the height of the hook block.**
- **If you leave the jib extended for a long time, the jib retracts a little due to a temperature change of the hydraulic oil. In such a case, extend the jib as necessary.**
- **When the jib extends to the point at which the hook block (3) pushes the weight (5) of the overwinding detector (4) upward, the extension of the jib stops. In this condition, the jib does not extend any more even if you make the extension operation.**
  In such a case, retract the jib or lower the hook block by unwinding.



- **When a load is hoisted, the jib retracts a little if it is not fully retracted. This happens due to the weight of the load, and is not a fault. When the load is released from this condition, the jib extends a little. Secure enough space around so that the tip of the jib does not bump into the ceiling or other objects.**

Operate the S5 lever (s5) as follows:



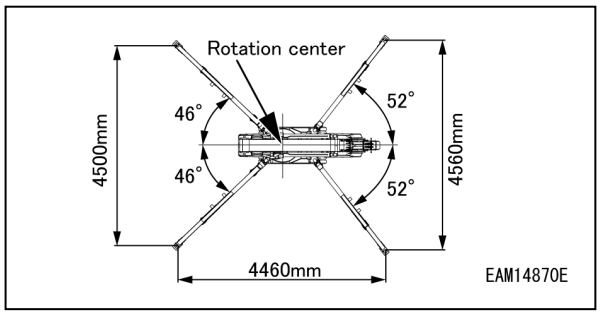
- Extending: Push the lever forward.
- Neutral: Release the lever. The lever returns to the neutral position and the extending/retracting of the jib stops.
- Retracting: Pull the lever toward you.

☞ When the jib extends, the 2nd and 3rd sections also extend at the same time. When the jib retracts, the 2nd and 3rd sections also retract at the same time.

5.8.11 Slewing

⚠ WARNING

- **Before slewing the crane, check the safety of the area around and sound the horn.**
- **Operate the slewing lever as slowly as possible.**
  Start the operation smoothly, slew the crane slowly, and stop slew softly.
  Fast operation of a lever is dangerous especially when the crane is lifting a load because it sways the load to destabilize the machine, resulting in damage on the crane or the tipping-over of the machine.
- **When a lifted load slews, the stability will change depending on the slewing direction, so pay careful attention to this when performing a working.**



- **When you cannot set the outriggers in the directions as shown in the figure, find out the positions where a load can be suspended and the positions where a load cannot be lifted before starting the hoisting operation.**

⚠ CAUTION

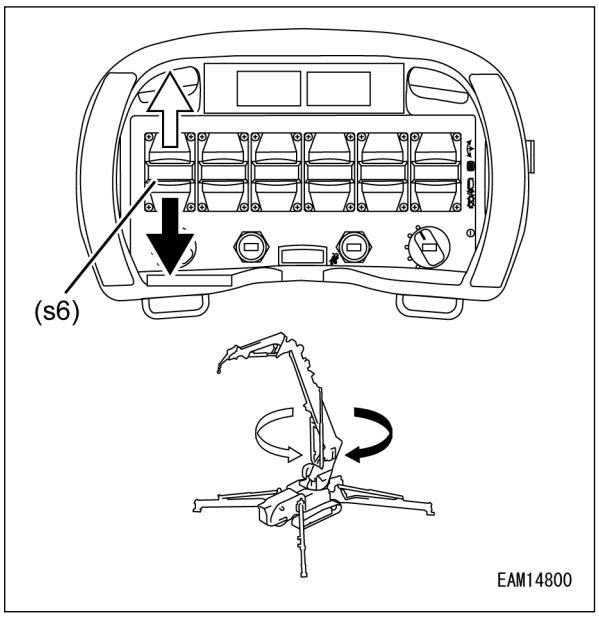
If you slew widely with the jib stowed, the jib and cover will come into contact with each other, causing possible damage.

Important

The rated total load varies depending on the slew angle if the extension positions of all four outriggers are not at the standard rotation angles.

☞ The slew speed drops when the boom lengthens and the load is heavy, but this is for safe operation and is not a fault.

Operate the S6 lever (s6) as follows:



- Slewing counterclockwise: Push the lever forward.
- Neutral: Release the lever. The lever returns to the neutral position and slew stops.
- Slewing clockwise: Pull the lever toward you.

5.8.12 Crane speed

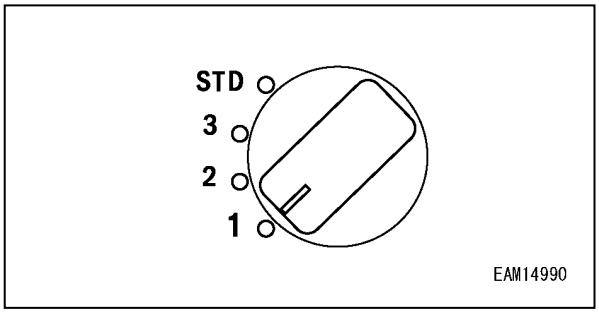
⚠ WARNING

Moving the crane unnecessarily fast is dangerous.

Important

Move the crane slowly at the start and end of each operation. Also, move the crane slowly or fast in accordance with the load weight.

If you want to operate the crane slowly, set the speed switch to 3, 2, or 1. In this setting, the crane speed is restricted and you can smoothly control the speed in a micro speed range.



☞ When the ECO mode is enabled, the speed may be restricted even if you set the speed switch to STD and operate the crane by full-lever.

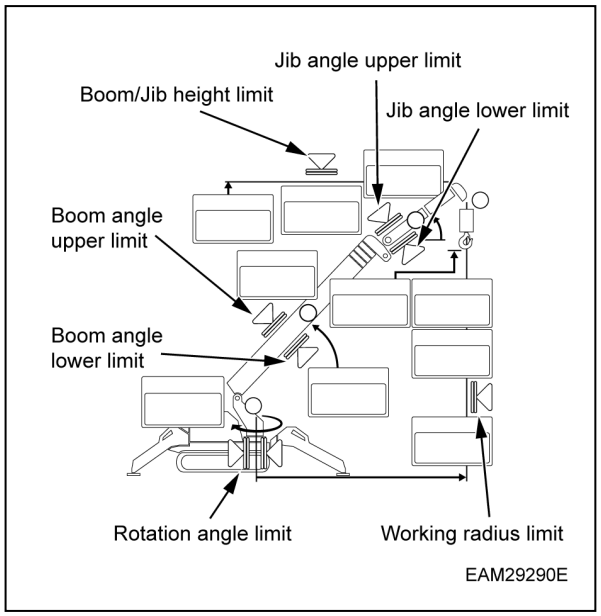
5.8.13 Moment limiter working range limiter operation

⚠ DANGER

The function of this device is to stop operation at the specified position. If you make a wrong setting or wrong usage, the operation does not stop and may cause a serious injury.
When you use this device, do not overestimate the capacity of the stopping function and operate the machine carefully. Even if you restrict the operation range by the moment limiter, the crane may move beyond the configured range if you operate the boom fast. When you configure an operation range, be sure to secure an enough distance from obstacles. Also, operate the crane slowly. After configuring an operation range restriction of the boom, be sure to confirm that the boom stops at the specified position.

When the boom approaches a point of a working range limit, an alarm sounds to notify the operator and people around.

The setting values of operation range restrictions are kept after the starter switch is turned off.



☞ Restriction statuses are indicated by different colors as follows:

- Blue: No restriction configured
- Yellow: A restriction setting item being selected (It changes to blue or orange if there is no operation for five seconds.)
- Orange: Restriction being configured.

If an operation range is set, the lamp and alarm work as follows:

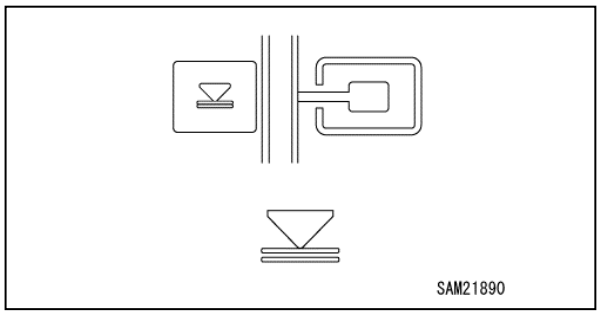
A. Safe range
   - The monitor display for the operation range restriction becomes orange.
   - The working status lamp flashes green.

B. Precaution alarm
   - The display for the operation range restriction flashes orange.
   - The alarm buzzer makes a peep sound intermittently.
     The alarm buzzer sounds only when the operation lever is used.
   - The working status lamp flashes green.

C. Limitation alarm
   - The display for the operation range restriction flashes orange.
   - The working status lamp flashes yellow.
   - The alarm buzzer makes a continuous peep sound.
     The alarm buzzer sounds only when the operation lever is used.
   - Movement toward the restricted range is stopped.

5.8.13.1 Setting/Cancelling the upper limit of the height of the boom and jib

To set or cancel the upper limit of the height of the boom and jib, use the following switch.



Restriction of the height of the boom and jib is made by detecting the height of the tip of the boom or jib.

[Setting]

Before setting the upper limit, raise the boom to the target height of the boom and jib, and then long press the switch.

The monitor display flashes orange, and the height of the boom and jib is set as the upper limit.

- ☞ Before starting work, confirm that the boom and jib automatically stop at the configured height. If the boom and jib do not stop automatically, set the upper limit of the height of the boom and jib again by the steps above.
- ☞ When the boom and jib are in the range of the precaution alarm or stopped at the upper limit, an alarm sounds only when you make a raising operation or extending operation.
- ☞ The setting value is kept after the starter switch is turned off.

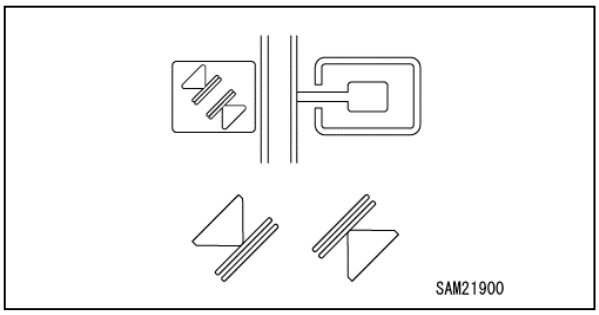
If the upper limit of the height of the boom and jib has been set and if the boom and jib enters the precaution alarm range or the upper limit stop condition, the monitor display flashes orange.

[Cancelling]

With the upper limit having been set, long press the switch. The color of the monitor display changes to blue, and the upper limit is cancelled.

5.8.13.2 Setting/Cancelling the upper/lower limit of the angle of the boom or jib

To set or cancel the upper/lower limit of the angle of the boom or jib, use the following switch.



[Setting]

Before setting the upper/lower limit, position the boom or jib at the target angle, and then press the switch. A yellow display appears, with which you can select upper limit setting or lower limit setting. Every time you press the switch, the setting condition changes from the boom angle upper limit to the boom angle lower limit, the jib angle upper limit, and then to the jib angle lower limit. While the yellow display is showing the target setting, long press the switch.

The monitor display flashes orange, and the current angle of the boom or jib is set as the upper limit or lower limit.

- ☞ Before starting work, confirm that the boom or jib automatically stops at the configured angle. If the boom or jib does not stop automatically, set the angle of the boom or jib again by the steps above.
- ☞ When the upper limit of the main boom or jib has been set and the boom or jib is in the range of the precaution alarm or stopped at the upper limit, an alarm sounds only when you make a raising operation. When the lower limit of boom or jib has been set and the boom or jib is in the range of the precaution alarm or stopped at the lower limit, an alarm sounds only when you make a laying-down operation.
- ☞ The setting value is kept after the starter switch is turned off.

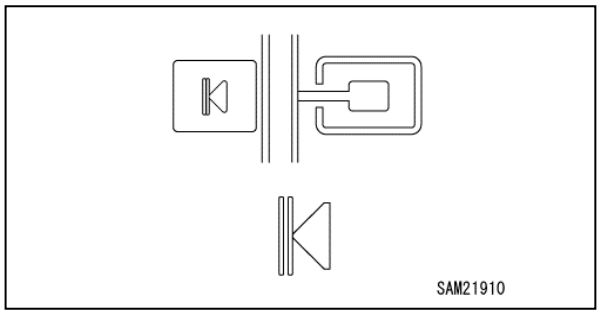
If the upper limit or lower limit of the boom or jib has been set and if the boom or jib enters the precaution alarm range or the upper or lower limit stop condition, the monitor display flashes orange.

[Cancelling]

With an upper limit or lower limit having been set, long press the switch. The color of the monitor display changes to blue, and the upper limit or the lower limit is cancelled.

5.8.13.3 Setting/cancelling working radius upper limit

To set or cancel the upper limit of the working radius, use the following marks.



[Setting]

Before setting the upper limit, position the boom and jib at the target working radius, and then long press the switch.

The upper value in the monitor display flashes orange, and the current working radius is set as the upper limit.

☞ Before starting work, confirm that the boom or jib automatically stops at the configured working radius. If the boom and jib do not stop automatically, set the working radius again by the steps above.

☞ When the boom and jib are in the range of the precaution alarm or stopped at the upper limit, an alarm sounds only when you make a derricking or telescoping operation, whichever makes the radius larger.

☞ The setting value is kept after the starter switch is turned off.

If the upper limit of working radius has been set and if the boom or jib enters the precaution alarm range or the upper limit stop condition, the monitor display flashes orange.

[Cancelling]

With the upper limit having been set, long press the switch. The color of the monitor display changes to blue, and the upper limit or the lower limit is cancelled.

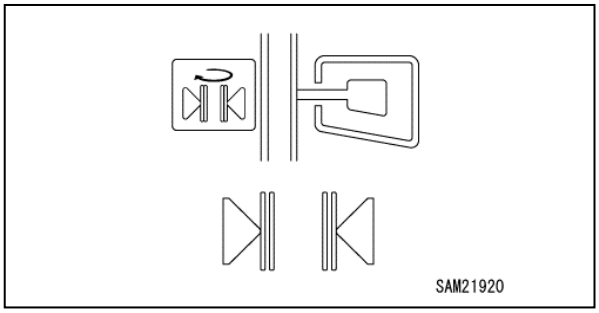
5.8.13.4 Setting/cancelling slewing angle limit

⚠ WARNING

Use the rotation restriction function noting that the machine stops by separate setting conditions for clockwise rotation and counterclockwise rotation.

- **When counterclockwise rotation restriction angle is set: The crane stops near the set angle when rotating counterclockwise, but does not stop at the set angle when rotating clockwise.**
- **When clockwise rotation restriction angle is set: The crane stops near the set angle when rotating clockwise, but does not stop at the set angle when rotating counterclockwise.**

To set or cancel the upper limit of the rotation angle, use the following switch.



[Setting]

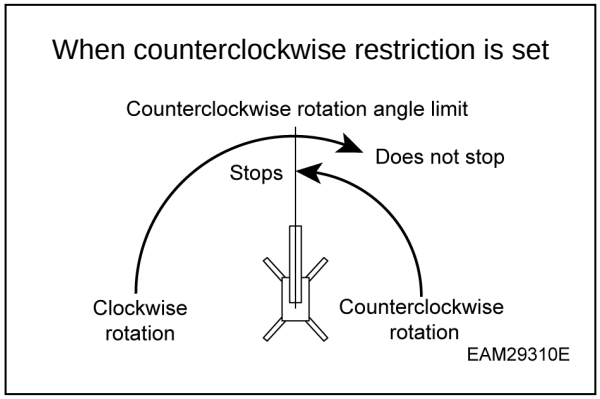
Before setting a rotation angle restriction, rotate the boom to the target angle, and then press the switch. Pressing the switch once displays a yellow display, with which you can select clockwise rotation setting or counterclockwise rotation setting. Every pressing of the switch alternates clockwise rotation setting and counterclockwise rotation setting. While the yellow display is showing the target setting, long press the switch. The restriction display in the monitor flashes orange, and a rotation angle restriction is set.

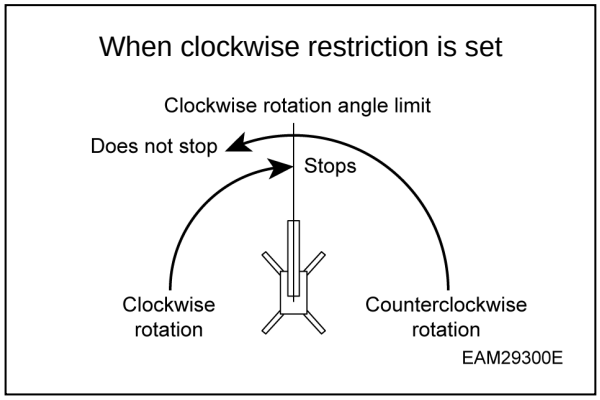
☞ If a rotation stop position has been set, the machine behaves as follows for safety:
- When the crane approaches the stop position, the rotation decelerates.
- The crane stops at a small distance before the set stopping position.

☞ When the slewing angle is in the range of the precaution alarm or stopped by restriction, an alarm sounds only when you make a slewing operation toward the restriction angle.

☞ When the machine is stopped by rotation restriction, the monitor and buzzer are in the following condition:
- The working status lamp flashes yellow.
- Rotation restriction display for clockwise rotation or counterclockwise rotation flashes orange.
- Buzzer sounds continuously (only when operation is made toward the restricted range).

☞ The setting value is kept after the starter switch is turned off.

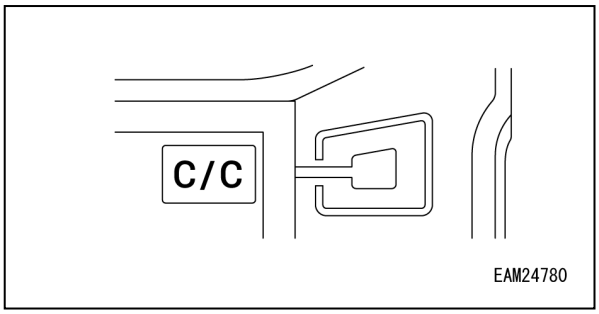




[Cancelling]

While clockwise or counterclockwise angle restriction is set, set the yellow display to show the setting that you want to unset, and then long press the switch.
The color of the monitor display changes to blue, and the setting is canceled.

5.8.13.5 Checking settings/cancel all



[Confirming the settings]

Use this function to confirm the content of settings.

Press the switch shown in the figure.

Setting values are displayed for five seconds.

[Canceling all settings]

Use this function to cancel all setting values.

Long press the switch shown in the figure.

5.8.14 Stowing the crane

⚠ WARNING

When you stow the jib, retract it slowly. If you make an abrupt or fast operation, the hook block or other parts may bump the machine body to cause damage. Such an operation may also cause a serious accident, trapping a person's hand or finger.

⚠ CAUTION

- **Do not make the retraction operation turning the moment limiter override switch on. The machine does not enter the stowing mode so that the hook block, stowing cam, weight, jib, boom, or wire rope may be damaged.**
- **When you make the stowing operation, pay careful attention so as not to hit people or objects nearby.**

Before stowing the jib, check the required height of the ceiling and the rotation radius with the table below to secure an enough space around.

・When using the fixed hook

Rotation direction	Height of ceiling	Rotation radius
Lateral direction of the machine (80 to 85 degrees, 275 to 280 degrees)	3.2 m or more	2.5 m or more
Other than the lateral direction of the machine	4.1 m or more	2.2 m or more
When there is a slewing-prohibited range in the stowing direction	4.8 m or more	1.6 m or more

・When using the single-fall hook block

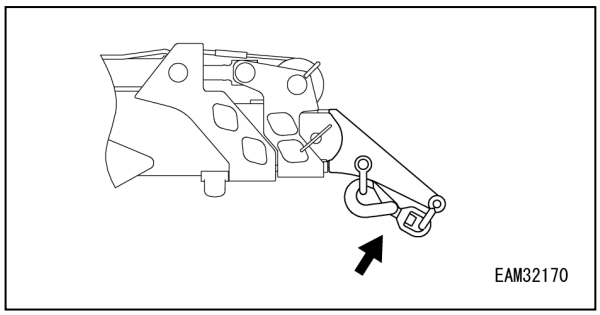
Rotation direction	Height of ceiling	Rotation radius	Jib raising direction space
Lateral direction of the machine (80 to 85 degrees, 275 to 280 degrees)	3.4 m or more	2.8 m or more	+0.2 m or more
Other than the lateral direction of the machine	4.9 m or more	2.2 m or more	+1.7 m or more
When there is a slewing-prohibited range in the stowing direction	5.3 m or more (only manual operation)	1.8 m or more (only manual operation)	side: +0.2 m or more other than side: +1.7 m or more

☞ With this machine, you can stow the jib on the machine side (in ranges of 80 to 85 degrees and 275 to 280 degrees). See "5.8.14.3 stowing the jib in the lateral direction of the machine."

5.8.14.1 Jib—Fixed hook specification

⚠ WARNING

- **In the stowing operation, orient the fixed hook downward with reference to "5.9.2 Installing the jib," and hang the hook on the attached shackle before making the stowing operation.**
- **If you make the stowing operation with the hook oriented upward, the hook may touch the machine to cause damage.**



When using the fixed hook, operations for unwinding of the winch (S2 lever) is not necessary.

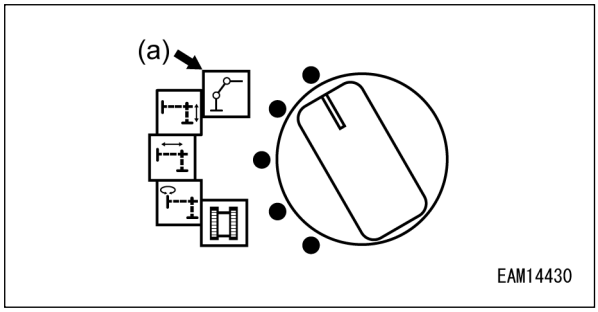
[1] Automatic stowing when using the fixed hook

⚠ WARNING

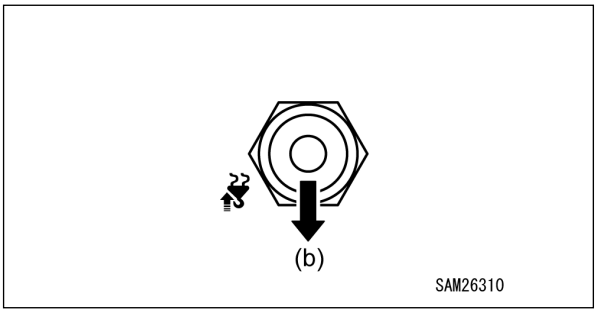
- **With automatic stowing, the boom and jib operate in the following order and conditions. Understand the order and conditions before making automatic stowing.**
- **Careless operation may result in a serious accident such as the boom or jib hitting an object.**
- **Order**
  1. **Jib retracting**
  2. **Boom retracting**
  3. **Boom raised**
  4. **Jib fully lowered**
  5. **slew**
  6. **Boom lowered**
  7. **Boom and jib automatically stopping in the stowing posture**
- **Conditions**
  - **Slewing is made in the shortest direction, i.e., the direction in which the stowing position is reached with the shortest movement.**
    If there is a non-operable range in the shortest direction, rotation is made in the opposite direction.
  - **If the job range during the current operation is sandwiched in the non-operable range, for example, when rotation must be made passing through a non-operable range, the boom is automatically raised to 60 degrees when it passes the non-operable range.**
- **There are cases in which automatic stowing cannot be made to prevent the tipping-over of the machine. In that case, make stowing manually with reference to "5.8.14.1 [2] Manual stowing when using the fixed hook."**

☞ Automatic stowing is made while you handle the hook stowing switch. Automatic retraction stops when you take your hand off the switch, and automatic retraction resumes when you start handling the switch.
If you make a different operation before the stowing finishes, automatic stowing stops and does not resume even if you handle the stowing switch again.
In that case, make stowing manually with reference to "5.8.14.1 [2] Manual retraction when using the fixed hook."

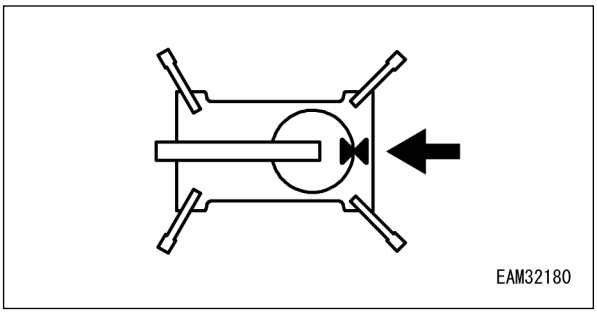
1. Set the mode switch to "crane operation (a)."



2. Pull the hook stowing switch toward you (b) and hold it there. The automatic stowing of the jib and boom starts.
   Hold the switch until the machine takes the stowing posture.



3. When the machine takes the stowing posture, take your hand off the switch and check the stowing position by the eye mark at the foot of the post.
   If it is not aligned, operate and rotate the S6 lever to align it. When doing this, be careful that the jib does not interfere with any of the covers.

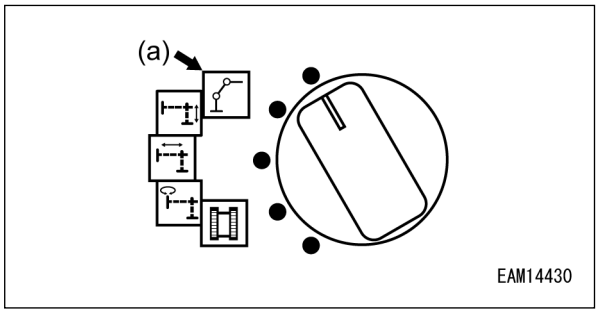


[2] Manual retraction when using the fixed hook

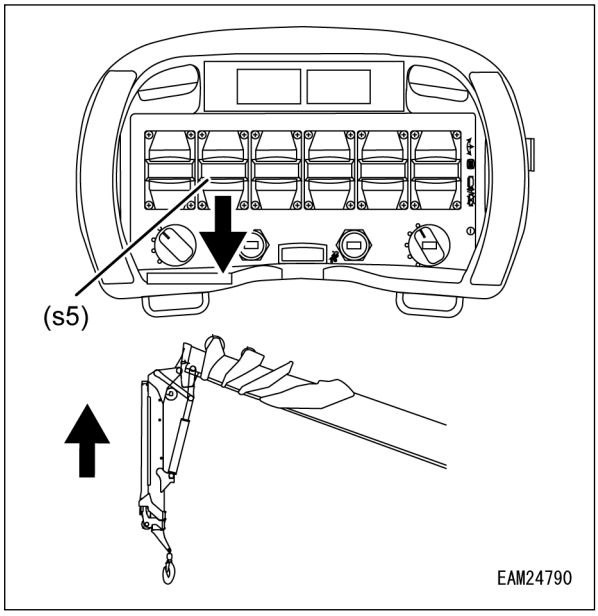
☞ Stowing operation is possible when the boom angle is 40 degrees or more.

☞ With the jib being retracted fully and lowered fully and the boom being retracted fully, if the boom angle becomes lower than 40 degrees, you cannot extend or raise the jib and cannot extend the boom.

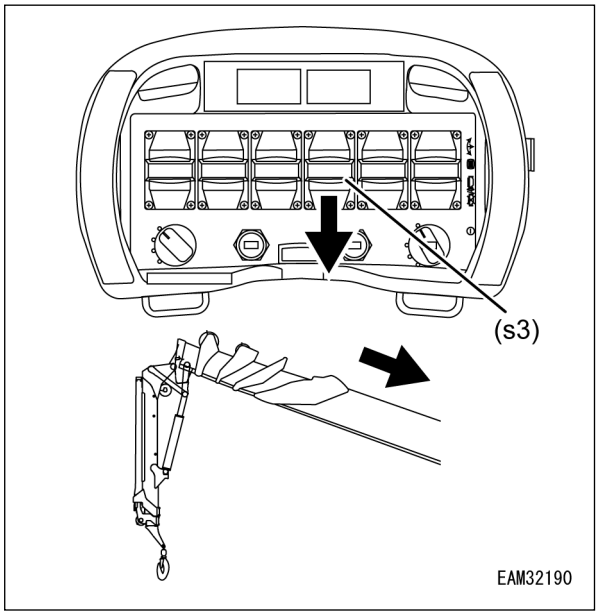
1. Set the mode switch to “crane operation (a).”



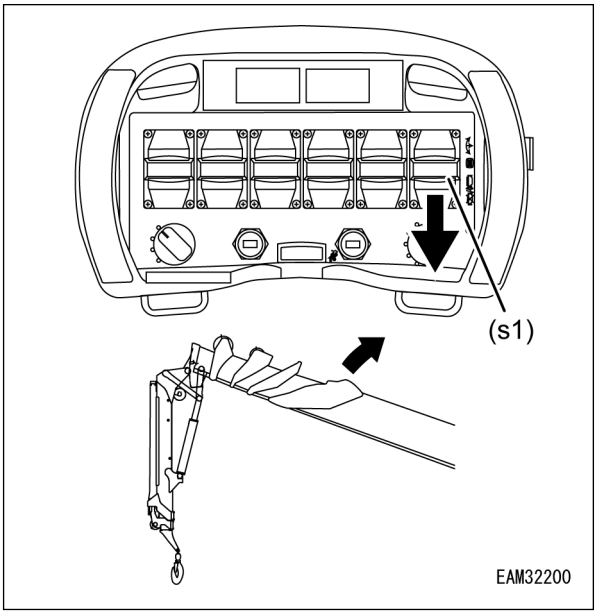
2. Pull lever S5 (s5) toward you to fully retract the jib.



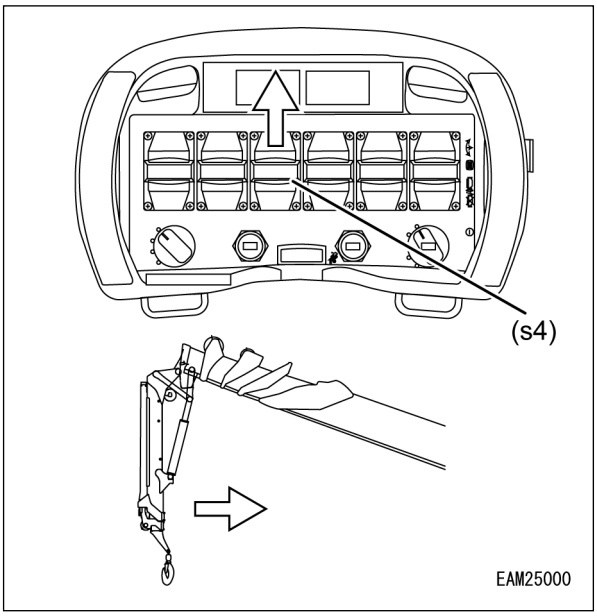
3. Pull lever S3 (s3) toward you to fully retract the boom.



4. Pull lever S1 (s1) toward you to raise the boom to the 40-degree position.

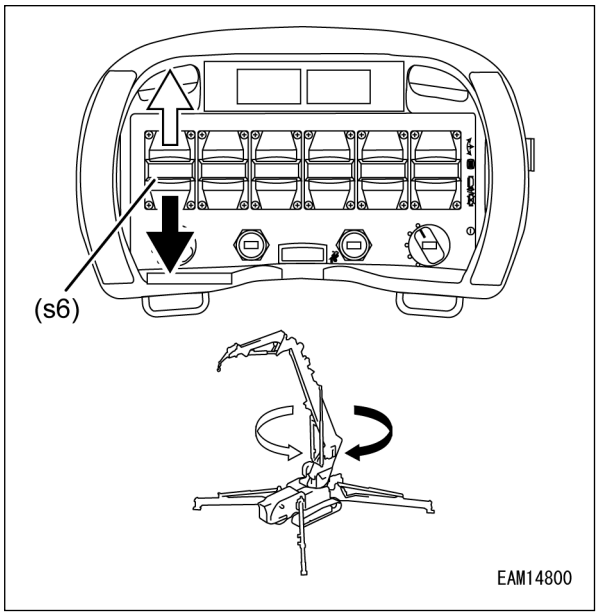


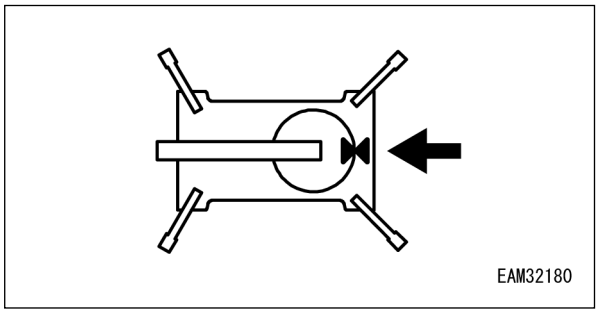
5. Push the S4 lever (s4) forward to lowered the jib fully.



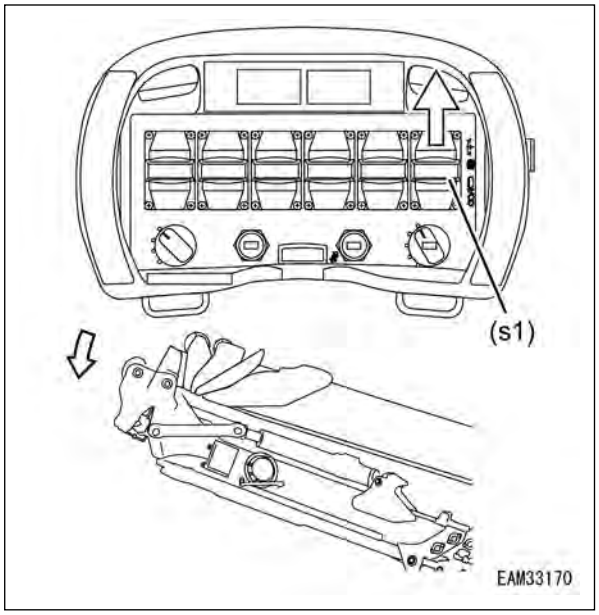
☞ The stowing of the jib is finished by step 5.

6. Use lever S6 (s6) to rotate the boom until it comes to the front and center of the machine body.
Find the center position by the eye mark below the post. Even if the displayed angle is 0 degree, the main boom may be shifted from the center due to loosening.





7. Push lever S1 (s1) forward to lowered the boom to the 0-degree (horizontal) position.



5.8.14.2 Jib—Single-fall hook block specification

Important

- **Before you stow the hook block, stop the hook block swaying.**
- **Be careful not to lower the hook block so low as lies on the ground. It may cause irregular winding on the winch drum due to loosening of the winch wire.**

[1] Automatic stowing when the single-fall hook block is used

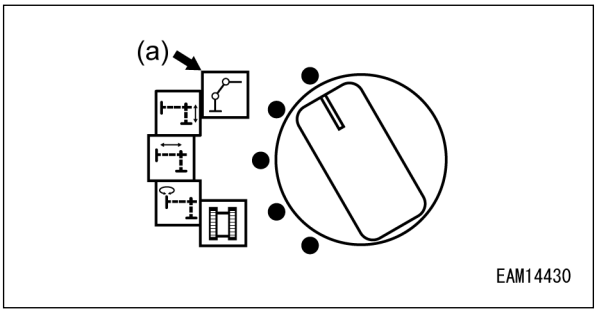
⚠ WARNING

- **If automatic stowing starts, the jib's raising radius widens. Be sure to stand on the jib side to avoid colliding with the jib.**
- **With automatic stowing, the boom and jib operate in the following order and conditions. Understand the order and conditions before making automatic stowing.**
- **Careless operation may result in a serious accident such as the boom or jib hitting an object.**
- **Order of operations (when the rotation angle is not in the lateral direction of the machine)**
  1. **Jib raising action (up to +5 degrees)**
  2. **Hook hoisted (until stowed)**
  3. **Jib fully lowered**
  4. **Slewing action (as far as the stowing position)**
  5. **Boom lowered**
  6. **Boom and jib automatically stopping in the stowing posture**
- **Order of operations (when the slewing angle is on the machine side (in ranges of 80 to 85 degrees and 275 to 280 degrees))**
  1. **Boom raising action (up to the jib angle +5 degrees)**
  2. **Hook hoisted (until stowed)**
  3. **Jib fully lowered**
  4. **Slewing action (as far as the stowing position)**
  5. **Boom lowered**
  6. **Boom and jib automatically stopping in the stowing posture**
- **During the operations in steps 1 and 2, be careful that the hook does not swing causing the stowing cam to tip-over on the opposite side. If it falls over on the opposite side, then immediately stop the automatic stowing and redo from the beginning.**
- **Conditions**
  - **Slewing is made in the shortest direction, i.e., the direction in which the stowing position is reached with the shortest movement.**
    If there is a non-operable range in the shortest direction, slewing is made in the opposite direction.
  - **If the job range during the current operation is sandwiched in the non-operable range, for example, when slewing must be made passing through a non-operable range, the automatic stowing does not start.**
    Take the following steps to have the boom and jib pass the non-operable range, set them in the automatic stowing posture again, and then start automatic stowing.
    1. **Retract the jib.**
    2. **Fully retract the boom.**
    3. **Raise the boom to 60 degrees or higher.**
    4. **Do not stow the hook, but extend the wire rope about one or two meters.**
    5. **Hold the hook so that it does not contact the machine, and lay down the jib fully without stowing the hook.**
    6. **Hold the hook and walk along with the slewing operation of the machine to pass the non-operable range, and put in the slewing stowage direction.**
    7. **Extend the jib while holding the hook by hand.**
    8. **Make the automatic stowing posture for non-lateral directions of the machine.**
    9. **The machine is now ready for automatic stowing.**

- **There are cases in which automatic stowing cannot be made to prevent the tipping-over of the machine. In that case, make retraction manually with reference to "5.8.14.2 [2] Manual stowing when the single-fall hook block is used."**

☞ Automatic stowing is made while you handle the hook stowing switch. Automatic retraction stops when you take your hand off the switch, and automatic retraction resumes when you start handling the switch.
If you make a different operation before the stowing finishes, automatic stowing stops and does not resume even if you handle the stowing switch again.
In that case, make retraction manually with reference to "5.8.14.1 [2] Manual stowing when the single-fall hook block is used."

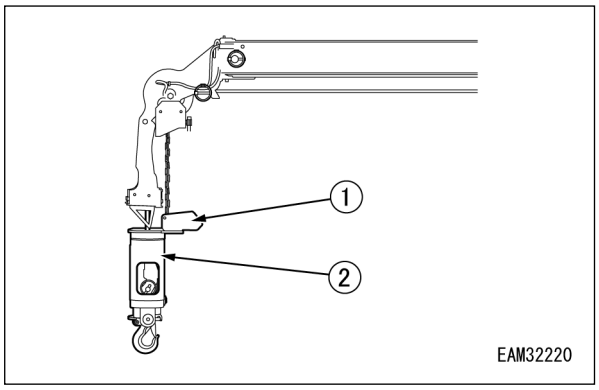
1. Set the mode switch to "crane operation (a)."



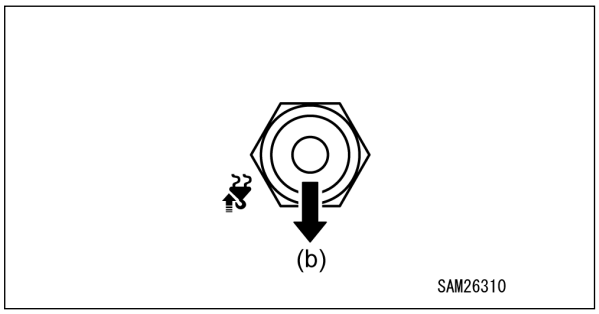
2. Set the boom and jib in the posture for starting automatic stowing according the table below.

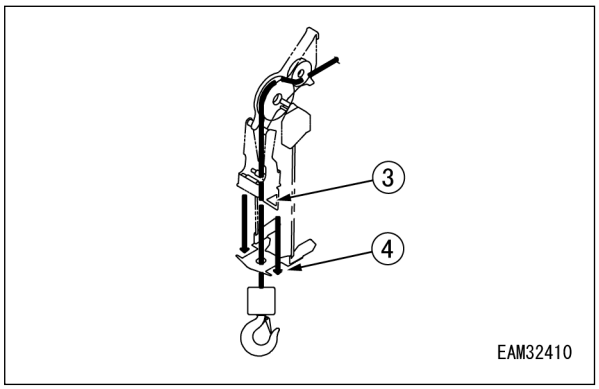
		Boom	Jib
Length		Fully retract	Fully retract
Derricking angle	Lateral direction of the machine (80 to 85 degrees, 275 to 280 degrees)	5 to 8 degrees	-14 to -17 degrees
	Other than the lateral direction of the machine	40 to 45 degrees	-75 to -80 degrees

3. Hoist the hook block slowly until it stops at the over-winding limit, and have the detection weight (1) and the hook block (2) contact by the magnet.

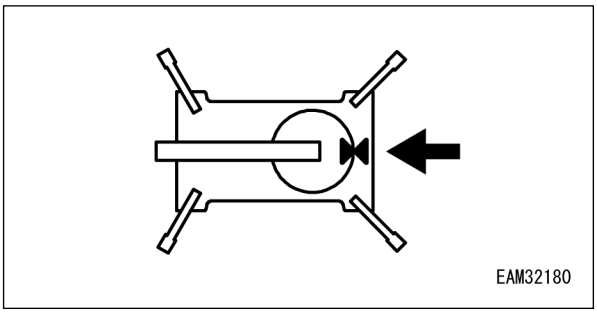


4. Stand on the jib side and after confirming the space in the jib raising direction, pull the hook stowing switch toward you (b) and hold it there. The automatic stowing of the jib and boom starts.
Before starting stowage, guide the tip (3) of the stowing cam by hand to fit it into the notch (4) of the detection weight.
Hold the switch until the machine takes the stowing posture.





5. When the machine takes the stowing posture, take your hand off the switch and check the stowing position by the eye mark at the foot of the post.
   If it is not aligned, operate and rotate the S6 lever to align it. When doing this, be careful that the jib does not interfere with any of the covers.



[When automatic stowing is suspended due to making a different operation]

There are the following patterns depending on the jib rising angle:

1. Before the jib lowering action starts
   - When the jib lowering angle is up to -45 degrees
     Extend the wire rope about one or two meters to lower the hook by unwinding the winch slowly or laying down the jib or boom, then make the automatic stowing posture again, and redo the automatic stowing.
     At this time, be careful not to have the wire rope slacken to cause irregular winding on the winch drum.

2. After the jib lowering action begins
   - When the jib lowering angle is up to -45 degrees
     Extend the wire rope about one or two meters to lower the hook by unwinding the winch slowly or laying down the jib or boom, then make the automatic stowing posture again, and redo the automatic stowing.
     At this time, be careful not to have the wire rope slacken to cause irregular winding on the winch drum.
   - When the jib lowering angle is -45 degrees or less
     See “5.8.14.2 [2] Manual stowing when the single-fall hook block is used.”
     While pulling the hook stowing switch toward you, lower the jib fully to the stowing position.
     Slew the jib to the stowing position, and check the alignment of the eye mark at the foot of the post.
     While pulling the hook stowing switch toward you, lower the boom fully to stow it.

[2] Manual stowing when the single-fall hook block is used

⚠ CAUTION

The hook stowing switch disables the automatic stop function of the overwinding detector. Slowly perform the hoisting up operation when you stow the hook block, paying careful attention so that the hook block does not bump the stowing point at the tip of the jib.
When you stow the hook block, be sure to orient the jib horizontally or above beforehand. If you stow the hook block with the jib lowered below the horizontal, the hook block, stowing cam, and the protection weight are damaged.
Do not raise or lay down the main boom with the hook block stowed. Such an operation damages the retraction cam and the resin plate at the top of the hook block.

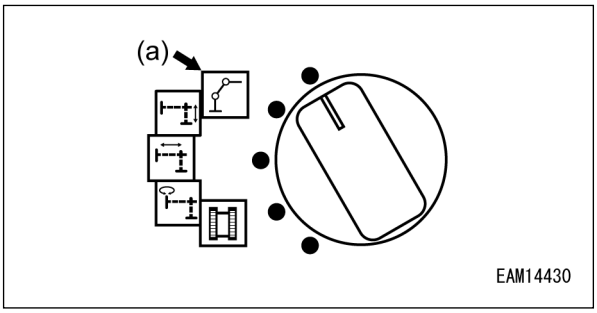
Important

- **When you make the retracting operation of the boom or jib, the hook block is lowered. When you lower the main boom or jib, the hook block is also lowered. However, the hook block is automatically lifted if you press the hook stowing switch when you make the lowering operation.**
- **Make the hoisting operation slowly, and do not stow the hook block fast.**

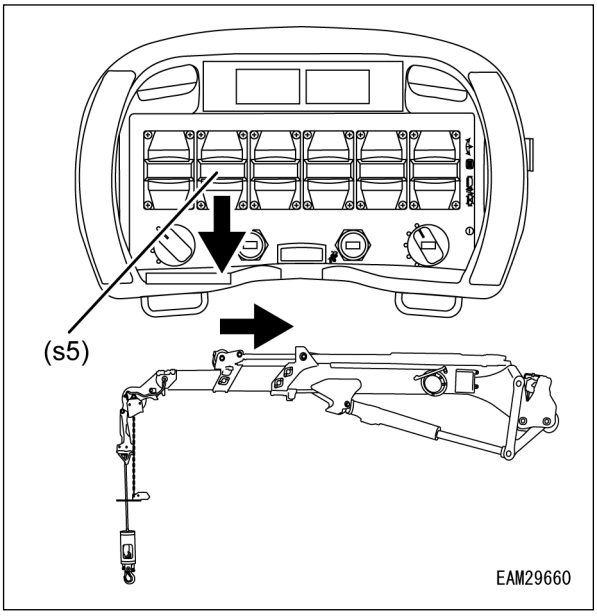
☞ The manual stowing operation is possible when the boom angle is 50 degrees or more.

☞ With the jib being retracted fully and lowered fully and the boom being retracted fully, if the boom angle becomes lower than 50 degrees, you cannot extend or raise the jib and cannot extend the boom.

1. Set the mode switch to “crane operation (a).”

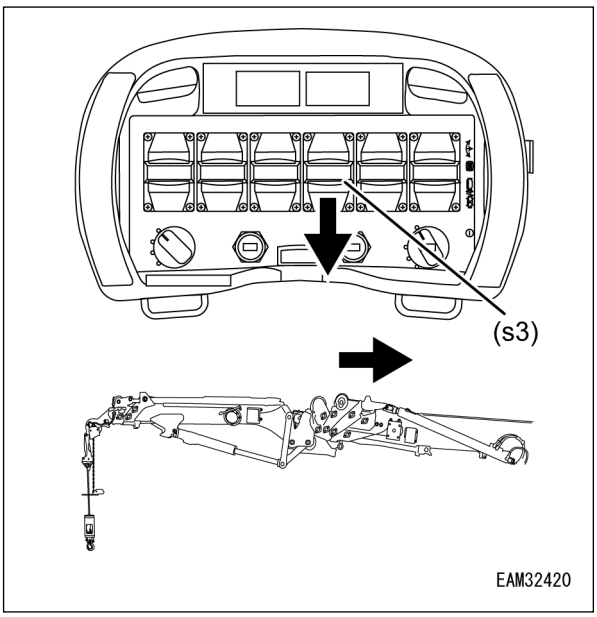


2. Pull lever S5 (s5) toward you to fully retract the jib.



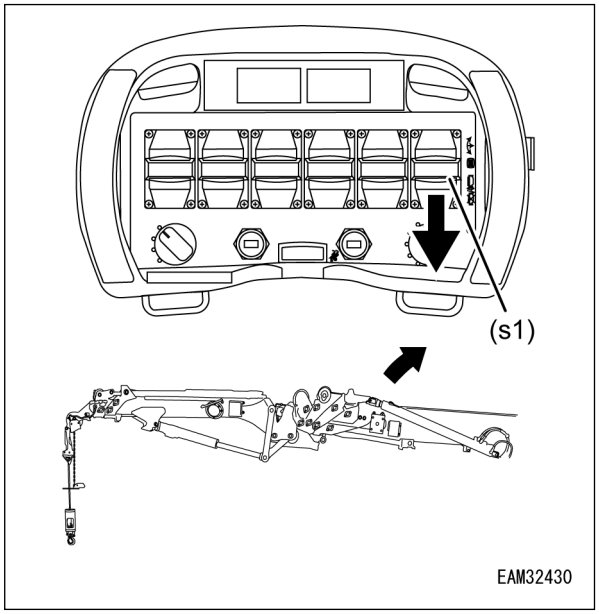
☞ When you retract the jib, the hook block is lowered. Hoisting the hook block from time to time by the hoisting operation.

3. Pull lever S3 (s3) toward you to fully retract the boom.



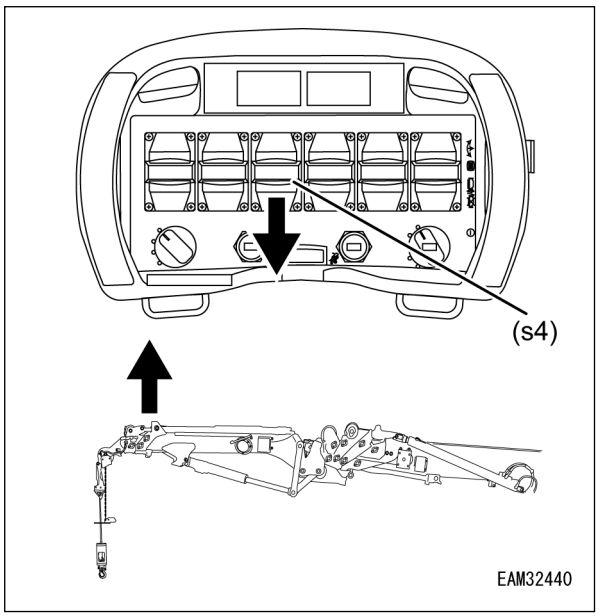
☞ When you retract the boom, the hook block is lowered. Hoist the hook block from time to time by the hoisting operation.

4. Pull lever S1 (s1) toward you to raise the boom to the 50-degree position.



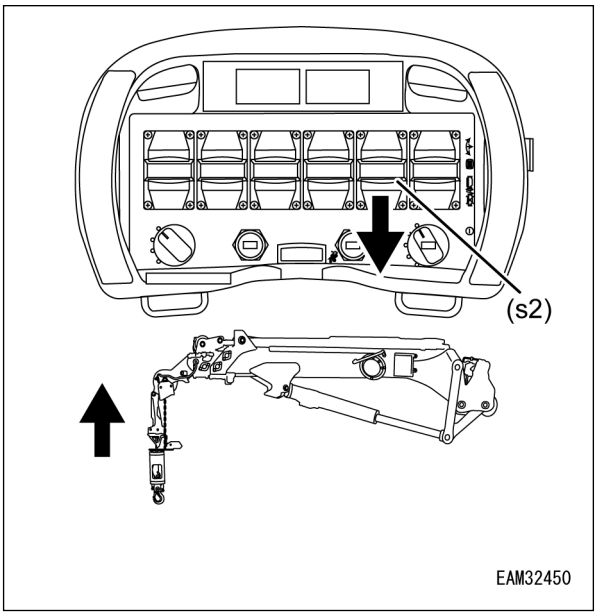
☞ When you raise the boom, the hook block is lifted. Make the lowering operation from time to time to lower the hook block.

5. Pull lever S4 (s4) toward you to raise the jib to the 0-degree or greater position.

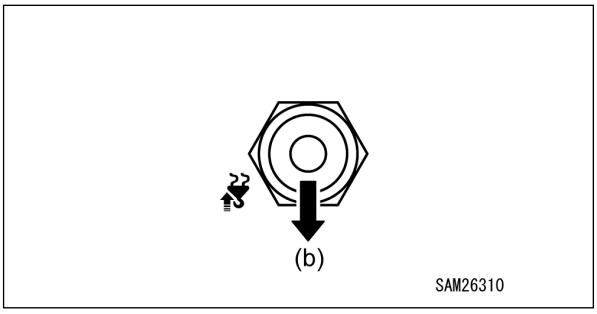


☞ When you raise the jib, the hook block is lifted. Make the lowering operation from time to time to lower the hook block.

6. Pull the S2 lever (s2) toward you to hoist the hook block so that it slowly pushes the weight up until the hook block is automatically stopped (over-winding). Before starting stowage, guide the tip of the stowing cam by hand to fit it into the notch of the detection weight.



7. While pulling the hook stowing switch toward you (b), pull the S2 lever toward you to hoist the hook block to stow it under the tip of the jib.

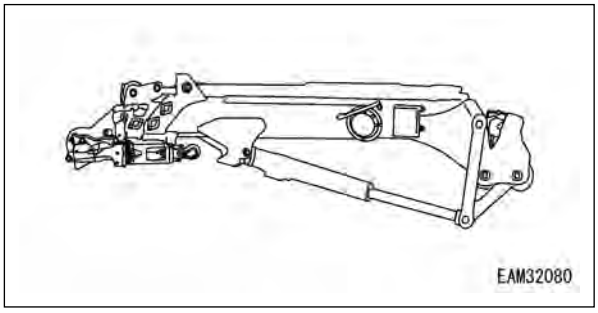


☞ When the hook block is stowed, the hook block, stowing cam, and weight are lying horizontally.

☞ While you are using the hook stowing switch to lift the hook block, the red lamp of the working status lamp is lit.

☞ You cannot lift a load when you operate the winch while using the hook stowing switch, but it is not a fault.

☞ The figure illustrates the hook block when it is stowed under the tip of the jib.

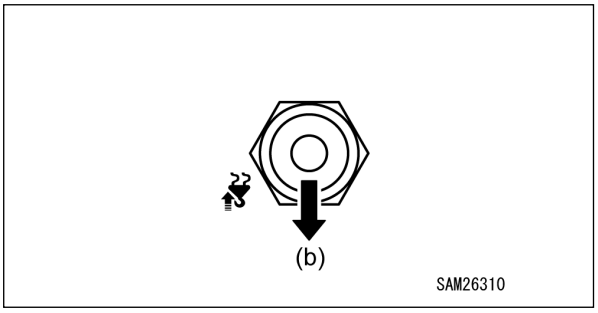


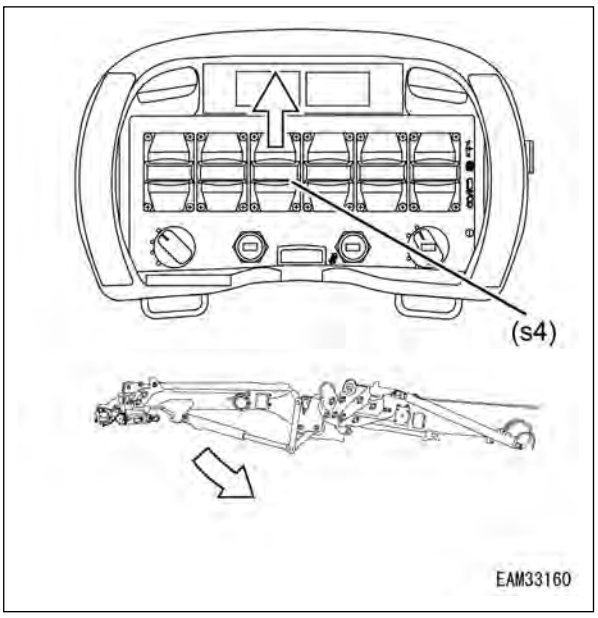
☞ The stowing of the single-fall hook block is finished by step 8.

8. Lower the jib fully by pushing the S4 lever (s4) forward while pulling the hook stowing switch toward you (b).

⚠ CAUTION

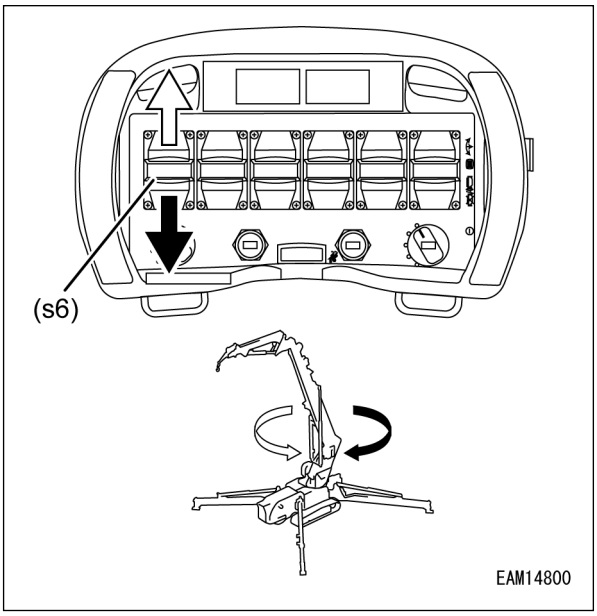
When you lower the jib, the hook block is lowered. When you lower the jib, press the hook stowing switch so that the hook block does not move from the stowing position.

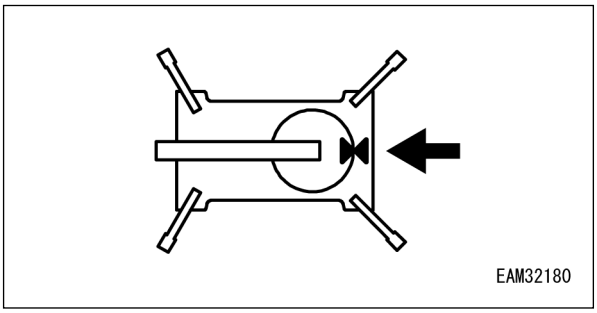




☞ The stowing of the jib is finished by step 9.

9. Use lever S6 (s6) to slew the boom until it comes to the front and center of the machine body.
   Find the center position by the eye mark below the post. Even if the displayed angle is 0 degree, the main boom may be shifted from the center due to loosening.

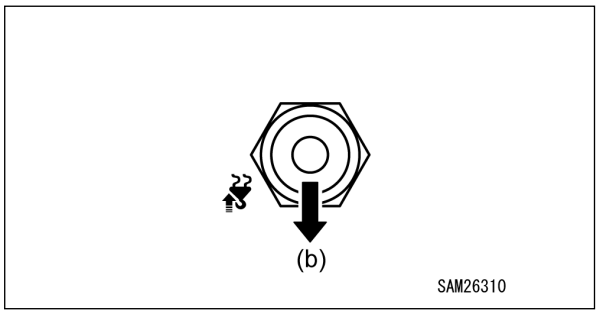


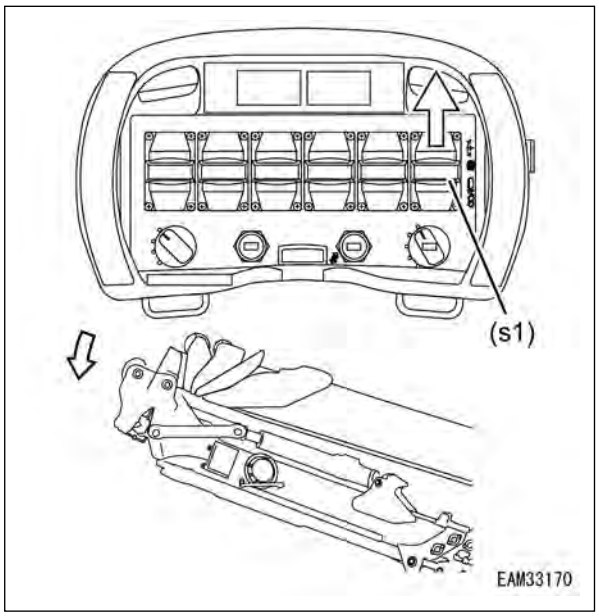


10. Lower the boom to the 0-degree (horizontal) position by pushing the S1 lever (s1) forward while pulling the hook stowing switch toward you (b).

⚠ CAUTION

- **When you lower the boom, the hook block is lowered. When you lower the boom, press the hook stowing switch so that the hook block does not shift from the stowing position.**
- **When you lower the boom while the jib head is set in the jib receiver at the front of the post, be careful not to damage the over-winding detection device by touching the jib receiver or other sections.**





5.8.14.3 Stowing the jib in the lateral direction of the machine

⚠ WARNING

- **Do not stow the jib outside the operable range. The machine may tip-over to cause a serious injury.**
- **The smaller the boom angle is, the larger the working radius becomes. So, pay attention to the area around the machine during operation.**

The jib can also be stowed in the lateral direction of the machine.
The basic operation is the same as the stowing when a fixed hook or single-fall hook block is used.
Operation is possible in the following conditions:

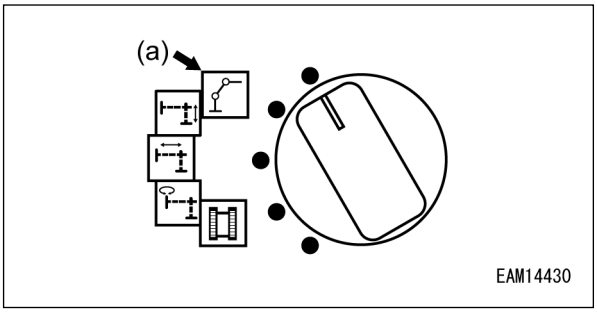
- Rotation angle: 80–85 degrees or 275–280 degrees
- Boom raised angle:
  When a fixed hook is mounted:
  20 degrees or more
  When a single-fall hook block is mounted:
  25 degrees or more

5.8.14.4 Boom—4-fall hook block specification

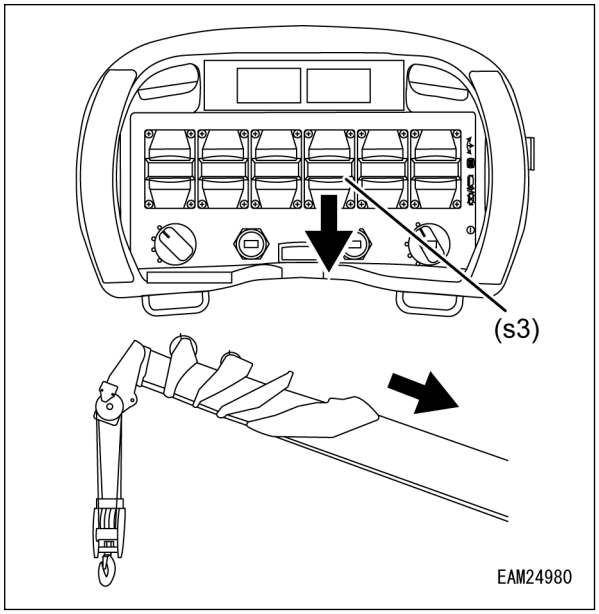
Important

When you make the retracting operation of the boom, the hook block is lowered. The hook block is also lowered when you make the lowering operation.
Make the hoisting operation simultaneously so that the hook block does not touch the ground or machine.

1. Set the mode switch to “crane operation (a).”



2. Pull lever S3 (s3) toward you to fully retract the boom.

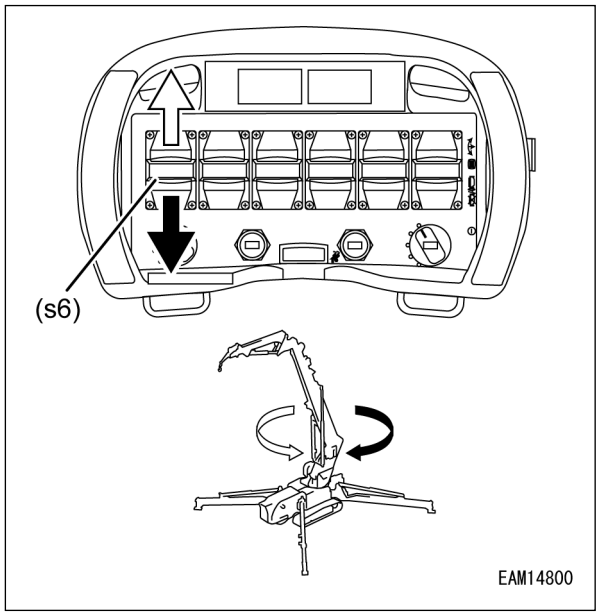


☞ When you retract the boom, the hook block is lowered. Hoist the hook block from time to time by the hoisting operation.

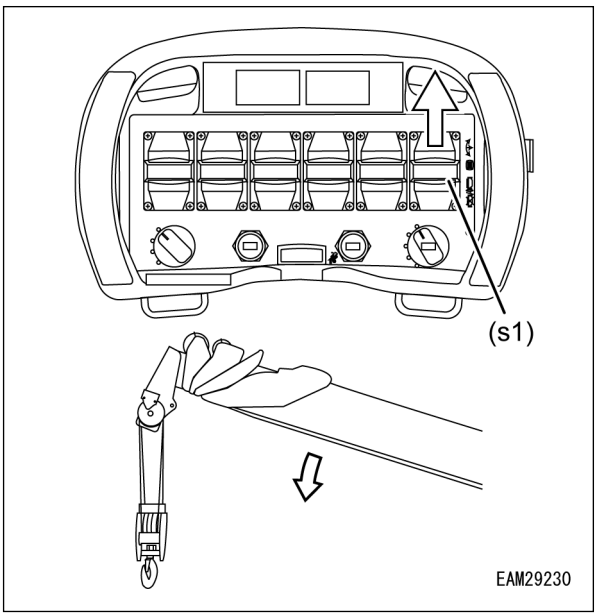
3. In step 2, when the hook block is lowered near to the ground, lay the S2 lever backward to lift the hook block to a point not too high.

☞ If you lift the hook block too high, the machine detects over-winding, and the alarm buzzer sounds and lifting is automatically stopped.

4. Use lever S6 (s6) to rotate the boom until it comes to the center of the machine body. Find the center position by the eye mark below the post. Even if the displayed angle is 0 degree, the main boom may be shifted from the center due to loosening.

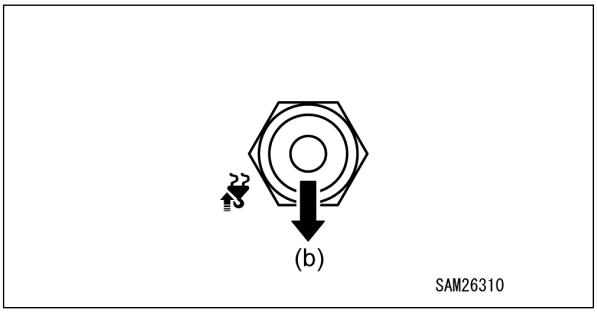


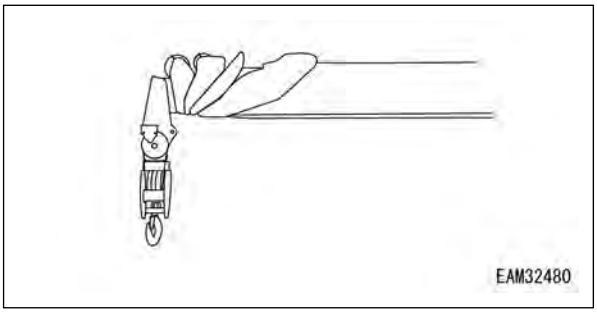
5. Push the S1 lever (s1) forward to lower the boom to the 0-degree position.



☞ When you lower the boom, the hook block is lowered. Hoist the hook block from time to time by the hoisting operation.

6. Pull the hook stowing switch (b) toward you to lift the hook block so that it slowly contacts the bottom of the boom tip, and then hold the switch for about one second to stow the hook block.





☞ While you are using the hook stowing switch to lift the hook block, the red lamp of the working status lamp is lit.

☞ You cannot hoist a load when you operate the winch while using the hook stowing switch, but it is not a fault.

☞ The figure illustrates the hook block when it is stowed under the tip of the boom.

☞ The stowing of the 4-fall hook block is finished by step 6.

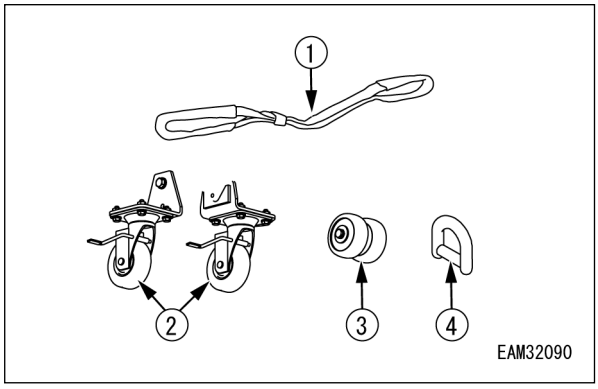
5.9 CHANGING CRANE OPTIONS

5.9.1 Precautions in the operation

⚠ WARNING

- **The slide plate deteriorates over time and deforms by moisture absorption. If it has deformed, adjust the bolt fixing position along the long-slotted hole to make the slide plate parallel to the metal surface. If the slide plate has deformed to much or the sliding surface has become rough, replace the slide plate.**
- **For precautions other than those remarked here, see "Chapter 2 SAFETY."**

- Auxiliary tools



(1) Nylon sling (1 pcs)

(2) Jib mover casters: link casters (for left/right jib links) (2 pcs)

(3) Jib mover casters: tip caster (for the tip of fixed hook) (1 pcs)

(4) Shackle (2 pcs)

(These items are to be prepared by the user.)

(5) Scaffold

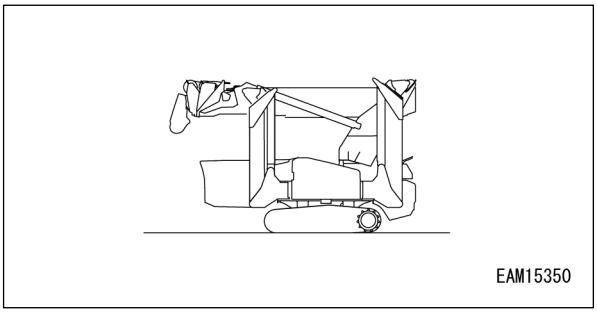
(These items are to be prepared by the user.)

5.9.2 Installing the jib

⚠ WARNING

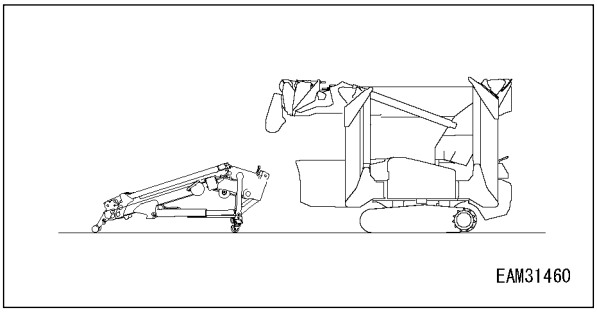
- **Read and understand the procedure described in this manual carefully, and then follow the steps below to install and stow the jib.**
- **Never stand on a crawler to carry out the working.**
- **During work, do not enter the area underneath the jib.**
- **Grab the handle during work, and do not insert your finger in a pin hole.**
- **Insert position pins in the correct positions from above, and fix them by linchpins.**
- **Do not use the nylon sling that comes with the jib for lifting a load.**
- **Stow the single-fall hook block in the optional bracket.**

1. Set the machine to the following posture.



- Move the machine to a level place.
- Fully retract the boom.
- Set the boom angle to 0 degree.
- Adjust the slew angle of the boom so that it comes to the center of the machine. Find the center position by the eye mark below the post.

2. Position the jib at the center of the machine.



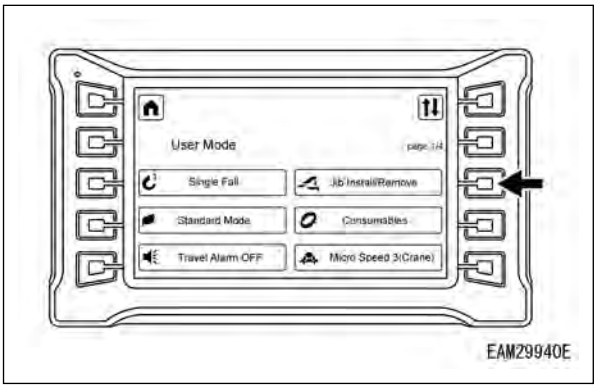
☞ In later steps, the jib is mounted on the boom using the hanging points of outriggers 2 and 3.
Position the jib so that the back end of the jib reaches the hanging points of the outriggers.

3. Extend and ground all outriggers firmly with reference to “5.7.3 Setting the outriggers.”

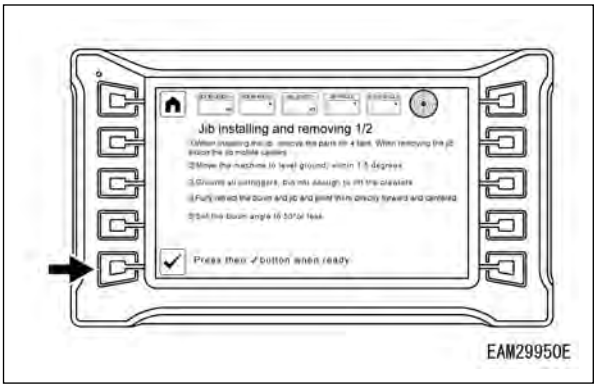
☞ Ground outriggers so that the crawlers touch the ground with the machine inclination being 3 degrees or less.

4. If the 4-fall hook block or boom head is mounted, remove them and the wire with reference to “5.9.12 Boom—Detaching a 4-fall hook block” and “5.9.14 Detaching the boom head.”

5. In the user mode screen, select [Jib Install/Remove].



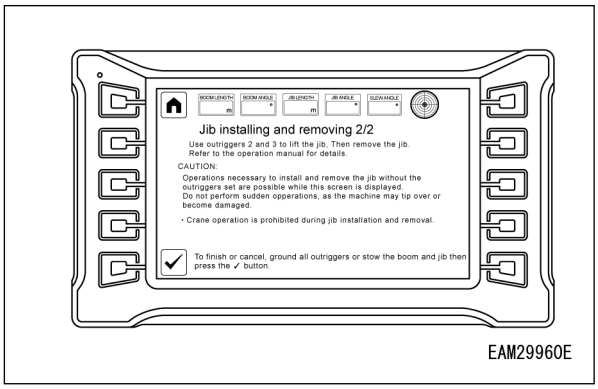
When you select it, confirmation screen [Jib installing and removing 1/2] appears.
In the confirmation screen, the posture of the machine and the outrigger grounding conditions are displayed.
Select the [✔] switch if the conditions are satisfied.



Then, operable screen [Jib installing and removing 2/2] appears.

☞ If you select the [✔] switch when the machine is not in the correct posture, message “The conditions are not satisfied.” appears and the operable screen does not appear.
In that case, return to step 1 to correct the posture and step 3 to set the outriggers again.
After setting the machine in the correct posture, selecting the [✔] switch displays the operable screen.

The interlock is released and operation is possible only while the following screen is displayed.



- Derricking, telescoping, and slewing the boom, and derricking and retracting the jib are possible even if the detection of the outrigger grounding is disengaged.
  - ・Slewing the boom (in the range of ±6 degrees)
  - ・Raising of the boom (up to 50 degrees)
  - ・Lowering the boom (down to 0 degrees)
  - ・Extending the boom (up to 0.2 m)
  - ・Retracting the boom
  - ・Derricking the jib
  - ・Retracting the jib
- Derricking and telescoping outriggers and driving the machine are possible even if the boom is not stowed.

⚠ WARNING

Do not make unnecessary operation of the boom or jib and do not travel the machine unnecessarily.

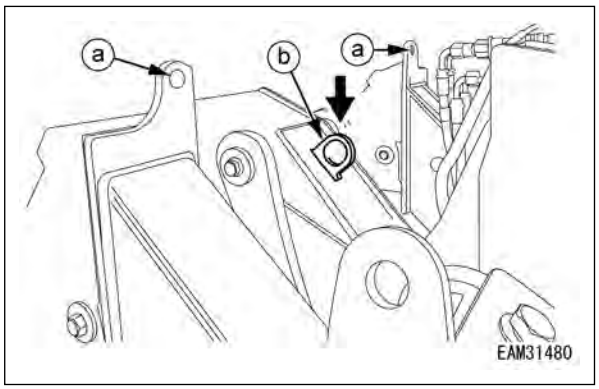
⚠ CAUTION

Do not make operations fast because the machine may tip-over.
During the No.2 and No.3 outriggers’ operation, pay careful attention so that they do not hit the boom right hand surface cable bear surround and the boom left hand surface length gauge tip.

6. Raise outriggers 2 and 3 to make them detach from the ground.

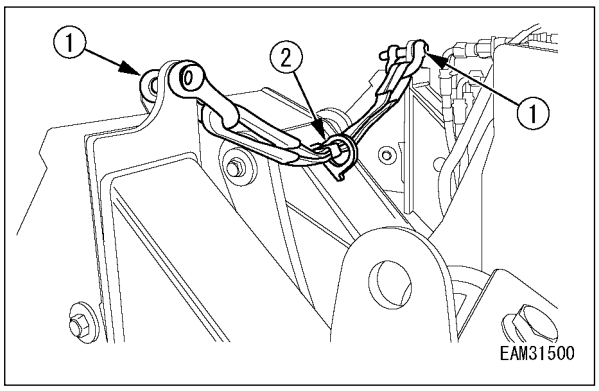
☞ If necessary at this time, move the machine to approach the jib so that at the hanging points (a) of the outriggers can reach the hanging point (b) of the jib rear tip.

7. Rotate outriggers 2 and 3 to orient the machine to the front.
8. Make the machine approach the hanging point (b) at the back end of the jib by derricking and telescoping outriggers 2 and 3.



☞ At this time, align the hanging points (a) of the outriggers and the handing section (b) at the back end of the jib horizontally along a line.
If the hanging points deviate largely from the above positioning, the load sways when the jib is raised and the machine may tip-over.

9. Attach a shackle (1) at the hanging points of the outriggers, run the attached nylon sling (2) through the handing section of the jib, and fix the sling.



☞ At this time, if a position pin is inserted at the boom head, it obstructs the mounting of the jib. Remove the position pin beforehand.

⚠ WARNING

Use the nylon sling that is prepared for this purpose.

⚠ CAUTION

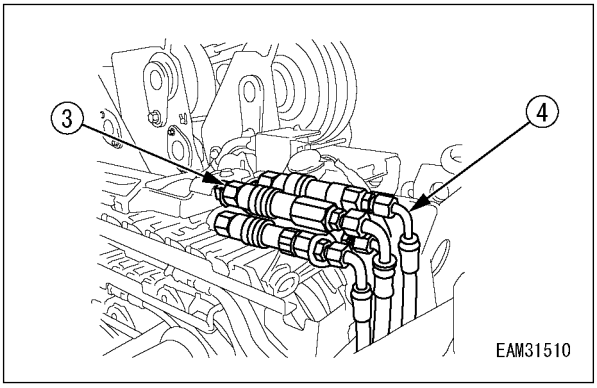
- **Do not twist the nylon sling when you attach it.**
- **To prevent the falling of the jib, be sure to run the nylon sling.**

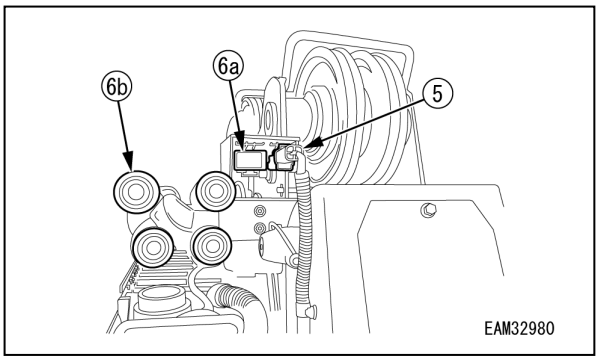
10. Raise the jib by raising, extending, and retracting the outriggers. Bring the jib to a point about 200 mm from the position pin.

Important

Make this operation little by little, while confirming that there is no danger of the jib falling and that the nylon sling is hanging the jib.

11. Attach hydraulic couplers (3) in 4 places and set the connectors (5).



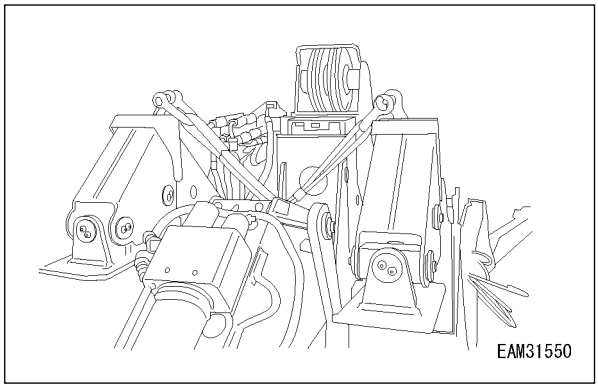


☞ There are black and gray ties attached on the hydraulic hoses (4). Connect the hoses firmly in accordance with the color and number of ties.
There are four types of hoses, each of which has two black ties, one black tie, one gray tie, or no tie.

Important

- **The jib does not work unless the harness is connected, so be sure to connect it.**
- **Remove the connectors (5), and in their place insert (2 gray) waterproof plugs securely until you hear a click.**
- **Remove (8P gray) waterproof plugs (6a), and in their place insert jib harnesses securely until you hear a click.**
- **Remove the protection plugs (6b), connect the hydraulic hose (4) securely, and shift the locking pins of the hydraulic couplers (3). (detachment prevention)**
- **The jib does not work unless you install the hydraulic hoses (4), so be sure to connect them.**
- **Confirm that the couplers (3) are inserted firmly on the installed hydraulic hoses (4).**
- **Pinch the plugs that have come off the hydraulic couplers (3) in the gaps so that they do not droop down and catch the cable bears, etc.**

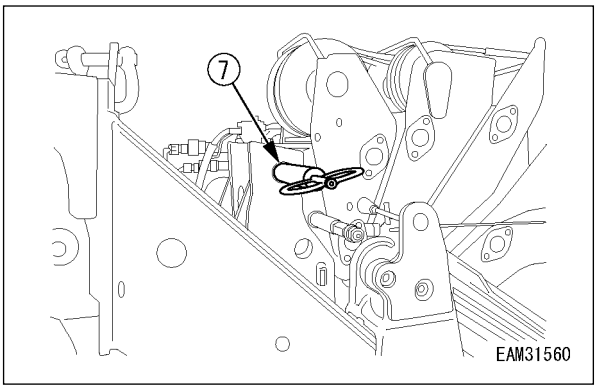
12. Derricking the jib to adjust the angle so that the boom head and the contact surface of the boom are parallel.



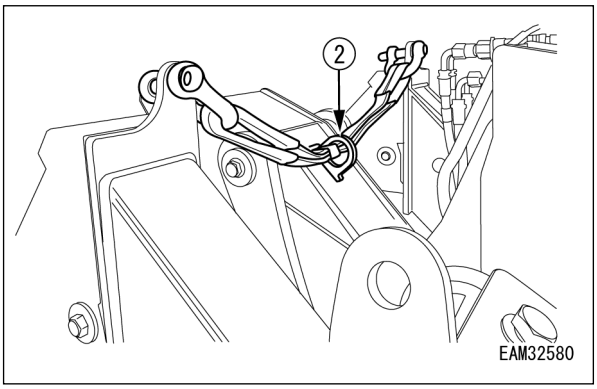
13. Raise, extend, and retract the outriggers to adjust the position of the upper pin hole.

⚠ WARNING

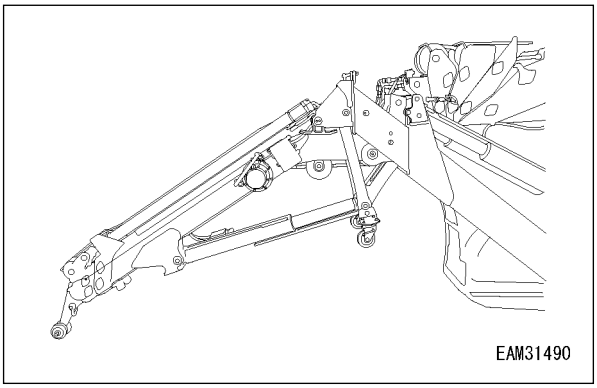
Never insert your finger in the pin hole. Adjust the position of the hole by sight.



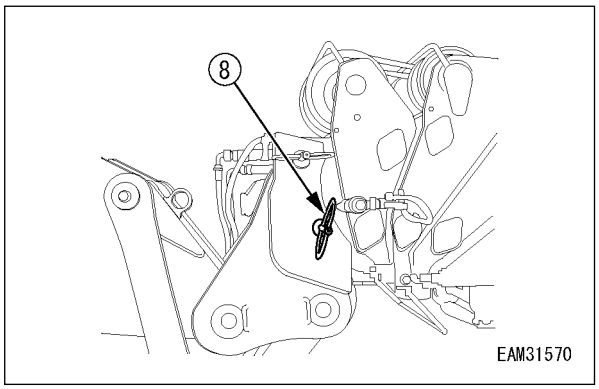
14. Apply grease on the boom head position pin (7), and push it in using a tool such as a plastic hammer.
    After inserting the pin, lock it firmly with a linchpin.
15. Lay down outriggers 2 and 3 little by little, and remove the sling when the nylon sling (2) slackens.



16. Raise the jib to the height at which it detaches the ground.



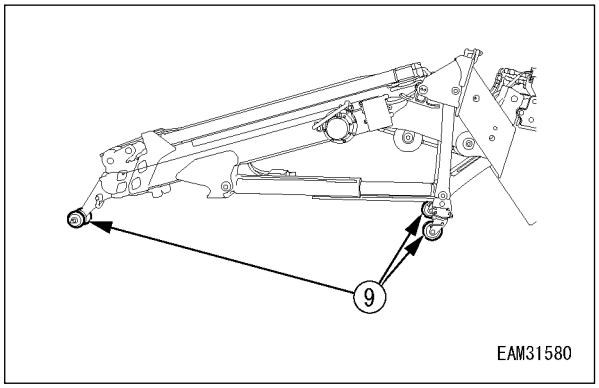
17. Check that the boom head lower pin hole is in the correct position, and insert the position pin (8).
    After inserting the pin, lock it firmly with a linchpin.



⚠ WARNING

Never insert your finger in the pin hole. Adjust the position of the hole by sight.

18. Remove the jib mover casters (one tip caster, and two link section casters) (9).



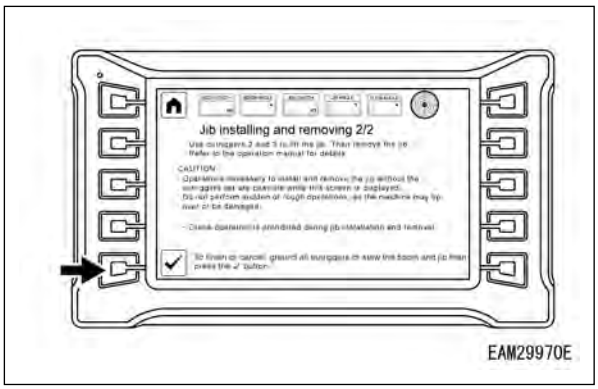
19. After installing the jib, derrick the jib slowly to confirm that the harness and hoses are not twisted or caught by the machine.

⚠ CAUTION

After installing the jib, set it in the stowing position, and lay down outrigger 2 at the rotation angle of 0 degree to confirm that it does not get stuck with the harness or hoses.

20. Change the jib head with a fixed hook or single-fall hook block in accordance with the work to be done.
    For how to change them, see “5.9.2 Installing the jib” and “5.9.7 Jib—Attaching a single-fall hook block.”

21. With the four outriggers set up or with the boom stowed, select the [✔] switch in the operable screen [Jib installing and removing 2/2]. The User Mode screen is displayed again.



☞ If you select the [✔] switch in the operable screen [Jib installing and removing 2/2] without the conditions being satisfied, a message appears in red reading “If you want to finish or cancel the operation, set all outriggers or retract the boom and jib before pushing the [✔] button,” and the User Mode screen does not appear.

☞ The normal interlock takes place when the User Mode screen appears again.

5.9.3 Removing the jib

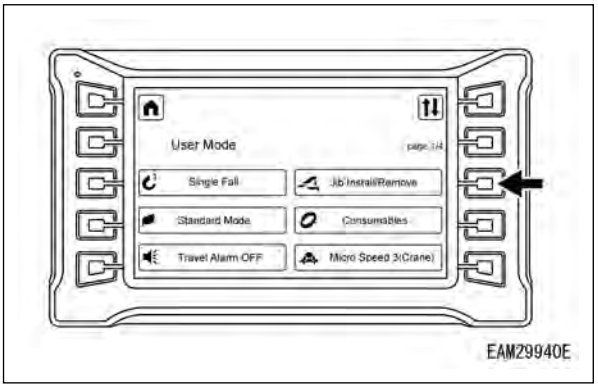
1. Move the machine to a level place.
2. If a single-fall hook block or jib head is mounted, remove them and the wire with reference to “5.9.8 Jib—Detaching a single-fall hook block.”
   After that, mount the fixed hook at the tip with reference to “5.9.5 Jib—Detaching the fixed hook.”

☞ Mount the fixed hook in the downward orientation. With the upward orientation, you cannot ground the caster (stowage part).

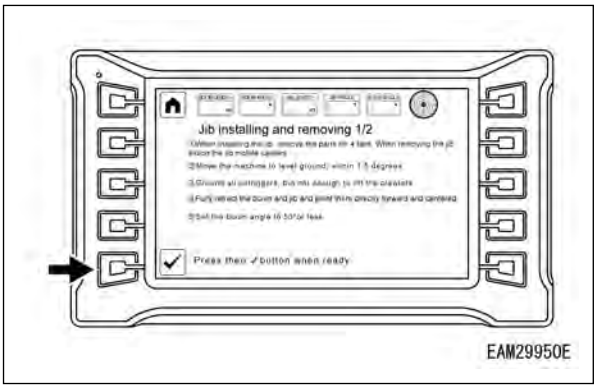
3. Stow the boom and jib, and extend all the outriggers and ground them firmly with reference to "5.7.3 Setting the outriggers."

☞ Ground outriggers so that the crawlers touch the ground with the machine inclination being 3 degrees or less.

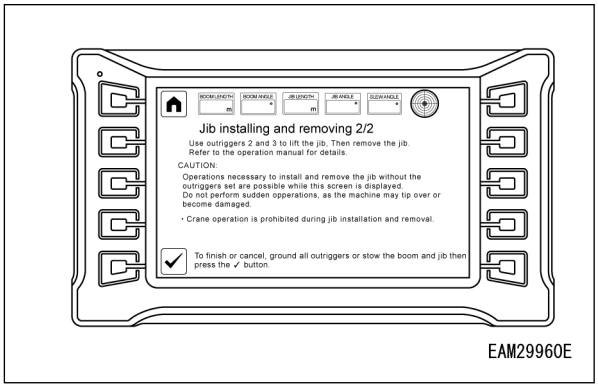
4. In the user mode screen, select [Jib Install/Remove].



When you select it, confirmation screen [Jib installing and removing 1/2] appears.
In the confirmation screen, the posture of the machine and the outrigger grounding conditions are displayed.
Select the [✔] switch if the conditions are satisfied.

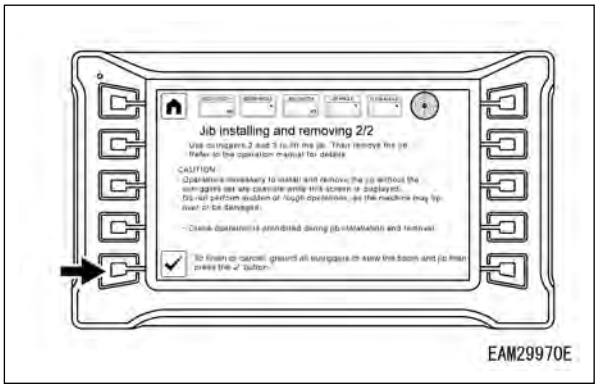


Then, operable screen [Jib installing and removing 2/2] appears.



☞ If you select the [✔] switch when the machine is not in the correct posture, message “The conditions are not satisfied.” appears and the operable screen does not appear.
In that case, return to step 1 to correct the posture and step 3 to ground the outriggers again.
After setting the machine in the correct posture, selecting the [✔] switch displays the operable screen.

The interlock is released and operation is possible only while the following screen is displayed.



- Derricking, telescoping, and slewing the boom, and derricking and retracting the jib are possible even if the detection of the outrigger grounding is disengaged.
  - ・Slewing the boom (in the range of ±6 degrees)
  - ・Raising of the boom (up to 50 degrees)
  - ・Lowering the boom (down to 0 degrees)
  - ・Extending the boom (up to 0.2 m)
  - ・Retracting the boom
  - ・Derricking the jib
  - ・Retracting the jib
- Derricking and telescoping outriggers and driving the machine are possible even if the boom is not stowed.

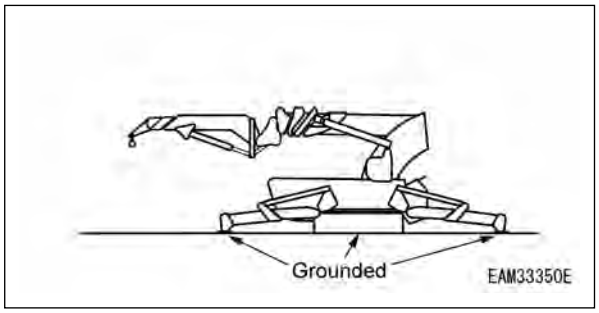
⚠ WARNING

Do not make unnecessary operation of the boom or jib and do not travel the machine unnecessarily.

⚠ CAUTION

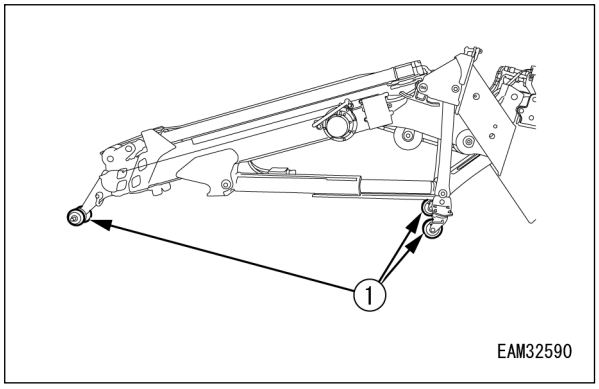
Do not make operations fast because the machine may tip-over.

5. Set the machine to the following posture.



- Fully retract the boom and jib.
- Set the boom and jib angles to 0 degree.
- Adjust the boom slewing angle so that it comes to the center of the machine. Find the center position by the eye mark below the post.

6. Attach the jib mover casters (1).



☞ There are left caster and right caster for the link. Check the bracket shapes when you attach them.

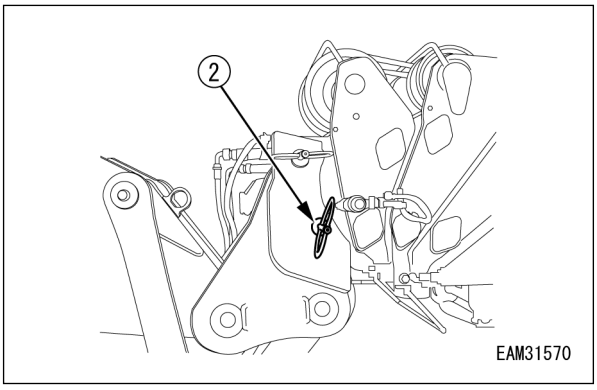
⚠ CAUTION

During the No.2 and No.3 outriggers' operation, pay careful attention so that they don't hit the cable bear on the right side of the boom and length sensor on the left side of the boom.

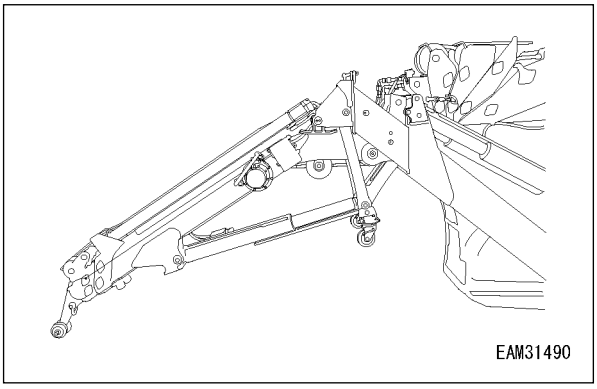
7. Lift all the outriggers and confirm that the crawlers are grounded.
8. Remove the linchpin of the lower position pin (2) of the boom head, and them remove the position pin (2).

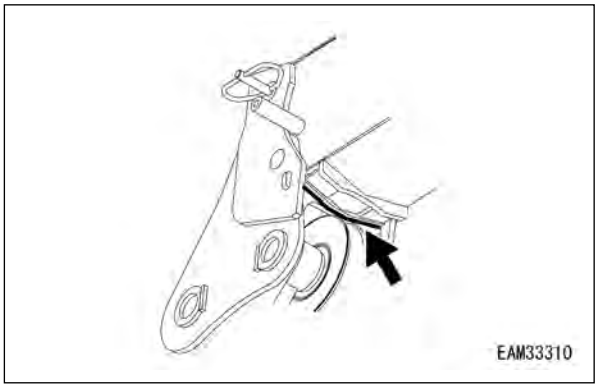
⚠ WARNING

Never insert your finger in the pin hole.



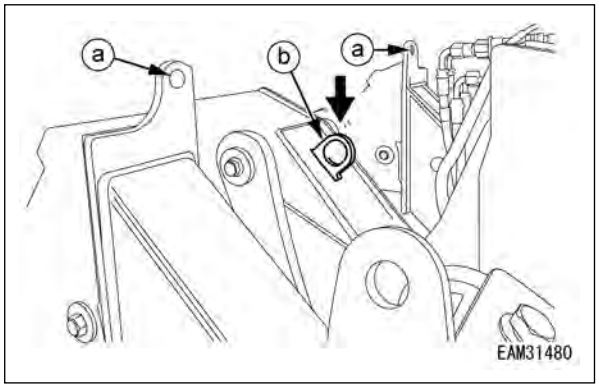
9. Lower the jib and ground the caster at the tip.
   Lower the jib little by little to the point at which the boom head and the contact surface of the No. 5 boom tip lower section are about 1 mm to 3 mm apart.





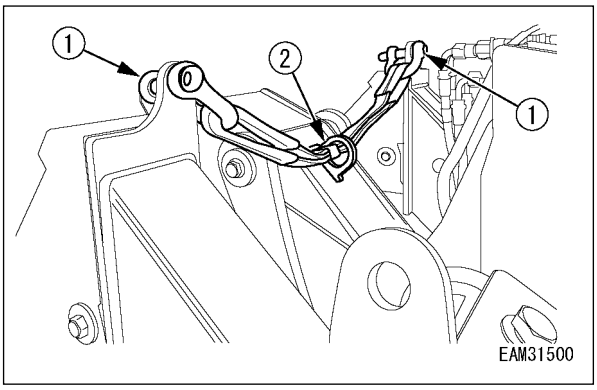
☞ If the boom is not at the center of the machine, parts of the outriggers, jib, and the boom contact each other to interfere the dismounting work.
Ground the boom aligning it with the center of the machine.

10. Rotate the outrigger No.2 and No.3 to the position where they are parallel with the jib.
11. Lift and extend outrigger No.2 and No.3 so that they reach the hanging point at the back edge of the jib.



☞ At this time, align the hanging points (a) of the outriggers and the handing points (b) at the back edge of the jib.
If the hanging points deviate largely from the above positioning, the load sways when the jib is raised and the machine may tip-over.

12. Attach a shackle (1) at the hanging points of the outriggers, run the included nylon sling (2) through the hanging point at the back edge of the jib, and fix the sling.



⚠ WARNING

Use the nylon sling that is prepared for this purpose.

⚠ CAUTION

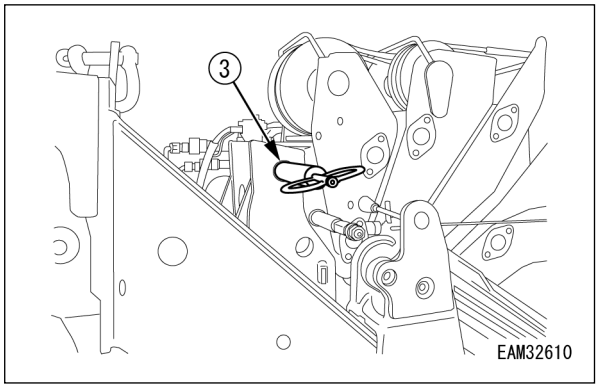
- **Do not twist the nylon sling when you attach it.**
- **To prevent the falling of the jib, be sure to run the nylon sling through the hanging point at the back end of the jib.**

13. While checking the slackness of the position pin (3) on the boom head, ground and extension the outriggers little by little to position them so that a vertical force is exerted on the sling.

⚠ CAUTION

Make this operation little by little, while confirming that there is no danger of the jib falling and that the nylon sling is hanging the jib.
During the No.2 and No.3 outriggers' operation, pay careful attention so that they don't hit the cable bear on the right side of the boom and length sensor on the left side of the boom.

14. Remove the linchpin of the position pin (3) on the boom head, and little by little remove the position pin (3).



⚠ WARNING

When you remove the pin, be careful not to have the boom, jib, and different parts of the outriggers contact each other.
Be careful not to over-extend the outrigger and damage the nylon sling.

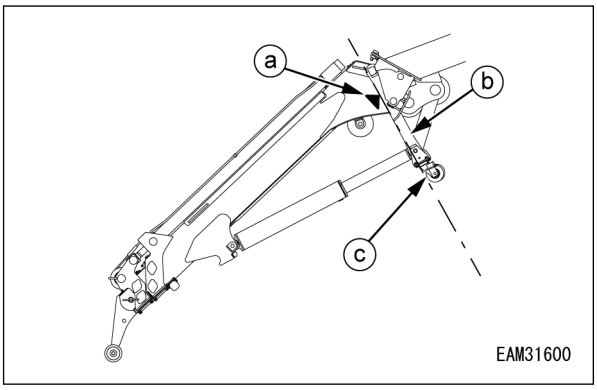
⚠ CAUTION

- **Never insert your finger in the pin hole.**
- **If you remove the position pin quickly, the jib may sway. When you remove the pin, remove it carefully so as not to be hit or caught by the machine.**

15. After removing the position pin, lower outriggers 2 and 3 a little. (about 200 mm)

☞ Lower the outriggers slowly avoiding tension on the hydraulic hoses and the harness so as not to break them.

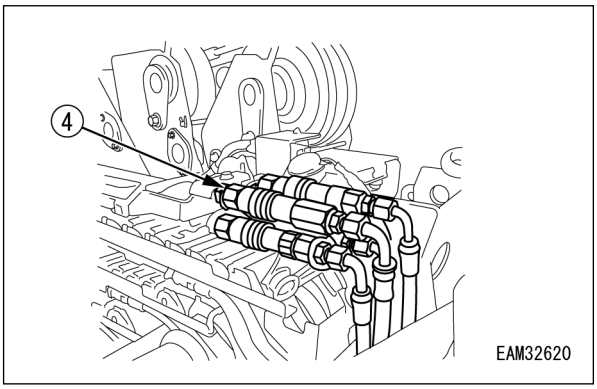
16. Derrick the jib and make adjustments so as to vertically align the eye mark (a) at the back of the jib with the link (b) and the caster (c).

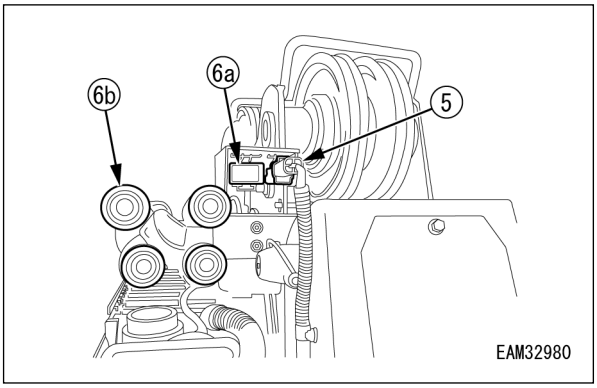


17. Remove the four hydraulic couplers (4).
18. Remove the jib harness connectors (6a) and in their place insert (8P gray) waterproof plugs.
19. Remove the (2P gray) waterproof plugs in (5) and securely insert the 4-fall hook block boom head harness until you hear a click.

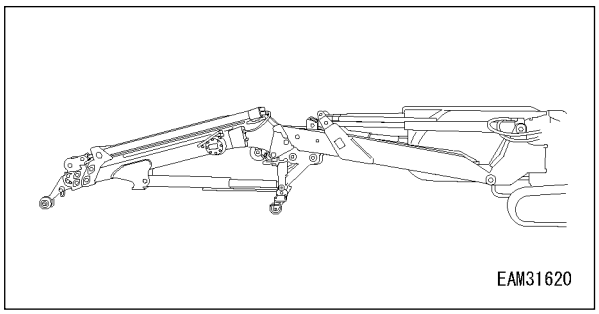
Important

To protect four hydraulic couplers (4) and the connectors (6a), put plugs on the unused connectors.

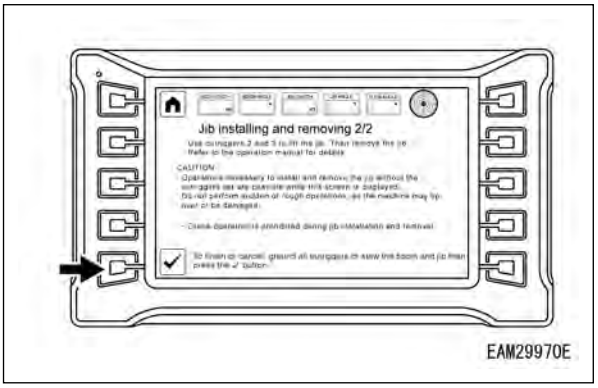




20. Lower outriggers 2 and 3 little by little to ground the caster of the jib.



21. After grounding the jib, remove the nylon sling when it slackens.
22. Fully ground all outriggers to make them stand firmly.
23. After confirming that the jib has been removed and the outriggers are grounded, select the [✔] switch on the monitor [Jib installing and removing 2/2], and return to the User Mode screen..



☞ If you select the [✔] switch even one outrigger is not grounded, when a message appears in red reading “To Finish or cancel, install all outriggers or stow the boom and jib then press the [✔] button,” and the User Mode screen does not appear.
In that case, return to step 20 to ground the outriggers again.

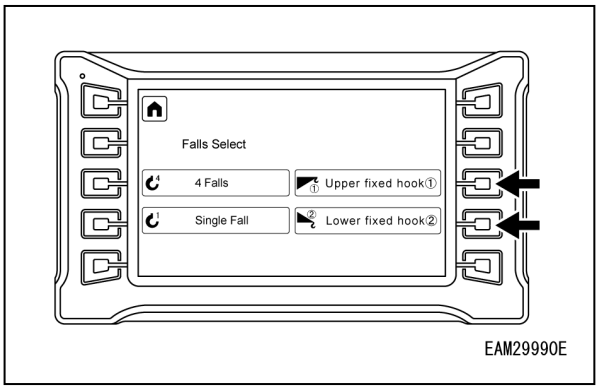
24. To use the fixed hook, detach the caster (a jib stowage part) and attach the hook at the tip.
To use the single-fall hook block, remove the fixed hook with reference to “5.9.5 Jib—Detaching the fixed hook,” and then attach the jib winch head with reference to “5.9.9 Attaching the jib winch head.”

5.9.4 Jib—Attaching a fixed hook

Important

You cannot use a fixed hook together with the winch or the single-fall hook block.

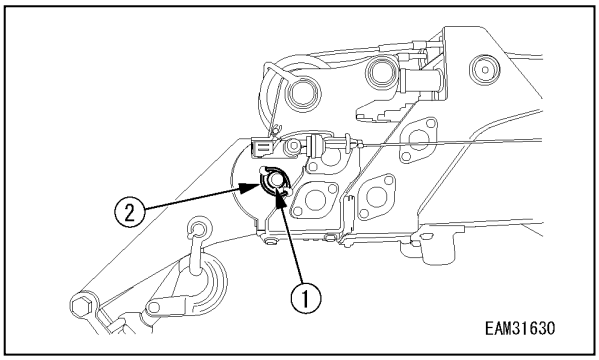
1. If a single-fall hook block or jib head is mounted, remove them and the wire with reference to “5.9.8 Jib—Detaching a single-fall hook block.”
2. In the user mode screen, select the wire number selection switch. From the screen, select the [Upper fixed hook (1)] switch if the fixed hook faces upward, or select the [Lower fixed hook (2)] switch if the fixed hook faces downward.



⚠ WARNING

- **If you select 4-falls or single-fall, conditions such as the load condition are not set appropriately for the fixed hook.**
- **Using the machine with the wrong setting may result in a serious accident.**
- **Be sure to check with your own eyes that the selected hook and the actually attached hook block are the same before starting work.**

3. Attach the fixed hook, check that the pin hole is at the correct position, and insert the position pin (1).
   After inserting the position pin, lock it firmly with a linchpin (2).



⚠ CAUTION

When you insert or remove the position pin, support the hook to prevent the fixed hook from dropping.

Important

Never insert your finger in the pin hole. Adjust the position of the hole by sight.

5.9.5 Jib—Detaching the fixed hook

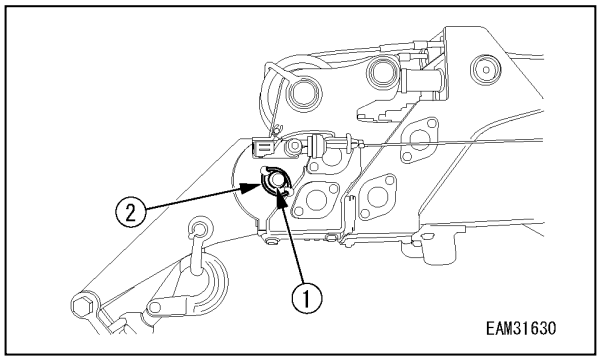
⚠ WARNING

When you insert or remove the position pin, support the hook to prevent the fixed hook from dropping.

Important

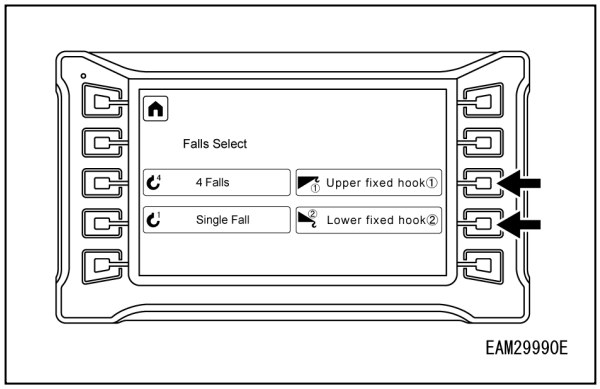
Never insert your finger in the pin hole.

1. Remove the linchpin (2), and then remove the position pin (1) while supporting the fixed hook. Pull out the fixed hook to remove it.



5.9.6 Jib—Changing the head position

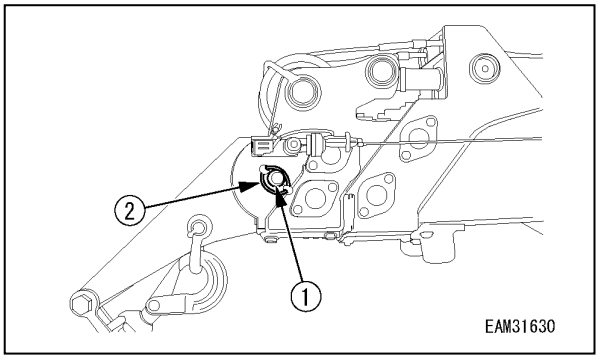
1. In the user mode screen, select the wire number selection button. From the screen, select the desired switch - the [Upper fixed hook (1)] switch if the fixed hook faces upward, or the [Lower fixed hook (2)] switch if the fixed hook faces downward.



⚠ WARNING

- **If you select 4-falls or single-fall, conditions such as the load condition are not set appropriately for the fixed hook.**
- **Using the machine with the wrong setting may result in a serious accident.**
- **Be sure to check with your own eyes that the selected hook block and the actually attached hook block are the same before starting work.**

2. Remove the linchpin (2), and then remove the position pin (1) while supporting the fixed hook.



3. Invert the fixed hook, check that the pin hole is at the correct position, and insert the position pin.
   After inserting the position pin, lock it firmly with a linchpin.

⚠ WARNING

Never insert your finger in the pin hole. Adjust the position of the hole by sight.

⚠ CAUTION

When you insert or remove the pin, support the hook to prevent the fixed hook from dropping.

5.9.7 Jib—Attaching a single-fall hook block

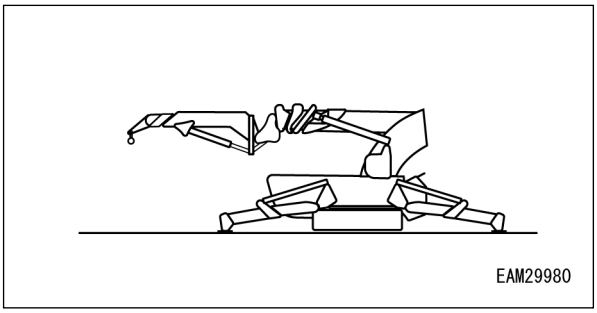
⚠ WARNING

- **Attach the rope wedge that fixes the wire rope correctly and firmly. Otherwise, the wire rope may drop off during the operation of the crane resulting in a serious accident.**
- **When you handle a wire rope, be sure to wear thick leather work gloves.**

Important

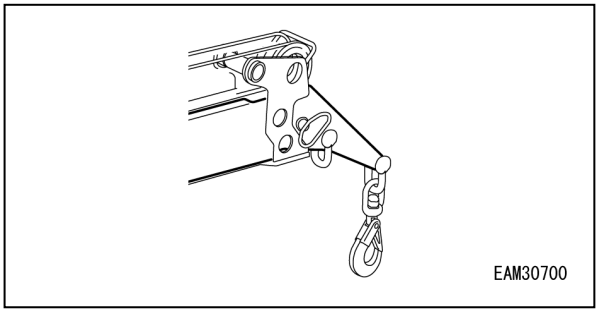
- **The steps of this section are to be taken after the winch and related parts are installed and the wire rope is wound around the winch drum.**
- **The single-fall hook block and a fixed hook cannot be used together.**

1. After setting the crane in the work posture with reference to “5.8.4 Work posture of the crane,” set the boom and jib in the horizontal posture.



☞ Lower the jib as necessary to make the working easier.

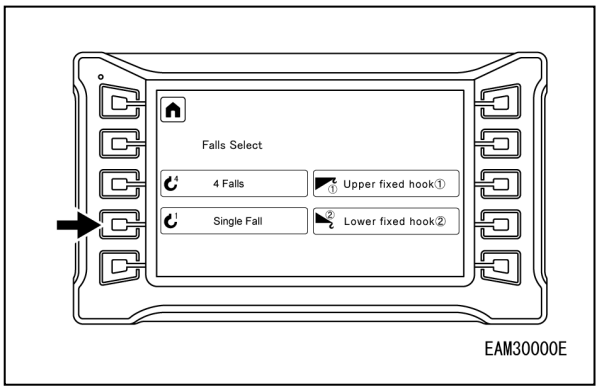
2. If a fixed hook is attached, remove it with reference to “5.9.5 Jib—Detaching the fixed hook.”



3. In the user mode screen, select the wire number selection button.
   Select the switch for single-fall following the instruction on the screen.

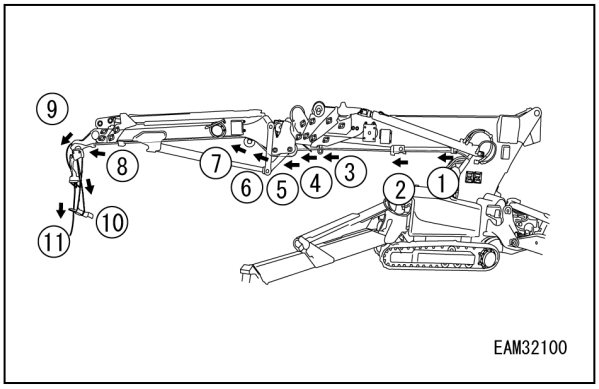
⚠ WARNING

- **If you select 4-falls or fixed hook, conditions such as the load condition are not set appropriately for the single-fall.**
- **Using the machine with the wrong setting may result in a serious accident.**
- **Be sure to check with your own eyes that the selected hook block and the actually attached hook block are the same before starting work.**

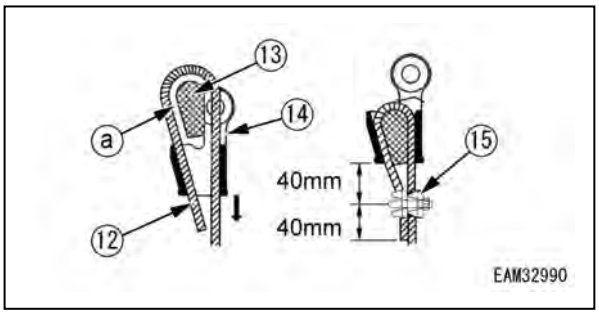


4. If a jib winch head is not yet attached, attach it with reference to "5.9.9 Attaching the jib winch head."

5. While pulling the wire rope without irregular winding, push the S2 lever of the transmitter forward to run the wire rope in the following order while extending the wire rope little by little:
   - Top of the boom's idler (1)
   - Top of the boom's wire guard (2)
   - Bottom of the boom's snap sheave (3)
   - Top of the boom's wire guard (4)
   - Top of the boom head's sheave (back) (5)
   - Bottom of the boom head's sheave (front) (6)
   - Top of the jib's snap sheave (7)
   - Bottom of the jib winch head's snap sheave (8)
   - Top of the jib winch head's top sheave (9)
   - Hole of the stowing cam (10)
   - Hole of the protection weight (11)



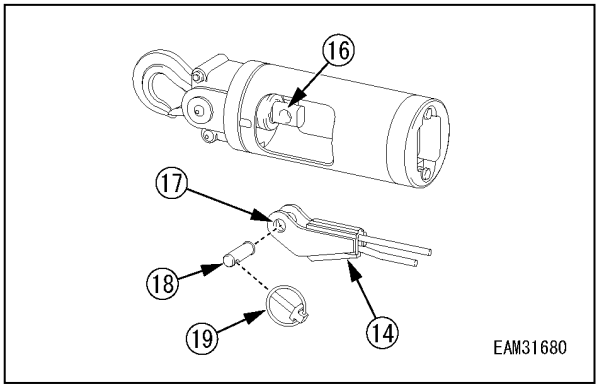
6. Fix the end of the wire rope (12) to the wedge socket (14) as follows:

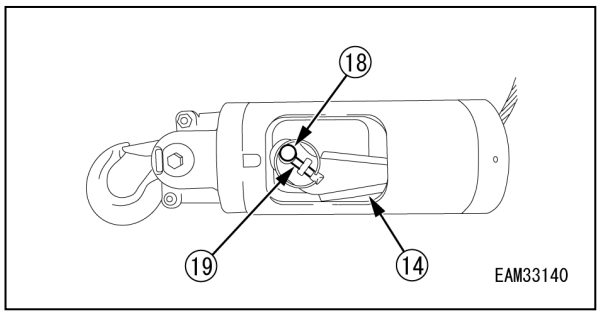


   1. Run the wire rope (12) through the wedge socket (14) as shown in the figure above.
   2. Set the rope wedge (13) at position (a), and pull the wire rope (12) strongly in the direction indicated by the arrow.
   3. Tighten the double wire clip (15) to fix the wire.

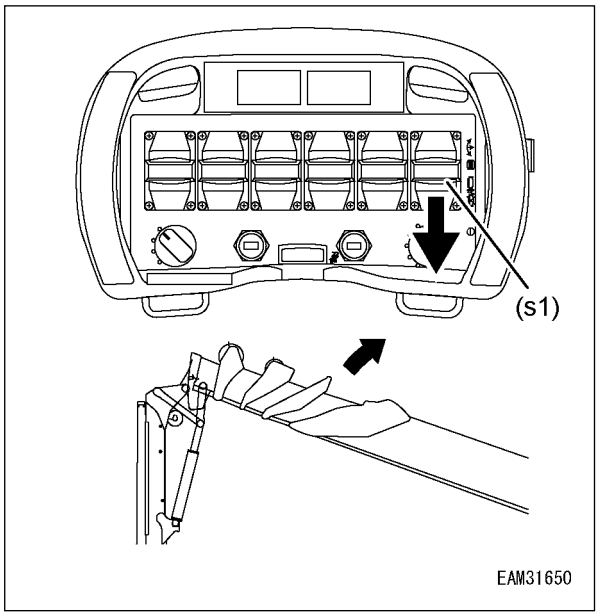
7. Grab the wire socket, and insert it so that the pin hole inside the hook block and the hole of the wire socket are aligned.

8. Grab the wedge socket (14), and insert it so that the pin hole (16) inside the hook block and the hole of the wedge (17) socket are aligned.
   Insert the wedge socket pin (18) in the aligned holes, align the fixing hole of the wedge socket pin and the fixing hole of the wire socket, and fix them by a linchpin (19).





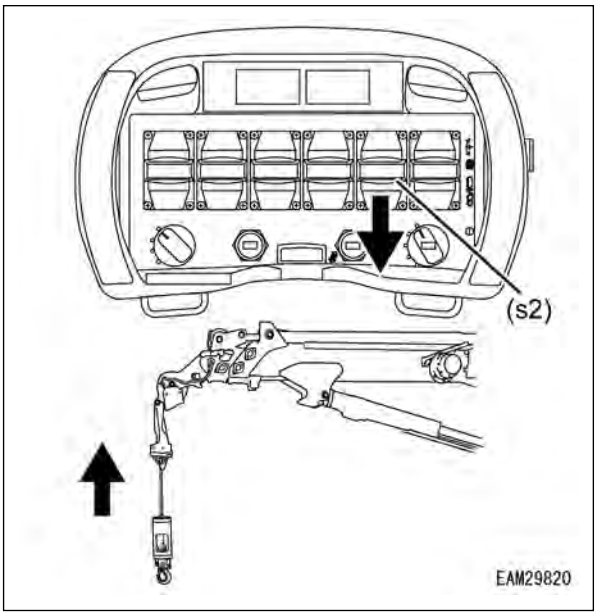
9. Pull the S1 lever (s1) of the transmitter toward you to raise the boom so that the hook block is raised until it is lifted from the ground.



Important

- **Do not operate the winch until the hook block is lifted.**
- **Operating the winch without tension on the wire rope may result in irregular winding.**

10. After the hook block is lifted from the ground, pull the S2 lever (s2) of the transmitter toward you to wind the wire rope. Wind the wire rope until the hook block touches the over-winding detection weight to confirm that the overwinding detector works normally.



5.9.8 Jib—Detaching a single-fall hook block

⚠ WARNING

- **When you handle a wire rope, be sure to wear thick leather work gloves.**

☞ The steps of this section are to be taken after the winch and related parts are installed.

1. Remove the wire rope connected to the single-fall hook block in the following steps:

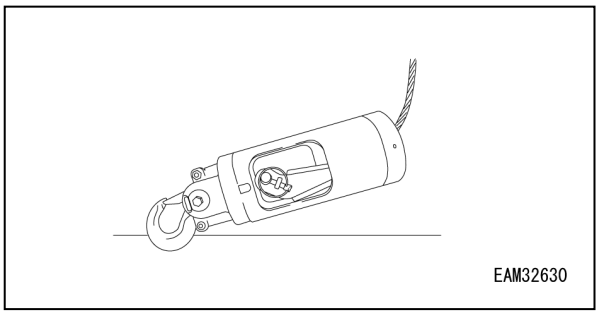
Important

- **Be careful of the irregular winding the wire rope.**
- **After the hook block touches the ground, do not lower the hook block on to the ground by unwinding the wire rope because it causes irregular winding of the wire rope on the winch drum. Such an operation may damage the jib or wire.**

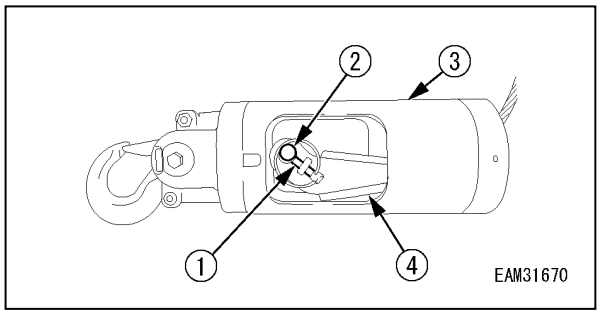
1. Retract the boom and jib fully, and set the boom angle to 10 degrees.

2. Unwind the winch to lower the single-fall hook block to the point just above the ground.

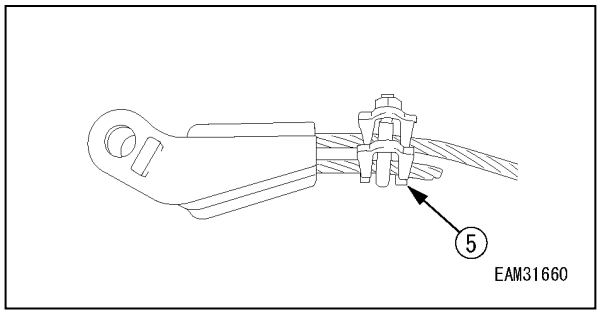
3. Lower the single-fall hook block on to the ground by laying down the boom.



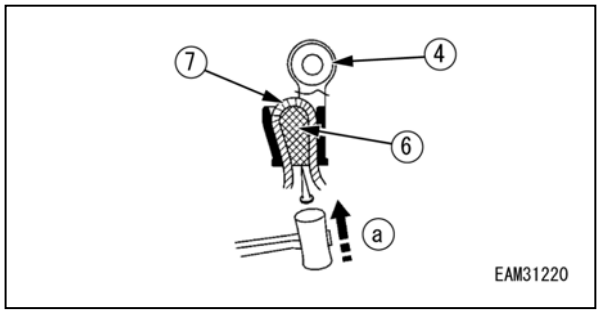
4. Remove the linchpin (1) and then the wedge socket pin (2), and remove the wedge socket (4) from the single-fall hook block (3).



5. Remove the double wire clip (5).



6. Put a round stick of 4 mm to 6 mm on the rope wedge (6) and hit it by a hammer lightly in the direction indicated by the arrow (a) to remove the rope wedge (6) from the wedge socket (4), and then remove the wire rope (7).

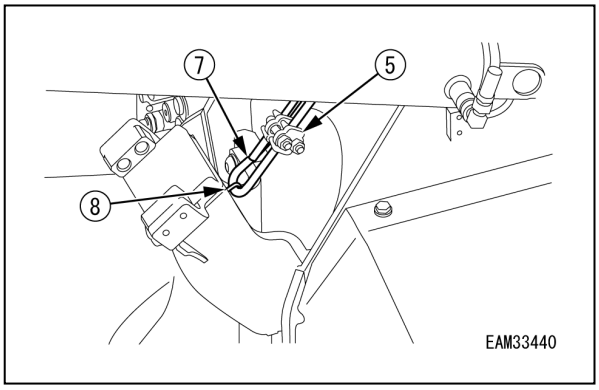


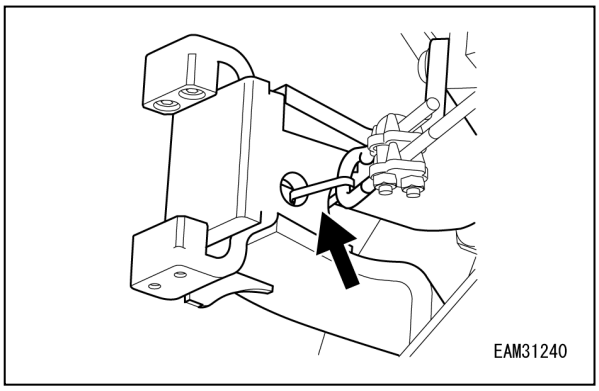
2. Wind up all the removed wire rope (7) from the wire guide and sheave up to the point just before the drum.
3. Put your hand on the pulled-out wire, and wind it while giving tension to prevent irregular winding.

⚠ WARNING

- **Guide the wire by putting your hand on it to prevent irregular winding.**
- **At this time, be careful not to have your hand caught by the wire or sheave.**

4. Store the wire rope (7).
Fix a double wire clip (5) at the end of the wire to make a ring shape, and run a cable tie through the hole in the bracket (8) in front of the post shown in the figure below to fix the end of the wire on the machine.



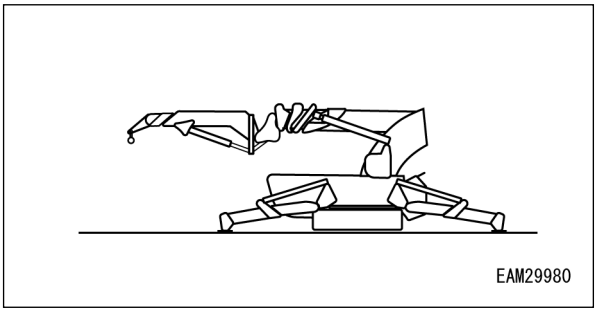


5.9.9 Attaching the jib winch head

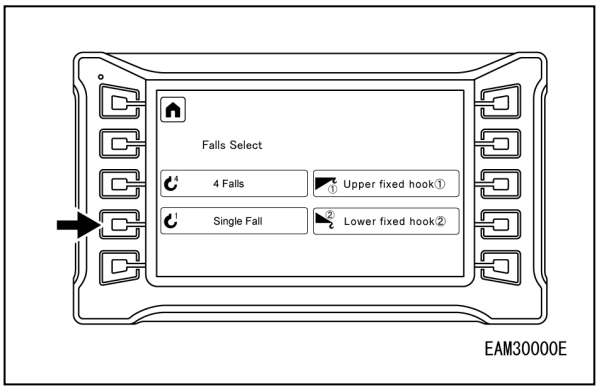
Important

- **The single-fall hook block and a fixed hook cannot be used together.**
- **The jib cannot be installed/removed when the jib winch head is attached. When you installed/removed the jib, replace the jib winch head with the fixed hook.**

1. Set the machine in the following condition.
   - Move the machine to a level place.
   - Fully retract the jib and boom.
   - Set the jib and boom angle to 0 degree (horizontal).



2. If a fixed hook is attached, remove it with reference to “5.9.5 Jib—Detaching the fixed hook.”
3. In the user mode screen, select the wire number selection button.
   Select the switch for single-fall following the instruction on the screen.



⚠ WARNING

- **If you select 4-falls or fixed hook, conditions such as the load condition are not set appropriately for the single-fall.**
- **Using the machine with the wrong setting may result in a serious accident.**
- **Be sure to check with your own eyes that the selected hook and the actually attached hook are the same before starting work.**

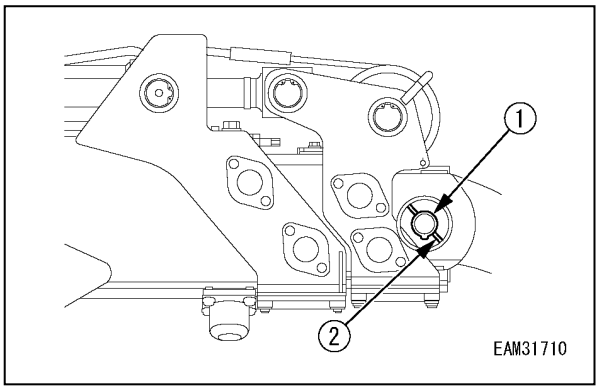
4. Attach the jib winch head, check that the pin hole is at the correct position, and insert the position pin (1).
   After inserting the pin, lock it firmly with a linchpin (2).

⚠ WARNING

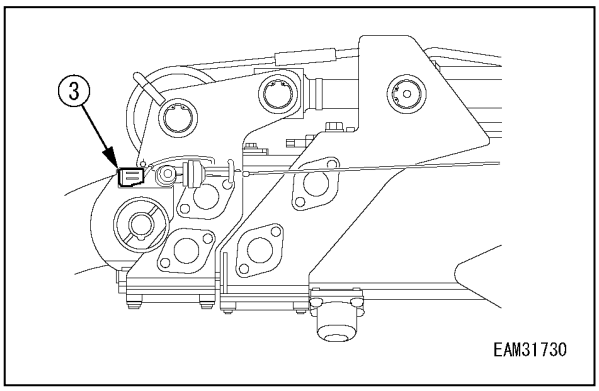
Never insert your finger in the pin hole. Adjust the position of the hole by sight.

⚠ CAUTION

When you insert or remove the pin, support the head to prevent the jib winch head from dropping.



5. Remove the (2P gray) waterproof plugs (3), and in their place securely insert the jib winch head harness connectors until you hear a click.

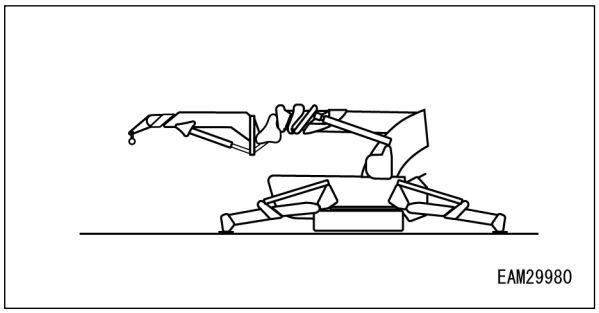


Important

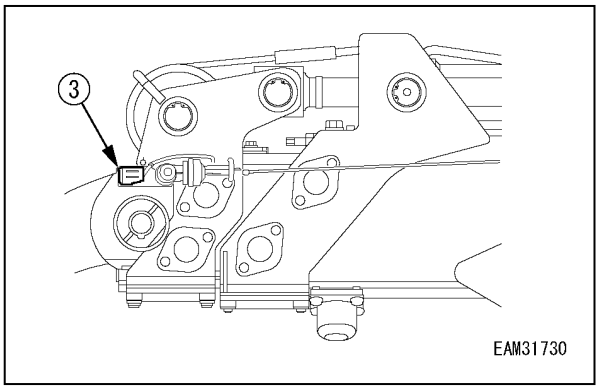
- **The connector of the jib winch head is connected to the dummy connector on the side of the cover of the overwinding detector.**
- **Push in the connector until you hear the sound of connector insertion, and confirm that the connector is engaged firmly.**
- **To protect connectors, put plugs on unused connectors.**

5.9.10 Detaching the jib winch head

1. Set the machine in the following condition.
   - Move the machine to a level place.
   - Fully retract the jib and boom.
   - Set the jib and boom angle to 0 degree (horizontal).



2. If a single-fall hook block is mounted, remove them and the wire with reference to “5.9.8 Jib—Detaching a single-fall hook block.”
3. Remove the connectors (3).



Important

- **To protect connectors, put (2P gray) plugs on unused connectors.**
- **Connect the connector of the jib winch head to the dummy connector on the side of the cover of the overwinding detector.**

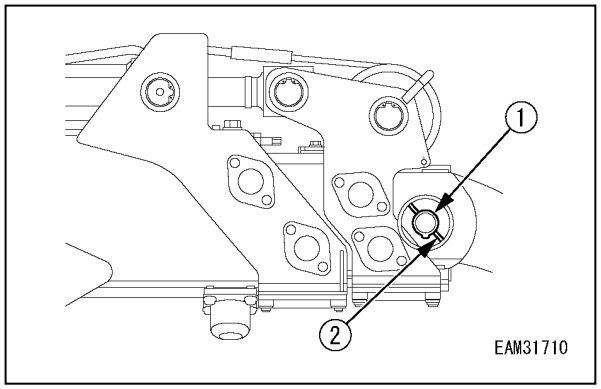
4. Remove the linchpin (2), and pull out the position pin (1), and remove jib winch head.

⚠ WARNING

Never insert your finger in the pin hole. Adjust the position of the hole by sight.

⚠ CAUTION

When you insert or remove the pin, support the head to prevent the jib winch head from dropping.



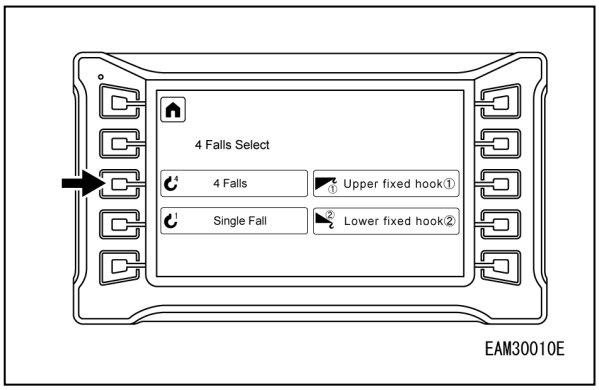
5.9.11 Boom—Attaching a 4-fall hook block

⚠ WARNING

- **Attach the rope wedge that fixes the wire rope correctly and firmly. Otherwise, the wire rope may drop off during the operation of the crane resulting in a serious accident.**
- **When you handle a wire rope, be sure to wear thick leather work gloves.**

☞ The steps of this section are to be taken after the winch and related parts are installed and the wire rope is wound around the winch drum.

1. In the user mode screen, select the wire number selection button.
   Select the switch for 4-falls following the instruction on the screen.

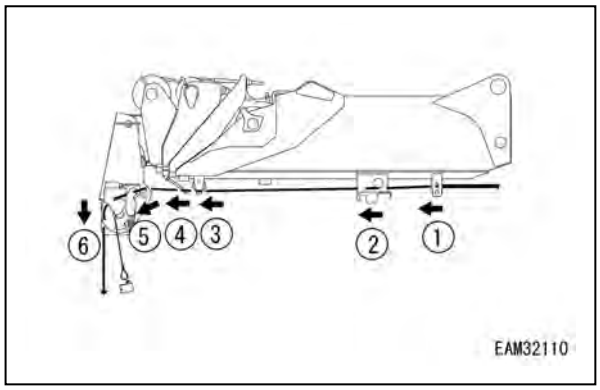


⚠ WARNING

- **If you select single-fall or fixed hook, conditions such as the load condition are not set appropriately for the 4-falls.**
- **Using the machine with the wrong setting may result in a serious accident.**
- **Be sure to check with your own eyes that the selected hook and the actually attached hook are the same before starting work.**

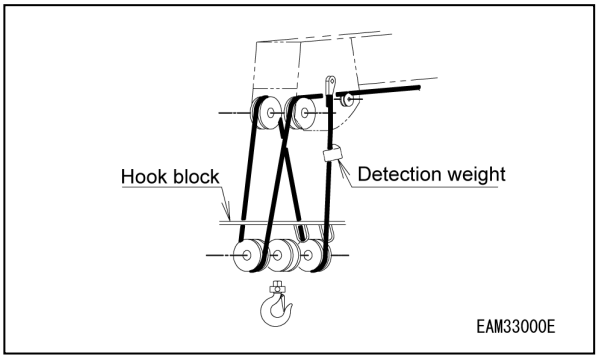
2. If the boom head is not attached, attach it with reference to “5.9.13 Attaching the boom head.”
3. Remove the plug of the connector at the tip of the boom, and securely insert the connector of the overwinding detector of the boom head until you hear a click.

4. While pulling the wire rope without irregular winding, lay the S2 lever of the transmitter forward to run the wire rope in the following order while extending the wire rope little by little:

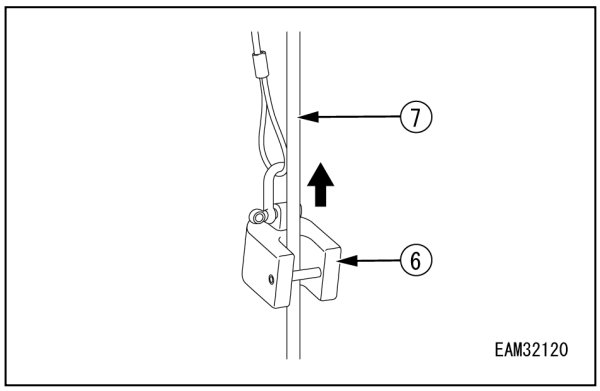


- Top of the boom's idler (1)
- Top of the boom's wire guard (2)
- Bottom of the boom's snap sheave (3)
- Top of the boom's wire guard (4)
- Top of the boom head's snap sheave (5)
- Top of the boom head's sheave (6)

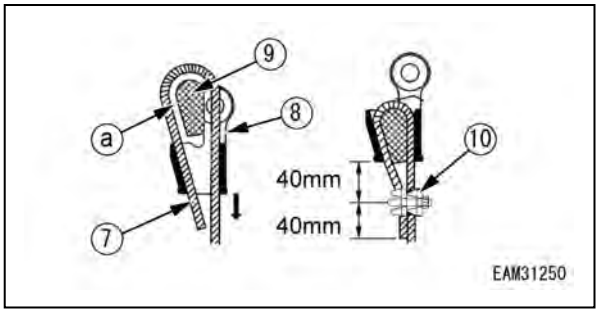
5. Attach the wire rope to the hook block in the following steps:
   1. Run the wire rope through the sheaves at the tip of the boom and the sheaves of the hook block as shown in the figure below.



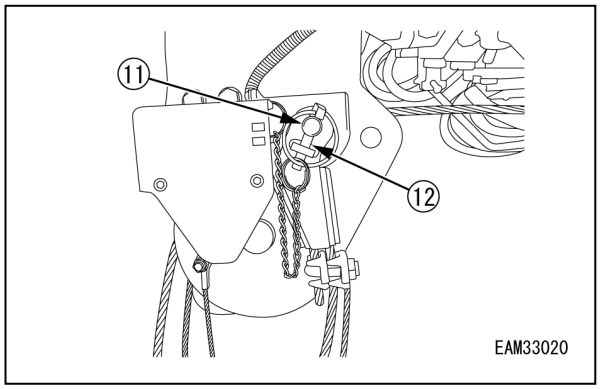
   2. Insert the end section of the wire rope (7) through the over-winding detection weight (6) of the overwinding detector.



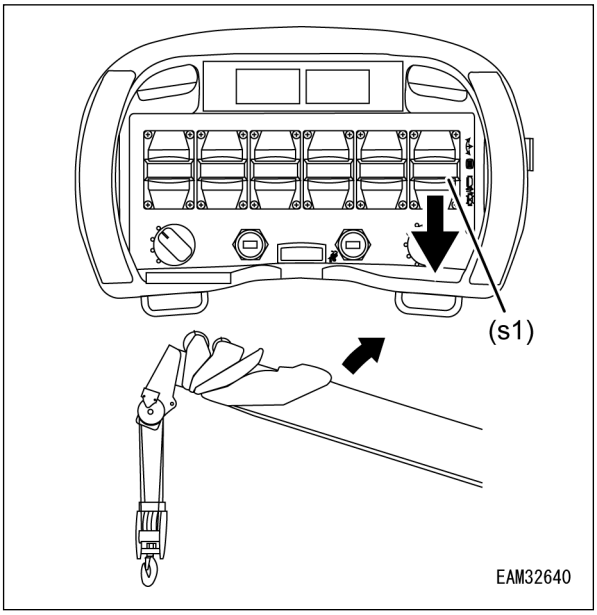
   3. Fix the end of the wire rope to the wedge socket as follows:
   (1) Run the wire rope (7) through the wedge socket (8) as shown in the figure below.
   (2) Set the rope wedge (9) at position (a), and pull the wire rope (7) strongly in the direction indicated by the arrow.
   (3) Attach the double wire clip (10) to the wire rope (7). See the figure below for the position at which to attach the rope clip.



   4. Attach the wedge socket to the boom by the wedge socket pin (11), and fix the wedge socket by a linchpin (12).
   Pass the linchpin (11) through the boom element's hole, too.



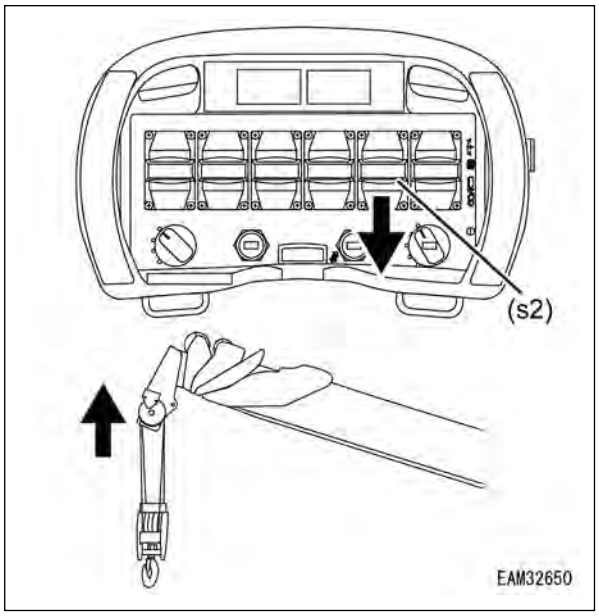
6. Pull the S1 lever (s1) of the transmitter toward you to raise the hook block until it is lifted from the ground.



Important

- **Do not operate the winch until the hook block is lifted.**
- **Operating the winch without tension on the wire rope may result in irregular winding.**

7. After the hook block is lifted from the ground, lay the S2 lever (s2) of the transmitter backward to wind the wire rope. Wind the wire rope until the hook block touches the over-winding detection weight to confirm that the overwinding detector works normally.



5.9.12 Boom—Detaching a 4-fall hook block

⚠ WARNING

- **When you handle a wire rope, be sure to wear thick leather work gloves.**

☞ The steps of this section are to be taken after the winch and related parts are installed.

1. Remove the wire rope connected to the 4-fall hook block in the following steps:

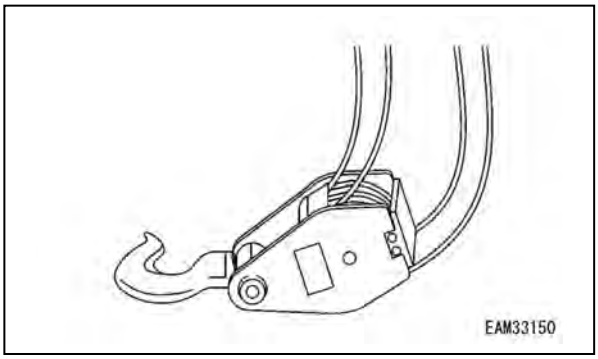
Important

- **Be careful of the irregular winding the wire rope.**
- **After the hook block touches the ground, do not lower the hook block on to the ground by unwinding the wire rope because it causes irregular winding of the wire rope on the winch drum. Such an operation may damage the jib or wire.**

1. Retract the boom fully, and set its angle to 20 degrees.

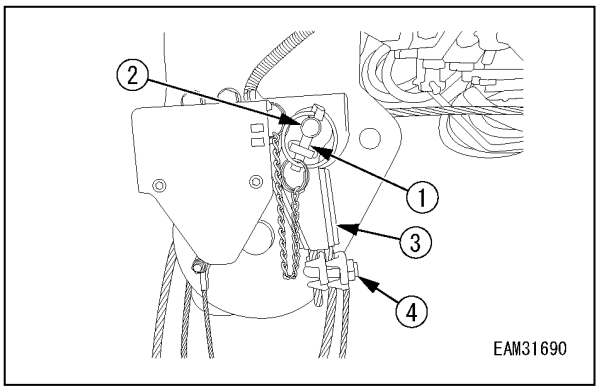
2. Unwind the winch to lower the 4-fall hook block to the point just above the ground.

3. Lower the 4-fall hook block on to the ground by lowering the boom.

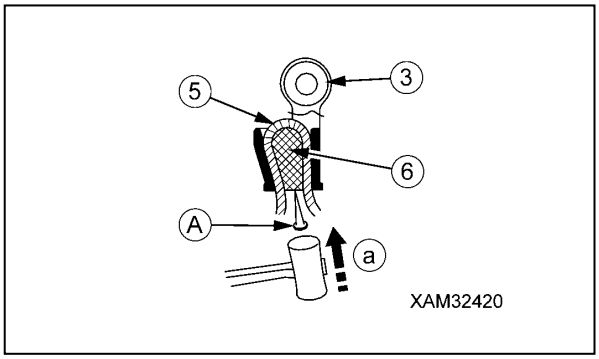


4. Remove the linchpin (1) and then the wedge socket pin (2), and remove the wedge socket (3) from the boom head.

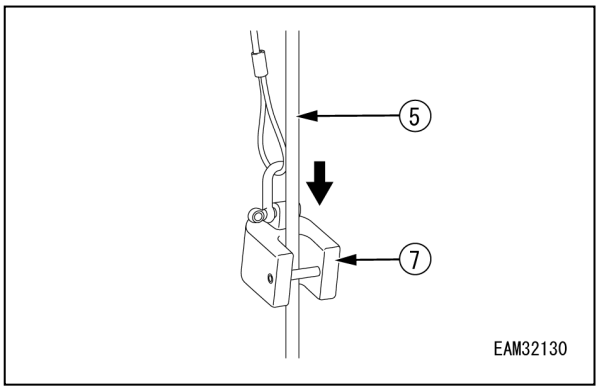
5. Remove the double wire clip (4).



6. Put a round stick of 4 mm to 6 mm on the rope wedge (6) and hit it by a hammer lightly in the direction indicated by the arrow (a) to remove the rope wedge from the wedge socket (3), and then remove the wire rope (5).



7. Remove the wire rope (5) from the over-winding detection weight (7).



8. Pull out the wire rope from the hook block.

9. Pull out the wire rope from the two sheaves at the tip of the boom.

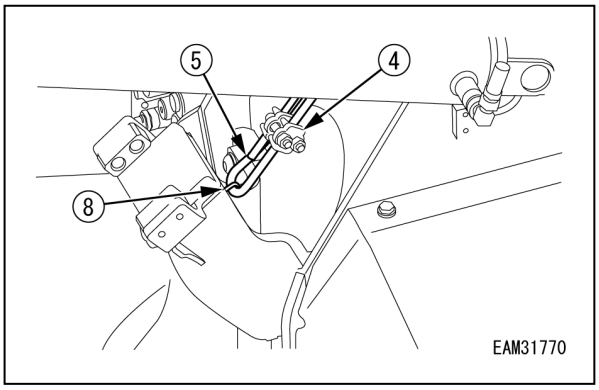
10. Wind up all the removed wire rope up to the point just before the drum.

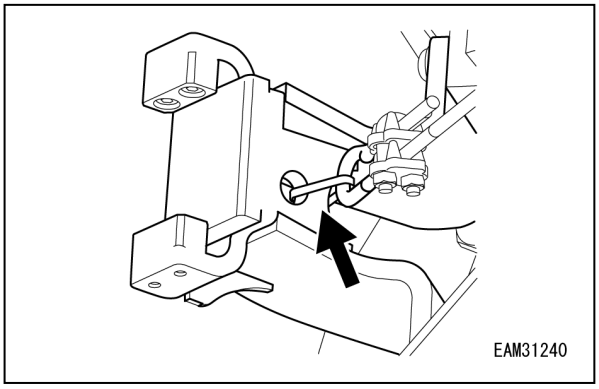
2. Put your hand on the pulled-out wire, and wind it while giving tension to prevent irregular winding.

⚠ WARNING

- **Guide the wire by putting your hand on it to prevent irregular winding.**
- **At this time, be careful not to have your hand caught by the wire or sheave.**

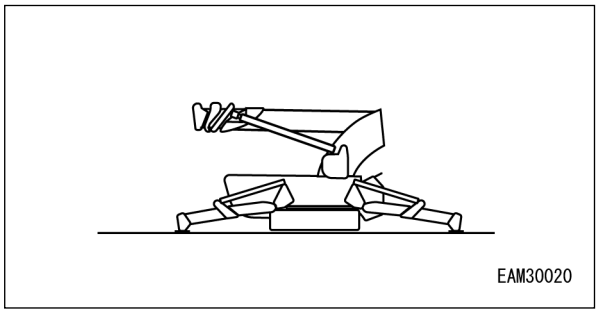
3. Store the wire rope (5).
   Fix a double wire clip (4) at the end of the wire to make a ring shape, and run a cable tie through the hole in the bracket (8) in front of the post shown in the figure below to fix the end of the wire on the machine.



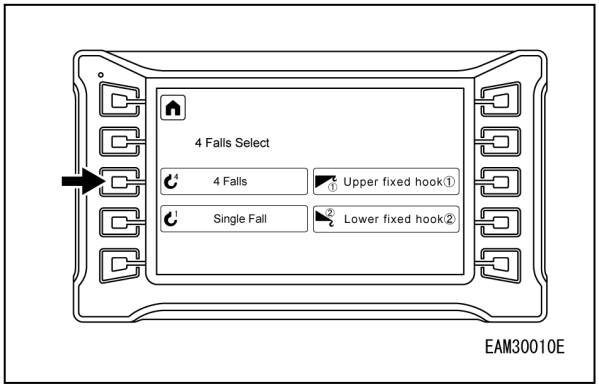


5.9.13 Attaching the boom head

1. Set the machine in the following condition.
   - Move the machine to a level place.
   - Fully retract the boom.
   - Set the boom angle to 0 degree (level).



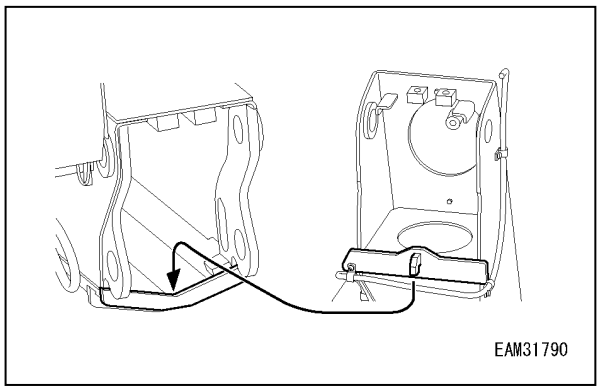
2. If the jib is mounted, remove the jib with reference to “5.9.3 Dismounting the jib.”
3. In the user mode screen, select the wire number selection button.
   Select the switch for 4-falls following the instruction on the screen.



⚠ WARNING

- **If you select single-fall or fixed hook, conditions such as the load condition are not set appropriately for the 4-falls.**
- **Using the machine with the wrong setting may result in a serious accident.**
- **Be sure to check with your own eyes that the selected hook and the actually attached hook are the same before starting work.**

4. Hook the catch of the end section of the boom head on the step at the rim of the boom.



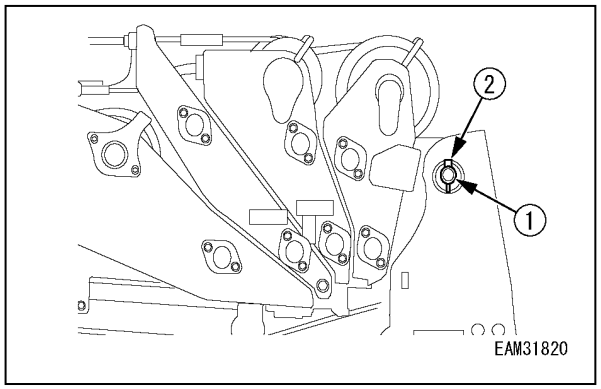
5. Mount the boom head, check that the pin hole is at the correct position, and insert the position pin (1).
   After inserting the position pin (1), lock it firmly with a linchpin (2).

⚠ WARNING

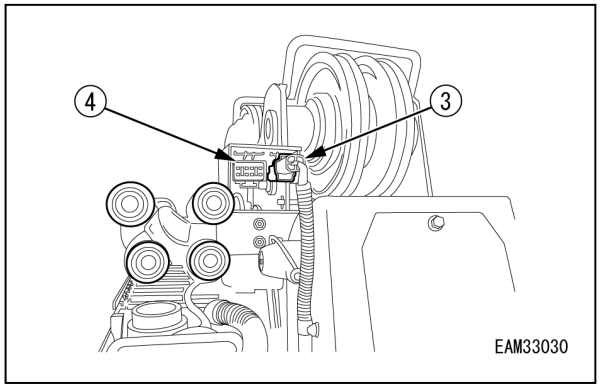
Never insert your finger in the pin hole. Adjust the position of the hole by sight.

⚠ CAUTION

When you insert or remove the position pin, support the boom head to prevent the boom head from dropping.



6. Swap connectors (3).
   Insert the (8P gray) plugs into (4).
   Securely insert the boom head harness into (3) until you hear a click.

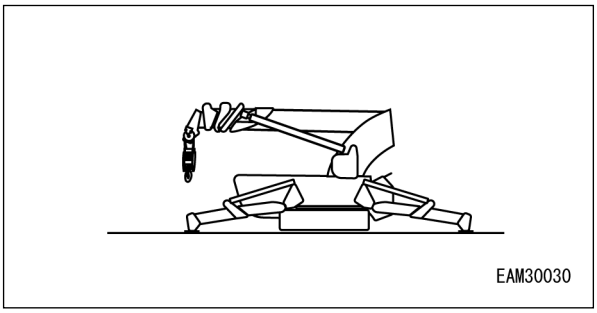


Important

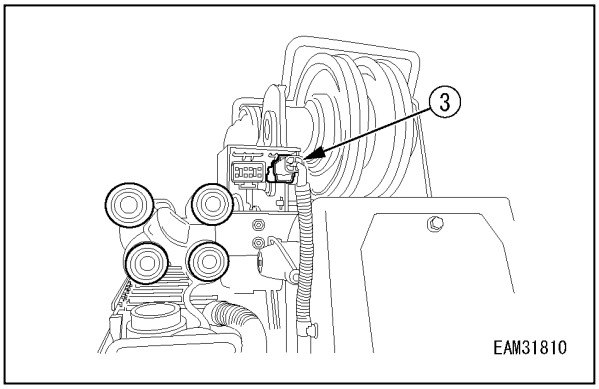
- **The boom does not work unless the connector is connected, so be sure to connect it.**
- **Push in the connector until you hear the sound of connector insertion, and confirm that the connector is engaged firmly.**
- **To protect connectors, put (8 gray) plugs on unused connectors.**

5.9.14 Detaching the boom head

1. Set the machine to the following posture.
- Move the machine to a level place.
- Fully retract the boom.
- Set the boom angle to 0 degree (level).



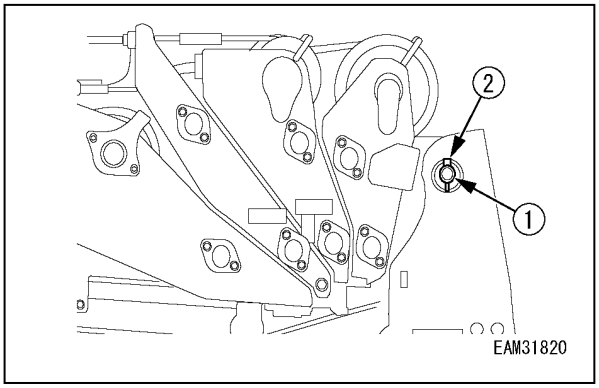
2. If a 4-fall hook block is mounted, remove them and the wire according to “5.9.11 Boom—Attaching a 4-fall hook block."
3. Remove the connector (3).



Important

To protect connectors, put (2P gray) plugs on unused connectors.

4. Remove the linchpin (2), and then remove the position pin (1).



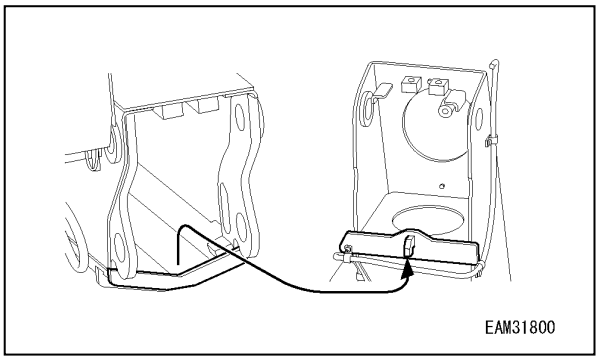
⚠ WARNING

Never insert your finger in the pin hole. Adjust the position of the hole by sight.

⚠ CAUTION

- **When you remove the position pin, the boom head may suddenly tilt by its weight.**
- **When you insert or remove the position pin, support the boom head to prevent the boom head from dropping.**

5. Lift the boom head a little and disengage the catch, and then remove the boom head from the main boom.



5.10 BATTERY CHARGING (BATTERY SPECIFICATION)

5.10.1 Precautions when you charge the battery

⚠ DANGER

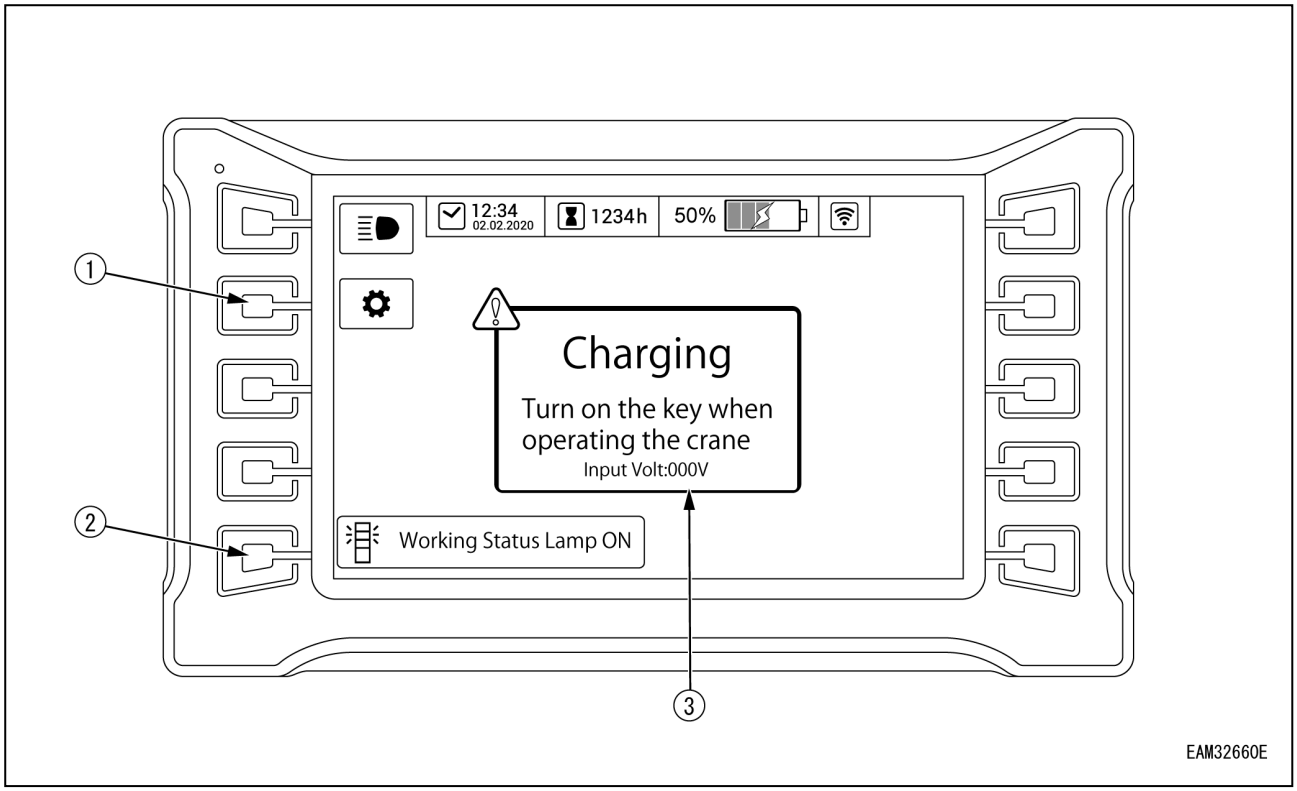
- **Do not recharge the battery with any device other than its provided charger. Incorrect charging nay result in electrolyte fluid leak, abnormal heating, smoking, or the battery bursting or catching fire.**
- **Be sure to ground the power cable. Otherwise, electrification during recharging may result in an electric shock.**
- **Do not recharge the battery in a wet place with rain or splash of water.**
- **Check the recharging port, power cord, or plug to confirm that water and dust is not adhering.**
- **Confirm that the power supply device is equipped with an electric leakage breaker.**

・Charge the lithium-ion battery when remaining charge becomes low.
・Charge the battery sufficiently before a long operation.
・If the lithium-ion battery discharges, take action as described in “6.14.3 Battery Handling [engine specification / engine and electric specification]”.
・Recharging may not start immediately in cold weather. In such a case, wait for a while until recharging starts.

5.10.2 Charging the battery

[1] Monitor display during charging

The figure below shows the screen displayed on the monitor when the battery is charged with the starter switch being OFF.



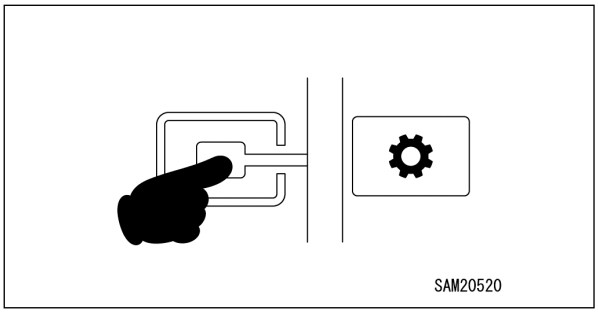
(1) User mode switch
(2) Working status lamp ON/OFF switch
(3) Input voltage indication

[1] User mode switch (1)

Use this switch to make different user settings.

When you press this switch, the user mode takes place.

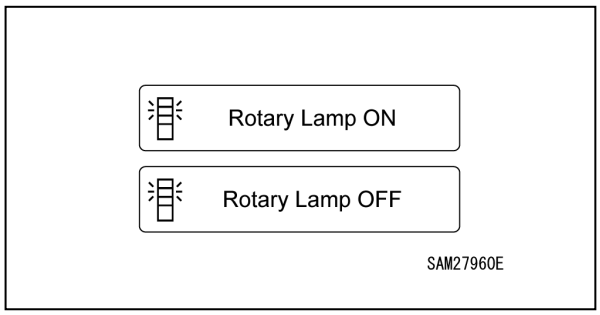
For details on the user mode, see “4.2.3 User mode screen.”



[2] Working status lamp ON/OFF switch (2)

You can turn on and off the working status lamp that flashes during the charging of the lithium-ion battery.

- ON: The working status lamp flashes.
- OFF: The working status lamp is turned off.

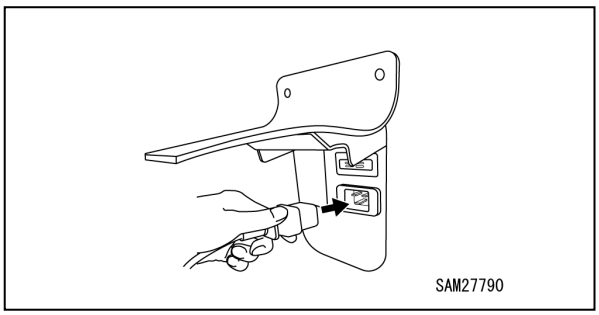


☞ During charging, you can find how much the battery is charged by the working status lamp. The following values are for the case when the starter switch is OFF.
- Flashing green: 96% to 100%
- Flashing yellow: 80% to 95%
- Flashing red: 0% to 79%

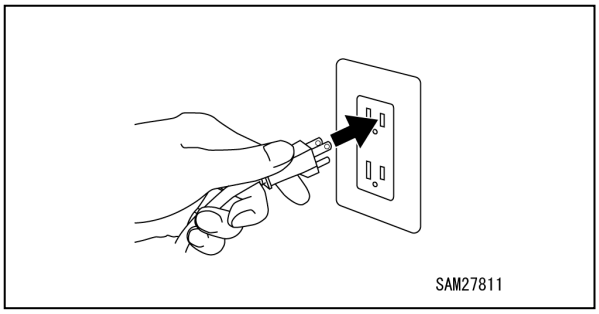
5.10.3 Charging procedure

Follow the steps below after reading the precautions described in “6.14.5.2 Cautions when charging the lithium-ion battery.”

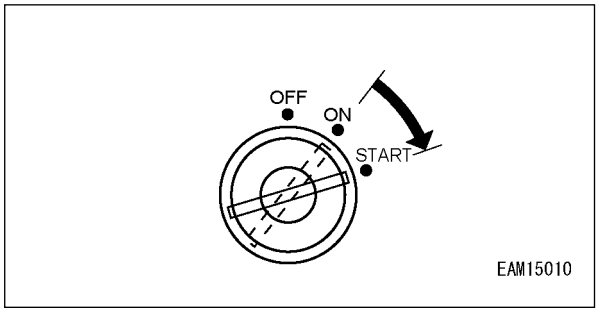
1. Prepare the power cable.
2. Connect the power cable to the charging port.



3. Connect the power cable to the outlet of the power supply.



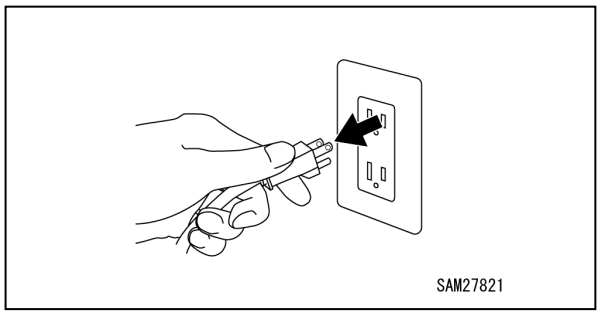
4. Turn the starter switch to START.
   Recharging starts.
   Check the monitor to confirm that charging has started, and then turn the starter switch OFF.



☞ If the starter switch is OFF, power is automatically turned off when charging finishes.

☞ If you want to operate the machine during charging, keep the starter switch ON. If the starter switch is ON, power is not turned off when charging finishes.
Charging starts again when the remaining charge in the lithium-ion battery drops below 50% only in the case when recharge was continued after the remaining charge in the lithium-ion battery reached to 100% once.

5. Pull out the power cable when charging finishes.



☞ When you pull out the power cable, grab the plug. Do not grab the cable to pull it out.

6. Remove the power cable from the charging port.
   After removing the power cable, close the lid of the charging port.

5.11 TRANSPORTATION

5.11.1 Precautions when you transport the machine

⚠ WARNING

Determine the route for transporting the machine in consideration of the road widths and the height and mass (weight) of the machine.

- Observe the relevant laws and regulations when you transport the machine.
  Make a preliminary survey on the transportation route about road widths, bridges, heights of overhead wiring, weight restrictions, and traffic regulations, and study them carefully to confirm that there is no problem in the transportation of the machine by a trailer or other ways.
- Depending on the conditions, you may have to obtain permission from relevant government agencies or may have to take some measures such as dismantling the machine to transport it.
  Check with the carrier about the conditions for the transportation.

Precautions when you transport the machine

During the transportation of the machine, there may be an accident causing a serious injury. Strictly observe the following when you transport the machine:

- Check the weight, height, and total length of the machine well because they vary depending on the mounted crane.
- If there is a bridge or structure in the transportation route, confirm that it sustains the weight of the machine and the trailer before deciding on the route.
- If you intend to use a public road to transport the machine, obtain transportation permission from the relevant government agency.
- Depending on the relevant laws and regulations (e.g., enforcement ordinance of Road Traffic Act), the machine may need to be dismantled before transportation. For transportation, contact us or our sales and service agent.

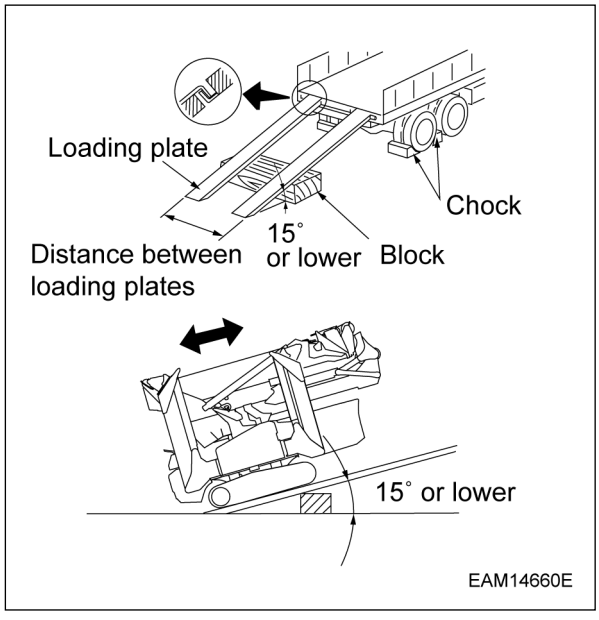
5.11.2 Loading/Unloading

Observe the relevant laws and regulations when you transport the machine.

Pay special attention when you load/unload the machine because a mistake may cause the tipping-over and dropping of the machine. Strictly observe the following when you load/unload the machine:

⚠ WARNING

- **For the dimensions and mass of the machine, see "3.1 MAIN SPECIFICATIONS."**
- **Select loading plates that satisfy the following conditions.**
  - **Long enough for achieving an angle of 15 degrees of less when set on the trailer**
  - **Wider than the crawler width**
  - **Thick and strong enough for sustaining the mass of the machine**

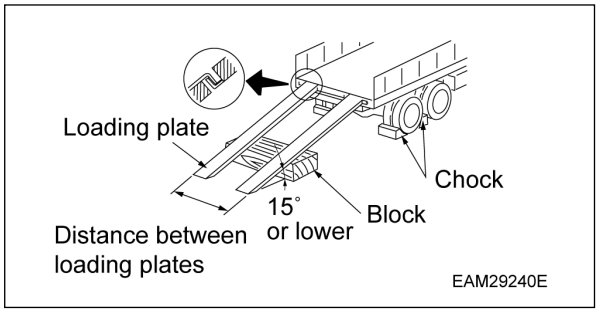


- **If the angle of the loading plates exceeds 15 degrees, the machine easily becomes unstable. So, set them with a gradient of 15 degrees or less.**
- **Set the loading plates with an interval so that each of them aligns with the center of each crawler.**

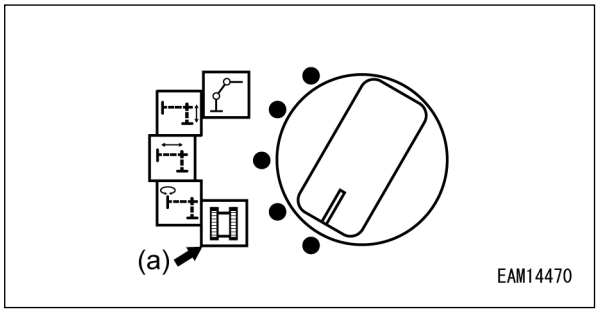
- **Select loading plates of an enough width, length, and thickness so that you can load/unload the machine safely.**
  If the loading plates sag too much, reinforce them with blocks or other support.
- **Set the loading plates parallel each other and perpendicular to the rear side of the trailer bed with an equal distance from the center of the trailer.**
- **Engage the hooks of the loading plates on the hook of the trailer firmly.**
- **Set the machine to the travelling posture when you load/unload the machine. For the travelling posture, see "5.6.2 Travelling posture of machine."**
- **When you load/unload the machine, set the travelling speed switch to "Slow", and drive the machine slowly.**
- **Be sure to drive the machine forward when you load the machine. Backward driving has the risk of tipping-over.**
- **Be sure to drive the machine backward when you unload the machine. Forward driving has the risk of tipping-over.**
- **Select a place of level and firm ground when you load/unload the machine.**
  Select a place that is reasonably distant from the road shoulder.
- **When you unload the machine to an embankment or platform, make sure that it has an adequate width, strength, and gradient.**
- **Remove mud from crawlers so that the machine does not skid on the loading plates.**
  Wipe grease, oil, snow, ice, and other adhering matters off the loading plates.
- **On the loading plates, never make operations other than forward/backward travelling and never change the travelling direction. When you want to change the travelling direction, drive the machine to get off the loading plate, and then change the travelling direction.**
- **When the machine moves through the end of the loading plates on to the trailer bed, the machine loses balance and becomes dangerous with a sudden movement of its gravity center. Drive the machine very slowly.**
- **When you change the orientation of the machine on the trailer bed, do it slowly because the trailer bed is not stable.**
- **After loading the machine, secure the machine firmly using wood blocks and wire ropes.**

5.11.2.1 Loading

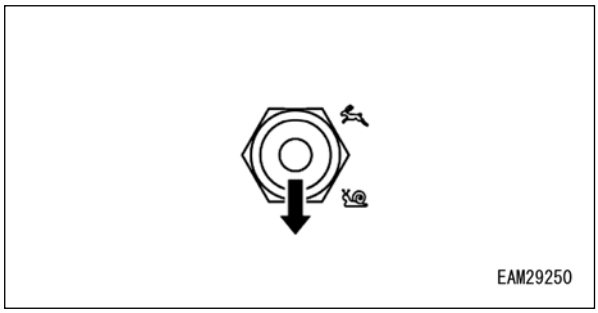
1. Select a place of level and firm ground for loading the machine. Select a place that is reasonably distant from the road shoulder.
2. Set the brake of the trailer firmly, and set stoppers on the tires to fix them.
3. Fix the loading plates firmly so that the center of the trailer and the center of the machine align.



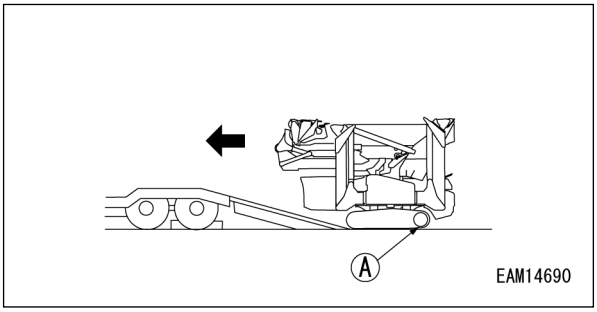
4. Start the machine.
   In cold weather, make warm-up operation well enough.
5. Set the mode switch to "crawler operation (a)."



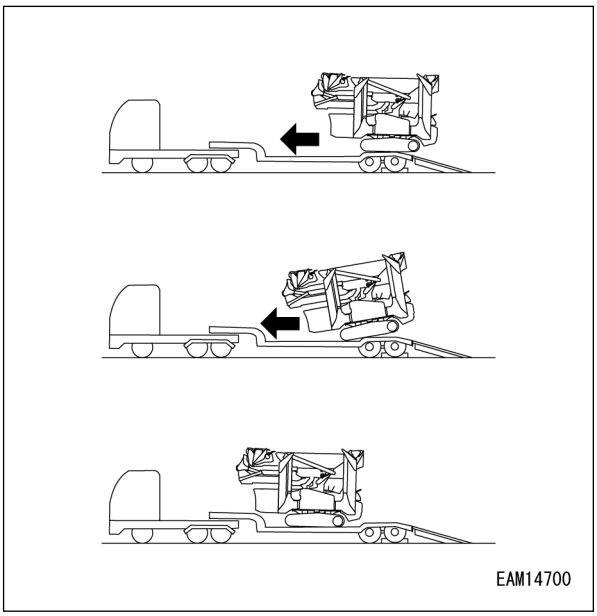
6. Make the travelling speed to slow.
   Use the travelling speed switch to change the travelling speed.



7. Before moving on to the loading plates, confirm that the machine is positioned straight toward the loading plates, the center of the machine aligns with the center of the trailer, and the sprocket (A) is on the down side of the slope.



8. Drive the machine slowly on to the loading plates to load the machine. On the loading plates, do not use a lever other than the driving lever.



9. Drive the machine slowly and carefully when the machine passes the point over the rear wheels of the trailer because the machine becomes unstable at that point. Never change the travelling direction.
10. When the machine passes the point over the rear wheels, the machine sways back and forth. So, drive forward to the target point carefully, and then stop.

5.11.2.2 Securing the machine

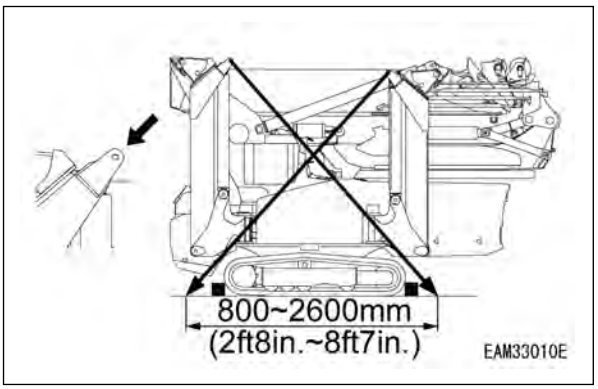
⚠ WARNING

Select a place of level and firm ground when you load/unload the machine.

After loading the machine on the trailer at the target position, secure the machine as follows:

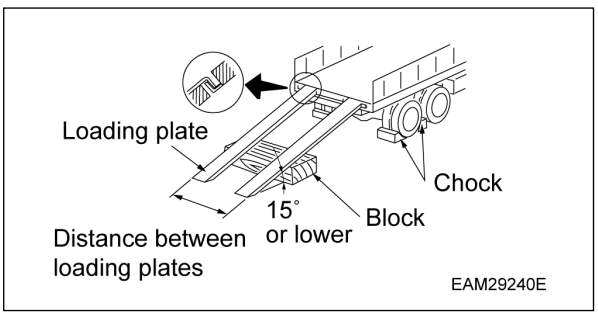
1. Stop the machine, and pull out the key of the starter switch.
2. To prevent the machine from moving during transportation, set wood blocks at the front and back of the rubber tracks and secure the machine using chains or wire ropes. Secure the machine firmly to prevent it especially from side skidding.

   Be careful that the sling does not interfere with the outrigger cylinder rod guard.



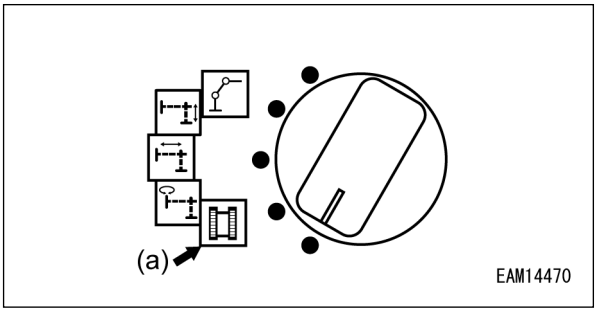
5.11.2.3 Unloading

1. Select a place of level and firm ground for unloading the machine. Select a place that is reasonably distant from the road shoulder.
2. Set the brake of the trailer firmly, and set stoppers on the tires to secure them.
3. Secure the loading plates firmly so that the center of the trailer and the center of the machine align.

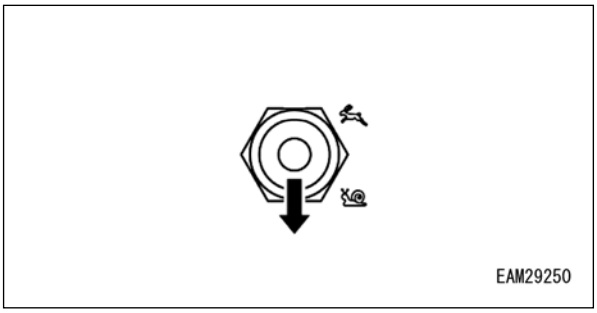


4. Remove the chains and wire ropes used for securing the machine.
5. Start the machine.
   In cold weather, make warm-up operation well enough.

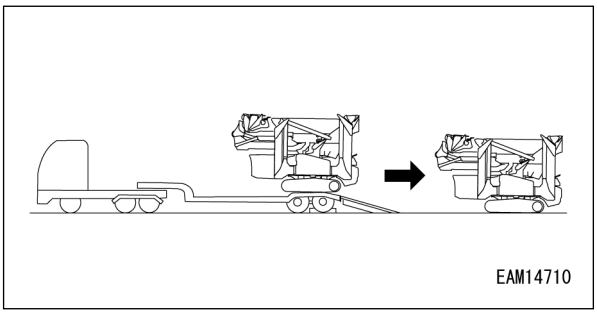
6. Set the mode switch to “crawler operation (a).”



7. Make the travelling speed to slow.
   Use the travelling speed switch to change the travelling speed.



8. Drive the machine slowly on to the loading plates to unload the machine. On the loading plates, do not use a lever other than the driving lever.

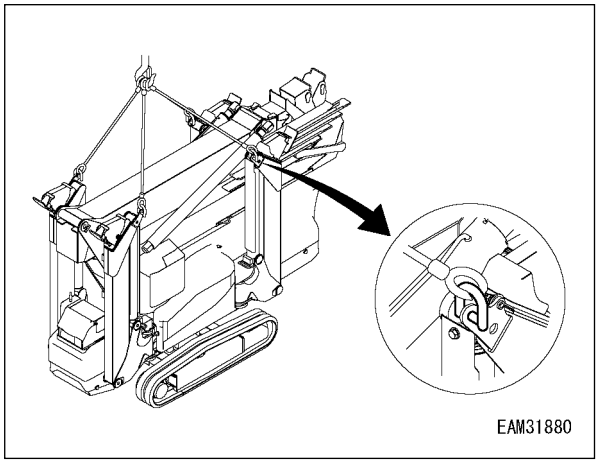


9. When the machine passes the point over the rear wheels, the machine sways back and forth. So, move to the target point carefully, and then stop.

5.11.3 Hoisting a load

⚠ DANGER

- **When you hoist the machine body, make sure that the outriggers are stowed, and hoist the machine by “four-rope slinging” at the four lifting brackets on the outrigger top boxes. If you hoist the machine by some other way or by using lifting brackets but not by four-rope slinging, the machine may break and drop, resulting in a serious injury.**
- **If hoisting the machine in another way is unavoidable, make an inquiry with us or our sales and service agent.**
- **To hoist the machine, use tackles such as a wire ropes or shackles that are strong enough for the mass (weight) of the machine.**



Important

- **For lifting the machine, use tackles that are of the specifics indicated below or greater. When you hoist the machine, be careful not to have the sling wire rope contact the machine.**
  - Wire rope: JIS13 or higher, φ12.5 × 1500 mm or more (breaking force: 1.1 t or more) eye lock at one end and 12A-type thimble at the other end
  - Shackle: BC-16 or SC-16 (breaking force: 7.5 t or more)

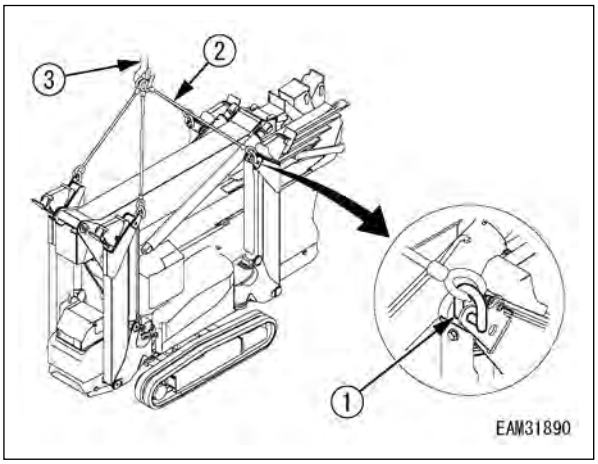
☞ The person who lifts the machine using a crane must have the following certificate:
- Completion certificate of skill training course for operation of small sized mobile crane
- (Article 61 of Industrial Safety and Health Act, Article 20 of Order for Enforcement of the same act, Article 41 of the Safety and Health Regulation of the same ordinance, Article 68 of the Cranes Ordinance)
- Completion certificate of skill training course for sling work
- (Article 61 of Industrial Safety and Health Act, Article 20 of Order for Enforcement of the same act, Article 41 of the Safety and Health Regulation of the same ordinance, Article 221 of the Cranes Ordinance)

☞ Find the mass (weight) of the machine in "Chapter 3 SPECIFICATIONS" or the rating plate attached on the machine.

☞ Specification data values depend on the model of the machine, so check carefully the model of the machine to be lifted.

When you hoist the machine, you need to retract the four outriggers. Lift the machine at a place of flat and firm ground.

1. Set shackles (1) through the holes of the four outrigger top boxes, and hook the hoisting tackles (2) on the hook (3).



2. Stop lifting the machine once when the machine has left the ground, wait a while until the machine stabilizes, and then hoist the machine slowly.

☞ Pay attention to changes of the machine posture when it is suspended, and hoist the machine while maintaining it stable.

5.12 EMERGENCY OPERATION

5.12.1 Operation from the monitor

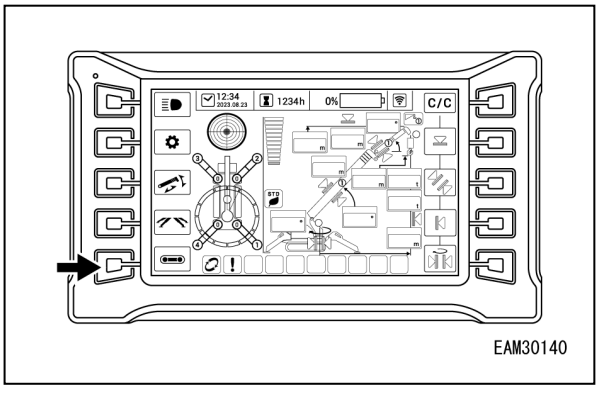
5.12.1.1 Travelling operation

⚠ WARNING

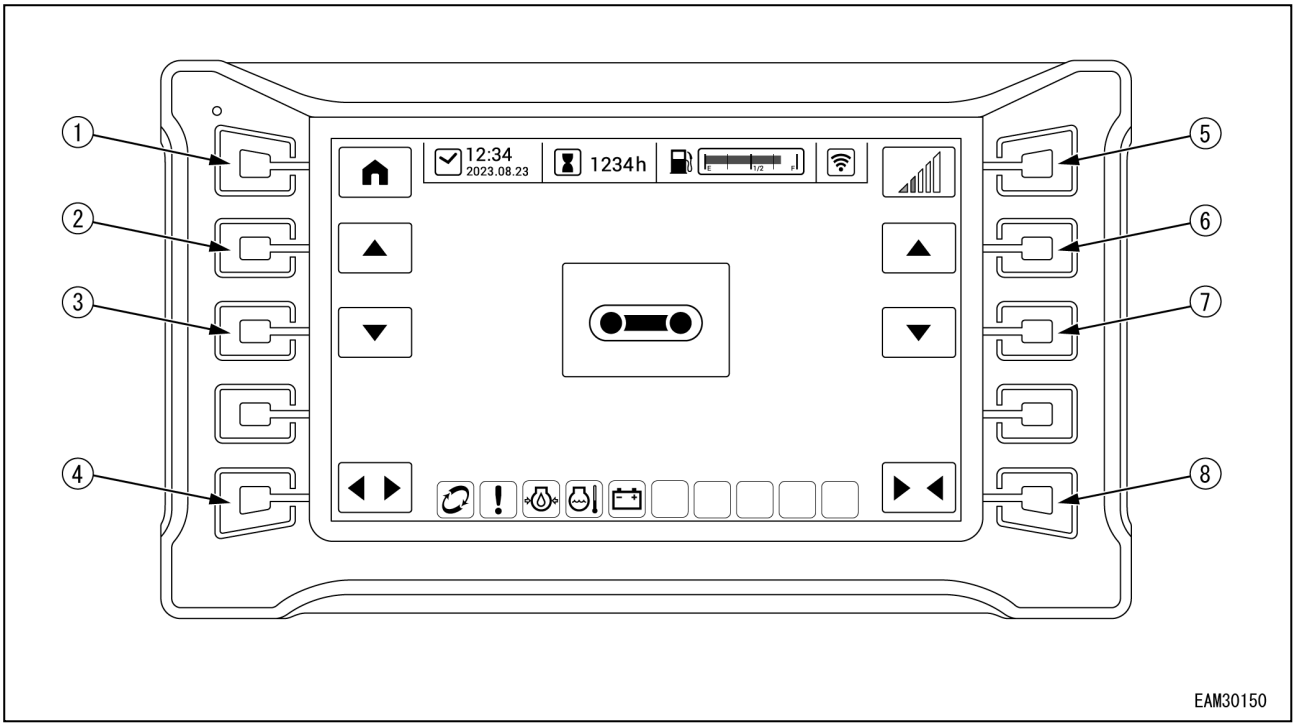
- **When the machine is driven from the monitor, the operator is expected to move with the machine once the machine starts.**
- **As opposed to operation from the radio controller, proportional control is not possible when you travel the machine from the monitor. So, secure an enough space around the machine, and do not start or stop the machine abruptly.**
- **Especially, when you travel the machine backward, be prepared for sudden acceleration. Doing so may cause a serious accident.**
- **You cannot view the area in front of the machine, so pay particular attention when you drive the machine forward.**
- **If the vision is blocked in the travelling direction so that you cannot confirm the safety, stop the machine for a while to check the safety in the travelling direction, and then start the machine again.**
- **Deploy a guide as necessary depending on the condition of the work site.**

The basic operations are the same as when you drive the machine from the radio controller. The following is the difference.

- To drive the machine from the monitor, use the driving operation mode screen.
  The travelling operation mode screen appears when you press the driving operation mode switch in the home screen. It cannot be switched to high speed.



☞ For the basic driving operations, see "5.6 OPERATING THE MACHINE."



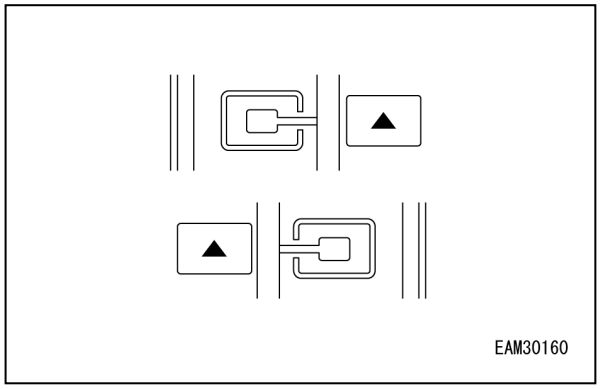
(1) Home switch
(2) Left crawler forwarding switch
(3) Left crawler backwarding switch
(4) Variable gauge widening switch
(5) Acceleration switch
(6) Right crawler forwarding switch
(7) Right crawler backwarding switch
(8) Variable gauge narrowing switch

[1] Home switch (1)

- Short press: Returns to the previous page.
- Long press: Returns to the home screen.

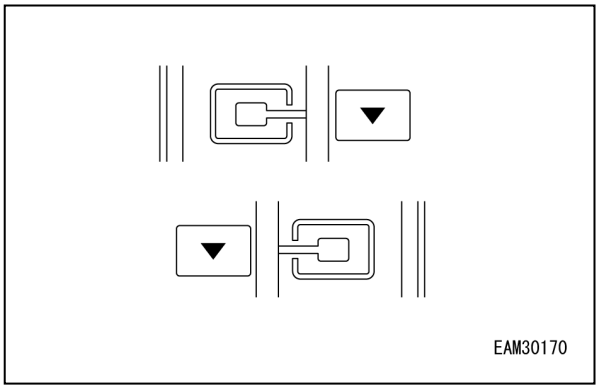
[2] Left crawler forwarding switch (2) Right crawler forwarding switch (6)

Forwards the left/right crawler.



[3] Left crawler backwarding switch (3) Right crawler backwarding switch (7)

Backwards the left/right crawler.

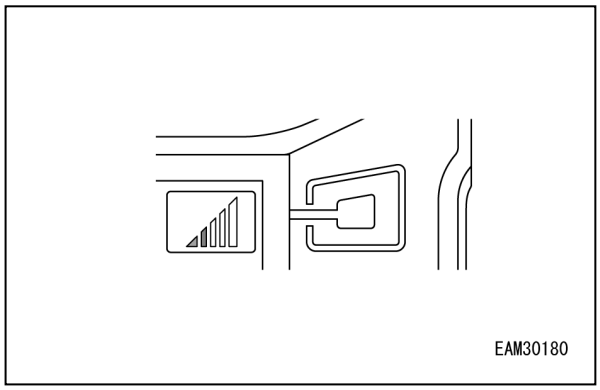


[4] Acceleration switch (5)

Switches between five levels of acceleration.

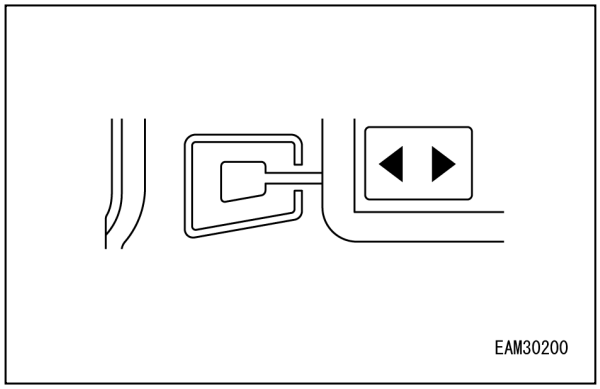
The same acceleration level is shared by the driving operation and the crane operation.

The acceleration switch is not displayed on the outrigger operation screen. So, if you want to change the acceleration level, use the screen for driving operation or crane operation.



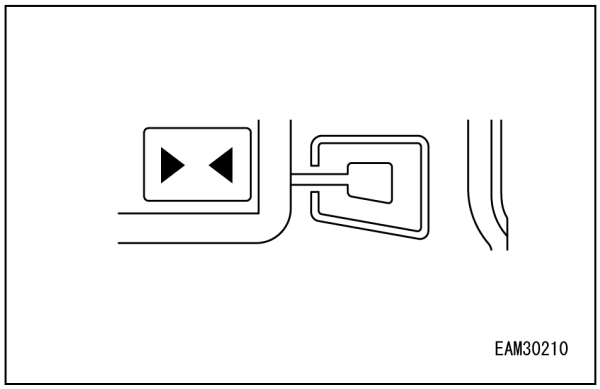
[5] Variable gauge widening switch (4)

Widens the variable gauge.



[6] Variable gauge narrowing switch (8)

Narrows the variable gauge.



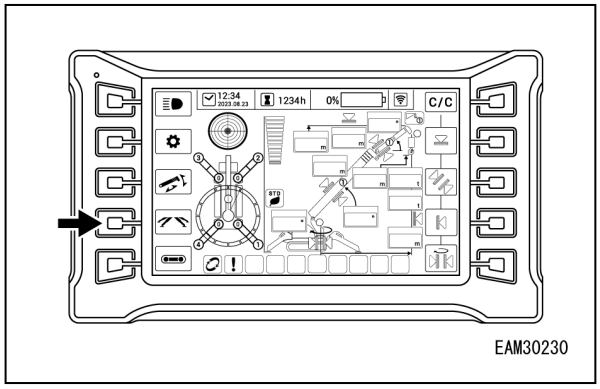
5.12.1.2 Operating the outriggers

⚠ WARNING

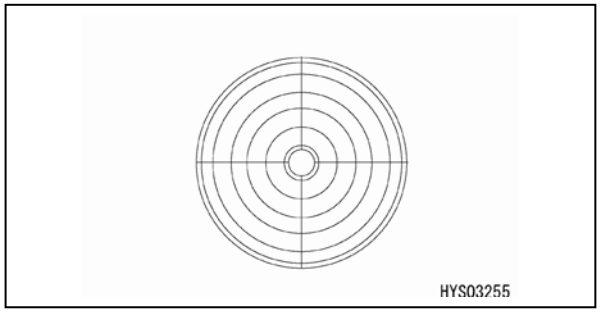
- **Do as follows to lift the crawlers from the ground using the outrigger operation switch.**
  There are four outriggers. Be careful not to use a wrong one among the four outrigger switches. Check the outrigger numbers on the outrigger display area of the monitor and the number plates sticked on the outriggers. A wrong operation may cause a serious accident.
- **When you operate only two outriggers simultaneously, operate the two outriggers at the front (outriggers No.2 and No.3) or the two outriggers at the back (outriggers No.1 and No.4). If you operate two switches of the left-side outriggers or right-side outriggers simultaneously, the two outriggers on one side moves rapidly causing the machine to tip-over.**
- **Operate four outrigger operation switches so as to extend four outrigger little by little equally. If two outriggers on one side are extended too rapidly, the machine may tip-over.**
- **If the machine inclines 3 degrees or more when you set outriggers, the fall alarm buzzer sounds. Operate the outrigger switches so as to maintain the level position to keep the buzzer silent.**
- **To lower the machine on to the ground when the crawlers are lifted, operate the outrigger switches so as to lower four outriggers little by little equally.**
  Operating only two outriggers on the left or right makes the machine unstable, causing it to tip-over.

The basic operations are the same as the steps of setting and stowing from the radio controller described in “5.7.3 Setting the outriggers” and “5.7.4 Stowing the outriggers.” The following is the difference.

- To operate the outriggers from the monitor, use the outrigger mode screen.
  The outrigger mode screen appears when you press the outrigger mode switch in the home screen.

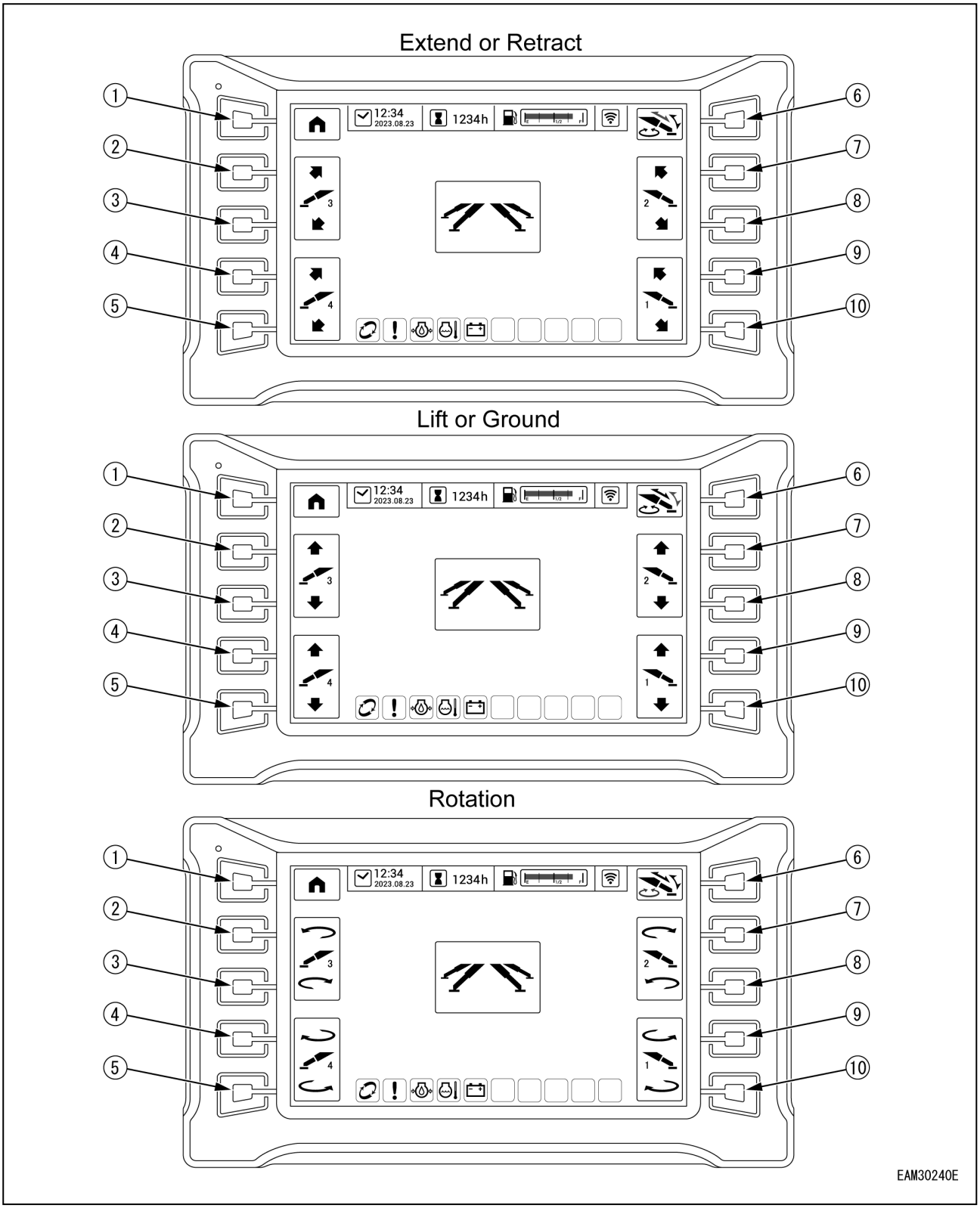


- From the monitor, you cannot operate multiple outriggers simultaneously. Simultaneous operation is up to 2 units. Operate each outrigger separately using its outrigger operation switch.
- Confirm that the machine stands horizontally by the position of the yellow ball of the level gauge on the monitor panel.



☞ For the basic operations of the outriggers, see “5.7 OPERATING THE OUTRIGGERS.”

☞ When the outrigger is operated, the engine or motor speed automatically rises, but this is not a defect.



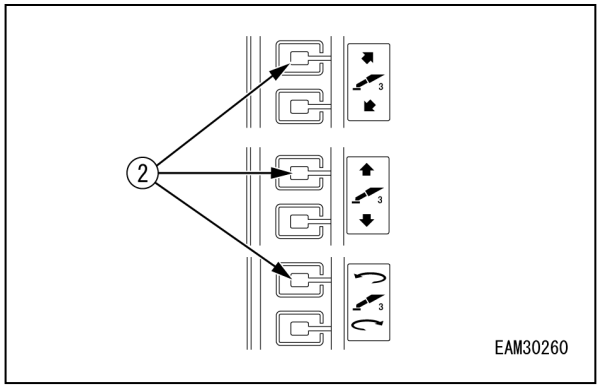
(1) Home switch
(2) No.3 outrigger retract/lift/rotate outward switch
(3) No.3 outrigger extend/ground/rotate inward switch
(4) No.4 outrigger retract/lift/rotate outward switch
(5) No.4 outrigger extend/ground/rotate inward switch
(6) Mode change switch
(7) No.2 outrigger retract/lift/rotate outward switch
(8) No.2 outrigger extend/lower/rotate inward switch
(9) No.1 outrigger retract/lift/rotate outward switch
(10) No.1 outrigger extend/ground/rotate inward switch

[1] Home switch (1)

- Short press: Returns to the previous page.
- Long press: Returns to the home screen.

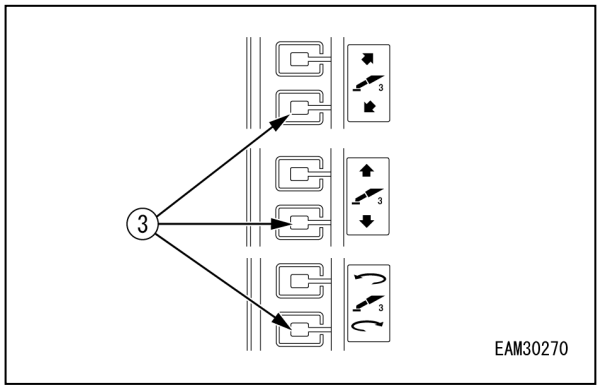
[2] No.3 outrigger retract/lift/rotate outward switch (2)

You can retract, lift, and rotate outward the No. 3 outrigger based on the operation mode.



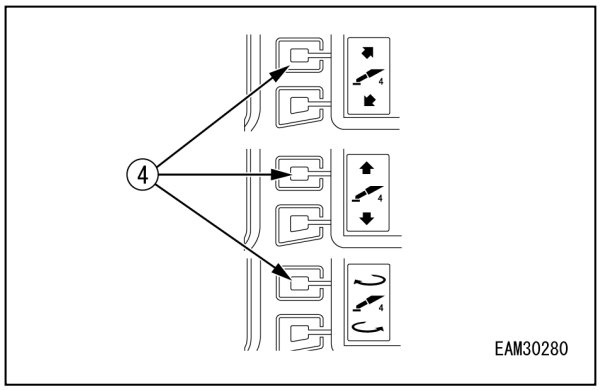
[3] No.3 outrigger extend/ground/rotate inward switch (3)

You can extend, ground, and rotate inward the No. 3 outrigger based on the operation mode.



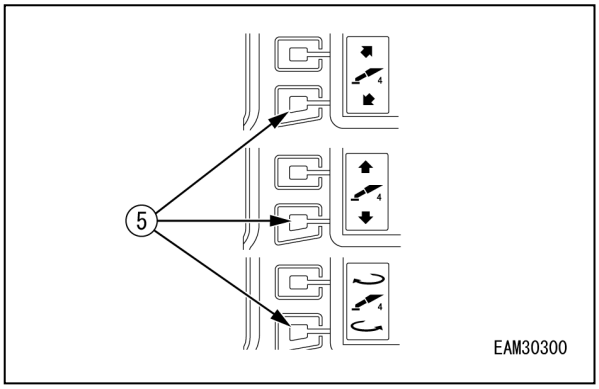
[4] No.4 outrigger retract/lift/rotate outward switch (4)

You can retract, lift, and rotate outward the No. 4 outrigger based on the operation mode.



[5] No.4 outrigger extend/ground/rotate inward switch (5)

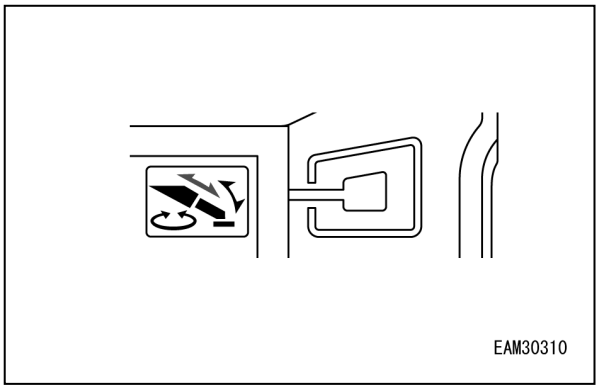
You can extend, ground, and rotate inward the No. 4 outrigger based on the operation mode.



[6] Mode change switch (6)

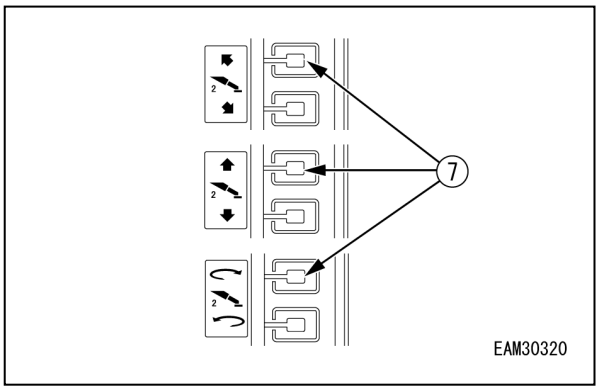
You can switch the operation mode of outriggers between extension, ground, and rotation.

The icon of the current mode is displayed in yellow.



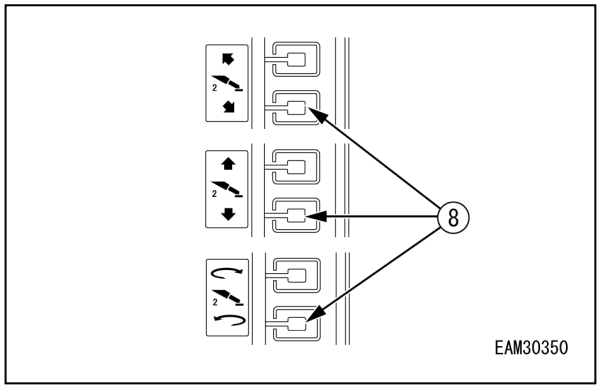
[7] No.2 outrigger retract/lift/rotate outward switch (7)

You can retract, lift, and rotate outward the No. 2 outrigger based on the operation mode.



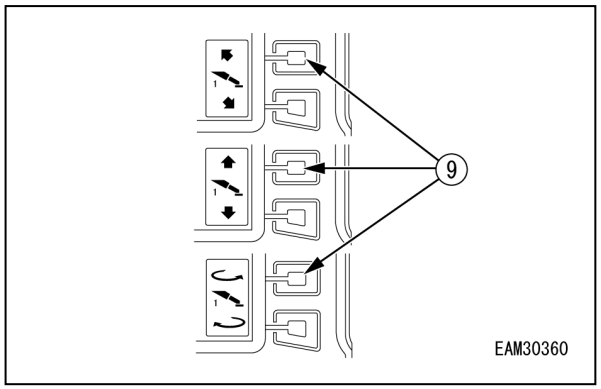
[8] No.2 outrigger extend/ground/rotate inward switch (8)

You can extend, ground, and rotate inward the No. 2 outrigger based on the operation mode.



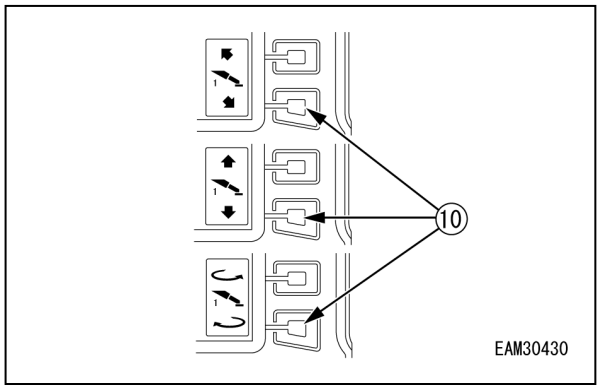
[9] No.1 outrigger retract/lift/rotate outward switch (9)

You can retract, lift, and rotate outward the No. 1 outrigger based on the operation mode.



[10] No.1 outrigger extend/ground/rotate inward switch (10)

You can extend, ground, and rotate inward the No. 1 outrigger based on the operation mode.



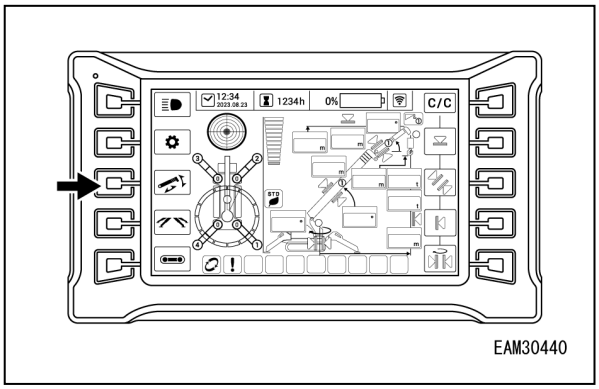
5.12.1.3 Operating the crane

⚠ WARNING

- **Do not use the monitor to operate the crane other than in an emergency.**
- **In three minutes after you display the crane operation screen, the monitor returns the home screen.**
- **The proportional operation of the crane is not possible from the monitor. Do not operate the crane in a narrow space.**
- **When the monitor enters the crane operation screen, the working status lamp flashes red and the alarm buzzer makes a peep sound intermittently.**
- **Although the moment limiter is effective in the crane operation made from the monitor, overestimating the limiter involves the risk of an accident. Operate the crane with great care so that the crane does not stop automatically.**
- **The speed of the crane is kept slow, as it is with the case when the moment limiter override switch is ON (override).**

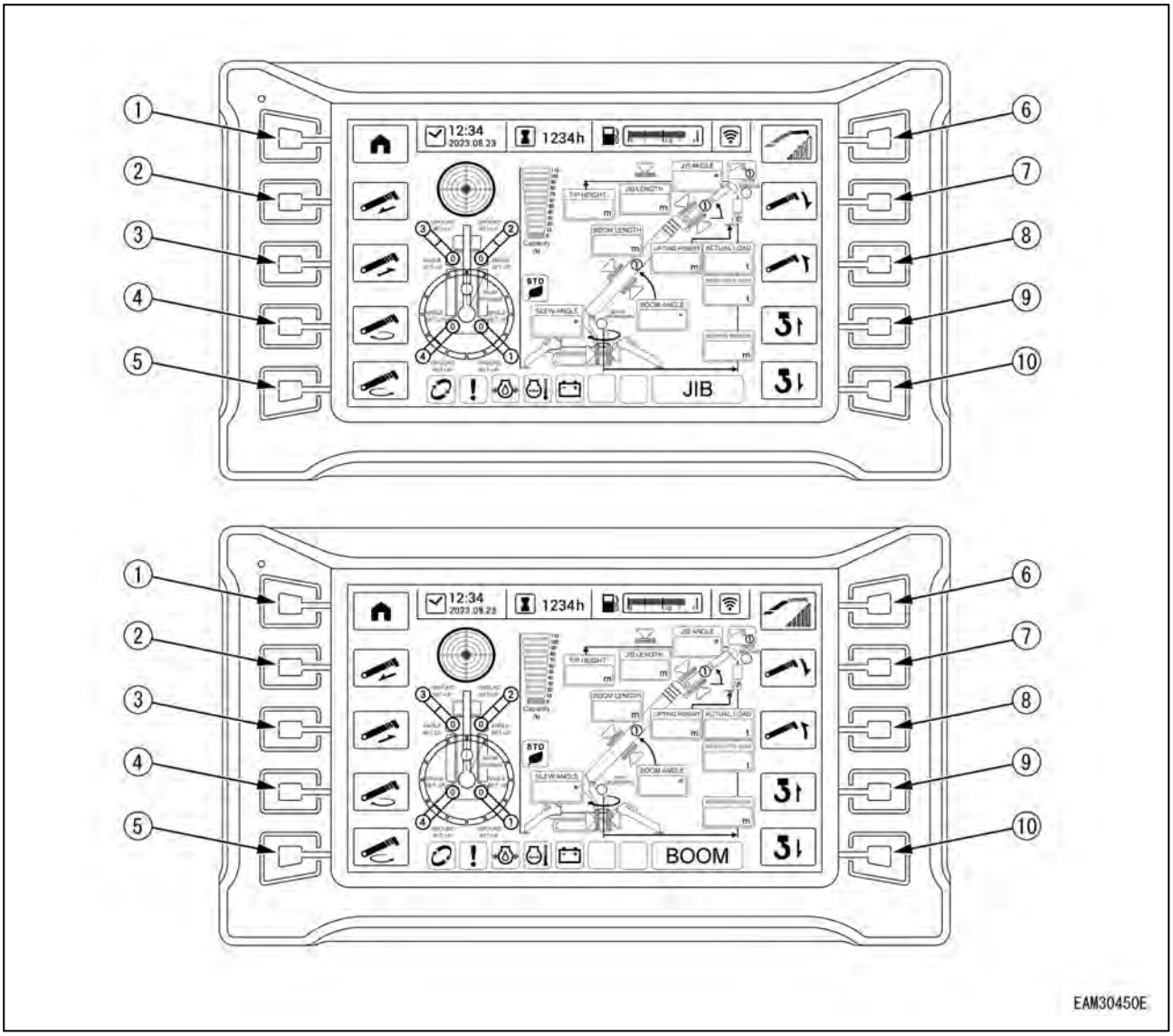
The basic operations are the same as when you operate the crane from the radio controller. The following is the difference.

- To operate the crane from the monitor, use the crane operation mode screen.
  The crane operation mode screen appears when you press the crane operation mode switch in the home screen.



☞ For the basic crane operations, see "5.8 OPERATING THE CRANE."

☞ When you operate the crane from the monitor, you cannot retract or extend the hook, jib, and boom.



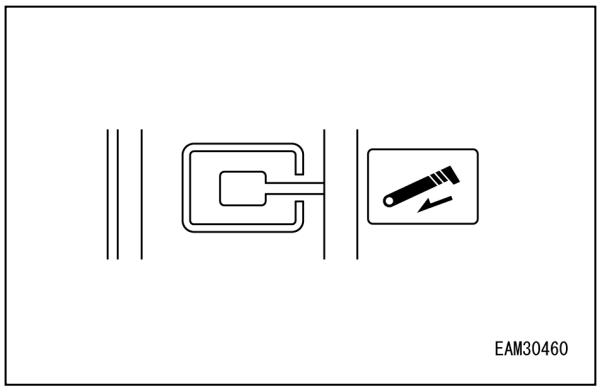
(1) Home switch
(2) Boom/Jib retract switch
(3) Boom/Jib extend switch
(4) Slew clockwise switch
(5) Slew counterclockwise switch
(6) Mode change/Acceleration switch
(7) Boom/Jib lower switch
(8) Boom/Jib raise switch
(9) Winch hoist up switch
(10) Winch hoist down switch

[1] Home switch (1)

- Short press: Returns to the previous page.
- Long press: Returns to the home screen.

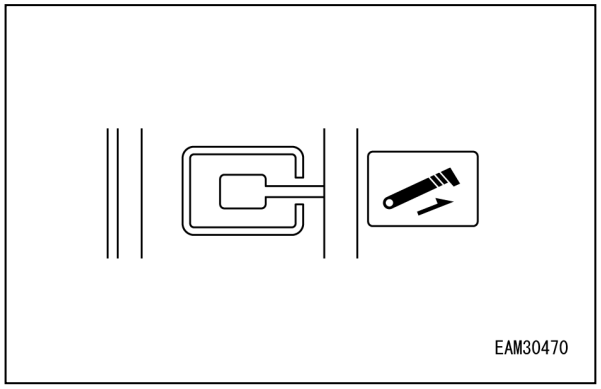
[2] Boom/Jib retract switch (2)

You can retract the boom or jib based on the operation mode.



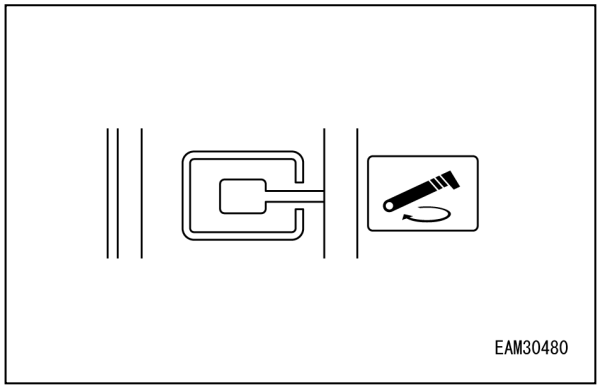
[3] Boom/Jib extend switch (3)

You can extend the boom or jib based on the operation mode.



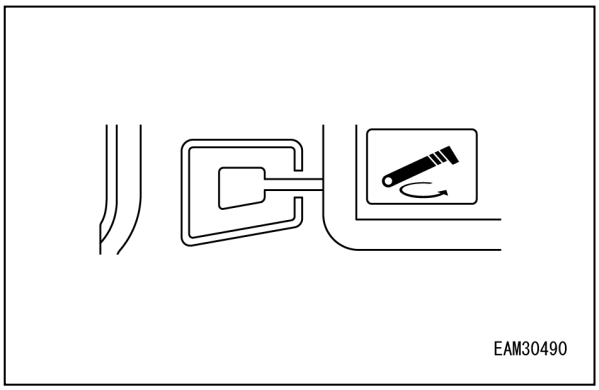
[4] Slew clockwise switch (4)

You can slew the boom clockwise.



[5] Slew counterclockwise switch (5)

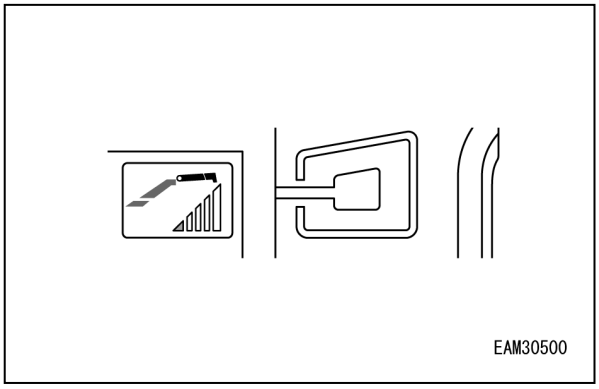
You can slew the boom counterclockwise.



[6] Mode change/Acceleration switch (6)

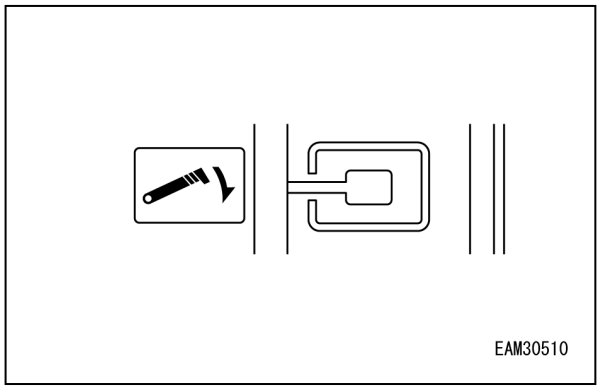
By long-pressing this switch, you can toggle the operation mode between the boom and jib modes.
The current mode is indicated by the yellow icon.
When you switch modes, “Boom” and “Jib” displayed in the bottom right corner of the screen also switch.

By short-pressing this switch, you can change the level of acceleration.
The same acceleration level is shared by the driving operation and the crane operation.
The acceleration switch is not displayed on the outrigger operation screen. So, if you want to change the acceleration level, use the screen for driving operation or crane operation.



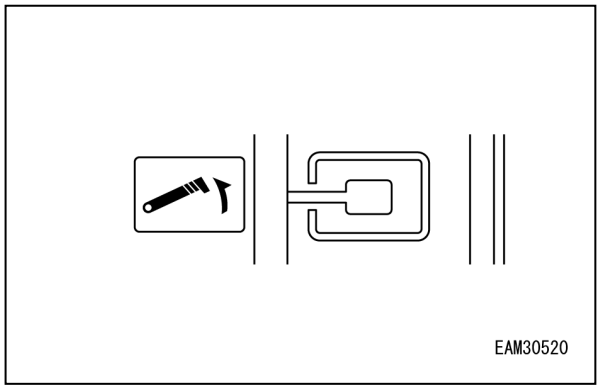
[7] Boom/Jib lower switch (7)

You can lower the boom or jib based on the operation mode.



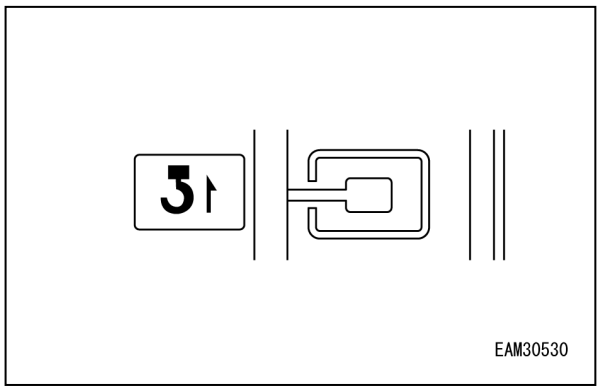
[8] Boom/Jib raise switch (8)

You can raise the boom or jib based on the operation mode.



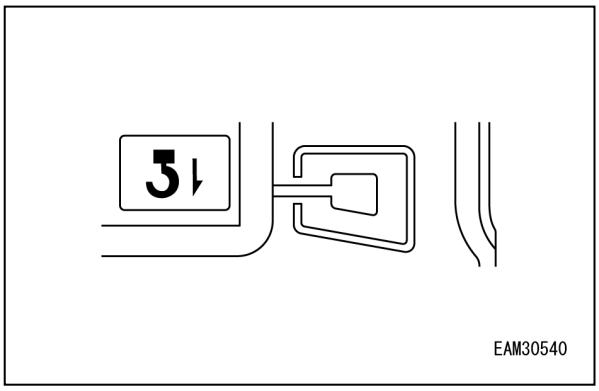
[9] Winch hoist up switch (9)

You can hoist up the winch.



[10] Winch hoist down switch (10)

You can hoist down the winch.



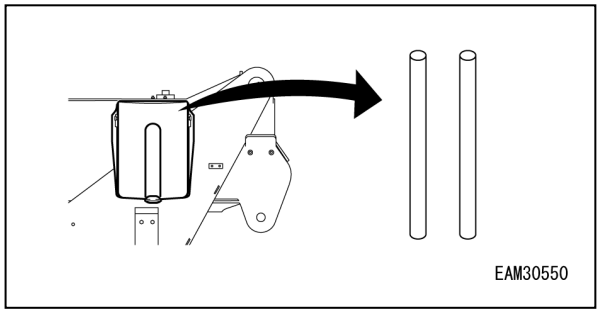
5.12.2 Operation using the emergency operation lever

⚠ WARNING

- **Do not use the emergency operation lever to drive the machine or operate outriggers other than in an emergency.**
- **When you drive the machine or operate outriggers by the emergency operation lever, the moment limiter is not effective to stop them.**
  Watch the condition of the machine and the monitor carefully while operating them. Careless operation may result in a serious accident such as the tipping-over and hitting of the machine.
- **The forward/backward operations of the emergency operation lever are not always the same as the forward/backward operations of radio controller levers.**
  Check the relationship of the forward/backward operations of the emergency operation lever and the machine movement directions before you make operations.

When you cannot drive the machine or operate the outriggers from the radio controller and the monitor, operate the crawlers and outriggers by inserting the emergency operation lever into the control valve inside the operating cover.

1. Remove the operating cover with reference to “6.9 COVERS.”
2. Check the number on the number plate of the operating cover to determine the target outrigger to operate.
3. Take out the emergency operation lever stowed in the manual stowage box, and insert it into the relevant control valve to operate the machine.



4. After you finish the work, put the operating cover back with reference to “6.9 COVERS.”

5.12.2.1 Travelling operation

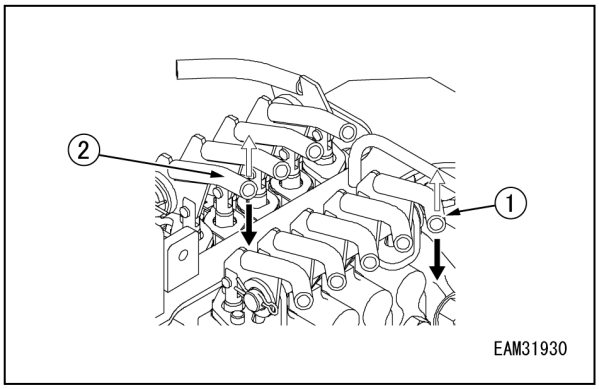
⚠ WARNING

- **When the machine is driven by the emergency operation lever, the operator is expected to move with the machine once the machine starts.**
- **Especially, when you drive the machine backward, do not accelerate the machine too quickly. Doing so may cause a serious accident.**
- **You cannot view the area in front of the machine, so pay particular attention when you drive the machine forward.**
- **If the vision is blocked in the travelling direction so that you cannot confirm the safety, stop the machine for a while to check the safety in the travelling direction, and then start the machine again.**
- **Deploy a guide as necessary depending on the condition of the work site.**

The basic operations are the same as when you drive the machine from the radio controller.

☞ For the basic driving operations, see “5.6 OPERATING THE MACHINE.”

Use the right crawler forward/back (1) lever and the left crawler forward/backward (2) lever as follows:



- Forward: Push the lever down.
- Neutral: Release the lever to let it return to the neutral position. The brake automatically actuates to stop the crawler.
- Back: Pull the lever up.

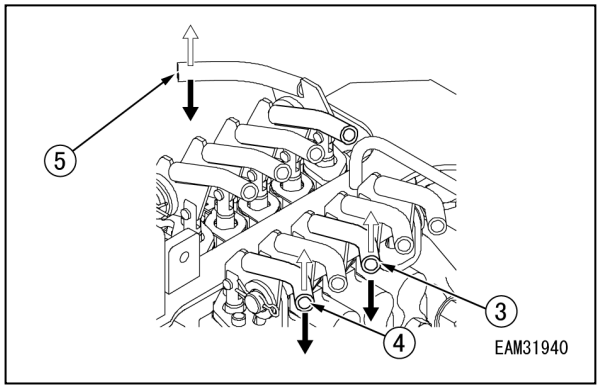
5.12.2.2 Operating the outriggers

The basic operations are the same as when you set and stow an outrigger from the radio controller.

☞ For the basic operations of setting and stowing the outriggers, see “5.7 OPERATING THE OUTRIGGERS.”

[Extending or retracting outriggers No.1, No.2, and No.4]

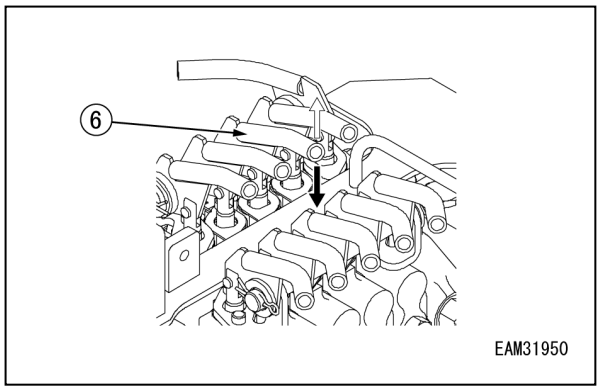
Operate the No.1, No.2, or No.4 outrigger extension and rotation levers (3) (4) (5) as follows:



- Extend: Pull the lever up.
- Retract: Push the lever down.
- Neutral: Release the operation lever to let it return to the neutral position. The outrigger stops stowing/extending.

[Extending or retracting No.3 outrigger]

Operate the No.3 outrigger extension and rotation lever (6) as follows:



- Extend: Push the lever down.
- Retract: Pull the lever up.
- Neutral: Release the operation lever to let it return to the neutral position. The outrigger stops stowing/extending.

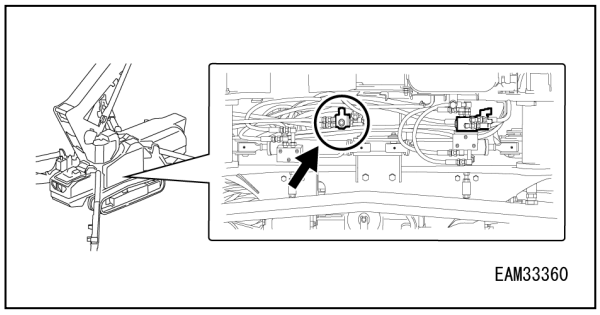
[Rotating No.1 outrigger]

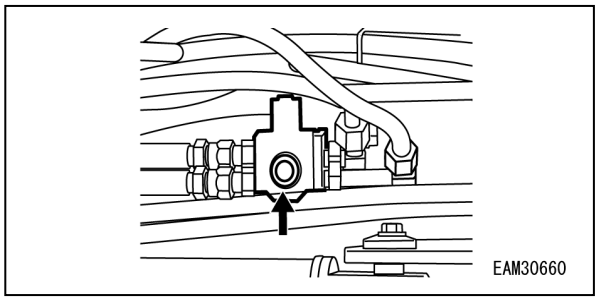
⚠ WARNING

- **Valves can be switched only when the spool is pressed. The operation requires one worker for the lever and another worker for the valve. So, carry out the operation safely by calling each other or other ways.**
- **Careless operation may lead to a serious accident.**

Important

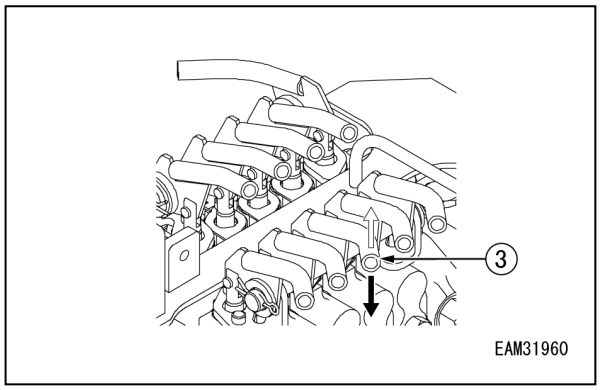
To rotate an outrigger, you need to press the spool of the valve to switch between rotating and extending/retracting of the outrigger.





You can rotate an outrigger by the outrigger extension and rotation lever only while the spool of the valve is pressed.

Operate the No.1 outrigger extension and rotation lever (3) as follows:

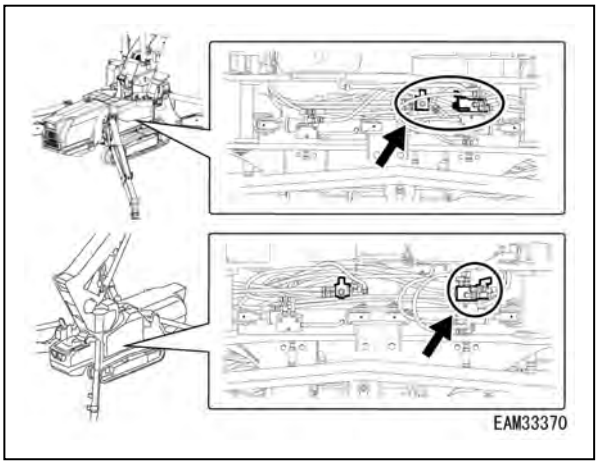


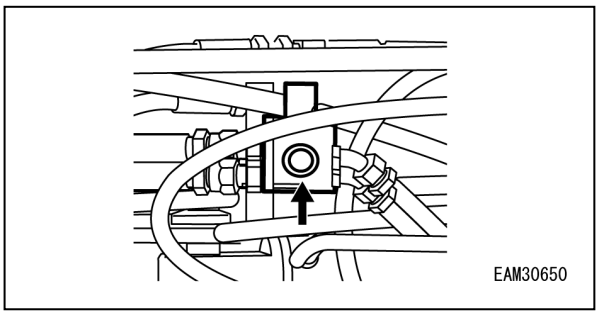
- Rotate inward: Push the lever down.
- Rotate outward: Pull the lever up.
- Neutral: Release the operation lever to let it return to the neutral position. The outrigger stops rotating.

[Rotating outriggers No.2, No.3, and No.4]

Important

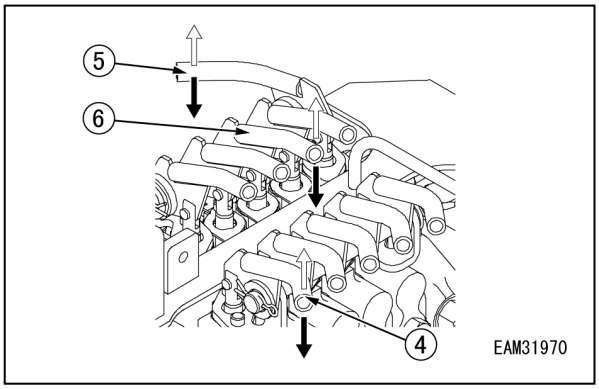
To rotate an outrigger, you need to press the spool of the valve to switch between rotating and extending/retracting of the outrigger.





You can rotate an outrigger by the outrigger extension and rotation lever only while the spool of the valve is pressed.

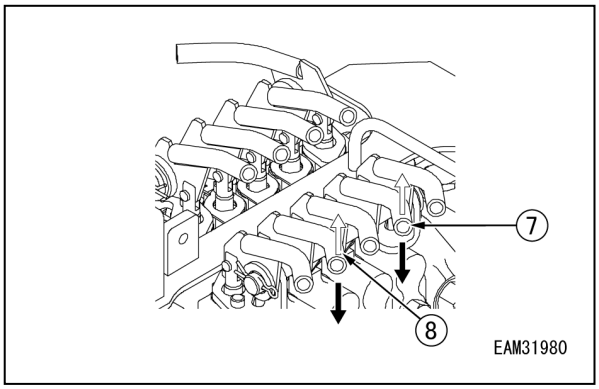
Operate the No.2, No.3, or No.4 outrigger extension and rotation levers (4) (6) (5) as follows:



- Rotate inward: Pull the lever up.
- Rotate outward: Push the lever down.
- Neutral: Release the operation lever to let it return to the neutral position. The outrigger stops rotating.

[Grounding outriggers No.1, No.2]

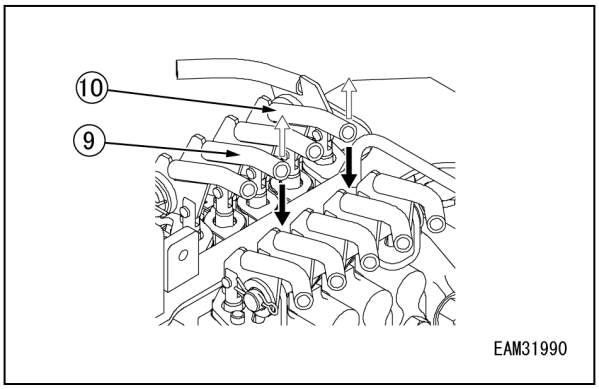
Operate the No.1, No.2 outrigger lifting and grounding lever (7) (8) as follows:



- Ground: Push the lever up.
- Lift: Pull the lever down.
- Neutral: Release the operation lever to let it return to the neutral position. The outrigger stops rising or lying down.

[Derricking outriggers No.3, No.4]

Operate the No.3, No.4 outrigger lifting and grounding lever (9) (10) as follows:



- Ground: Push the lever down.
- Lift: Pull the lever up.
- Neutral: Release the operation lever to let it return to the neutral position. The outrigger stops rising or lying down.

5.12.3 Operation by the crane control valve

⚠ WARNING

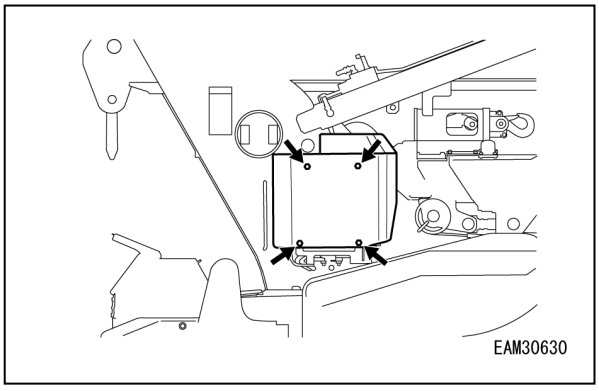
- **Do not use the crane control valve to operate the crane other than in an emergency.**
- **The proportional operation is not possible when you operate the crane by the crane control valve.**
  Do not operate the crane in a narrow space.
- **When you drive the machine or operate outriggers by the emergency operation lever, the moment limiter is not effective to stop them.**
  Watch the condition of the machine and the monitor carefully while operating them.
  Careless operation may result in a serious accident such as the tipping-over and hitting of the machine.

When you cannot operate the crane from the radio controller and the monitor, operate the crane by pressing the control valve inside the valve cover.

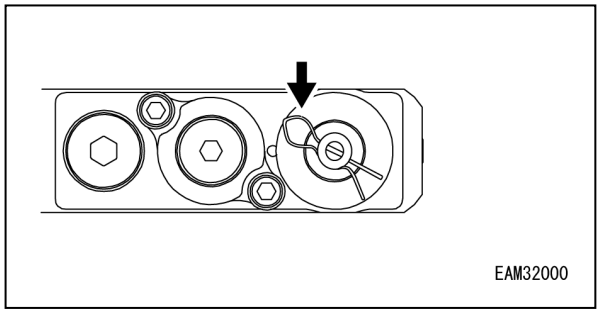
The basic operations are the same as when you extend and stow the crane from the radio controller.

☞ For the basic operations of extending/stowing the crane, see "5.8 OPERATING THE CRANE."

1. Remove the valve cover on the post.
   You can remove the valve cover by removing the four bolts on the front of the cover.



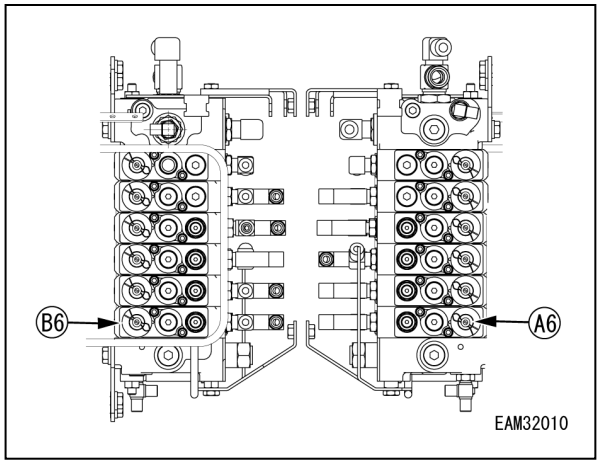
2. Remove the pin of the crane control valve.



3. Operate the machine by different control valves.
4. After you finish the work, put the pin back on the crane control valve.
5. Set the removed valve cover by the four bolts.

5.12.3.1 Hoist Up/Down the winch

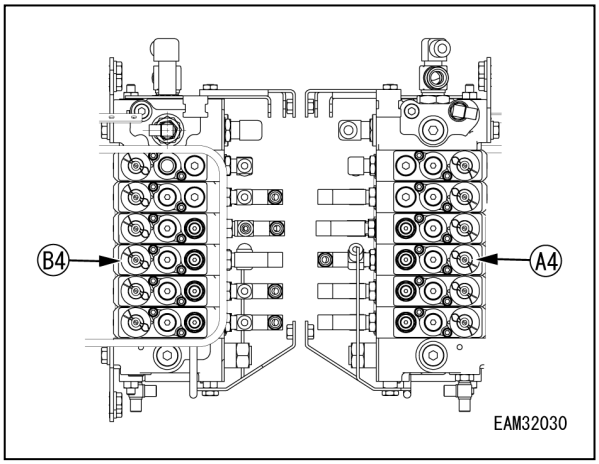
Use the control valves for Hoisting up and down the winch as follows:



- Hoist up: Press the winch hoist up control valve (A6).
- Hoist down: Press the winch hoist down control valve (B6).

5.12.3.2 Derricking the boom

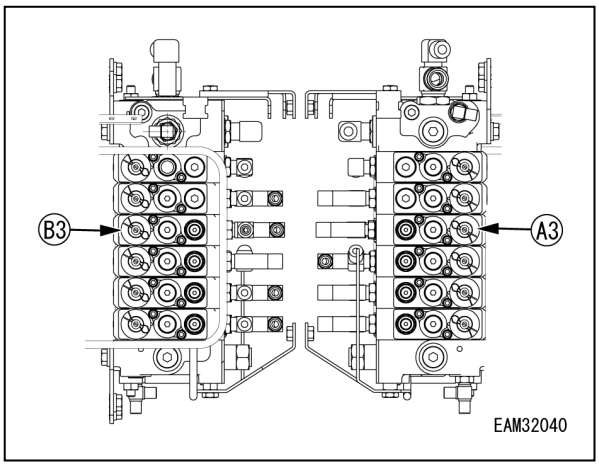
Use the control valves for derricking the boom as follows:



- Raise: Press the boom raising control valve (A4).
- Lower: Press the boom lowering control valve (B4).

5.12.3.3 Derricking the jib

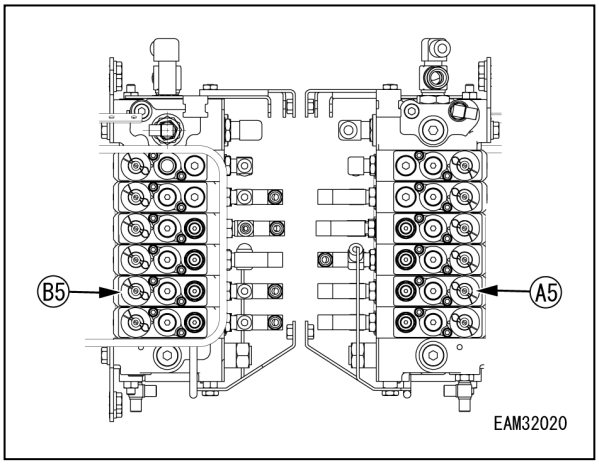
Use the control valves for derricking the jib as follows:



- Raise: Press the jib raising control valve (A3).
- Lower: Press the jib lowering control valve (B3).

5.12.3.4 Telescoping the boom

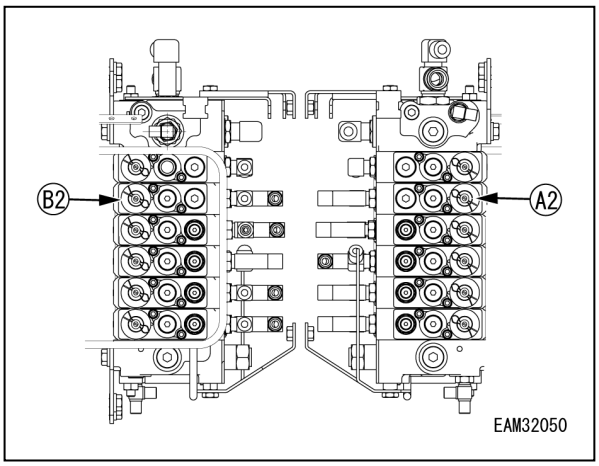
Use the control valves for telescoping the boom as follows:



- Retract: Press the boom retracting control valve (A5).
- Extend: Press the boom extending control valve (B5).

5.12.3.5 Telescoping the jib

Use the control valves for telescoping the jib as follows:



- Retract: Press the jib retracting control valve (A2).
- Extend: Press the jib extending control valve (B2).

5.12.3.6 Slewing

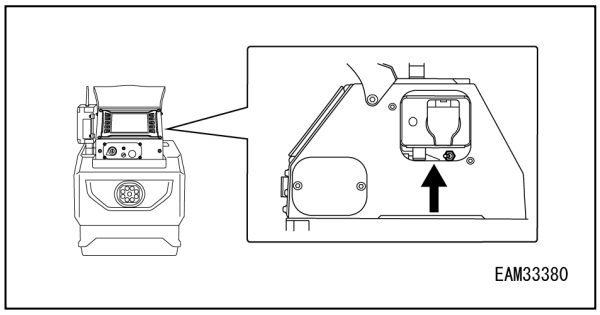
⚠ WARNING

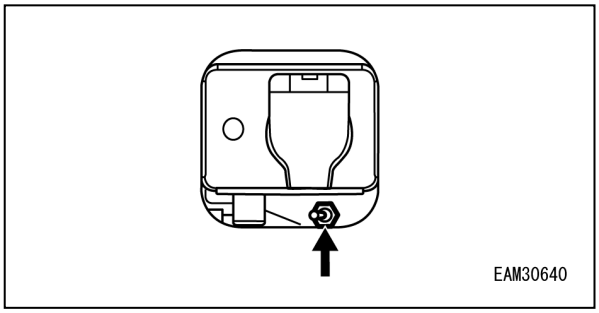
When you make a slewing operation, be careful not to be caught by objects around such as the cover.

1. Remove the cover from the right of the control unit, and turn ON the slew brake release toggle switch. The slew brake is released only while the toggle switch is ON.

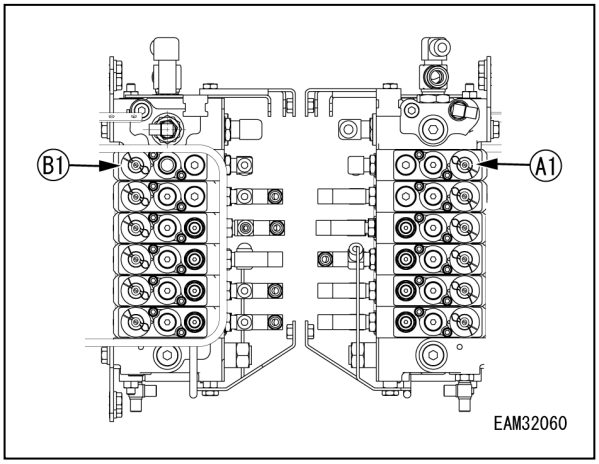
☞ The slew brake release toggle switch returns to OFF automatically.

☞ When you turn ON the slewing brake release toggle switch, the monitor displays an error, but it is not a problem. You can make slew operation while the error is displayed.





2. Use the control valves for clockwise (counterclockwise) slewing / variable gauge stewed (extend) as follows:



- Slewing clockwise: Press the clockwise slewing / variable gauge stewed control valve (A1).
- Slewing counterclockwise: Press the counterclockwise slewing / variable gauge extend control valve (B1).

3. Confirm that the slewing brake release toggle switch is OFF, and then put the cover back on the right of the control unit.

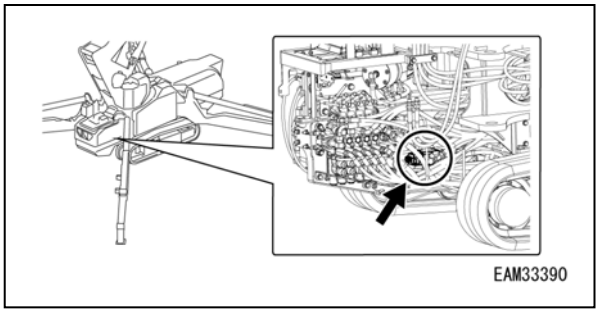
5.12.3.7 Variable gauge operation

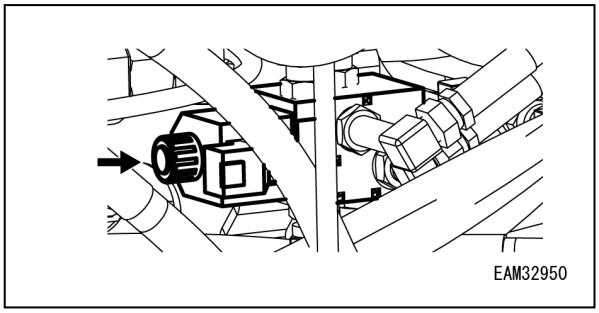
⚠ WARNING

- **Valves can be switched only when the spool is pressed. Since this is a two-person job requiring a control valve operator and a switching valve operator, the operators should ensure safe performance of the operation by signalling to each other or by other means.**
- **Careless operation may lead to a serious accident.**

Important

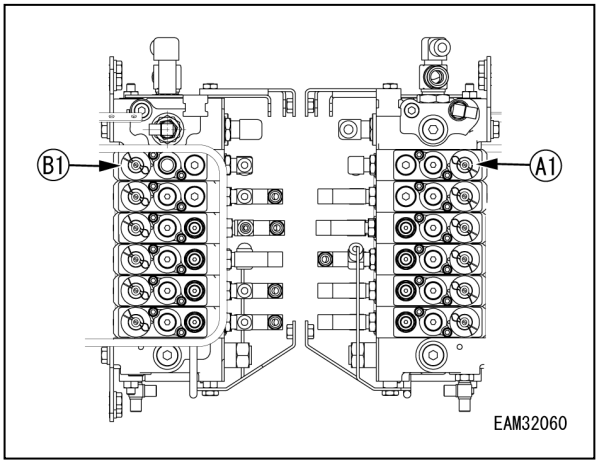
When performing the variable gauge widening/reduction operation, it is necessary to press the spool of the crane slewing / variable gauge switching valve.





The variable gauge widening / reduction operation can only be performed while the valve's spool is being pressed.

1. Use the control valves for clockwise (counterclockwise) slewing / variable gauge stewed (extend) as follows:



- Stewed: press the clockwise slewing / variable gauge stewed control valve (A1).
- Extend: press the counterclockwise slewing / variable gauge extend control valve (B1).

5.13 OPERATING A MACHINE OF THE ENGINE AND ELECTRIC SPECIFICATION

5.13.1 Connecting power supply cable

⚠ WARNING

- **Neglecting these precautions may cause a serious accident.**
- **Tasks of connecting the power supply device to the power source and tasks of inspecting and maintaining the power system shall be conducted by a chief power engineer of the security self-maintenance organization as defined by the Electricity Business Act or an electrician as defined by the Electrician Act.**
- **Supply power to the machine satisfying the specification of the machine.**

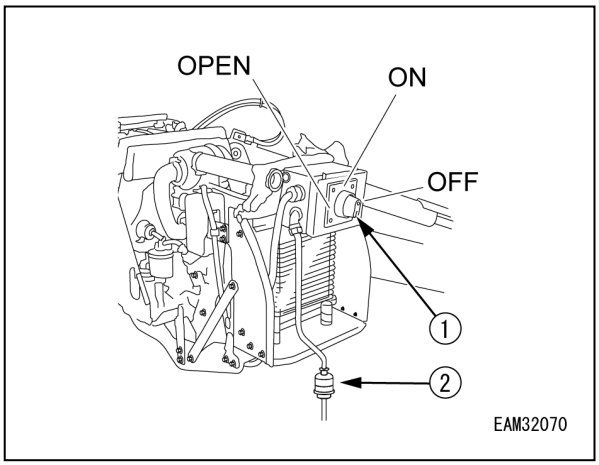
Voltage (V)	Current (A)	Frequency (Hz)
380 to 415	10.5	50

- **Use a cabtyre cable that is suitable for the machine.**
  Cable specification: 3.5 sq or more
- **Determine the length of the cabtyre cable in consideration of voltage drop and other factors as well as the specification of the cable.**
- **Use a cabtyre cable that is completely dry. You may have an electric shock if an end of the cabtyre cable is wet or you perform the connecting working with wet hands.**
- **Be sure to set the main breakers of the power supply device and the machine to the OFF position before connecting the cabtyre cable to this machine.**
- **Do not damage or bend the cabtyre cable. If the cabtyre cable is damaged, replace it with a new one.**
- **Check the area in which you will run the cabtyre cable, and remove any sharp-pointed objects.**
  Otherwise, the cabtyre cable may be damaged or broken when it is caught by a sharp-pointed object.
- **When you connect the cabtyre cable to the breaker switch panel in the power supply box, tighten the screw with the specified tightening torque. Loosening of the screw may cause fire or electric shock due to short circuit.**
- **When you connect the cabtyre cable to the breaker switch panel in the power supply box, fix the screw of the cable ground firmly to prevent the ingress of water and to protect the cable.**
- **Connect the grounding wire of the cabtyre cable to the grounding port in the power supply box firmly.**
- **After you finish power connection, close the door of the power supply box and put the cover on the control panel.**

Follow the steps below to supply power from the power supply device to the machine.

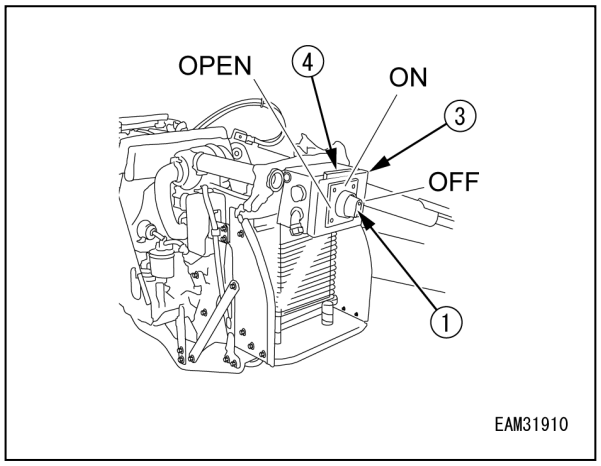
[When the power plug is connected]

1. Set the breaker of the power supply device to the OFF position.
2. Set the breaker switch (1) of the power supply box to the OFF position.
3. Attach the power plug (2).

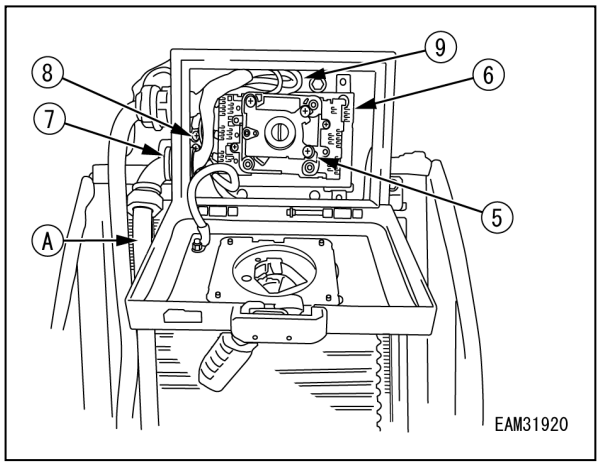


[When the power plug is not connected]

1. Remove the engine cover with reference to “6.9 COVERS.”
2. Confirm that the breaker of the power supply device and the breaker switch (1) of the power supply box are at the OFF position.



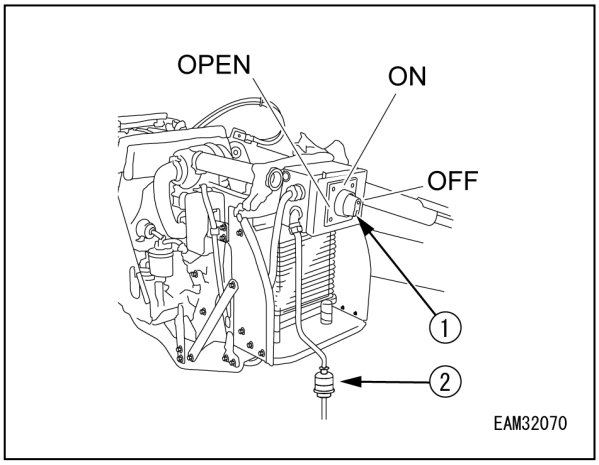
3. Unlock the door by setting the breaker switch (1) of the power supply box at the OPEN position, pull the handle (4) toward you, and then open the door (3) of the power supply box.
4. Remove the cover (6) of the breaker switch box (5) of the power supply box.



5. Run a cabtyre cable (A) that matches the specification of the machine through the cable insertion hole (7) at the bottom of the power supply box, and connect it to the breaker switch panel (5).

☞ Be sure to connect the grounding cable (8) of the cabtyre cable to the grounding port. Since the cables (9) (three cables) other than the grounding cable are directly driven, check the L1, L2, and L3 terminal connections and the circuit of the cable on the vehicle body side, and match the colors.

6. After connecting the cabtyre cable (A) to the power supply box, insert the cover (6) of the breaker switch panel (5) in the original position, and close the door (3) of the power supply box.
7. After you finish power connection, put the engine cover with reference to “6.9 COVERS.”
8. Attach the power plug (2).



9. Set the breaker switch (1) of the power supply box to the ON position.

5.13.2 Operation and inspection after connecting power supply cable

⚠ WARNING

- **When you start the electric motor, check the area around the machine for any people or obstacles, and sound the horn before starting the electric motor.**
- **Be sure to make warm-up operation. Especially in cold weather, make warm-up operation well enough. Without a warm-up operation, the travelling unit and the crane do not react promptly to lever operations, posing a risk of a serious accident.**
- **During warm-up operation, watch around the control panel and power unit for any strange sound, smell, or abnormal vibration. If there is any problem, promptly turn the starter switch to OFF to stop of the machine quickly, and immediately set the breaker of the power supply device to the OFF position to stop power supply. After that, check around the control panel, electric motor, and power cables for any smell or trace of burn. For checkup and repair, contact us or our sales and service agent.**
- **After warm-up operation, be sure to make checkup to confirm the operation of the crane.**
  At that time, be careful not to have the hook block contact or hit the boom.
- **When you rotate the boom, be careful not to have the boom hit yourself or the machine body.**
- **If you find any problem during the confirmation of the crane operation, stop the machine immediately. You need to repair it.**
  Using the machine without repairing it may cause a serious accident.
- **When you drive the machine, pay careful attention not to have the machine run over or tangle the cabtyre cable.**
  Deploy a guide as necessary, and follow the instructions of the guide.
- **Do not put an inflammable object on the control panel cover or around it.**
  Heat inside the control panel may cause fire.

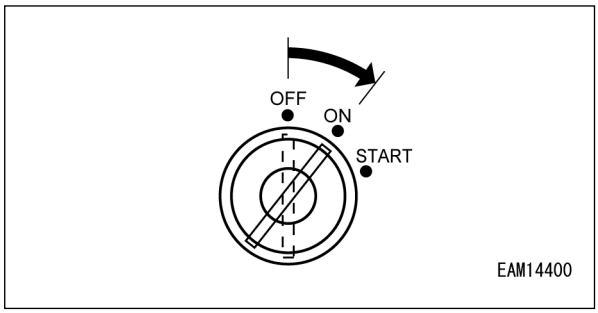
☞ The suitable temperature of hydraulic oil is 45 to 55 ℃.
When you inevitably use the machine when the temperature of the hydraulic oil low, raise the temperature at least to about 20 ℃.

☞ Set both the power box breaker and the control panel breaker to ON.
If the start switch key is started with the breaker OFF, then the engine starts.

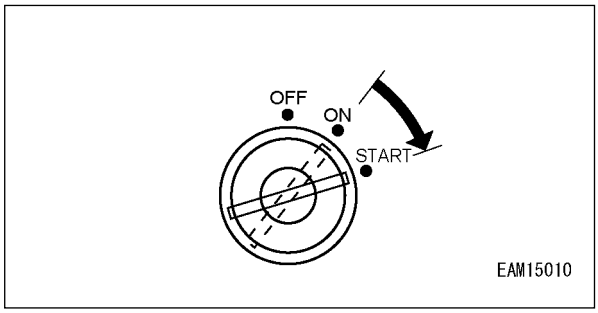
☞ This machine's rotor has a constant speed of rotation.

☞ There is no outrigger stop function.

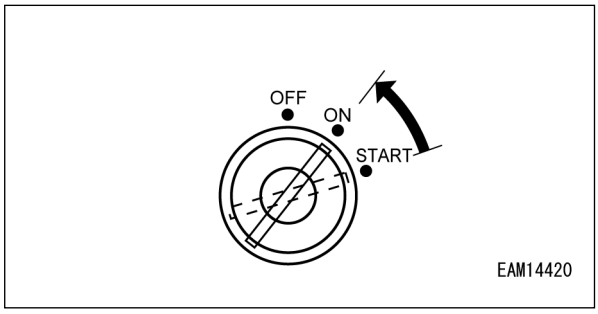
1. Insert the key in the starter switch, and turn it to the ON position.



2. Turn the starter switch to the START position.



3. When the electric motor starts, take your hand off the key.
   The key automatically returns to the ON position.



4. After the electric motor starts, make a warm-up operation for about five minutes.
5. If you find a strange sound, smell, or abnormal vibration around the power unit, check the power unit in the following steps:
   1. Turn the starter switch to the OFF position to stop the electric motor.
   2. Remove the engine cover with reference to “6.9 COVERS.”
   3. Check the electric motor and hydraulic pump for any loosening or dropping of bolts or loosening of coupling.
   If there is a loose point, tighten it with the specified torque.
   4. Check around the power unit to see if withered leaves, paper strips, or dust are piling or adhering.
   If there are such things adhering, remove them.
   5. After the checkup and cleaning, put the engine cover with reference to “6.9 COVERS.”

5.13.3 Operating the machine

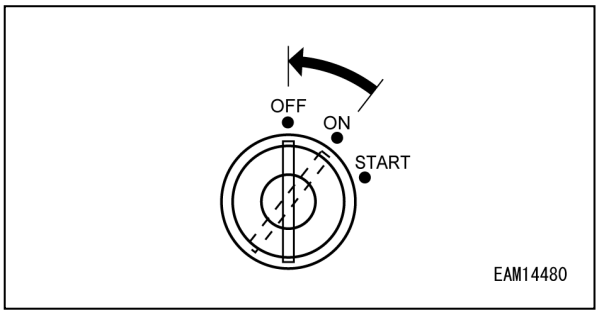
Operating of the machine is the same as other models.

☞ For the basic operations, see sections from “5.6 OPERATING THE MACHINE” to “5.8 OPERATING THE CRANE.”

☞ Because the cabtyre cable is connected, the machine can move only within the scope of the cable reach.

5.13.4 Stopping the machine and checkup/confirmation after stopping the machine

1. Turn the key of the starter switch to the OFF position. The machine stops.



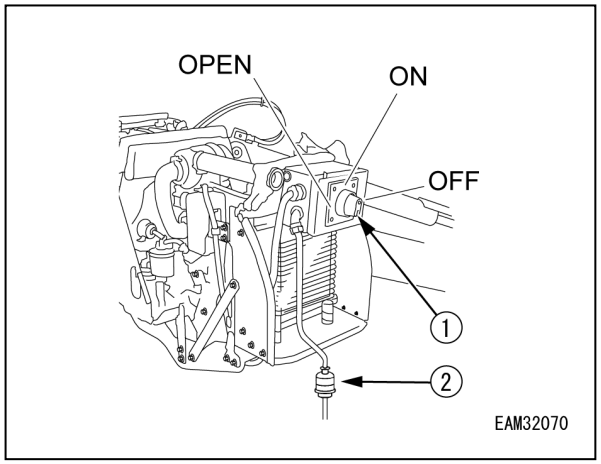
2. Pull out the key of the starter switch.
3. Walk around the machine to check the crawlers, crane, and the body of the machine and see if there is any oil leak. Repair the machine if there is any oil leak or abnormality.
4. Remove mud adhering to the crawlers and outriggers.
5. Remove withered leaves and paper strips from around the control panel because they may cause fire.

5.13.5 Disconnecting the power supply device

⚠ WARNING

Precautions for connecting the power supply device also apply when disconnecting it.

1. Set the breaker of the power supply device to the OFF position.
2. Set the breaker switch (1) of the power supply box to the OFF position.



3. Remove the power plug (2).

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Chapter 6
INSPECTIONS AND MAINTENANCE

6.1 MAINTENANCE PRECAUTIONS

In order to use this machine safely and without malfunction, fully understand the inspection and maintenance items and how to carry them out as described in this manual, and be sure to perform the inspection and maintenance for all parts.

⚠ WARNING

- **Do not perform inspection or maintenance tasks not described in this manual. Relying on individual judgment may lead to a serious accident or malfunction. If the extent of a malfunction or defect cannot be assessed, contact us or our sales service agency to request an inspection and repairs.**
- **Should a malfunction or defect be discovered during use or as a result of an inspection, promptly report it to the business owner or person responsible, and contact us or our sales service agency to request repairs.**
- **When performing inspection and maintenance tasks, first stop the machine on firm level ground where it has a good footing.**

6.1.1 PRECAUTIONS BEFORE MAINTENANCE

Failure report

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

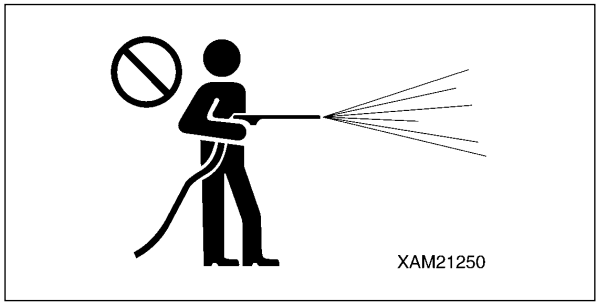
Clean before inspection or maintenance

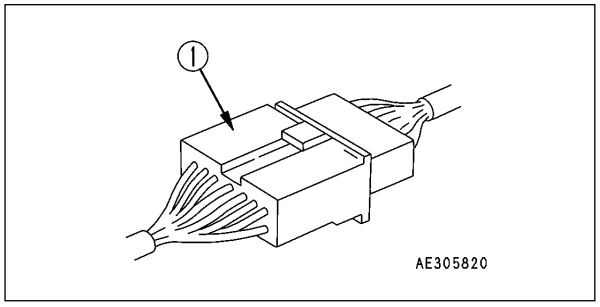
Before starting an inspection or maintenance, clean the Machine and prevent rubbish from entering the Machine and make sure safety will be ensured during maintenance.

- Attempting to inspect or maintain the Machine whilst still dirty not only lessens chance of locating faults, but may cause rubbish to enter your eye, or slipping and tripping that result in injury.
- Always observe the following when washing the vehicle.

Use antislip shoes to prevent slips and trips caused by wet foothold.

- When washing the vehicle, definitely do not perform high-pressure washing.
- Do not directly spray water onto the electrical system (sensors, connector, receiving box etc.) . Water entering the electrical system is dangerous and will cause faulty or improper operations.





Tidy up workplace

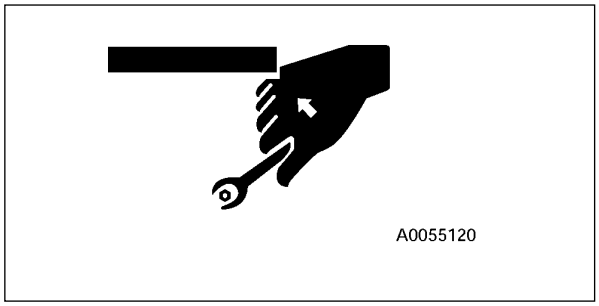
Always tidy away tools, hammers and other things that obstruct the working area; grease and oil should be wiped off immediately after use.
An untidy workplace may cause safety hazards and result in injuries to personnel.

Follow supervisor's 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.

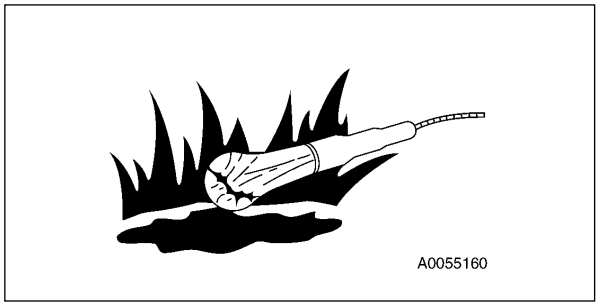
Use appropriate tools

Do not use damaged or deteriorated tool, or use a tool for a purpose other than its intended purpose.
Use tools suitable for the maintenance work.
Entrance of a broken piece of a tool such as a drift with a crushed head or a hammer may destroy eyesight.



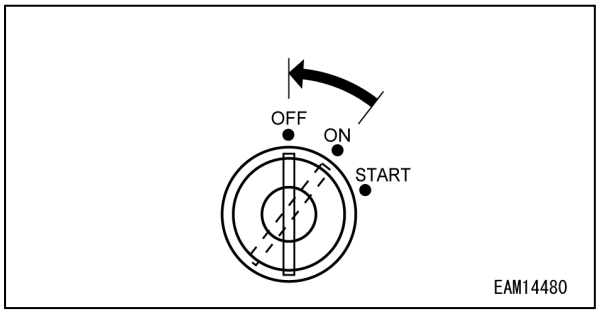
Handling illumination devices

- Use explosion proof illumination device when inspecting the fuel, oil, battery fluid or similar substance. Failure to use an explosion proof illumination device may cause a serious fire and/or explosion.
- Attempting to work without using an illumination device in a dark place may cause injury or other issues. Always use illumination device.
  Do not use a lighter or other burning objects instead of the illumination device even if it is dark. Such use may cause fire, and furthermore the battery gas may catch fire and explode.



Stop engine before inspection or maintenance

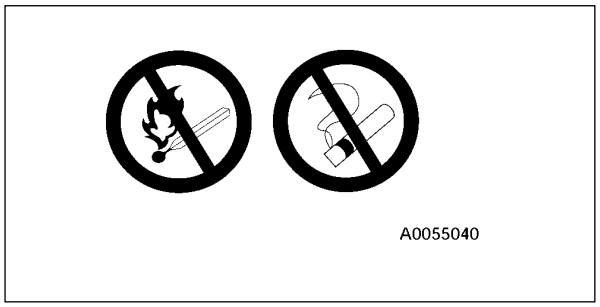
- Before inspection or maintenance, always park the Machine at a location where the ground is level and firm, and rock-falls, landslides and flooding do not occur, fully retract and lower the boom, and stop the engine.
- Operate each of the crane operation levers back and forth 2 - 3 times to relieve the pressure remaining in the hydraulic circuits.
- Apply pawls to prevent rubber tracks from moving.
- Persons in charge of the maintenance should pay attention to prevent parts of the body and clothes from contacting any moving parts.



Fire risk prevention

Always observe the following during maintenance where the fuel, oil, battery or other substance that may catch fire are handled.

- Keep the fuel, oil and any other easily combustible oil and grease away from fire during stowage.
- Do not leave the site when replenishing the fuel or oil.
- Use incombustible cleaning oil for cleaning components, and do not use light oil, petrol or anything else that may catch fire.
- Do not smoke during inspection and maintenance. Only smoke at a designated location.
- Loosened or damaged electrical connections may short the circuit and result in fire. Inspect accordingly before starting the work.
- Check to make sure a fire extinguisher is near the inspection/maintenance site.



6.1.2 PRECAUTIONS DURING MAINTENANCE

No entry of unauthorized personnel

Do not allow anyone, other than the necessary personnel, to enter the site during maintenance. Post a guard, if necessary.
Take special care in case of polishing, welding work, or digging work.

Measures upon finding abnormality during inspection

- Always repair whenever any abnormality is found during inspection.
  Attempt to use without repairing the defect may cause accidents.
- Ask us or our sales service agency for repair depending on the failure type.

Do not drop tools or parts inside machine

- Be careful not to drop any bolts, nuts or tools' inside the Machine when inspecting while opening the inspection port or tank replenishment port. Dropping object may damage the Machine or cause the Machine to operate improperly and thus may cause accidents.
  If anything drops, always retrieve it.
- Do not keep anything unnecessary for the inspection in your pocket.

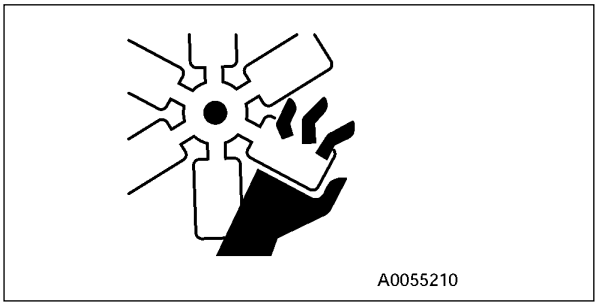
Noise caution

Loud noise in the surroundings may cause hearing difficulty or deafness. Use ear protection or ear plugs during long-term noise exposure, such as engine maintenance.

Work by at least two persons during maintenance with engine running [engine specification / engine and electric specification]

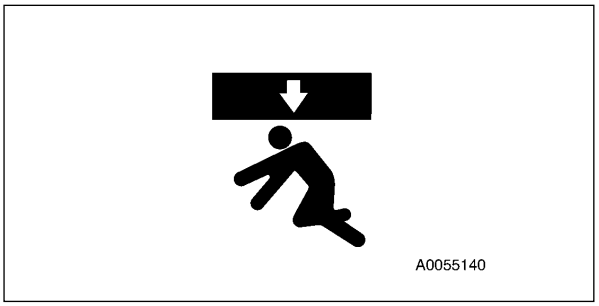
To prevent accidents, do not attempt maintenance when the engine is running.
Always observe the following in case of maintaining with the engine running for unavoidable reason.

- 1 person should stand at the driving operation position on the travel operation panel side, and keep checking each other while ensuring that the engine can be stopped at any time.
- Be especially careful when working near a slewing part because you may get entangled.
- Do not touch operation levers. If it is unavoidable to use the operation levers, always give a sign to the other person and let him/her evacuate to a safe place.
- Do not touch the alternator belt or other parts, as this may break tools or sever limbs.



Cautions when working under machine

- Park the machine on a level and firm place, and fully retract and lower the boom.
- Before maintenance under the Machine, extend the outriggers to maximum so the machine lifts. If the machine is unstable and sways, insert support platforms (height increasers) below the front and rear parts of the Machine frame to stabilize the machine.



Precautions when working on machine

- Keep footings tidy during maintenance on the machine to avoid falling, and always observe the following precautions:
  - Do not spill oil or grease.
  - Do not leave tools scattered around.
  - Be careful of footings when walking.
- Never jump off the machine.
  Use a platform and handrails, and secure your body in three locations (both feet and one hand, or both hands and one foot) when climbing up or down the machine.
- Use protective equipment that suit the work.
- Never step on the boom, jib, outrigger or machinery cover to prevent accidents such as falling or tripping due to slippage.
- Do not put a load on the machine such as on the cover.

Cautions when replenishing fuel or oil [engine specification / engine and electric specification]

Letting fire approach the fuel or oil may result in catching fire.

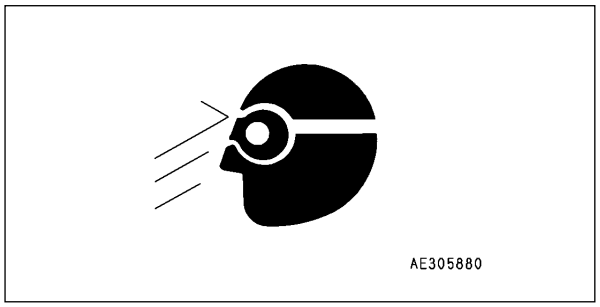
Light oil is used as the fuel and thus requires extra effort to observe the following.

- Stop the engine when refilling.
- Do not smoke when refilling.
- Immediately wipe away spilt fuel or oil.
- Securely tighten the fuel and oil caps.
- Supply fuel/oil at a location with good ventilation.
- Do not leave the site when replenishing the fuel or oil.

Beware of chips when working with hammer

When using a hammer, always wear protective equipment such as safety goggles and a helmet. Also, insert a brass bar or similar object between the hammer and target object.

Hitting hard metal parts such as a pin or bearing may cause splintering or chipping, which in turn could cause eye injuries if safety precautions are not met.



Cautions during welding repair

Weld in a location with good facilities, and only authorized personnel are permitted to weld.

Unauthorized personnel are strictly prohibited since risks such as gas generation, fire and electrical shock are present when welding.

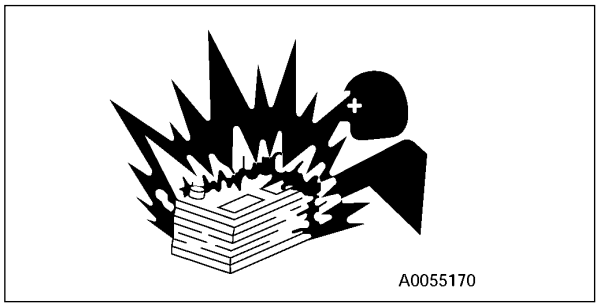
The personnel authorized to weld are requested to always observe the following.

- Turn off the electric power. (Move the starter switch to the “OFF” position.)
- Do not apply over 200 V continuously.
- Connect the earth within 1 m of the welding part. In addition, connect the earth as close as possible and confirm that there are no electrical parts in-between.
- For battery specifications, turn the disconnect switch to “OFF.”
  For engine specifications or engine and electric specifications, remove the battery’s earth.
- Peel off the paint from the welding section to prevent gas generation.
- Attempting to heat up hydraulic machinery, piping or a section near such parts may cause combustible vapour or mist to be generated and catch fire. Avoid heating such areas.
- Directly heating a pressurized piping or rubber hose may cause a sudden snip. Apply a fire protection cover.
- Wear protective equipment.
- Always ventilate the area.
- Keep combustibles away from the area and prepare a fire extinguisher.

- Do not ground to a location near electrical parts. Such may cause the electrical part to malfunction.
- Make sure no seals, bearings, etc. come between the welding part and the earth part. Otherwise, sparks may cause damage to seals, etc.
- Keep the boom, the pin surround of the jib, etc., and the hydraulic cylinder away from the electrical earth.
  Otherwise, sparks may cause damage to the plating.

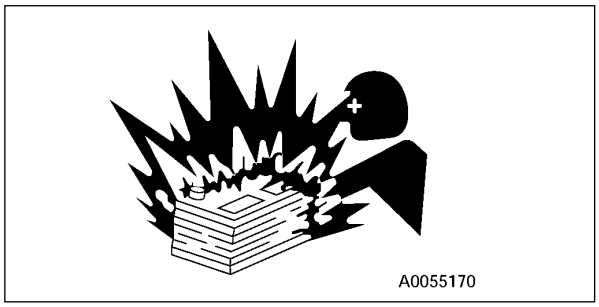
Disconnect battery terminal [engine specification / engine and electric specification]

Disconnect (-) terminal of the battery and stop the electrical flow before repairing the electrical system or starting an electrical weld.
For details, refer to “6.14.3 Battery hanging [engine specification / engine and electric specification].”



Disconnect battery terminal [battery specification]

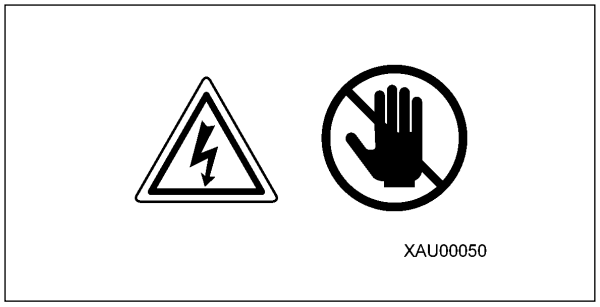
Isolate the lithium-ion battery with the disconnect switch and stop the electrical flow before repairing the electrical system or starting an electrical weld.
When you unlock the disconnect switch, be sure to turn the starter switch to "OFF" for at least one minute before doing so. If you shut the electricity off by unlocking the disconnect switch while the starter switch is "ON", the information of the machine will not be saved correctly which may lead to an accident.



Beware of high voltage

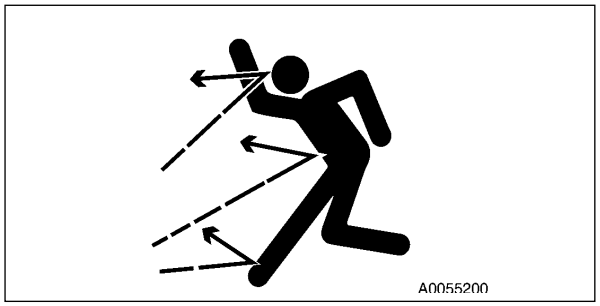
During engine operation or immediately after stopping the engine, the engine controller interior and around the engine fuel injector will be at high voltage. There is therefore a risk of electric shock.

Never touch the inside of the engine controller or engine fuel injectors. If there is a need to touch these parts for some reason, contact us or our sales service agency.



Cautions when adjusting rubber track tension

- Grease is sealed inside the rubber track tension adjuster. The grease is at a high pressure because of the tension of the rubber track. Attempting to release the grease without observing the following precautions may cause the grease valve to pop out and result in serious accident.
- Do not loosen the tension adjustment grease valve more than one full turn. Doing so may cause the grease valve to pop out.
- To avoid the risk during tension adjustment, do not place your body in front of the grease valve.
  For details, refer to “6.11.3 [1] Inspecting and adjusting the rubber track tension.”

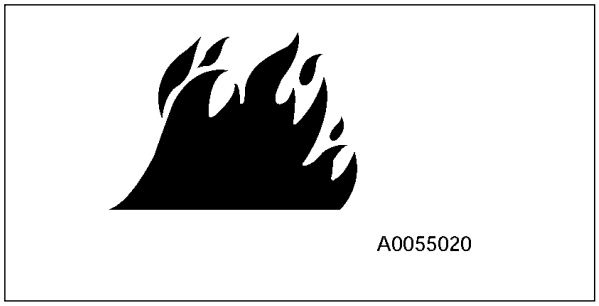


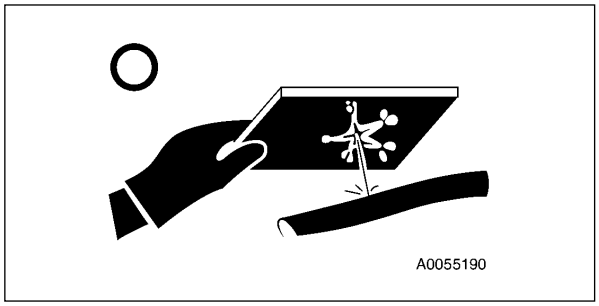
Cautions when handling high pressure hose

Oil leaking from a high pressure hose may cause fire or accident due to faulty operation.

Whenever a damaged hose or loosened bolt is found, abort working and ask us or our sales service agency for a repair.

- Replacement of a high pressure hose requires experienced skill. In addition, the tightening torque is decided by the hose types and size.
  Customers are prohibited to repair.
- If any of the following conditions are found, replace the applicable parts:
  - Hose sleeve damage or leak.
  - Scratch or truncation of the coat, or exposure of reinforcing layer of a wire.
  - Coat is partially swollen.
  - Indication of twist or collapse on a movable part of hose.
  - Foreign object buried in coating.
  - Hose sleeve deformation.

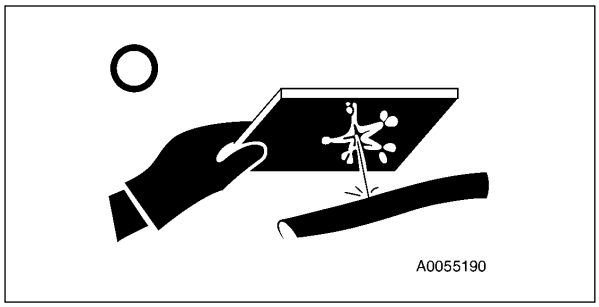




High pressure oil cautions

Failure to check to make sure the pneumatic circuit pressure is relieved before inspection or replacement of a high pressure piping or hose may result in accidents.
Strictly observe the following.

- Do not start any inspection or replacement before the pressure dissipates.
- Put on safety goggles and leather gloves.
- When a piping or hose leak exists, the piping/hose itself or the vicinity of the ground is wet. Check for a piping crack and hose crack or inflation.
  If detection is difficult, ask us or our sales service agency for repair.
- High pressure oil leaking through a small hole may puncture the skin or destroy eyesight upon contact. If this happens, wash away with flowing water and see the doctor as soon as possible.



Cautions when temperature is high

Parts such as the engine, motor, motor controller, oil in various parts, exhaust system manifold and muffler are at high temperature immediately after stopping the engine.

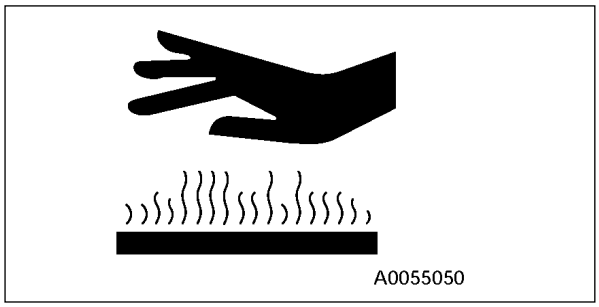
Attempts to execute maintenance in this condition may result in burns.
Wait until the temperature lowers, then execute the inspection/maintenance following the procedure described in this manual.

“6.11.2 Inspections before starting the machine”:

[1] Cooling water quantity inspection and replenishment

[3] Inspection of the quantity of oil in the engine oil pan and replenishment

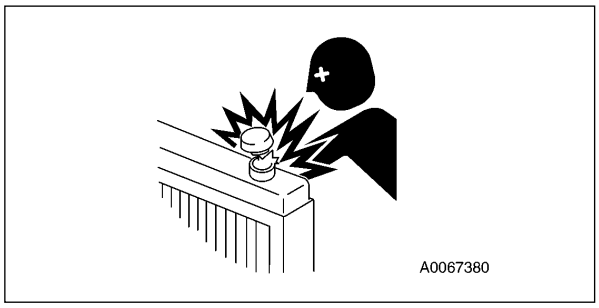
etc.



Beware of hot cooling water [engine specification / engine and electric specification]

When checking or discharging cooling water, ensure that the radiator cap has cooled down so that it can be touched with bare hands, thus preventing burn injuries from hot water or high-pressure steam.

When removing the cap, first loosen it slowly to relieve the radiator internal pressure.



Checks after inspection/maintenance

Failure to execute an inspection/maintenance item or failure to check the function and operation of the maintained part may cause an unexpected fault which may result in accidents.

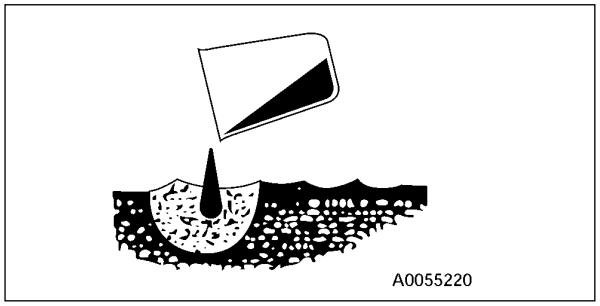
Strictly observe the following.

- Checks while machine is stopped
  - Check for unexecuted inspection/maintenance.
  - Check that inspection/maintenance was completed without errors.
  - Check for any dropped tools or parts. Ones caught in the inside or lever related link mechanism in particular pose danger.
  - Check for any fuel leak, water leak, oil leak, bolt loose and similar issues.
- Checks while machine is running
  - Check that the inspected/maintained parts operate normally.
  - Check that issues such as an oil leak do not occur when load is applied to the oil pressure by increasing the engine or motor rotation.

Cautions when treating waste

To prevent environmental pollution, strictly observe the following:

- Never allow waste oil to flow into water systems, such as river or sewage system.
- Always drain into a container when draining the oil from the Machine.
  Do not directly drain to the ground under any circumstances.
- Observe the applicable legal regulations and rules when disposing of harmful substance such as the oil, fuel, solvent, filter or battery.



[1] Hour meter confirmation

Read the hour meter when you use the machine to confirm that there are no maintenance items that are due.

[2] Genuine parts for replacement parts

For replacement parts, use the genuine parts indicated in the parts catalog.

[3] Cautions about oils and greases used

For the oils and grease used, use the specified items. In addition, use items of the indicated viscosity based on the temperature.

[4] Use clean oils and greases

Use clean oils, greases, etc. and use clean containers, too, to prevent contamination.

[5] Keep the machine clean

Clean the machine well to make defective parts easy to discover. In particular, keep the grease nipple, the breather, and the oil level gauge (oil inspection window) clean to avoid contamination.

[6] Cautions about the water and oil temperatures

Draining water, draining oil, or replacing filters immediately after stopping the machine is dangerous. Therefore, do so only after waiting for their temperatures to fall.

In contrast, when draining oil when the oil is cold, warm the oil to raise its temperature to 20 to 40°C.

[7] Inspecting the oil drainage and filter

When replacing the oil, filter, etc., inspect the oil drainage and old filter to confirm that there is not a large amount of metal powder or foreign matter.

[8] Cautions when refilling the oil

When there is a strainer over the oil refill port, the strainer must not be removed when pouring in the oil.

[9] Cautions about contamination

When inspecting or replacing oil, do so in a dust-free location to prevent contamination.

[10] Attaching a warning label

When draining out cooled water or oil, remove the key from the starter switch to prevent another person mistakenly starting up the machine. In addition, attach a warning label to the machine's emergency stop switch.

[11] Observing cautionary items

Observe the cautionary items attached to the machine and the cautionary items in this manual when performing jobs.

[12] Cautions about flames

When cleaning parts, use a nonflammable cleaning agent.

[13] Keep the installation surface clean

When removing the O-ring and the gasket seal from where they are fitted, clean the installation surface and replace with the new parts.

When doing this, do not forget to install the O-ring or gasket.

[14] Do not drop pocket contents

When opening the cover and performing the inspection and maintenance while facing downward, first remove the contents of pockets so that nothing falls inside.

[15] Undercarriage inspection

When a job is being conducted in a stony and rocky area, be careful about damaging the undercarriage, loosening of bolts and nuts, cracks, wear, and tears, and loosen the crawler's tension more than normally.

[16] Inspections when washing the vehicle

- Do not spray steam directly on the electrical parts or connectors.
- You absolutely must not apply water around areas where there are cautionary items attached forbidding washing with water (monitor, controller, receiver, battery, electrical components, charging port).
- When cleaning, while applying the water, wipe away mud and dust, etc. with a clean waste cloth.

[17] Confirmations and inspections before and after a job

When performing a job in muddy water, in the rain, in coastal areas, or in the snow, confirm the tightness of each plug, valve, etc. before the job, wash the vehicle after the job, and then inspect it for cracks to parts, damage, loosening of bolts and nuts, or anything having fallen off.

In addition, promptly carry out all the greasing. In particular, apply grease to the work machine pins of parts whenever they have entered muddy water. If earth and sand adhere to the variable gauge peripheral motion part, then remove it.

[18] Dusty work sites

When performing a job in a dusty location, pay attention to the following points.

- When inspecting or replacing oil, move the machine to a dust-free place to prevent contamination.
- Inspect the air cleaner frequently for clogging.
- Clean the radiator and oil cooler core promptly and ensure there is no clogging.
- Clean or replace the fuel filter promptly.
- Clean the electrical components, in particular, the starter, the alternator, and the battery to ensure there is no build up of dust.

[19] Avoid use of mixed oils

Oils other than the manufacturer's and different types of oil mixed together must absolutely not be used.

When replenishing the oil, replace all of it.

[20] Preparing the footing

When accessing a place unreachable by hand during maintenance, prepare the footing before performing the job.

6.2 BASIC MAINTENANCE

[1] Handling oil

- Oil is used under extremely harsh conditions (high temperatures, high pressures) such as in engines or work machines, so it deteriorates with use over time.
  Be sure to use oil that matches the grade and usage temperature described in this manual. And even if the oil is not dirty, be sure to replace the oil at the prescribed time.
- Since oil corresponds to blood in the human body, exercise due caution when handling the oil so that it is not contaminated with impurities (e.g., water, metal powder, garbage). The majority of machine problems are caused by contamination with impurities.
  In particular, when storing or replenishing the oil, etc., exercise due caution so that it is not contaminated with impurities.
- Oils of differing grades or differing brands must not be mixed together.
- The quantity of oil added should be that prescribed.
  Both too much or too little oil can cause problems.
- If the work machine oil is cloudy, it is possible that water or air has contaminated the circuit. In such an instance, please contact us or our sales service agency.
- When replacing the oil, be sure to replace the related filters, too.
- Refrain from using an oil other than that recommended by Maeda as it will cause clogging of the filter. It is not a problem if oil in the quantity that is left in a pipe or cylinder, etc. becomes mixed in.

[2] Handling fuel [engine specification / engine and electric specification]

IMPORTANT

Be sure to use a fuel that conforms to the standards. For details of the oil to be used, refer to "6.5.1 Use of fuel and lubricating oil depending on temperature."
Since this machine's engine has excellent fuel characteristics and exhaust gas characteristics, it employs an electronically controlled high pressure fuel injection device. This device requires highly accurate parts and excellent lubricating performance, so when a low lubricity, low viscosity fuel is used, there is the risk of significantly reduced durability.

- The fuel pump is a precision device so if fuel is used containing water or garbage, it will become inoperable.
  Therefore, when storing or replenishing the oil, exercise due caution so that the pump is not contaminated with impurities.
- Also, do not take off the oil refill port strainer when replenishing the fuel.
- Be sure to use fuel that matches the grade and usage temperature described in this manual.
- To prevent air containing moisture condensing in the fuel tank and contaminating the fuel, after the work is finished each day, fill up the fuel tank.
- Before starting the engine or after about 10 minutes have passed since refueling, discharge sediment and water from the fuel tank.
- When the fuel has run out or the fuel filter has been replaced, it is necessary to remove the air from within the circuit.
- When the fuel tank has become contaminated with foreign matter, clean the tank and fuel system.
- When refueling, exercise due caution so as not to spill the fuel round about. Should a spillage occur, be sure to wipe it up.
- For the fuel, be sure to use diesel fuel. Do not use any alternative fuel as the type is unknown or there is the possibility of deterioration.
  Kerosene with an extremely low cetane number has a bad effect on the engine.
- Do not mix gasoline or alcohol in the diesel fuel. Doing so may cause an explosion.

[3] Oil and fuel preservation and stowage

- Preserve and stow the oil and fuel indoors to prevent contamination with impurities such as moisture and garbage.
- When storing oil or fuel long term in drums, place the drums horizontally so that the access ports to the drums are below the liquid surface to prevent moisture entering. If stowage outdoors is unavoidable, then take precautions like covering with waterproof sheets.
- To avoid deterioration due to long-term stowage, in accordance with the principle of first in, first out, first use the items that were first in.

[4] Handling grease

- Grease prevents the generation of burrs or noise in joints, etc.
- Nipples that do not appear in the regular maintenance manual are overhaul nipples and so do not require replenishment of grease. However, apply grease if the machine is haltering after being used for a long period.
- After applying grease, wipe up all the old grease pushed out.
  In particular, carefully wipe parts to which sand, garbage, etc. adhere, accelerating the wear and tear of slewing parts.

[5] Handling filters

- Filters are extremely important parts that prevent oil, fuel, and impurities in the circulating air from entering important equipment and causing malfunction. Replace the filters regularly as prescribed in this manual.
  However, it is also necessary to consider shortening the replacement timing depending on the harshness of the operating environment and the oil and fuel (sulfur content) used.
- (Cartridge-type) filters must absolutely not be reused even after washing.
- When replacing an oil filter, confirm that there is no metal powder, etc. adhering to the used filter.
  If that is the case, contact us or our sales service agency.

- Regarding spare filters, the packaging should not be opened until immediately before use.
- Be sure to use the genuine product for filters.

[6] Handling the cooling water [engine specification / engine and electric specification]

- River water contains large quantities of calcium and other impurities, so, if used, limescale will adhere to the engine and radiator causing heat exchange defects, for example, and overheating.
  Do not use water that is unsuitable for drinking.
- When using antifreeze, use in line with the cautionary items described in this manual.
- As antifreeze is combustible, exercise due caution regarding fires.
- The proportion of antifreeze that should be mixed in varies depending on the outside temperature.
  For details about the mixing proportion, refer to "6.13.8 [3] Cleaning the cooling system internals [engine specification / engine and electric specification]."
- If overheating occurs, do not perform an emergency engine stop, but reduce the load, perform a cooling operation such as an idling operation for at least five minutes, and after gradually cooling then stopping the engine, replenish the cooling water.
- Insufficient cooling water will cause overheating together with corrosion problems due to air contamination.

[7] Handling electrical components

- If electrical components get wet with water or have tears in their coating, they will short-circuit, leading to machine malfunction that is extremely dangerous.
- The inspection and maintenance include inspection of the belt tension and checking for damage to the belt. Depending on the type of battery, there may also be a check of the volume of liquid.
- Devices (electrical components) attached in the machine must absolutely not be removed from the machine or disassembled.
- Electrical components other than equipment prepared as options must not be installed.
- When washing the vehicle or when it is raining, be careful that water does not get on to the electrical components.
- When conducting a job in a coastal area, perform maintenance of electrical components often to prevent corrosion.

[8] Handling hydraulic equipment

- Hydraulic equipment heats up during a job and is hot at the end of a job. Also, during a job, high pressure is applied.
  Pay attention to the following points when conducting inspections and maintenance of hydraulic equipment.
  - Perform measures to prevent things falling off the machine, such as placing the machine in a travel position on firm level ground.
  - Be sure to stop the machine.
  - Immediately after operation, the hydraulic oil and lubricating oil are at high temperatures and high pressures. Only begin the maintenance after the oil temperature has dropped in all the parts. Even if the temperature has dropped, internal pressure may remain. When loosening plugs, screws, or hose joints, do not stand face on, loosen them gradually and slowly, and remove them while releasing the internal pressure.
  - During inspection and maintenance of the hydraulic circuit, be sure to release the air from the hydraulic oil tank to reduce the internal pressure.
- The inspections and maintenance include checking the amount of hydraulic oil, replacing filters, and replacing the hydraulic oil.
- When the high-pressure hose, etc. has been removed, confirm that the O-ring is not damaged and replace it if it seems to be damaged.
- When replacing or washing the hydraulic oil filter elements, strainers, etc., or when repairing or replacing the hydraulic equipment, removing the hydraulic piping, etc., then the air in the internal circuit must be released.
- If oil gets on the electrical parts, be sure to wipe them clean.

6.3 LEGAL INSPECTION

6.3.1 Safety regulations for cranes and other equipment

As stated in clauses 76 to 80 of “Safety regulations for cranes and other equipment,” the business operator is obliged to conduct inspections before starting a job as well as monthly and annual voluntary inspections, to immediately conduct repairs when a defect is discovered, and to save the records of monthly and annual voluntary examinations for three years.

Inspections before the start of the current job as well as monthly and annual voluntary examinations should be conducted according to the “Maintenance note” in the separate manual.

In addition, when conducting an annual examination, carry out a load test (suspend a load corresponding to the rated weight, raise it up, and carry out actions such as slewing at the rated speed).

6.3.2 Cautions during inspection

1. Check that the safety equipment has no defects.

2. Check that there are no defects in the sling equipment such as the hook block.

3. Check that there is no damage to the end of the winch wire rope or wire clip.

4. If there is any damage to the wire rope, replace it promptly.

5. Check that there are no oil leaks from the hydraulic hose, no surface scratches caused by friction, and so on. If there are any surface scratches, replace the hose.

6. Check that there are no cracks or deformations in the structural parts.

7. Check that there is no looseness in any of the attached bolts and joints, and that none have fallen off.

8. Confirm the reliability of the operation and stopping of the telescoping, derricking, and slewing movements of the boom and the jib.

If defects are discovered when conducting an inspection, contact us or our sales service agency.

6.4 PARTS REPLACEMENT

6.4.1 Periodic replacement of critical parts

To ensure safe use of the machine over a long period, please regularly replace the parts in the list of important parts, particularly those related to safety and fire risk.

The material of these parts changes over time so that wear and deterioration is prone to occur. But as the extent of these issues is difficult to judge based on regular maintenance and so on, after a certain period of use, it is necessary to replace the parts with new parts, even if no particular defect has been discovered, to maintain normal and complete functionality.

It is necessary to repair or replace these parts even before the replacement time should some defect be discovered.

In addition, regarding the hose part, when deterioration such as deformation or cracks in the hose clamp band are discovered, replace the clamp band, too, at the same time as the hose.

Also, perform the regular inspections in the following table on hydraulic hose in parts other than those regularly replaced, and if defects are discovered, tighten or replace as appropriate.

- When replacing the hose, also replace the O-ring and gaskets at the same time.
- For replacement of important parts, contact us or our sales service agency.
- When performing the regular inspections shown in the following table, also inspect the hydraulic hose and the fuel hose.

Inspection classification	Inspection item
Daily inspections (inspections before starting a job)	Oil leaks from the connecting parts or caulking parts of the fuel hose or hydraulic hose
Monthly inspections	Oil leaks from the connecting parts or caulking parts of the fuel hose or hydraulic hose Fuel hose or hydraulic hose damage (cracks, wear, tears)
Specific voluntary examinations (annual inspections)	Oil leaks from the connecting parts or caulking parts of the fuel hose or hydraulic hose Fuel hose or hydraulic hose interference, crushing, aging, twisting, or damage (cracks, wear, tears)

Table of important parts

Regularly replaced parts		Number of items	Replacement frequency
Hydraulic hose	Hydraulic piping and crane rotation part	53	The earlier of every two years or 2,000 hours
	Hydraulic piping and crane fixing part	56	
	P/T line [engine specification]	10	
	P/T line [engine and electric specification]	13	
	P/T line [battery specification]	7	

6.4.2 Consumables

Replace consumables, such as filter elements or wire ropes, during regular maintenance or before the wear-and-tear limit.

Securely replace the consumables so that the machine is used more efficiently.

Be sure to use genuine products for part replacement.

When requesting a part, confirm the part number in the parts catalog.

Table of consumables

Part		Replacement time		Target specification	
		Initial time	Regular period	・Engine specification ・Engine and electric specification	Battery specification
Filter	Engine oil filter	50 hours	Every 200 hours	✓	
	Hydraulic oil return filter		Every 500 hours	✓	✓
	Fuel filter		Every 400 hours	✓	
Belt	Fan belt		Every 500 hours	✓	
Air cleaner	Air cleaner element		As required or annually	✓	
Hose, clamp band	Fuel hose, clamp band		As required or every 2 years	✓	
	Air cleaner hose			✓	
	Radiator hose, clamp band			✓	
Cylinder packing	Each type of cylinder packing		As required or every three years	✓	✓
Slide plate	Boom slide plate replacement			✓	✓
	Jib slide plate replacement			✓	✓
	Jib stowing slide plate replacement			✓	✓
	Track frame slide plate replacement			✓	✓
Wire rope	Winch wire replacement			✓	✓
	Boom extension wire replacement			✓	✓
	Boom retraction wire replacement			✓	✓
	Jib extension wire replacement			✓	✓
	Jib telescope wire replacement			✓	✓

☞ For part replacement, contact us or our sales service agency.

6.5 USE OF FUEL AND LUBRICATING OIL

- To maintain the machine in its best condition for a long period, we recommend using the oil, grease, and coolant specified by Maeda in this manual.
- If these recommended oils are not used, the operating lifetimes of the engine and the cooling system may be reduced and wear and tear may be increased, etc.
- The additives in commercially available oils may lower oil performance. We do not recommend any commercially available oil.
- Vary usage depending on the temperature as shown in the table.

6.5.1 Use of fuel and lubricating oil depending on temperature

Vary usage depending on the temperature according to the following.

Table of lubricating oils

Oil refilling place	Oil type	Depending on the temperature How to vary usage (°C)		Recommended oil
		Minimum	Maximum	
Engine oil pan	Engine oil (note 1)	-25	50	SAE 10W-30 (when shipped)
		-25	50	SAE 10W-40
		-10	50	SAE 15W-40
Hydraulic oil system	Abrasion-resistant hydraulic oil (note 2)	-30	50	ISO VG22
		-25	50	ISO VG32 (when shipped)
		-20	50	ISO VG46
Winch motor speed reducer case	Gear oil	-20	50	SAE#90 equivalent GL4 Class equivalent
Travel motor speed reducer case	Gear oil	-20	50	ISO VG320
Slewing motor	Gear oil	-20	50	ISO VG320
Cooling system	Coolant (note 3) Water (soft water)	-	-	LLC (ethylene glycol-type)
Fuel tank	Light oil (note 4)	-10	50	JIS No. 2
		-20	-10	JIS No. 3
		-30	-20	JIS Special No. 3

Note 1: About the engine oil

(1) For the engine oil, be sure to use an oil with characteristics at least equivalent to MIL-L-2104C or CF Class (API classification).

(2) Recommended oil types

Refer to the following table and use an engine oil with a suitable API classification or JASO classification depending on the engine type (no EGR, or with internal EGR) and type of fuel used (high-sulfur, low-sulfur, or ultra-low-sulfur fuel).

Fuel type	Engine oil API classification
High-sulfur fuel [sulfur content is from 0.05% (500 ppm) to 0.5% (5,000 ppm)]	CF (or JASO classification DH-1) (TBN≧10) (when using CH-4 or CI-4 engine oil together with high-sulfur fuel, replace the engine oil (approximately half) at short intervals.)
Low-sulfur fuel [sulfur content is less than 0.05% (500 ppm)] or [sulfur content is less than 0.001% (10 ppm)]	CF, CH-4, or CI-4

(3) When operating a non-EGR engine or an engine with internal EGR with high-sulfur fuel with a sulfur content of at least 0.05% (500 ppm), we recommend using an engine oil conforming to the API-classified CF or the JASO-classified DH-1 with a total salt base value (TBN) of at least 10.

(4) CJ-4, DH-2, DL-1 are engine oils that assume use with an engine equipped with a DPF (diesel particulate filter), so do not use them with any other type of engine.

Note 2: About the hydraulic oil

(1) For the abrasion-resistant hydraulic oil (ISO VG46, VG32, VG22) in the hydraulic oil system, use the oil recommended by Maeda.

(2) Only use ISO VG22 during the cold when the engine startup performance is poor. If it is used other than during the cold, the operating lifetime of the winch, etc. may be reduced.

Note 3: About the coolant

(1) If the cooling water freezes, the cylinder or radiator may be damaged. Always mix the antifreeze (long life coolant) 50-50 with clean water (soft water) and pour it into the radiator and the reserve tank.

(2) There are several types of antifreeze, but please use the ethylene glycol (EG) type long life coolant that can be used with this engine throughout the year regardless of season.

Note 4: About the fuel

(1) Cetane value: use fuel with a cetane value of at least 45. In particular, when operating the machine at a temperature of -20°C or under or on high ground at an altitude of 1500 m or higher, we recommend fuel with a cetane value of at least 50.

(2) We strongly recommend using diesel fuel with a sulfur content of less than 0.1% (1,000 ppm).

(3) Do not use fuel with a sulfur content exceeding 1.0% (10,000 ppm).

(4) If high-sulfur (from 0.5% (5,000 ppm) to 1.0% (10,000 ppm)) fuel is used as the diesel fuel, replace the engine oil and oil filters within a shorter period than stipulated (half the normal period).

(5) We recommend diesel fuel conforming to EN590 or ASTM D975.

(6) In the US, use No. 2-D fuel conforming to SAE J313.

(7) The Kubota diesel engine of up to 56 kW (75 hp) complies with the EPA Tier 4 and provisional Tier 4 standard, so when operating these engines in regions where the US EPA regulations are enforced, use of ultra-low-sulfur fuel is mandatory. Therefore, use No. 2-D S15 diesel fuel as a substitute for No. 2-D. Also, when the ambient temperature is less than -10°C, use No. 1-D S15 diesel fuel as a substitute for No. 1-D.

Table of oil amounts

Oil refilling place	Oil amount (L)
Engine oil	3.8
Hydraulic oil system	40
Slewing speed reducer case	0.8
Travel motor speed reducer case	0.33
Winch motor speed reducer case	0.5
Cooling system	2.8
Fuel tank	12

6.6 FUSES

⚠ CAUTION

[Engine specification / engine and electric specification]
When inspecting or replacing fuses, be sure to remove the battery earth.
[Battery specification]
When inspecting or replacing fuses, be sure to move the disconnect switch to the "OFF" position.

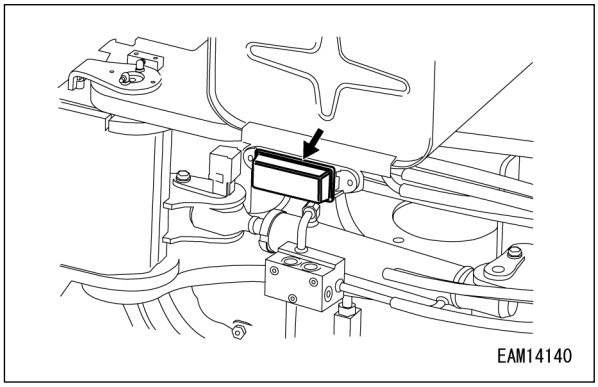
IMPORTANT

Fuses protect the electrical components and wiring from burnout.

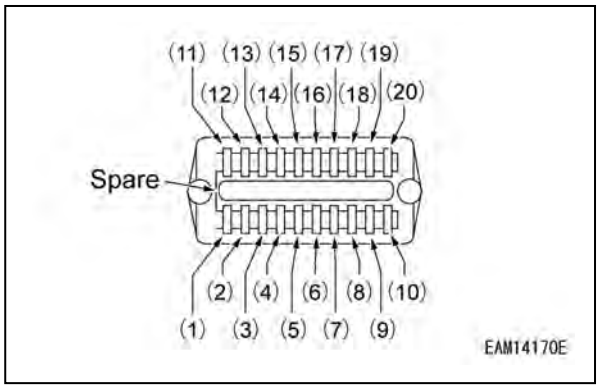
- **Use blade fuses for the fuses. If a fuse corrodes and white powder is wiped up, be sure to replace the fuse.**
- **When a fuse has blown, be sure to check the cause in the circuit and repair the circuit, then replace the fuse.**
- **When replacing a fuse, be sure to replace it with a blade fuse of the same capacity.**

[1] Fuse box [common to the engine and the battery]

This is installed on the left side of the machine at the bottom of the hydraulic oil tank.



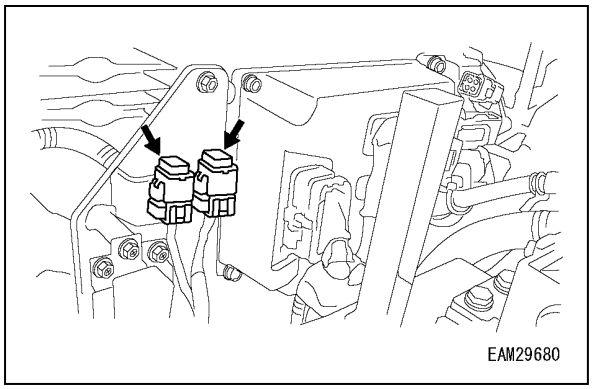
[Fuse capacity and circuit name]



No.	Capacity	Connection table
(1)	5A	Machine control unit control power supply
(2)	20A	Machine control unit output power supply
(3)	-	-
(4)	10A	Engine control unit control power supply [engine specification]
(5)	10A	Key switch [engine specification]
(6)	5A	IOT (BAT)
(7)	-	-
(8)	-	-
(9)	5A	Horn
(10)	10A	Engine ignition power supply [engine specification]
(11)	5A	Engine ignition power supply control power supply
(12)	5A	Override Unit
(13)	15A	Upper normal power supply
(14)	5A	Radio controller power supply
(15)	5A	Inclination sensor power supply
(16)	5A	Emergency stop
(17)	15A	OR slew switching
(18)	10A	OR extension and manual slewing brake release
(19)	5A	IOT (ACC)
(20)	5A	Start signal [engine specification]

[2] Fuses [battery specification]

Installed on the side of the motor controller.



[Fuse capacity and description]

No.	Capacity	Description
FO1	10A	When the machine does not start up, it may be due to a disconnected (startup) wire.
FO2	15A	Even if the monitor lights up and the machine body starts up, if the motor, etc. does not work, it may be due to a disconnected (normal operation) wire.

6.7 FUSIBLE LINKS

Engine specification / engine and electric specification

⚠ CAUTION

When inspecting or replacing fusible links, be sure to remove the battery earth.

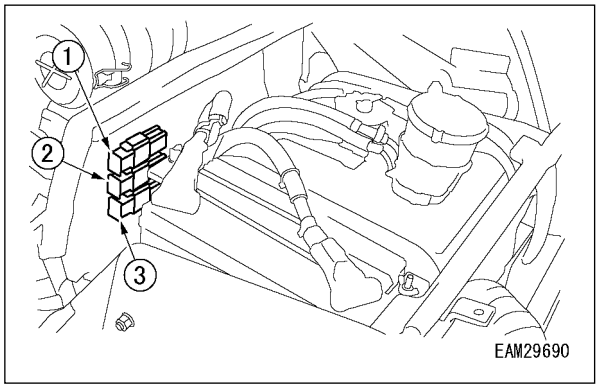
IMPORTANT

A fusible link is a large fuse wire attached in a circuit with large current flows.
Similarly to a normal fuse, a fusible link protects electrical components and wiring from burnout due to abnormal currents.

- **When a fusible link has blown, be sure to check the cause in the circuit and repair the circuit, then replace the fusible link.**
- **When replacing a fusible link, be sure to replace it with a fusible link of the same capacity.**

[1] Fusible links

Installed inside the battery container on the left



[Fusible link capacity and circuit name]

No.	Fuse No.	Capacity	Connect to
(1)	FL1	45A	Start
(2)	FL2	65A	Main power supply
(3)	FL3	45A	Glow

When the following phenomena occur, it may be due to disconnection of the fusible link so check it and replace it, if necessary.

- When it is cold and it is difficult to start up the engine even when the starter switch is turned to the “ON” position, the problem may be due to the disconnection of the FL3 fusible link.
- When the starter does not work even when the starter switch is turned to the “START” position, it may be due to the FL1 fusible link.
- When the machine does not work at all, it may be due to the FL2 fusible link.

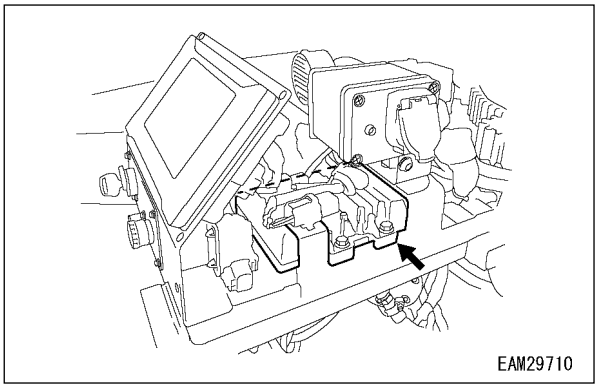
6.8 CONTROLLERS

IMPORTANT

- **Do not get water, mud, etc. on the controllers. Doing so may cause malfunction.**
- **If a defect occurs with a controller, do not repair it yourself, but contact us or our sales service agency to request an inspection and repairs.**

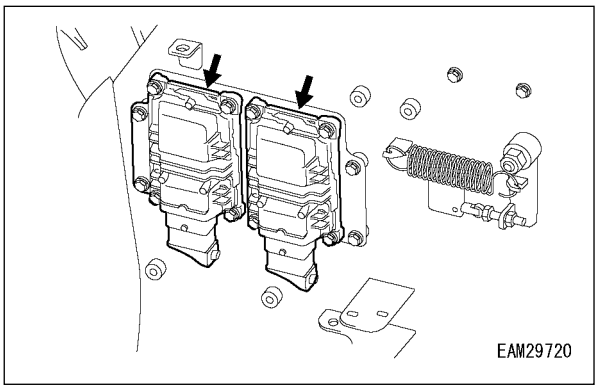
[1] Main controller

Mounted under the cover (monitor case) surrounding the monitor and at the bottom of the monitor.



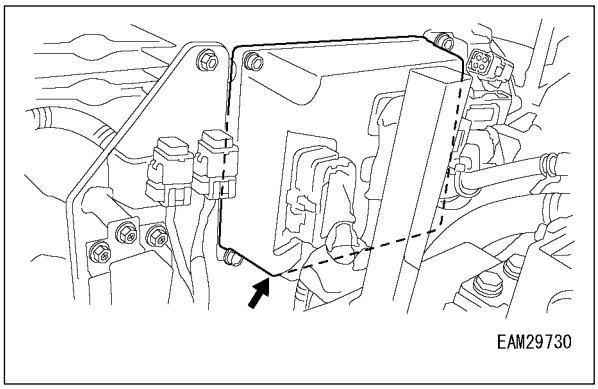
[2] Sub controller x 2 (I/O unit)

Mounted under the cover (controller cover) on the left side of the post.



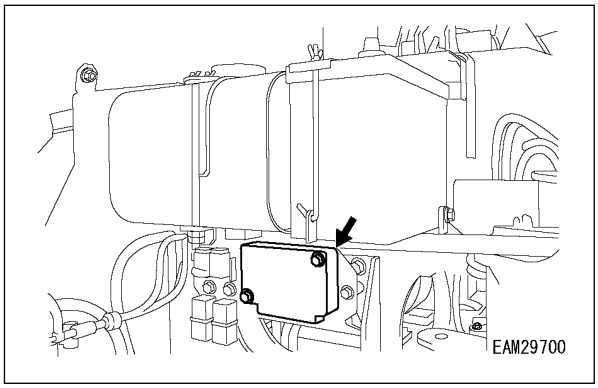
[3] Motor controller [battery specification]

If the battery cover and the cover for the electrical components at the top of the battery unit are taken off, the motor controller installation can be confirmed.



[4] Engine controller [engine specification / engine and electric specification]

If the engine cover and the left engine cover are taken off, the engine controller installation below the 12 V battery can be confirmed.



6.9 COVERS

⚠ WARNING

[Engine specification / engine and electric specification]

- **Before taking off the machinery cover, be sure to stop the engine and remove the key switch.**
- **Do not take off the machinery cover when the engine is hot, such as immediately after finishing a job.**

[Battery specification]

- **When taking off the machinery cover, set the starter switch to the "OFF" position.**
- **Do not take off the machinery cover when the machine is hot, such as immediately after finishing a job.**
- **Do not take off the cover in a location where the device may get wet, for example, due to rain.**

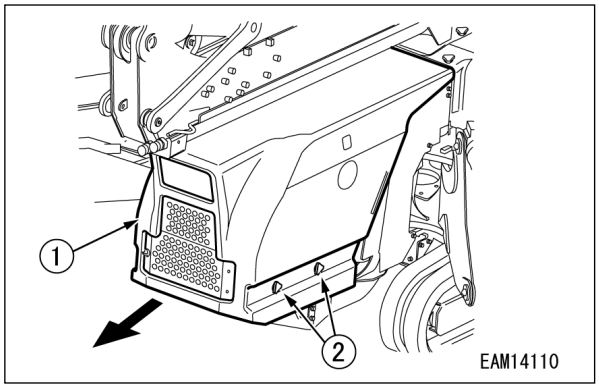
[1] Taking off the engine cover [engine and electric specification] or the battery cover [battery specification]

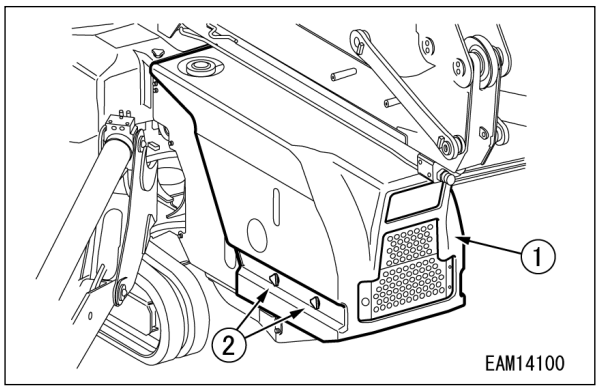
When conducting inspections and maintenance inside the engine cover or the battery cover, take off the engine cover or the battery cover according to the following procedure.

1. Remove the four fixing bolts (2) of the engine cover or the battery cover (1).

☞ Two of the fixing bolts (2) are used on the surface on the left side and two on the surface on the right side.

2. Take off the engine cover or the battery cover (1) in the direction of the arrow.





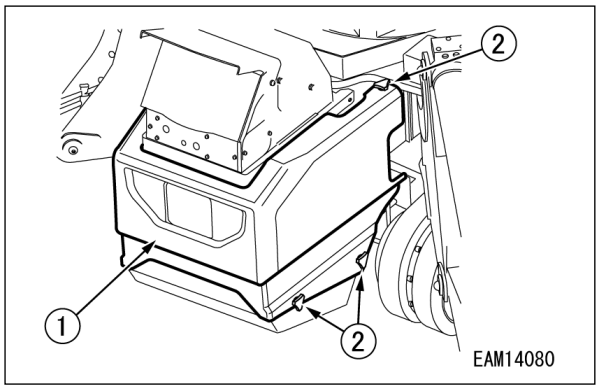
[2] Taking off the operating cover

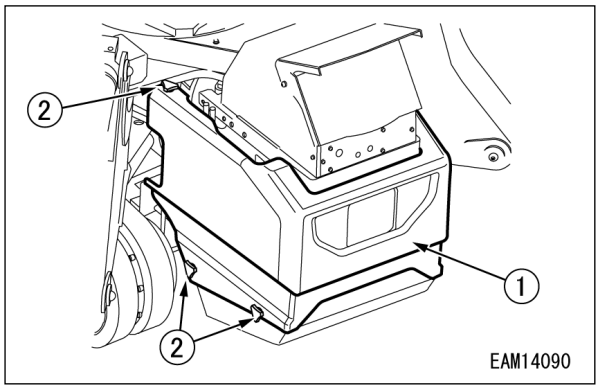
When conducting inspections and maintenance inside the operating cover, take off the operating cover according to the following procedure.

1. Remove the six fixing bolts (2) of the operating cover (1).

☞ Two fixing bolts (2) are used on the top surface, two on the surface on the left side, and two on the surface on the right side.

2. Take off the operating cover (1).





[3] Taking off the left/right machinery cover

When conducting inspections and maintenance inside the left/ right machinery cover, take off the machinery cover according to the following procedure.

1. Remove the five fixing bolts (2) of the left machinery cover (1).

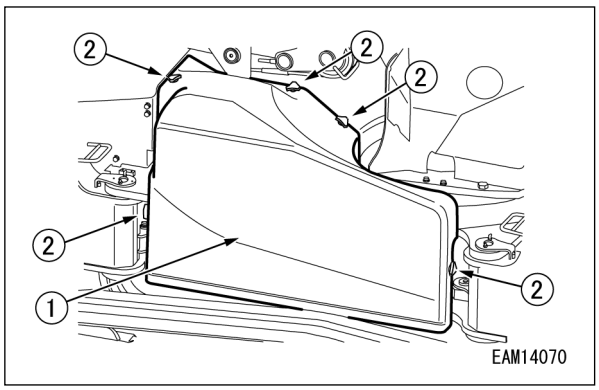
☞ One fixing bolt (2) is used on the rear surface, one on the front surface, and three on the top surface.

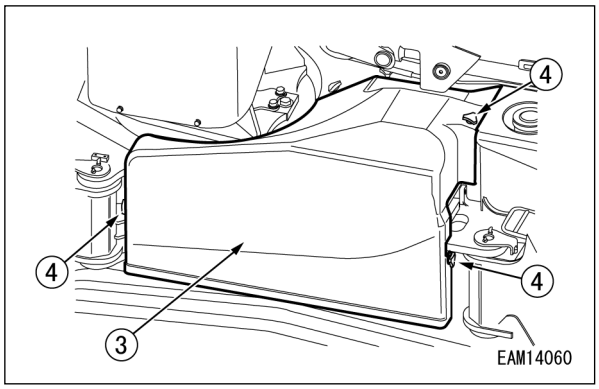
2. Remove the three fixing bolts (4) of the right machinery cover (3).

☞ One fixing bolt (4) is used on the rear surface, one on the front surface, and one on the top surface.

3. Taking off the left machinery cover (1).

4. Taking off the right machinery cover (3).





[4] Taking off the left engine cover [engine and electric specification] or the left battery cover [battery specification]

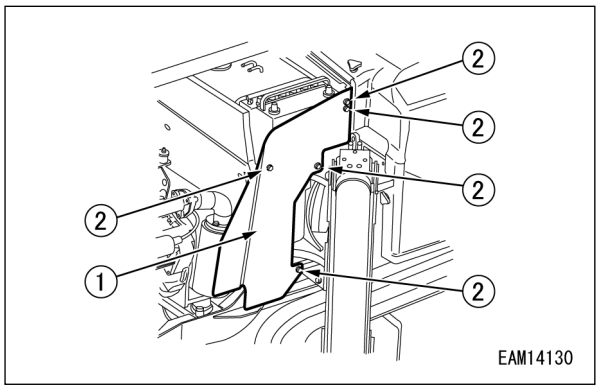
When conducting inspections and maintenance inside the left engine cover or the left battery cover, take off the left engine cover or the left battery cover according to the following procedure.

1. Remove the engine cover or the battery cover.

2. Remove the fixing bolts (2) of the left engine cover or the left battery cover (1).

☞ Five fixing bolts (2) are used on the surface on the side.

3. Take off the left engine cover or the left battery cover (1).



[5] Taking off the right engine cover [engine and electric specification] or the right battery cover [battery specification]

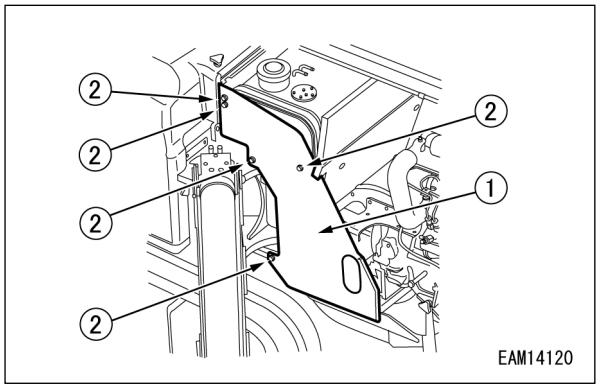
When conducting inspections and maintenance inside the right engine cover or the right battery cover, take off the right engine cover or the right battery cover according to the following procedure.

1. Remove the engine cover or the battery cover.

2. Remove the fixing bolt (2) of the right engine cover or the right battery cover (1).

☞ Five fixing bolts (2) are used on the surface on the side.

3. Take off the right engine cover or the right battery cover (1).



[6] Attaching the covers

When the inspection and maintenance inside the covers are completed, attach each cover according to the reverse procedure to removal.

6.10 TABLE OF INSPECTIONS AND MAINTENANCE

[Daily inspections / irregular inspections]

Inspection and maintenance items	Daily			Irregular
	Before starting a job Visual inspection	Before starting a job Before starting the machine	Before starting a job After starting the machine	
Jib derricking cylinder inspection (p.6-32)	✓			
Jib inspection (p.6-32)	✓			
Jib telescoping cylinder inspection (p.6-32)	✓			
Boom derricking cylinder inspection (p.6-32)	✓			
Boom inspection (p.6-32)	✓			
Boom telescoping cylinder inspection (p.6-32)	✓			
Retracting wire tensioner indicator inspection (p.6-32)	✓			
Link inspection (p.6-32)	✓			
Hose guide inspection (p.6-32)	✓			
Length sensor cord reel inspection (p.6-32)	✓			
Post inspection (p.6-32)	✓			
Outrigger inspection (p.6-32)	✓			
Outrigger cylinder inspection (p.6-32)	✓			
Ground detection unit inspection (p.6-32)	✓			
Engine surround inspection [engine specification / engine and electric specification] (p.6-33)	✓			
Battery surround inspection [battery specification] (p.6-33)	✓			
Hydraulic equipment inspection (travel motor, controller valve, hydraulic oil tank, hose, joint) (p.6-33)	✓			
Undercarriage inspection (rubber track, track roller, sprocket, idler) (p.6-33)	✓			
Fixed hook inspection (p.6-33)	✓			
Wire rope inspection (p.6-33)	✓			
Overwinding prevention device inspection (p.6-34)	✓			
Winch motor inspection (p.6-34)	✓			

Inspection and maintenance items	Daily			Irregular
	Before starting a job Visual inspection	Before starting a job Before starting the machine	Before starting a job After starting the machine	
Winch drum inspection (p.6-34)	✓			
Hook block inspection (p.6-34)	✓			
Inspection of each type of sheave (p.6-35)	✓			
Wedge socket pin inspection (p.6-35)	✓			
Inspection before powering on the transmitter (p.6-35)	✓			
Inspection before powering on the receiver (p.6-35)	✓			
Cooling water quantity inspection and replenishment [engine specification / engine and electric specification] (p.6-36)		✓		
Fin inspection and cleaning [engine specification / engine and electric specification] (p.6-37)		✓		
Engine oil pan's oil quantity inspection and replenishment [engine specification / engine and electric specification] (p.6-37)		✓		
Fuel quantity inspection and replenishment [engine specification / engine and electric specification] (p.6-38)		✓		
Water separator inspection and cleaning [engine specification / engine and electric specification] (p.6-39)		✓		
Inspection of quantity of oil in the hydraulic oil tank and replenishment (p.6-40)		✓		
Inspection of quantity of oil inside the slewing speed reducer case and replenishment (p.6-41)		✓		
Inspection of quantity of oil inside the travel motor speed reducer case and replenishment (p.6-42)		✓		
Electric wiring inspection (p.6-42)		✓		
Jib, boom, and frame crack, deformation, and damage inspection (p.6-42)		✓		
Wire rope deformation, damage, and wear inspection (p.6-42)		✓		
Air cleaner vacuator valve inspection [engine specification / engine and electric specification] (p.6-42)		✓		
Inspection after powering on the transmitter (p.6-43)		✓		
Rubber track tension inspection and adjustment (p.6-43)			✓	

Inspection and maintenance items	Daily			Irregular
	Before starting a job Visual inspection	Before starting a job Before starting the machine	Before starting a job After starting the machine	
Rubber track damage and wear inspection (p.6-45)			✓	
Outrigger operation inspection (p.6-46)			✓	
Crane operation inspection (p.6-47)			✓	
Overwinding prevention device inspection (p.6-51)			✓	
Moment limiter inspection (p.6-51)			✓	
Emergency stop switch operation inspection (main unit side) (p.6-52)			✓	
Emergency stop switch operation inspection (radio controller side) (p.6-52)			✓	
Engine exhaust gas color, noise, and vibration inspection [engine specification / engine and electric specification] (p.6-52)			✓	
Horn inspection (machine side) (p.6-53)			✓	
Horn operation inspection (radio controller side) (p.6-53)			✓	
Working light inspection (p.6-53)			✓	
Engine start and stop operation inspection [engine specification / engine and electric specification] (p.6-53)			✓	
Travel operation inspection (p.6-53)			✓	
Speed control function inspection (p.6-54)			✓	
Inspection after powering on the receiver (p.6-54)			✓	
Rubber track replacement (p.6-55)				✓
Rubber track removal (p.6-55)				✓
Rubber track installment (p.6-56)				✓
Wire rope replacement, inspection, and adjustment (p.6-58)				✓
Wire rope replacement criteria (p.6-58)				✓
Winch wire rope removal (p.6-59)				✓
Winch wire rope installment (p.6-61)				✓
Boom telescoping wire rope inspection (p.6-64)				✓
Boom extending wire rope adjustment (p.6-66)				✓

Inspection and maintenance items	Daily			Irregular
	Before starting a job Visual inspection	Before starting a job Before starting the machine	Before starting a job After starting the machine	
Boom retracting wire rope and retracting wire tensioner adjustment (p.6-68)				✓
Jib telescoping wire rope inspection (p.6-70)				✓
Jib telescoping wire rope adjustment (p.6-71)				✓

[Initial inspections and regular inspections]

Inspection and maintenance items	INSPECTION AND MAINTENANCE ITEMS		
	Initial 10 hours	Initial 50 hours	Initial 250 hours
Greasing the machine parts (p.6-73)	✓		
Engine oil and engine oil filter cartridge replacement [engine specification / engine and electric specification] (p.6-72)		✓	
Replacement of oil in the hydraulic oil tank (p.6-72)		✓	
Hydraulic oil return filter replacement (p.6-72)		✓	
Fan belt tension inspection/adjustment [engine specification / engine and electric specification] (p.6-72)		✓	
Slewing speed reducer case oil replacement (p.6-72)			✓
Travel motor speed reducer case oil replacement (p.6-72)			✓
Winch speed reducer case oil replacement (p.6-72)			✓

Inspection and maintenance items	Regular period					
	50 hours	100 hours	200 hours	250 hours	400 hours	450 hours
Greasing the machine parts (p.6-73)	✓					
Fuel hose and clamp band inspection [engine specification / engine and electric specification] (p.6-76)	✓					
Inspection of oil quantity inside the winch speed reducer case and replenishment (p.6-76)		✓				
Engine oil replacement [engine specification / engine and electric specification] (p.6-77)		✓				

Inspection and maintenance items	Regular period					
	50 hours	100 hours	200 hours	250 hours	400 hours	450 hours
Air cleaner element inspection and cleaning [engine specification / engine and electric specification] (p.6-78)		✓				
Alternator belt tension inspection and adjustment (p.6-80)		✓				
Cooling fan crack inspection [engine specification / engine and electric specification] (p.6-80)		✓				
Engine oil filter cartridge replacement [engine specification / engine and electric specification] (p.6-81)			✓			
Air cleaner hose inspection [engine specification / engine and electric specification] (p.6-82)			✓			
Radiator hose and clamp band inspection [engine specification / engine and electric specification] (p.6-83)			✓			
Outrigger rotation angle inspection (p.6-84)			✓			
Inspection of oil quantity inside the travel motor speed reducer case and replenishment [engine specification / engine and electric specification] (p.6-85)				✓		
Fuel filter element replacement [engine specification / engine and electric specification] (p.6-86)					✓	
Discharge of contaminated water and sediment from the fuel tank [engine specification / engine and electric specification] (p.6-86)						✓
Cooling system internal cleaning [engine specification / engine and electric specification] (p.6-87)						✓

Inspection and maintenance items	Regular period						
	500 hours	800 hours	1000 hours	1500 hours	3000 hours	1 year	2 year
Hydraulic oil return filter replacement (p.6-89)	✓						
Fan belt replacement (p.6-90)	✓						
Valve clearance inspection [engine specification / engine and electric specification] (p.6-91)		✓					
Replacement of oil in the hydraulic oil tank (p.6-91)			✓				

Inspection and maintenance items	Regular period						
	500 hours	800 hours	1000 hours	1500 hours	3000 hours	1 year	2 year
Slewing speed reducer case oil replacement (p.6-92)			✓				
Travel motor speed reducer case oil replacement (p.6-93)			✓				
Winch speed reducer case oil replacement (p.6-94)			✓				
Nozzle inspection and cleaning [engine specification / engine and electric specification] (p.6-95)				✓			
Fuel injection pump inspection [engine specification / engine and electric specification] (p.6-95)					✓		
Air cleaner element replacement (p.6-95)						✓	
Radiator cooling water, radiator hose, and clamp band replacement [engine specification / engine and electric specification] (p.6-96)							✓
Air cleaner hose replacement [engine specification / engine and electric specification] (p.6-96)							✓
Fuel hose and clamp band replacement [engine specification / engine and electric specification] (p.6-97)							✓

6.11 INSPECTIONS

6.11.1 Inspection before starting the job [engine specification / engine and electric specification / battery specification]

6.11.1.1 Visual inspection (before starting the machine)

⚠ WARNING

[Engine specification / engine and electric specification]

- **This machine has a diesel engine installed. If there is a fuel odor from around the engine, there may be a fuel leak. Check well for cracks in the fuel hose and inspect the fuel hose joints.**
- **Deposition of combustible materials or oil leaks around the hot part of the engine, such as the engine and silencer, or around the battery can cause a fire in the machine. Conduct a full look-around inspection and if there is a defect, be sure to contact us or our sales service agency about the need for repair.**

[Battery specification]

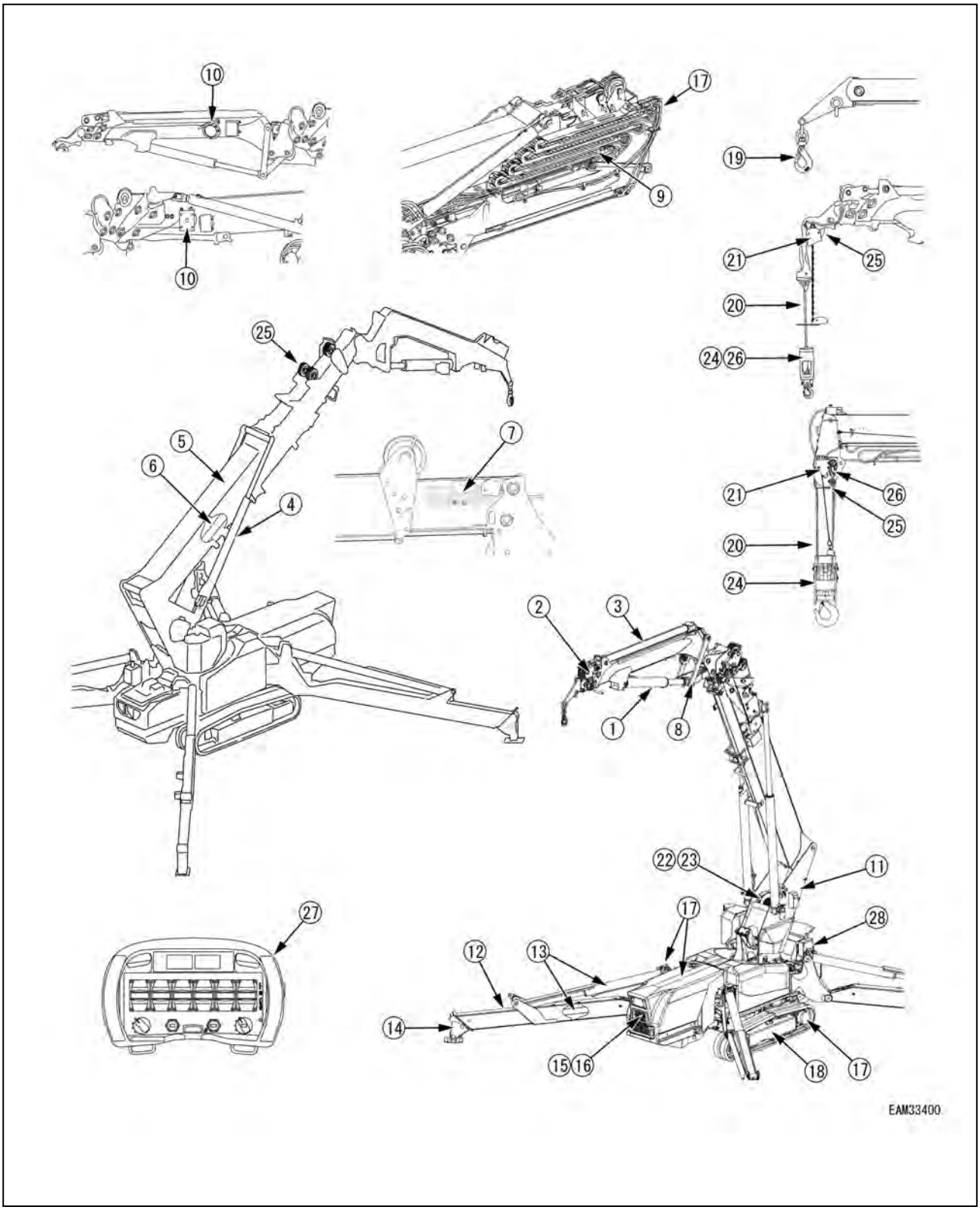
- **This machine has a battery unit installed.**
- **Deposition of combustible materials or oil leaks around the battery can cause a fire in the machine. Conduct a full visual inspection and if there is a defect, be sure to contact us or our sales service agency about the need for repair.**

[Engine specification / engine and electric specification]

Before the engine is started, check that there is no fuel odor in parts surrounding the engine.
Look around and under the machine, check for loose bolts or oil leaks, and inspect the crane equipment, hydraulic system, etc.
Inspect the electrical wiring for looseness or play and inspect the parts that become hot for the buildup of dust.
Perform the contents indicated in this item before initially starting the engine on the first day.

[Battery specification]

Look around and under the machine, check for loose bolts or oil leaks, and inspect the crane equipment, hydraulic system, etc.
Inspect the electrical wiring for looseness or play and inspect the parts that become hot for the buildup of dust.
Perform the contents indicated in this item before initially starting the machine on the first day.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EAM33400

[1] Inspecting the jib derricking cylinder

- Check for looseness in the connecting parts of the piping, oil leaks, wear, damage, etc. in the support pins, and repair any defects found.

[2] Inspecting the jib

- Check for cracks, bending, or damage in each part, for wear in the support pins, etc., and repair any defects found.
- Inspect the bolts in the support pin retention plate for looseness and tighten any loose bolts.

[3] Inspecting the jib telescoping cylinder

- Inspect the connecting parts of the piping for looseness, oil leaks, etc. and repair any defects found.

[4] Inspecting the boom derricking cylinder

- Check for looseness in the connecting parts of the piping, oil leaks, wear, damage, etc. in the support pins, and repair any defects found.

[5] Inspecting the boom

- Check for cracks, bending, or damage in each part, for wear in the support pins, etc., and repair any defects found.
- Inspect the bolts in the support pin retention plate for looseness and tighten any loose bolts.

[6] Inspecting the boom telescoping cylinder

- Inspect the connecting parts of the piping for looseness, oil leaks, etc. and repair any defects found.

[7] Inspecting the retracting wire tensioner indicator

- Before a job, inspect the retracting wire tensioner indicator to confirm it has come between the adjustment standard hole position and the limit hole position.
- If the indicator is at the limit hole position, make an adjustment according to “6.12.2 [8] Adjusting the boom retracting wire rope and retracting wire tensioner.”
- If the indicator has not come between the standard hole position and the limit hole position even if it has been adjusted, then replace the wire rope.

[8] Inspecting the link

- Check for cracks, bending, or damage in each part, for wear in the support pins, etc., and repair any defects found.

[9] Inspecting the hose guide

- Inspect each part for cracks, bending, and damage, and inspect the parts connecting the piping for looseness, oil leaks, etc., and repair any defects found.

[10] Inspecting the length sensor cord reel

- Check that there is no malfunction due to damage, deformation, or adhesion of garbage, ice, etc., and repair any defects found.

[11] Inspecting the post

- Inspect each part for cracks, bending, and damage; inspect the post and slewing ring attachment bolts for looseness; and, inspect the slewing device speed reducer attachment bolts and parts connecting the piping for looseness, oil leaks, etc. Repair any defects found.

[12] Inspecting the outriggers

- Check for cracks, bending, or damage in each part, for wear in the support pins, etc., and repair any defects found.

[13] Inspecting the outrigger cylinder

- Check for looseness in the connecting parts of the piping, oil leaks, wear, damage, etc. in the support pins, and repair any defects found.

[14] Inspecting the ground detector

- Check that there is no malfunction due to damage or adhesion of garbage, ice, etc., and repair any defects found.

[15] Inspecting the engine surround [engine specification / engine and electric specification]

- Inspect the hot parts of the engine, such as the engine silencer and the battery surround, for deposition or adhesion of combustible materials such as dead leaves, paper scraps, dust, oil, and grease, and remove any deposited or adhered materials.
- Inspect the engine for fuel leaks and oil leaks, and repair places where any defects are found. In addition, inspect the electrical wiring in the starter, alternator, battery surround, etc. for slackness, and the connecting parts for looseness or burn marks, and repair places where any defects are found.

[16] Inspecting the battery unit surround [battery specification]

- Inspect the battery unit surround for deposition or adhesion of combustible materials such as dead leaves, paper scraps, dust, oil, and grease, and remove any deposited or adhered materials. In addition, inspect the motor and electrical wiring for slackness, and the connecting parts for looseness or burn marks, and repair places where any defects are found.

[17] Inspecting the hydraulic equipment (travel motor, controller valve, hydraulic oil tank, hose, joints)

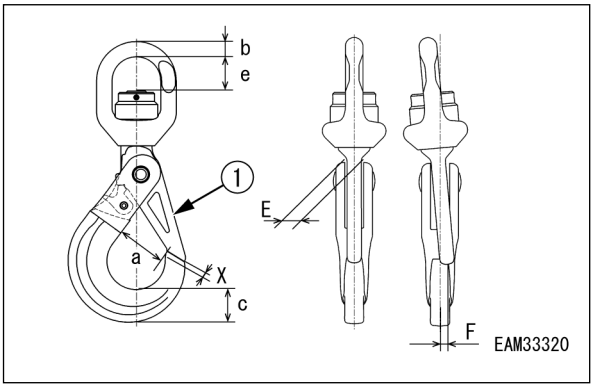
- Inspect the connecting parts of the piping for looseness, oil leaks, etc. and repair any defects found.

[18] Inspecting the undercarriage (rubber track, track roller sprocket, idler)

- Inspect each part for damage and wear and the rubber track for looseness, etc., and repair any defects found.
- Check that there are no loose bolts and that no bolts have dropped off, and tighten any loose bolts found.
- For details of the rubber track, refer to “6.11.3 [1] Inspecting and adjusting the rubber track tension” or “6.11.3 [2] Inspecting the rubber track for damage and wear.”

[19] Inspecting the fixed hook

- Inspect the hook and jib head for cracks, bending, damage, etc., and repair any defects found.
- Inspect the condition of the hook part rotation, and inspect whether it rotates smoothly or whether it generates an abnormal noise. Repair the relevant parts if there is any abnormality.
- Inspect the shackle for looseness, wear, etc., and repair any defects found.
- On the jib head side, apply grease in order to reduce wear on the shackle hole.
- Check that the hook retainer (1) is functioning normally. Repair the relevant parts if there is any abnormality.
- If each of the hook dimensions satisfies the replacement criteria, replace the hook.



[Replacement criteria]

a	b	c
38.8 mm or more / 35.2 mm or less	11.5 mm or less	23.8 mm or less
e	E	X
28.3 mm or more	14.7 mm or more	2.7 mm or more

[20] Inspecting the wire rope

- Inspect the wire rope for damage, deformation, twisting, kinking, corrosion, etc., and replace it if there are any defects.
- For details of handling the wire rope, refer to section “5.8.2 Precautions and prohibitions while operating the crane,”

[21] Inspecting the overwinding detector

- Inspect the overwind weight wire rope for damage, etc., and replace it if there are any defects.

[22] Inspecting the winch motor

- Inspect the connecting parts of the piping for looseness and oil leaks, and the attached parts for looseness, etc., and repair any defects found.

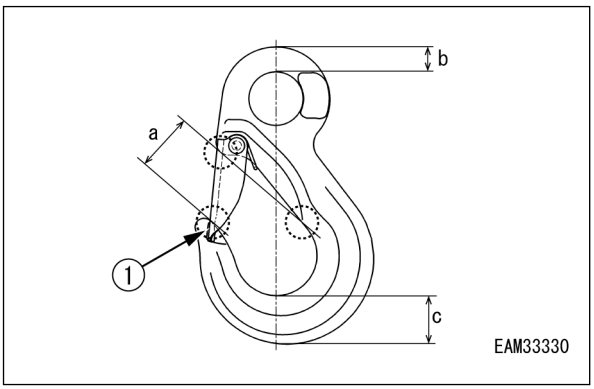
[23] Inspecting the winch drum

- Inspect each part of the drum for cracks, bending, damage, etc., and repair any defects found.
- Check the wire rope used for hoisting up for disorderly winding, etc., and repair any defects found.

[24] Inspecting the hook block

- Inspect each part of the hook block and sheave for cracks, damage, etc., and repair any defects found.
- Inspect the condition of the hook part and sheave rotation, and inspect whether they rotate smoothly or whether they generate an abnormal noise. Repair the relevant parts if there is any abnormality.
- Check that the hook retainer (1) is functioning normally. Repair the relevant parts if there is any abnormality.
- If each of the hook dimensions satisfies the replacement criteria, replace the hook.

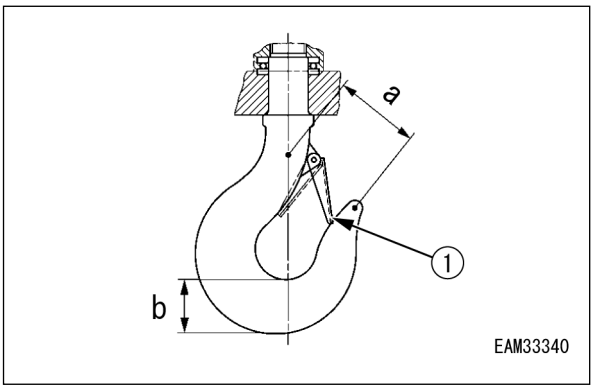
[Single-fall hook block case]



[Replacement criteria]

a	b	c
27.3 mm or more / 24.7 mm or less	12.4 mm or less	21.9 mm or less

[4-fall hook block case]



[Replacement criteria]

a	b
105 mm or more	51 mm or less

[25] Inspecting each type of sheave

- Inspect each sheave for damage, deformation, wear, defective rotation, etc., and repair any defects found.
- As the criterion for the amount of wear, when the diameter of a rope using the sheave's standard groove diameter has been worn away by a factor of 0.3, please replace it.

[26] Inspecting the wedge socket pin

- Inspect the pin for cracks, bending, damage, and wear, and repair any defects found.
- Check that there are no loose pins and that no pins have dropped off, and re-fasten any loose pins found.

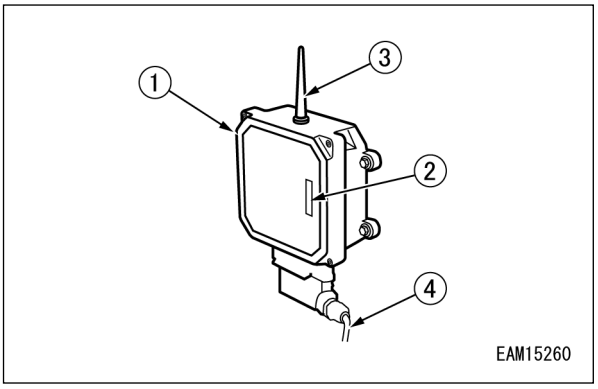
[27] Inspection before powering on the transmitter

Conduct the following inspections with the transmitter power turned off.

- Inspect the operating lever, the switch, and the appearance, and confirm that there are no oil stains, etc. If there are stains, wipe off the stains using a clean cloth or similar.
- Inspect the gap between the operating lever and the switch for deposition of foreign matter such as small stones or sand. If foreign matter is deposited there, clean it up. If foreign matter is deposited in the gap between the operating lever and the switch, it will interfere with the operation, the crane will behave unexpectedly, and this may cause a serious accident.
- Inspect the main body's case for cracks and damage, and inspect the operating lever and film cover of the switch for damage, etc. If there are cracks or any damage, repair them promptly. Water, etc. can penetrate via the cracked or damaged areas causing transmitter malfunction or breakdown, and this may cause a serious accident.
- Check that the operating lever and switch, respectively, move smoothly and regularly, and that they return smoothly to their original position (neutral position) when the finger is taken off them. If there are abnormalities in the movement of the operating lever or switch, promptly repair them. If there are abnormalities in the operating lever or switch, the crane may behave unexpectedly, and it may cause a serious accident.
- Confirm that the battery is correctly installed. If the battery is not correctly installed, reinstall it. If it is not correctly installed, the transmitter's internal equipment may malfunction, the crane may behave unexpectedly, and it may cause a serious accident.
- Inspect the battery electrodes for foreign matter such as metal or paper. If foreign matter is deposited there, clean it up. Failure to do so may cause an electric shock or a fire.

[28] Inspections before powering on the receiver

Conduct the following inspections with the receiver power turned off.



- Inspect the control box (1), the LED monitor (2), antenna (3), and the radio controller cable (4) for dirt, cracks, damage, looseness, etc. If there are stains, wipe off the stains using a clean cloth or similar. If there are any cracks, damage, looseness, etc., promptly repair them. Water, etc. can penetrate via the cracked or damaged areas causing receiver malfunction or breakdown, and this may cause a serious accident.

6.11.2 Inspections before starting the machine

Perform the contents indicated in this item before initially starting the engine or the machine on the first day.

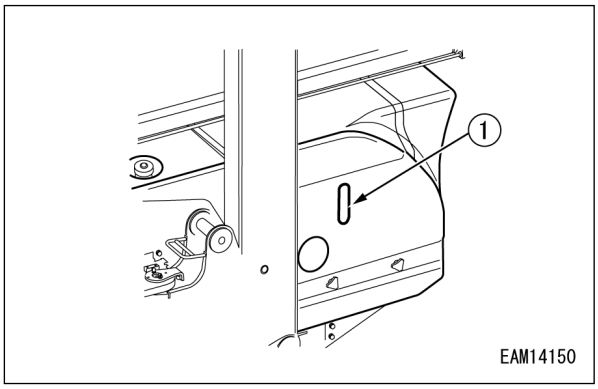
[1] Cooling water quantity inspection and replenishment [engine specification / engine and electric specification]

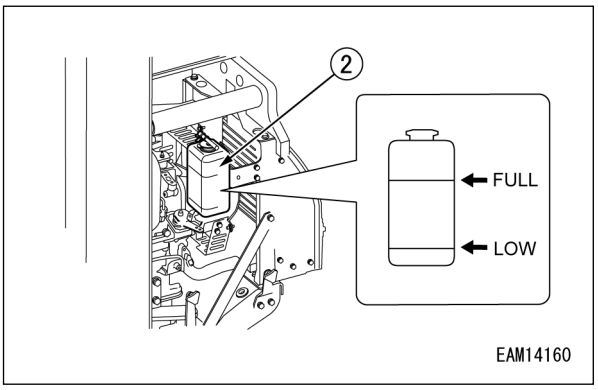
⚠ WARNING

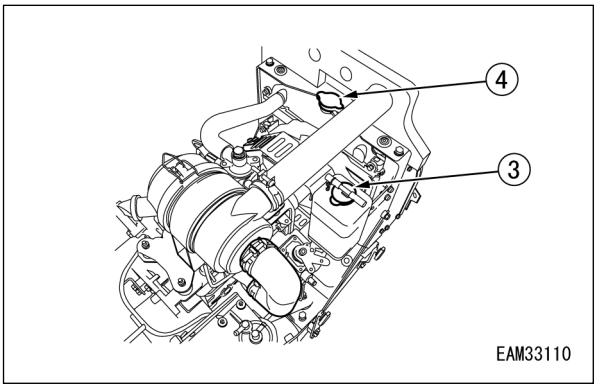
- **When checking the quantity of cooling water and replenishing the water, remove the radiator cap only after it has cooled down enough to be touched with a bare hand.**
- **First, slowly loosen the cap as far as the first stop, then after releasing all the pressure, turn the cap once again and remove it.**
- **If the cap is opened during engine operation or immediately after stopping, the heated cooling water may spurt out, resulting in scalding.**

1. Stop the machine on firm level ground.

2. Inspect the level of the reserve tank (2) from the inspection window (1) in the side of the engine cover, and confirm that the cooling water is between “low” and “full.”







3. If the quantity of the cooling water is at or below the “low” level, replenish the cooling water according to the following details.

1. Referring to section “6.9 COVERS,” take off the engine cover.
2. Remove the reserve tank’s (2) cap (3), then refill the water from the water refill port until the level is “full.”
3. After replenishing the cooling water, securely attach the reserve tank’s (2) cap (3).
4. Referring to section “6.9 COVERS,” attach the engine cover.

4. If the reserve tank is empty, proceed as follows.

1. Referring to section “6.9 COVERS,” take off the engine cover.
2. Remove the radiator cap (4), then inspect the water level in the radiator.
3. If the radiator’s water level is low, inspect the radiator, the radiator hose, and each engine part for water leaks.
4. Refill the water from the radiator’s water refill port, then securely attach the radiator cap (4).
5. Remove the reserve tank’s (2) cap (3), then refill the water from the water refill port until the level is “full.”
6. After replenishing the cooling water, securely attach the reserve tank’s (2) cap (3).
7. Referring to section “6.9 COVERS,” attach the engine cover.

[2] Inspecting and cleaning the fin [engine specification / engine and electric specification]

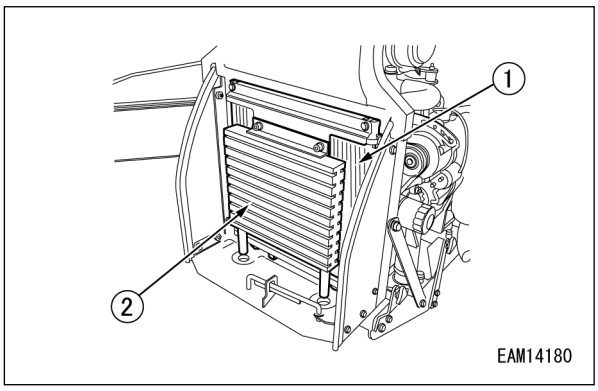
⚠ WARNING

Using an air blow cleaner or compressed air can be dangerous as garbage or dust may fly up. So be sure to wear protective goggles and a mask.

IMPORTANT

- **If there is garbage, etc. between the fins, in order to prevent damage to the fins, clean them using an air blow cleaner or similar.**
- **On very dusty sites, inspect the fins every day and clean them as required.**
- **Do not use hard items, such as a spatula or a screwdriver, for cleaning. Doing so may reduce the radiator's cooling capability or cause cooling water leaks.**

1. Referring to section "6.9 COVERS," take off the engine cover.
2. Clean off the mud and garbage clogged in the fins by blowing air on the oil cooler (2) and the radiator (1) using an air blow cleaner or similar.
3. Referring to section "6.9 COVERS," attach the engine cover.



[3] Inspection of the quantity of oil in the engine oil pan and replenishment [engine specification / engine and electric specification]

⚠ CAUTION

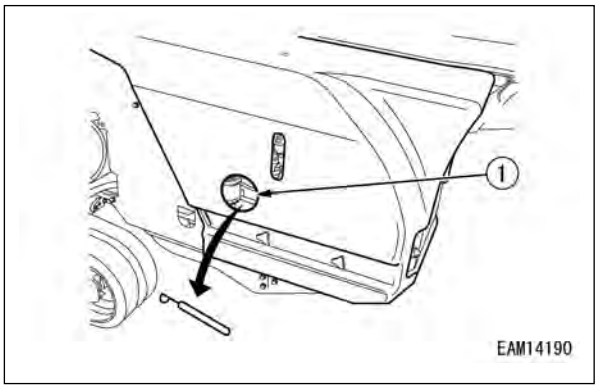
After checking the quantity of oil and replenishing the oil, securely attach the oil level gauge and the oil refill port cap. Otherwise, the oil level gauge may come off during operation, and the heated oil may spurt out, resulting in scalding.

IMPORTANT

- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
  If oil other than that specified is used, the engine lifetime may be shortened.
  Be sure to replenish the oil with the indicated oil.
- **Maintain a suitable quantity of engine oil. If too much oil is put in, too much oil will be consumed, the oil temperature will tend to rise, and the oil will degrade more quickly. If too little oil is put in, the engine may be burned.**
- **When replenishing the oil, be careful that garbage, etc. does not get in from the oil refill port.**
- **Perform the inspection before starting the engine or from about five minutes after stopping the engine.**
- **The replenished oil requires a certain amount of time to descend to the oil pan, so check the quantity of oil again after five minutes have passed since replenishing the oil.**

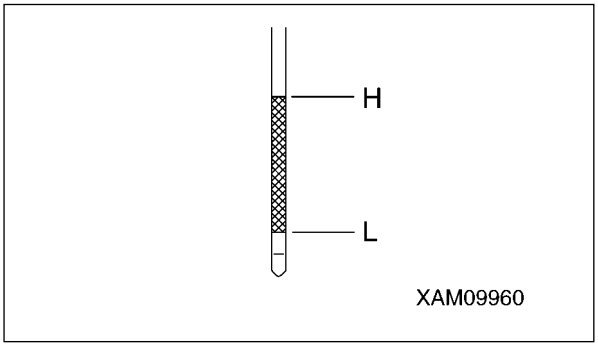
1. Stop the machine on firm level ground.

2. Pull out the oil level gauge (1) from the round hole in the side of the engine cover, and wipe off the oil with a waste cloth.



3. Insert the oil level gauge (1) into the oil level gauge hole and pull it out.

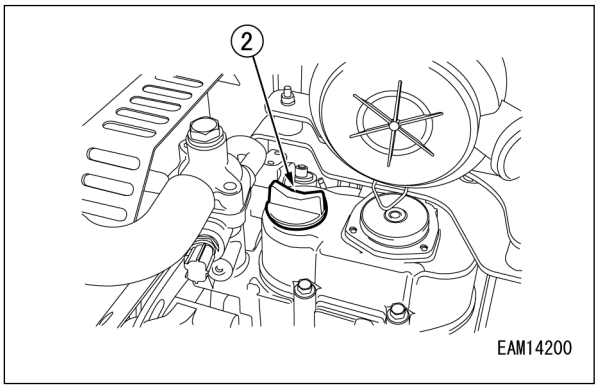
4. If the oil is in the range of “H” or “L” on the oil level gauge (1), this is suitable.



5. If the oil is below “L,” replenish the oil according to the following steps.

1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Remove the oil refill port cap (2) and replenish the engine oil from the oil refill port.



3. Replenish the engine oil so that it is partway between “H” and “L” on the oil level gauge (1).

4. After replenishing the oil, securely attach the oil level gauge (1) and the oil refill port cap (2).

5. Referring to section “6.9 COVERS,” attach the machinery cover.

[4] Fuel quantity inspection and replenishment [engine specification / engine and electric specification]

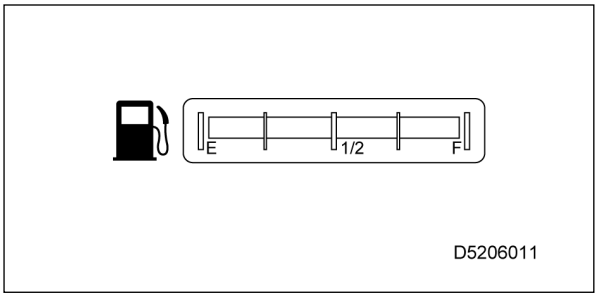
⚠ DANGER

- **For details of the fuel to be used, refer to section “6.5.1 Use of fuel and lubricating oil depending on temperature.”**
- **Be extremely careful about naked flames such as lit cigarettes.**
- **When replenishing the fuel, be sure to stop the engine first. Since if the fuel is replenished while the engine is running, spilled fuel may be ignited by the silencer or other parts that heat up.**
- **Adding too much fuel is dangerous as it may spill. Add slightly less than the stipulated maximum level. If fuel is spilled, be sure to wipe it all up.**
- **When replenishing the fuel, be careful that garbage, etc. does not get in from the oil refill port.**
- **After replenishing the fuel, close the tank cap securely.**

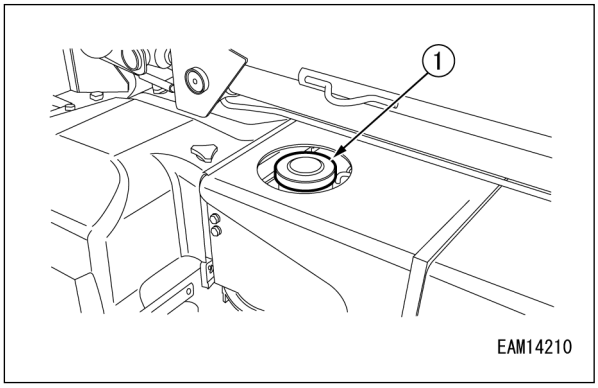
1. Stop the machine on firm level ground.

2. Turn the starter switch to “ON.”

3. View the monitor fuel gauge and check the fuel to see if it is full (near “F”).



4. If there is insufficient fuel, remove the tank cap (1) at the top right of the engine cover and while checking the fuel gauge, replenish the fuel from the oil refill port.



5. After replenishing the fuel, turn the tank cap (1) and close it tightly.

☞ One day after completing the working, fill up the oil tank.

[5] Inspecting and cleaning the water separator [engine specification / engine and electric specification]

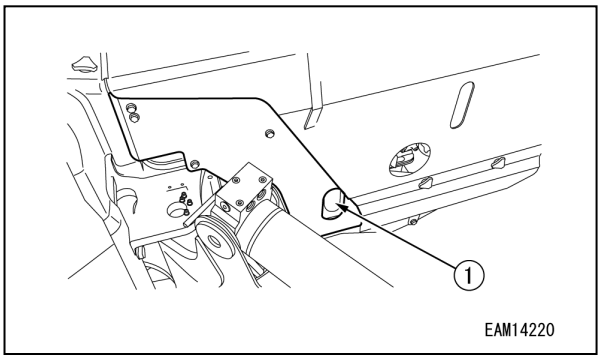
⚠ WARNING

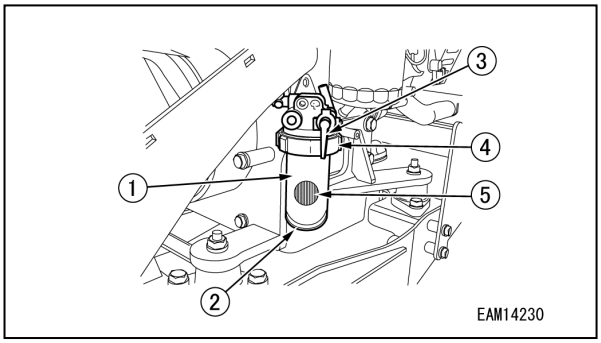
- **There is fuel (light oil) inside the water separator pot. So, when cleaning the water separator pot, be very careful about naked flames such as lit cigarettes.**
- **If oil is spilled when removing the water separator pot, be sure to wipe it all up.**

IMPORTANT

- **If water or garbage collects inside the water separator pot, it may cause engine failure. So, inspect the inside of the water separator pot and if water or garbage has collected, clean the pot.**
- **If water has collected inside the water separator pot, it is also possible that the fuel tank has become contaminated with water. Referring to section "6.13.8 [2] Discharging contaminated water and sediment from inside the fuel tank [engine specification / engine and electric specification]," discharge contaminated water and sediment from the fuel tank.**

1. Inspect the pot (1) from the round hole in the side of the right engine cover, and confirm that there has been no sedimentation of water or dirt contained in the fuel inside the pot on the inside of the water separator, and that the red float (2) inside the pot has not floated up from the bottom. If the red float (2) has floated up, the pot is contaminated with water.



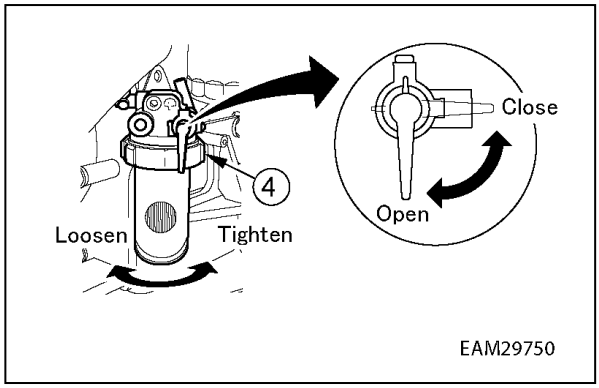


2. When cleaning the waterless separator pot, referring to the section "6.9 COVERS," take off the right engine cover.

3. If water and garbage collect in the pot (1), clean inside the pot (1) according to the following procedure.

1. Turn the fuel lever (3) to the level position (closed) to stop the fuel.

2. Turn the retainer ring (4) to the left to loosen it, then remove the pot (1).



3. Remove the mesh (5) from the inside of the pot (1).

4. Clean the pot (1) interior and the mesh (5) with light oil and blow compressed air (at a suitable pressure) inside to bring the garbage off the surface.
5. Insert the mesh (5) inside the pot (1).
6. Install the pot (1) in its original position and turn the retainer ring (4) to the right to tighten it.
7. Turn the fuel lever (3) to the perpendicular position (open).

4. When the water separator pot has been cleaned, refer to section "6.14.8 Fuel circuit air removal" to perform air removal of the fuel system.

5. Referring to section "6.9 COVERS," attach the right engine cover.

[6] Inspection of the quantity of oil in the hydraulic oil tank and replenishment

⚠ WARNING

- **Immediately after operation of the machine, each part is hot. So do not replace the oil immediately. Do so only after the oil has cooled down (at an oil temperature of 45°C or less).**
- **The level of the hydraulic oil varies greatly with the oil temperature. Aim for the oil level to come to the "H" position in the level gauge at an oil temperature of 50°C.**
- **When replenishing the oil, do not add it above "H" (the maximum) on the level gauge. If too much oil is added, during travel or crane operation, the oil may spurt out of the oil refill port, resulting in scalding.**
- **When replenishing the oil, be careful that garbage, etc. does not get in from the oil refill port.**
- **After replenishing the oil, securely close the tank cap. Otherwise, the tank cap may come off during operation, and the heated oil may spurt out, resulting in scalding.**

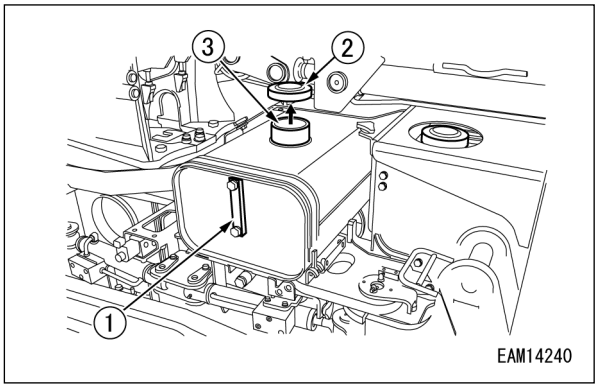
IMPORTANT

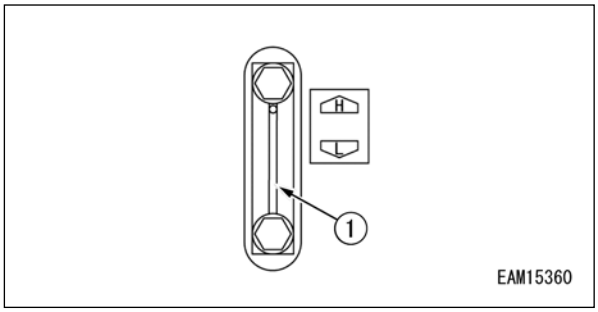
- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
- **When checking the quantity of oil, be sure to place the machine in the travel position. If the oil quantity is checked in the operating position, as the oil in each cylinder will not have returned to the tank, too much oil will end up being added.**

1. Stop the machine at a firm level ground.

2. Referring to section "6.9 COVERS," take off the right machinery cover.

3. View the oil level gauge (1) and check whether the oil is between “H” and “L.”





4. If there is insufficient oil, replenish the hydraulic oil according to the following procedure.

1. Remove the oil refill port cap (2) at the top of the hydraulic oil tank.

2. While viewing the oil level gauge (1), replenish the hydraulic oil from the oil refill port (3).

3. After replenishing the oil, securely close the oil refill port cap (2).

4. Referring to section “6.9 COVERS,” attach the right machinery cover.

[7] Inspection of the quantity of oil inside the slewing speed reducer case and replenishment

IMPORTANT

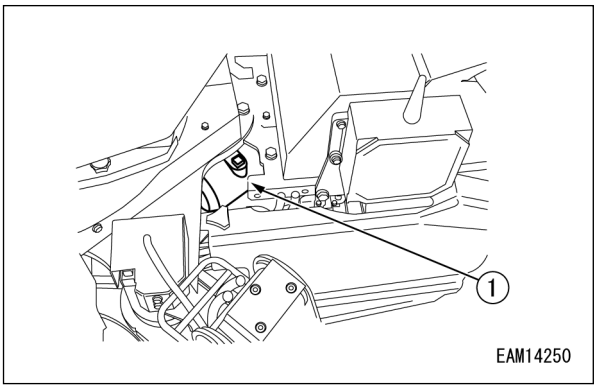
- **For details of the oil to be used, refer to section “6.5.1 Use of fuel and lubricating oil depending on temperature.”**
- **After replenishing the oil, use sealing tape or similar as an oil leak stop by adhering it to the screw part of the oil refill plug, and securely tighten the screw.**

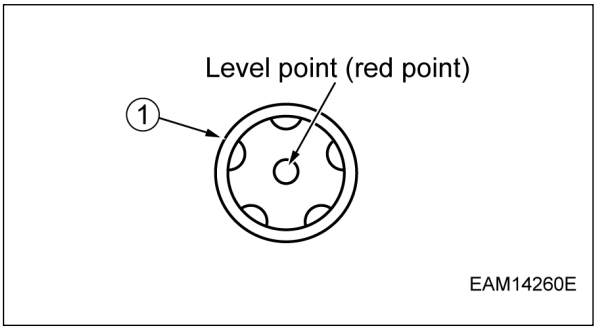
1. Stop the machine on firm level ground.

2. Referring to section “5.7.3 Setting the outriggers,” slew the outrigger’s (4) outrigger rotary to the outside.

3. Referring to section “6.9 COVERS,” take off the operating cover.

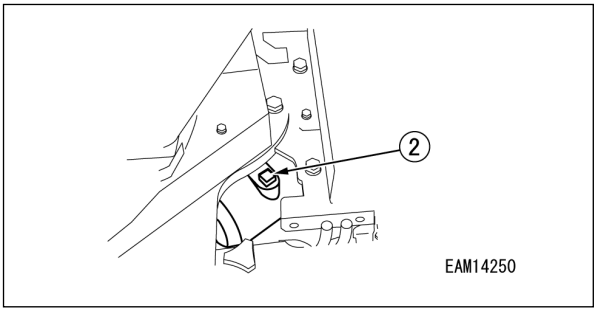
4. From the side of the machine, inspect the side gauge (1) for checking the quantity of oil in the slewing speed reducer case. Confirm that there is oil up to the side gauge’s (1) level point.





5. If there is insufficient oil, replenish the gear oil according to the following procedure.

1. Remove the oil refill port plug (2) at the rear of the post, then pour in gear oil from the oil refill port.



☞ Pour in oil from the oil refill port up to the side gauge’s (1) level point.

2. After replenishing the oil, attach the oil refill plug (2) and tighten it securely.

3. Referring to section “5.7.4 Stowing the outriggers,” stow the outriggers.

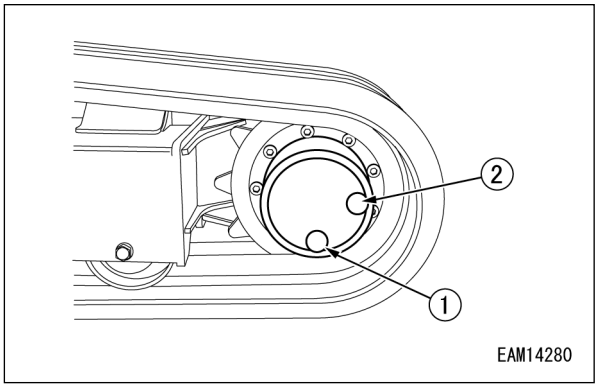
6. Put the operating cover back with reference to "6.9 Covers."

[8] Inspection of the quantity of oil inside the travel motor speed reducer case and replenishment

IMPORTANT

- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
- **After checking and replenishing the oil, use sealing tape or similar as an oil leak stop by adhering it to the screw part of the oil quantity inspection plug, and securely tighten the screw.**

1. Move the machine forwards and backwards so that the drain plug (1) of the travel motor speed reducer case is directly below.
2. Remove the travel motor speed reducer case's oil quantity inspection plug (2) and inspect to see whether the oil comes out of the plug hole.
3. If there is insufficient oil, pour in gear oil from the plug hole of the oil quantity inspection plug (2).



☞ Pour in the gear oil until the oil is exiting the oil quantity inspection plug hole.

4. After checking and replenishing the oil, securely tighten the oil quantity inspection plug (2).

[9] Inspecting the electrical wiring

⚠ WARNING

If the fuses blow often or there are traces of short-circuiting in the electrical wiring, be sure to investigate the cause and repair it.

For details of the fuse position, refer to section "6.6 FUSES."

1. Inspect the fuses for damage or to see if they have blown and to check whether the stipulated capacity of fuse is being used.
2. If the fuse has blown or the electrical wiring is disconnected or shows traces of short-circuiting, contact us or our sales service agency.

[10] Inspecting the jib, boom, and frame for cracks, deformation, or damage

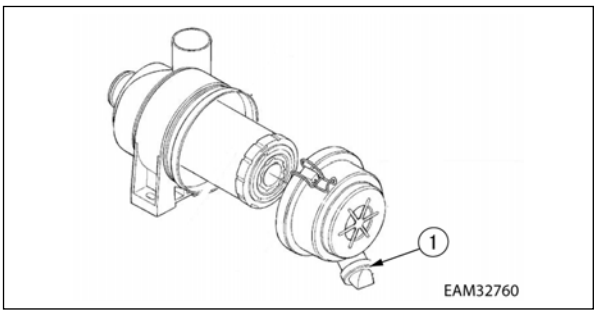
Inspect the jib, boom, and frame for cracks, deformation, damage, etc., and repair any defects found.

[11] Inspecting the wire rope for deformation, damage, or wear

Check the fixed end of the rope, the hoisting up condition, and the contact between ropes. For details of inspection and examination of wire rope during winch and boom telescoping, refer to section "6.12.2 Replacing, inspecting, and adjusting the wire rope."

[12] Inspecting the air cleaner vacuator valve [engine specification / engine and electric specification]

Open the air cleaner cover's vacuator valve (4), remove any garbage, clean it, and repair any defects found.



[13] Inspection after powering on the transmitter

Confirm that the transmitter power is correctly turned on and that the display is shown.

6.11.3 Inspections after starting the machine

[1] Inspecting and adjusting the rubber track tension

IMPORTANT

- **When checking and adjusting the rubber track tension, set up the outriggers and raise the rubber track above the ground.**
- **When stretching the rubber track, a gap of 5 to 10 mm between the central track roller tread and the rubber track shoulder is standard.**
- **If the tension is loose even if grease has been press-fitted, it may be necessary to replace the rubber track or the tension-adjusting cylinder seal.**
- **For judging whether to replace, repair, or continue with the rubber track, refer to this manual.**
  If replacements or repairs are required, contact us or our sales service agency.

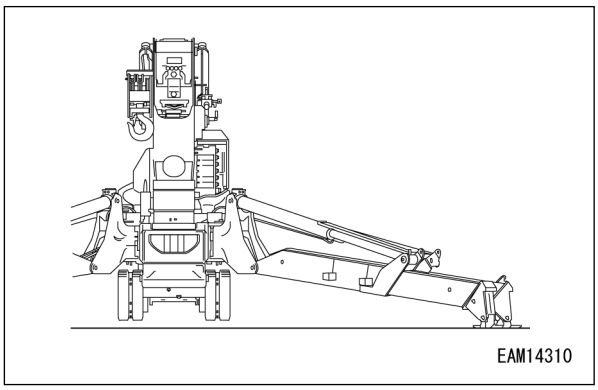
The wear of the rubber track varies depending on the work conditions and the soil quality, so always check the amount of wear and the tension.

In particular, when the vehicle is new or new items have been installed, after adjusting the amount of tension to the stipulated value, if travel is repeated for around 5 to 30 hours, the “initial loosening” will occur.

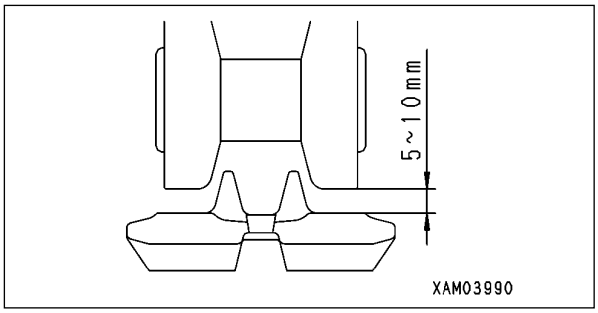
Until the “initial loosening” period has been exceeded, adjust the tension frequently. This prevents “rubber track deviation caused by insufficient tension.”

Tension Inspection

1. Referring to section “5.7.3 Setting the outriggers,” install the outriggers and raise the undercarriages above the ground.



2. Measure the gap between the track roller tread and the rubber track shoulder.



☞ If the gap is 5 to 10 mm, then the tension is the standard amount.

3. If the tension is not the standard amount, refer to the following “Tension adjustment” section and adjust the tension.

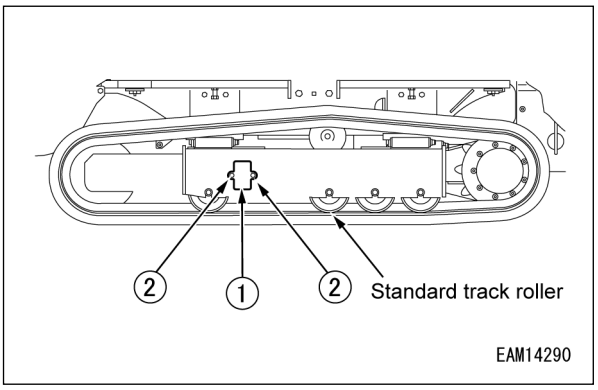
Tension adjustment

If the result of the rubber track “tension inspection” is that the rubber track tension is looser than the standard amount, then adjust the tension in the following way.

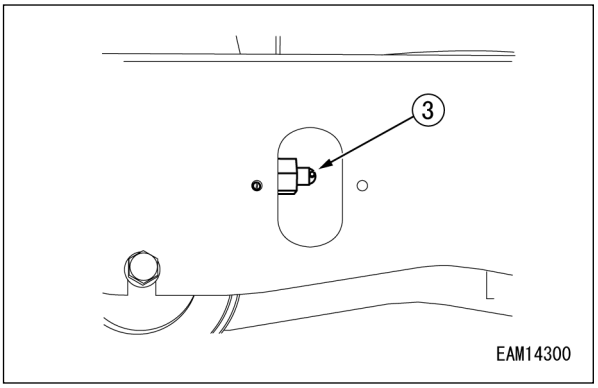
If the working is conducted with the rubber track in a loose condition (the rubber track tension is 15 mm or more), this may cause a wheel to come off the tracks or the core metal wear to quicken.

- **When the tension is loose (increasing the tension)**
  - Prepare a grease gun (pump).

1. Remove the two attachment bolts (2) and take off the inspection cover (1).



2. Press-fit the grease from the grease nipple (3) using the grease gun.



3. To confirm that the tension is correct, perform the following workings.

1. Referring to section “5.7.4 Stowing the outriggers,” stow the outriggers and lower the machine to the ground.

2. Move the machine forward and backward.

3. Referring to section “5.7.3 Setting the outriggers,” install the outriggers and, once again, raise the undercarriages above the ground.

4. Conduct the rubber track tension inspection again. If the tension is not suitable, adjust it again.

5. Using the two attachment bolts (2), attach the inspection cover (1).

6. Referring to section “5.7.4 Stowing the outriggers,” stow the outriggers and lower the machine to the ground.

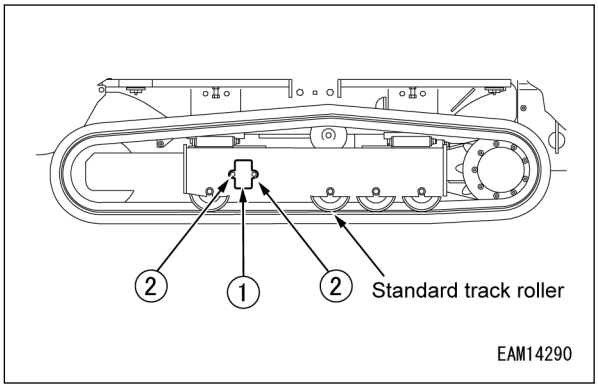
- **When the tension is high (decreasing the tension)**

⚠ WARNING

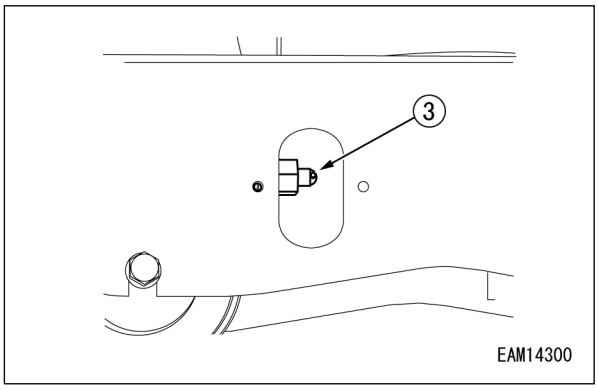
Grease is sealed inside the rubber track's tension adjustment equipment. The grease achieves a high pressure due to the tension of the rubber track.
If the adjustment is performed without observing the following cautionary items, the grease valve may fly out and cause a serious accident.

- **The grease valve for tension adjustment should not be loosened by more than one rotation. Otherwise, there is the danger of the grease valve flying out.**
- **When the tension adjustment is performed, avoid danger by not placing your body in front of the grease valve.**

1. Remove the two attachment bolts (2) and take off the inspection cover (1).



2. Loosen the grease valve (3) a little at a time and eject the grease.



3. When the ejection of the grease is poor, perform the following workings to eject the grease.

1. Referring to section "5.7.3 Setting the outriggers," stow the outriggers and lower the machine to the ground.

2. Move the machine forward and backward.

3. Referring to section "5.7.3 Setting the outriggers," install the outriggers and, once again, raise the undercarriages above the ground to a height convenient for the job.

4. Tighten the grease valve (3).

5. Conduct the rubber track tension inspection. If the tension is not suitable, adjust it again.

6. Use the two attachment bolts (2) to attach the inspection cover (1).

7. Referring to section "5.7.4 Stowing the outriggers," stow the outriggers and lower the machine to the ground.

[2] Inspecting the rubber track for damage and wear

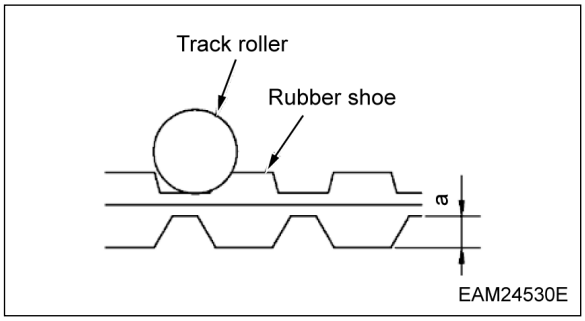
IMPORTANT

For judging whether to replace, repair, or continue with the rubber track, refer to this manual.
If replacements or repairs are required, contact us or our sales service agency.

- If any of the following states occur, the rubber track requires repair or replacement, so contact us or our sales service agency to request repairs or replacement.

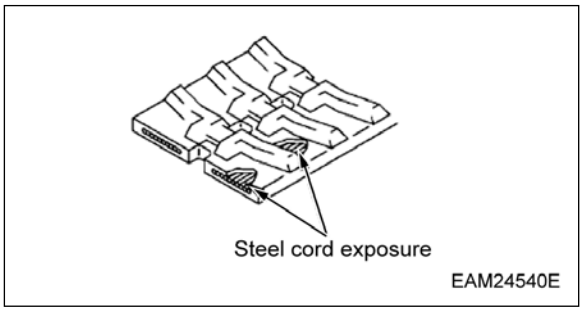
- **Lug height**

- If the lug height (a) decreases due to wear, the traction force decreases.
  If the lug height (a) is 5 mm or less, replace it with a new one.

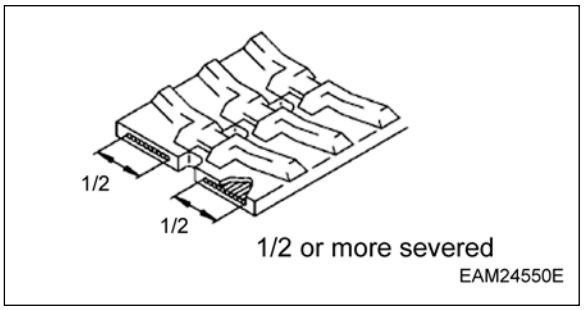


(1) Track roller
(2) Rubber shoe

- If the lug is worn and the exposed part (3) of the steel cord inside the rubber track is across two links or more, then replace it with a new one.

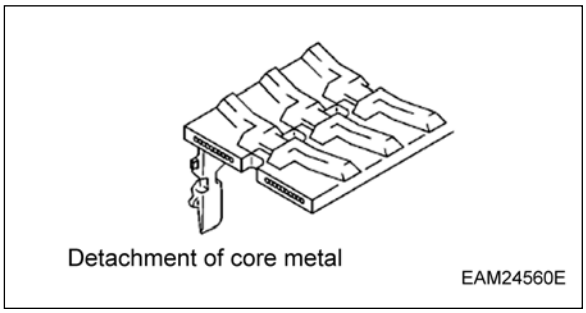


- **Steel cord severed**
- If half or more of the steel cord layer on one side is severed, replace with a new item.



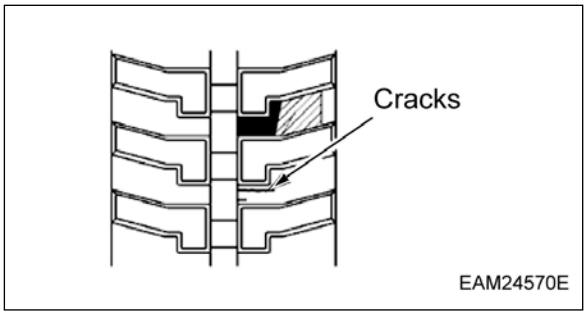
(4) Half or more of the steel cord layer

- **Detachment of core metal**
- If the rubber track's core metal (5) has broken away in one place or more, replace with a new item.



- **Cracks**

For an item in which cracks (6) have appeared in the rubber track lag, repair it promptly or replace it with a new one.



[3] Outrigger operation inspection

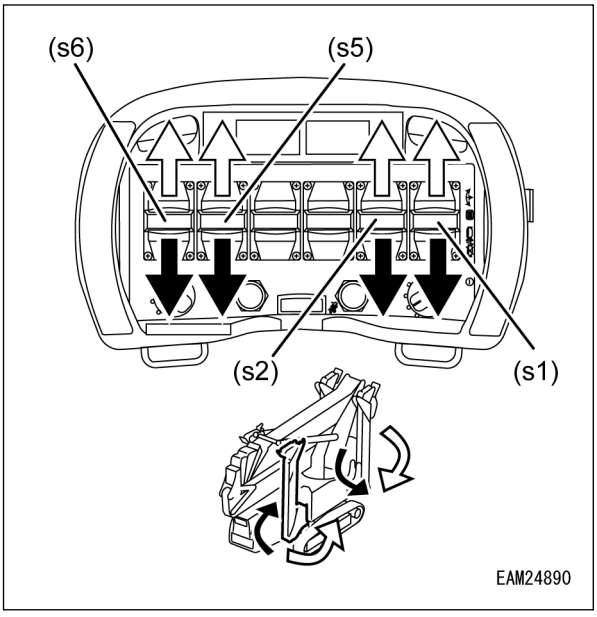
⚠ WARNING

When performing the outrigger operation inspection, be sure to refer to section "5.7.3 Setting the outriggers" and "5.7.4 Stowing the outriggers," and strictly observe the procedure and cautionary items.

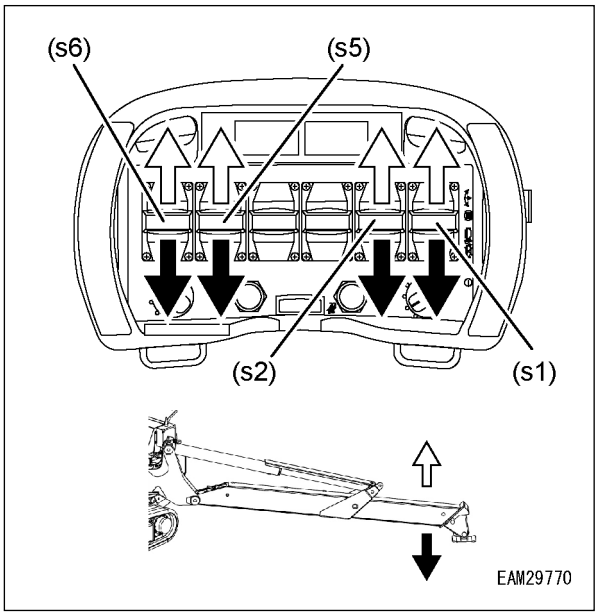
IMPORTANT

When performing the crane operation inspection described in the next section, it is necessary to set up the outriggers to their maximum extension. So, in this section, it is convenient to set the outriggers to their maximum extension in preparation for the next section.

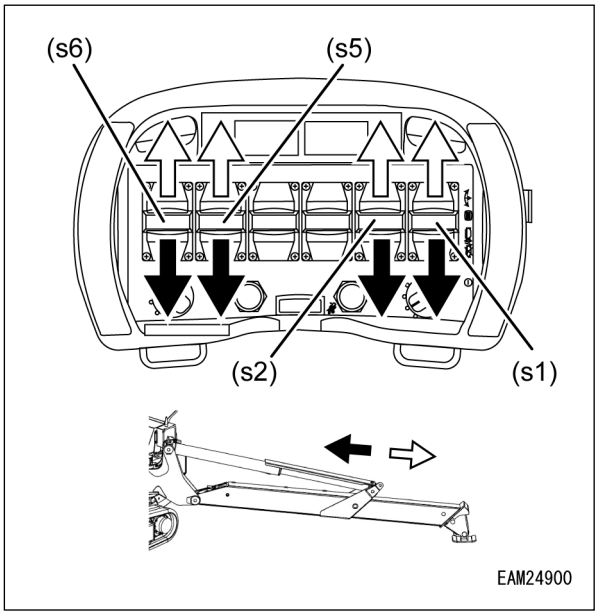
1. Referring to "5.7.3 Setting the outriggers," confirm that the selected outrigger slews smoothly. In that case, confirm that there are no strange noises from any part of the outrigger. Operate the remaining individual operation buttons similarly and confirm the operation.



2. Referring to “5.7.3 Setting the outriggers,” confirm that the selected outrigger lifts and grounds smoothly. In that case, confirm that there are no strange noises from any part of the outrigger. Operate the remaining individual operation buttons similarly and confirm the operation.



3. Referring to “5.7.3 Setting the outriggers,” confirm that the selected outrigger extends and retracts smoothly. In that case, confirm that there are no strange noises from any part of the outrigger. Operate the remaining individual operation buttons similarly and confirm the operation.



4. While operating the outrigger operation lever, confirm that the alarm buzzer makes an intermittent sound. If the alarm buzzer does not sound, the buzzer may be malfunctioning or disconnected. Contact us or our sales service agency to request repairs.

[4] Crane operation inspection

⚠ WARNING

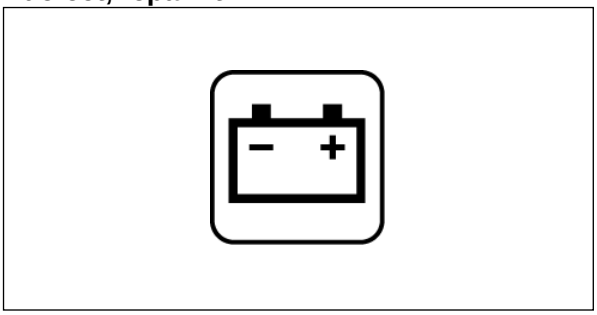
- **If a defect is discovered when checking the crane operation, promptly perform an emergency stop, and be sure to repair the defect. If the crane is used with the defect as is, it may cause a serious accident.**
- **When performing the crane workings, referring to sections “5.8.1 Precautions before operating the crane” to “5.8.2 Precautions and prohibitions while operating the crane,” strictly observe the procedures and cautionary items.**

IMPORTANT

- **It is suitable to use the hydraulic oil at a temperature of 45 to 55°C. Even if it is unavoidable that the working is performed at a low temperature, only conduct the working after raising the hydraulic oil temperature to around 20°C.**

Engine specification / engine and electric specification

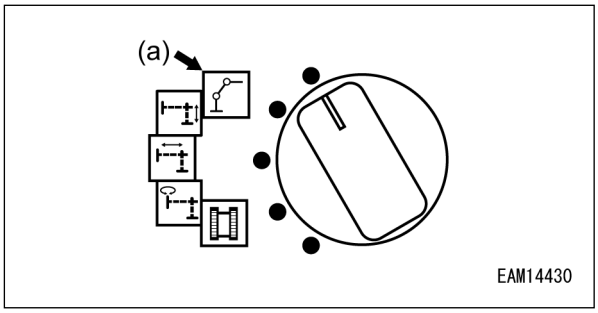
- **Check that the charging lamp goes out once the engine has started. If there is a defect, repair it.**



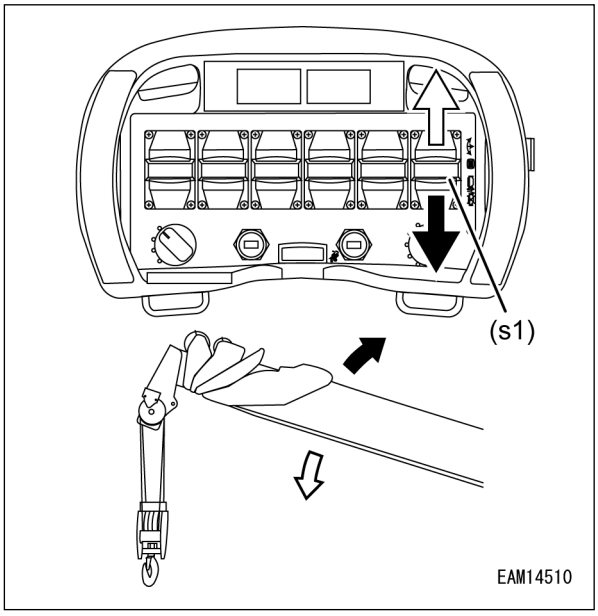
- **If the engine is run at low speed for a long time, the lubrication of the engine cylinder head will become insufficient and may cause engine malfunction. If using the engine at low speed, rev up the engine for around five minutes once a day.**

1. Referring to section “5.7.3 Setting the outriggers,” set up the outriggers.

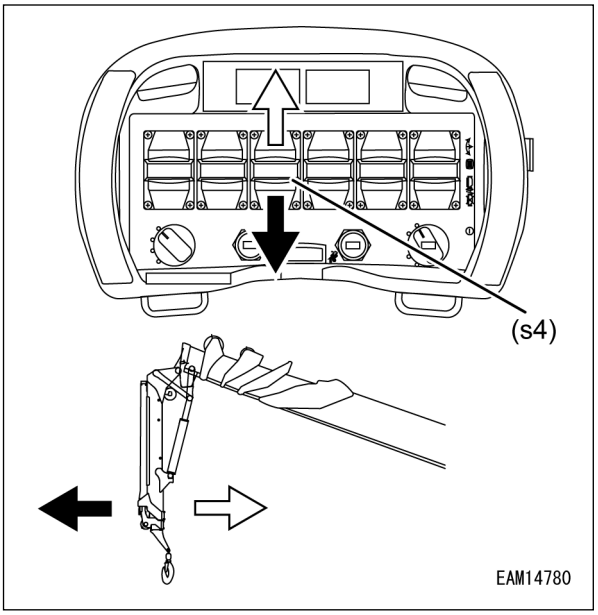
2. Switch the mode-changing switch to crane operation (a). When this has been done, confirm that the mode shown on the display is “CRANE.”



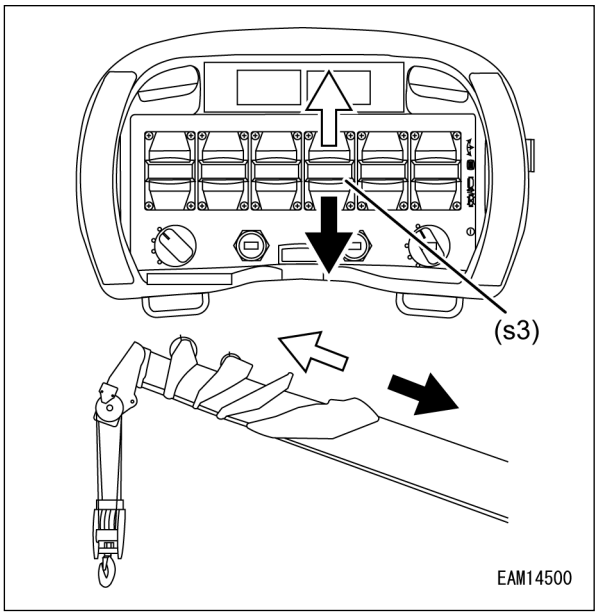
3. When the S1 lever (s1) has been pulled toward you, confirm that the boom rises smoothly. In addition, push the S1 lever forward and confirm that the boom lowers smoothly, and move the boom from the maximum to the minimum, and inspect the operating condition for defects.
When doing this, at the same time, confirm that “B.ANGLE” on the display varies according to the boom movement.



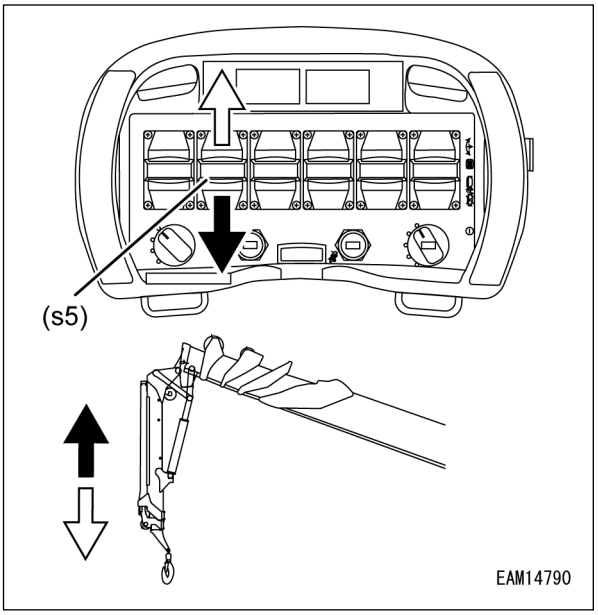
4. When the S4 lever (s4) has been pulled toward you, confirm that the jib rises smoothly. In addition, push the S4 lever (s4) forward and confirm that the jib lowers smoothly. Move the S4 lever (s4) backward and forward, raise and lower the jib derricking cylinder, and check that there are no defects in the operation.
When doing this, at the same time, confirm that “J.ANGLE” on the display varies according to the boom movement.



5. When the S3 lever (s3) has been pushed forward, confirm that the boom extends smoothly. Then, pull the S3 lever (s3) toward you and confirm that the boom retracts smoothly. Extend and retract the boom until the stroke end and inspect the operation condition for any defects.
When doing this, at the same time, confirm that “B.LENGTH” on the display varies according to the boom movement.

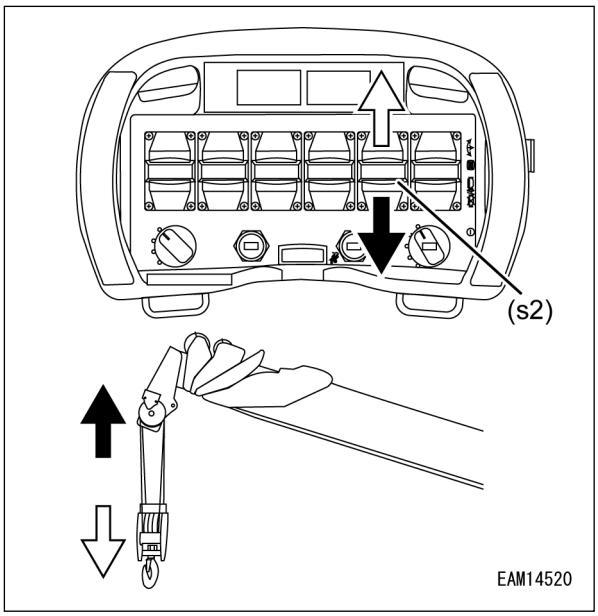


6. When the S5 lever (s5) has been pushed forward, confirm that the jib extends smoothly. Then, pull the S5 lever (s5) toward you and confirm that the jib retracts smoothly. Pull the S5 lever (s5) forward and toward you, extend and retract the jib until the stroke end, and inspect the operation condition for any defects.
When doing this, at the same time, confirm that “J.LENGTH” on the display varies according to the jib movement.

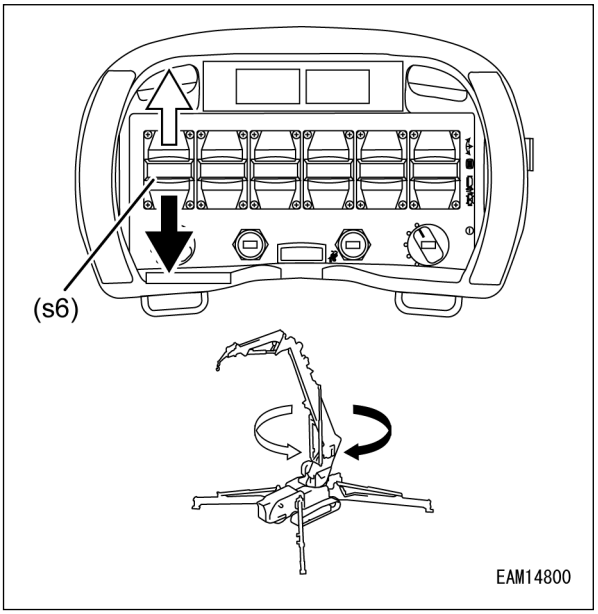


7. (Perform this check only when using the winch.)

When the S2 lever (s2) has been pushed forward, confirm that the hook block hoists down smoothly. Then, pull the S2 lever (s2) toward you and confirm that the hook block hoists up smoothly. Push the S2 lever (s2) forward and toward you, and check that the hook block hoists up and down smoothly; when the S2 lever (s2) has been returned to the “neutral” position, check that the hook block has stopped immediately; and, check that the winch drum is winding in an orderly manner and that each sheave is rotating smoothly.



8. When the S6 lever (s6) has been pushed forward, confirm that the boom slews smoothly to the left. Then, pull the S6 lever (s6) toward you and confirm that the boom slews smoothly to the right. Push the S6 lever (s6) forward and pull the S6 lever (s6) toward you, and check that the boom slews smoothly 360° or more left and right, respectively; and, when the S6 lever has been returned to “neutral,” check that the boom stops immediately. If there are any defects, repair them.
In addition, view the monitor display and check that the boom slewing position lamp is lit green when the boom is in the stowing direction.

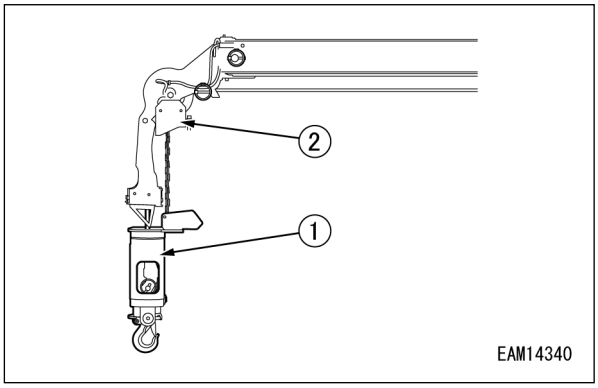


[5] Inspecting overwinding detector

Put the hook block (1) in an overwinding state, and when, respectively, the winch is hoisted up and the boom and jib are extended, or the boom and jib are started up, confirm that the alarm buzzer sounds, and that the hoisting up of the winch, the extension of the boom and the jib, and the boom and jib startup operations are all stopped.

If this does not occur, the overwinding detector (2) may be malfunctioning. When the alarm does not stop sounding, the overwinding detector (2) may be malfunctioning or be disconnected.

Contact us or our sales service agency to request repairs.



[6] Inspecting the moment limiter

⚠ WARNING

When a defect has occurred with the moment limiter, immediately contact us or our sales service agency.

1. Turn the starter switch to the “ON” position.

2. Check the monitor display. Confirm that there is no defect occurrence display on the monitor.

3. Start the engine and operate the crane as in the following table, and confirm that the monitor display of the moment limiter is correct when doing so.

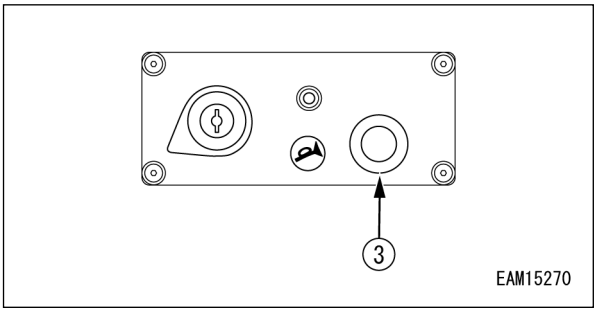
4. Measure the “working radius” when the crane is operated and the moment limiter’s monitor display values have been set to the “maximum contracted” boom length, the “maximum contracted” jib length, a boom angle of “45°,” and a jib angle of “0.0°.” If there is a difference between the actual measurement value and the moment limiter’s monitor display values, contact us or our sales service agency.

Crane operation and display items	Moment limiter's monitor display value
The "BOOM LENGTH" display when the boom length has been set to the minimum	3.1m
The "BOOM LENGTH" display when the boom length has been set to the maximum	10.3m
The "JIB LENGTH" display when the jib length has been set to the minimum	2.3m
The "JIB LENGTH" display when the jib length has been set to the maximum	4.8m
The "BOOM ANGLE" display value when the boom angle has been measured with a calibrated square clock and set to "55°"	55°
The "JIB ANGLE" display value when the jib angle has been measured with a calibrated angle meter and set to "30°"	30°
"WORKING RADIUS" display value when the boom length is fully retracted, the boom angle is set to "45.0°," the jib length is fully retracted, and the jib angle is set to "0.0°"	3.8 to 4.0m (When the fixed hook is mounted)
"Actual load" display value when a weight is prepared to determine the mass and is hoisted (a mass-calibrated weight is recommended) ★It is the same as the total mass of the weight + the suspension fittings. ★However, there may be a slight error depending on the boom conditions.	Actual load
The "SLEW ANGLE" display value when a slewing operation is performed from a state in which the slewing angle of the eye mark on the lower part of the post is misaligned by 10° or more and the eye mark was aligned and the stowing position set.	0° or 360°

[7] Emergency stop switch operation inspection (main unit)

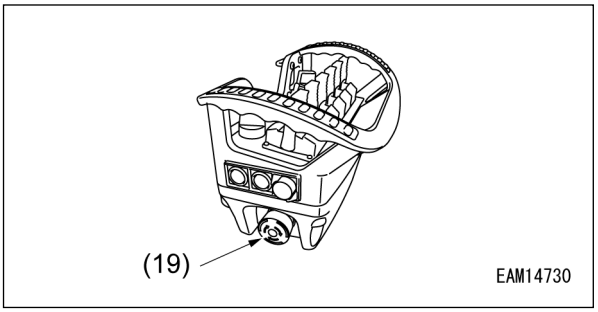
Press the emergency stop switch (3) and check that the machine stops. If the machine does not stop, the switch may be malfunctioning or disconnected, so Contact us or our sales service agency to request repairs.

☞ When re-starting the machine after an emergency stop, make sure the emergency stop switch has been returned to the "OFF" position, then start the machine. The machine will not start with the switch in the "ON" position.



[8] Emergency stop switch operation inspection (radio controller)

When the machine is starting, press the emergency stop / radio controller power OFF switch (19) and confirm that the machine stops. Confirm that the transmitter power supply is turned off at the same time.



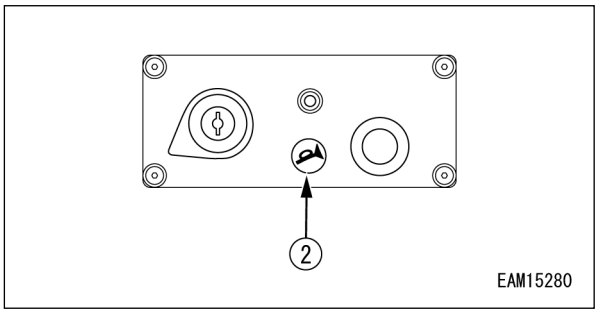
[9] Inspecting the engine exhaust gas color, noise, and vibration [engine specification / engine and electric specification]

1. Continue load-free operation for approximately five minutes.

2. Confirm that the engine's exhaust gas is colorless. In addition, check whether noise or vibrations occur. If there are any defects, repair them.

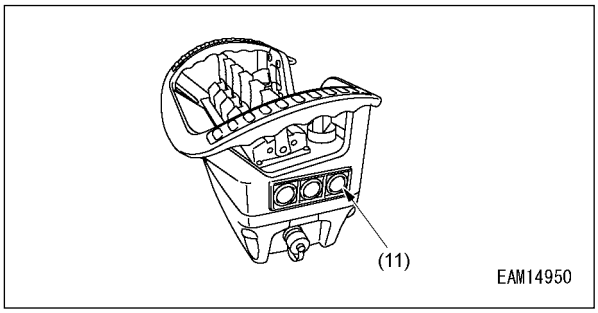
[10] Inspecting the horn (machine side)

Press the horn switch (2) and confirm that the horn sounds. If the horn does not sound, the horn may have a malfunction or disconnection. Repair or replace it.



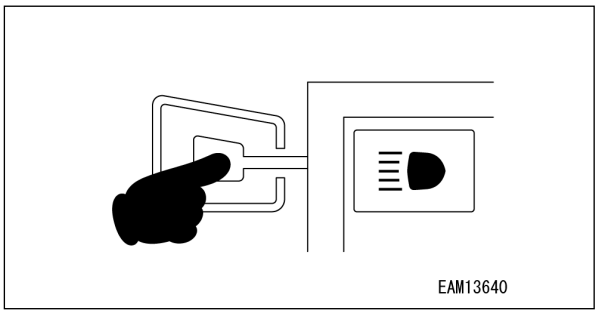
[11] Horn operation inspection (radio controller side)

While pressing the horn switch (11), confirm that the horn sounds.



[12] Inspecting the working light

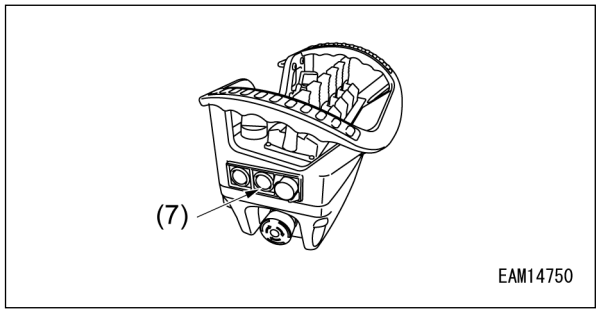
1. Turn the monitor light switch “ON” and check that the headlights at the front of the machine are lit. If they do not light up, the bulbs may have gone or there may be a disconnection, so repair or replace them.



[13] Engine start and stop operation inspection [engine specification / engine and electric specification]

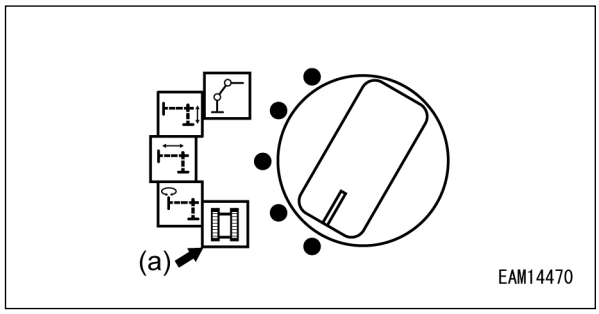
1. When the engine is stopped, press the engine start / stop switch (7) and confirm that the engine starts.

2. When the engine is started, press the engine start / stop switch (7) and confirm that the engine stops.

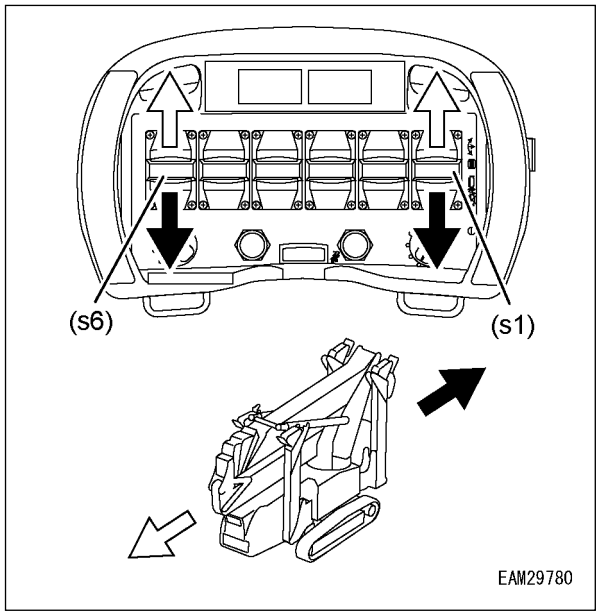


[14] Travel operation inspection

1. Switch the mode-changing switch to crawler operation (a). When this has been done, confirm that the mode shown on the display is “TRAVEL.”



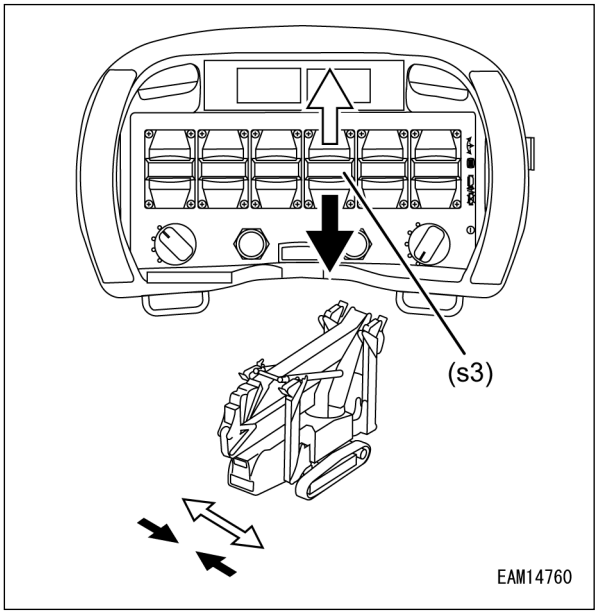
2. When the sprocket (A) is positioned at the rear of the machine, push the S1 and S6 levers forward, confirm that the machine moves forward. In addition, when the S1 and S6 levers have been pulled toward you, confirm that the machine moves backward.



☞ When traveling, confirm that the travel alarm sounds normally.

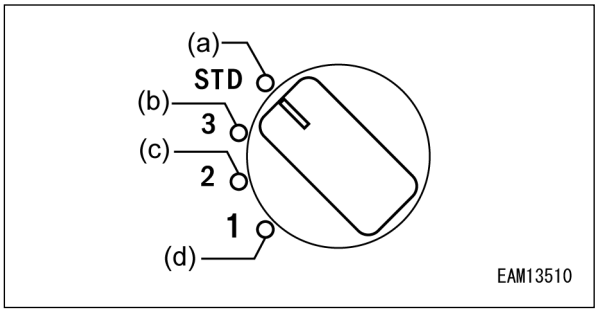
☞ The travel alarm can also be turned off. For details, refer to “4.2.3 [3] Switch the travel alarm ON/OFF.”

3. When the S3 lever (s3) has been pushed forward, confirm that the gauge width expands smoothly. Then, pull the S3 lever (s3) toward you and confirm that the gauge width contracts smoothly.



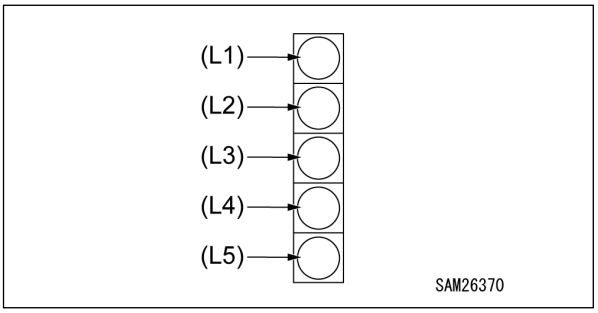
[15] Speed control function inspection

When the speed change switch has been moved to STD (a), confirm that the engine RPM increases according to the operating lever. Also, when the speed change switch is moved to STD (a) → 3 (b) → 2 (c) → 1 (d), confirm that the maximum speed drops.



[16] Inspections after powering on the receiver

Start the following inspections with the transmitter and receiver power turned off.



1. Set the machine main unit’s starter switch to “START” and confirm that the receiver is powered on. When the power is turned on, LED L1 and LED L2 in the LED monitor light up.

2. With the receiver powered on, turn on the transmitter and establish communication. If communication is established, the LED L2 in the LED monitor turns off and the LED L3 lights up.

6.12 IRREGULAR MAINTENANCE

6.12.1 Replacing the rubber track

⚠ WARNING

Grease is sealed inside the rubber track's tension adjustment equipment. The grease achieves a high pressure due to the tension of the rubber track. If the grease is removed without observing the following cautionary items, the grease valve may fly out and cause a serious accident.

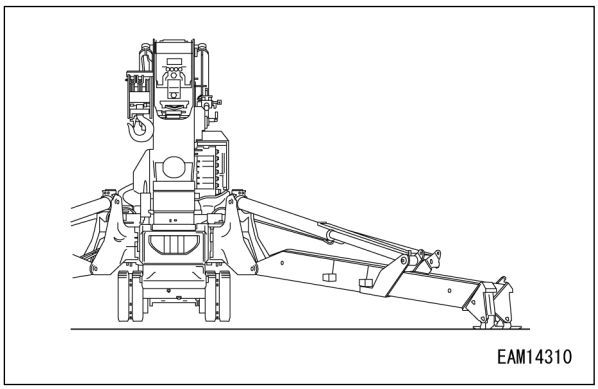
- **The grease valve for tension adjustment should not be loosened by more than one rotation. There is the danger of the grease valve flying out.**
- **When the tension adjustment is performed, avoid danger by not placing your body in front of the grease valve.**

Before removing the rubber track, confirm that the internal grease has been completely removed, then turn the sprocket.

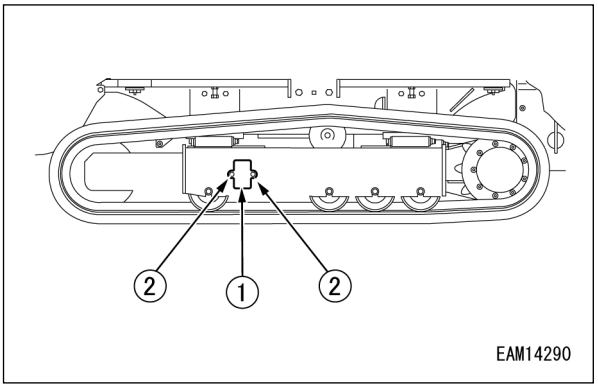
[1] Taking off the rubber track

- Prepare an iron pipe.

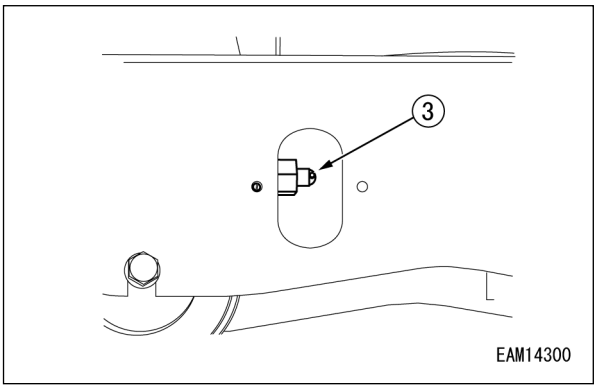
1. Referring to section “5.7.3 Setting the outriggers,” set up the outriggers and raise the undercarriage above the ground.



2. Remove the two attachment bolts (2) and take off the inspection cover (1).

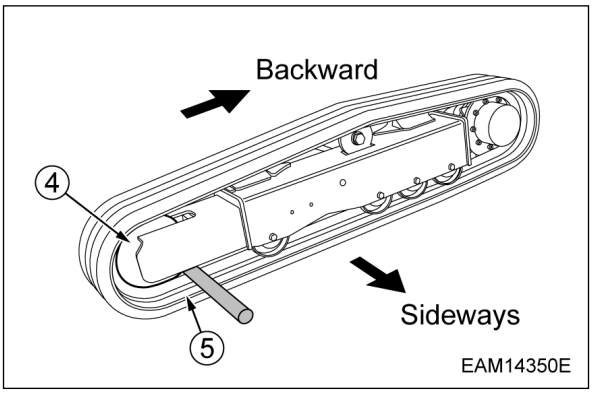


3. Loosen the grease valve (3) a little at a time and eject the grease.



4. When loosening the grease valve (3), rotate it a maximum of one turn.

5. After wedging the iron pipe between the idler (4) and the rubber track (5) as in the following diagram, turn the sprocket backward.



6. When the rubber track (5) rises above the idler (4) due to the iron pipe, slide it in the horizontal direction and remove it.

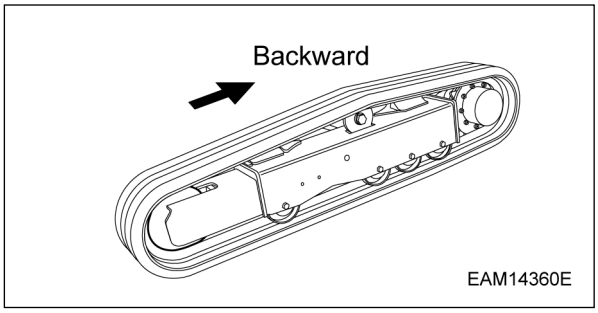
[2] Taking off the rubber track

- Prepare a grease gun.
- Prepare an iron pipe.

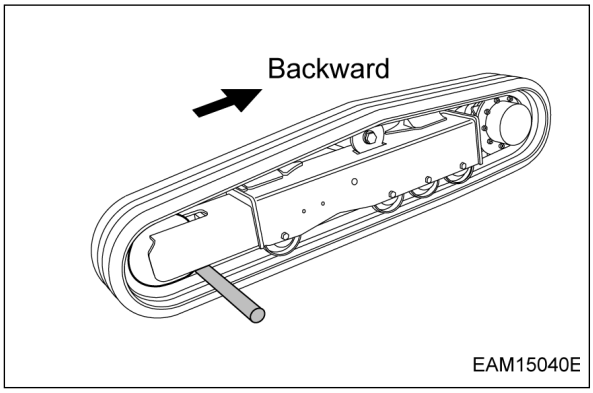
1. Referring to section “5.7.3 Setting the outriggers,” set up the outriggers and raise the undercarriage above the ground.

2. Interlock the rubber track with the sprocket, then put it on the idler.

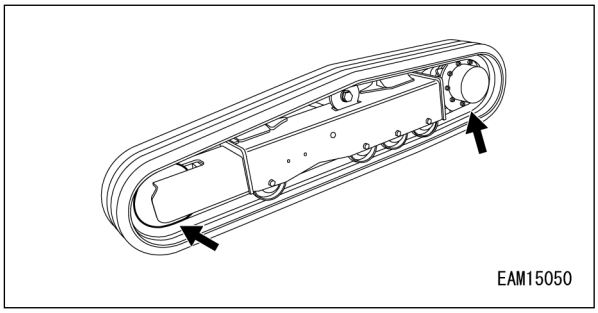
3. Turn the sprocket backward, push in the rubber track, and stop the rotation.



4. After the iron pipe is wedged into the rubber track, turn the sprocket backward again and put the rubber track securely on the idler.



5. Stop the rotation and confirm that the rubber track is placed securely between the sprocket and the idler.



6. Referring to section “6.11.3 [1] Inspecting and adjusting the rubber track tension,” adjust the tension of the rubber track.

7. Confirm that the state of the interlocking and tension of the rubber track, sprocket, and the idler are sufficient.

8. Referring to section “5.7.4 Stowing the outriggers,” stow the outriggers and bring the machine down to the ground.

6.12.1.1 Handling rubber tracks

[1] Good use

While the rubber tracks demonstrate many advantages not found in iron shoes, their advantages cannot be fully demonstrated if they are used in the same manner as the iron shoes. Proceed with reasonable operations depending on the worksite condition and operation content.

☞ This machine is equipped with rubber tracks as standard.
There is no optional setting of iron shoes.

Comparison between rubber tracks and iron shoes

Comparison item	Rubber tracks	Iron shoes
Less vibration	◎	△
Smooth travelling (no squeaks)	◎	○
Noise is small.	◎	△
Do not damage paved road surfaces.	◎	△
Handling is easy.	◎	△
Less vulnerable to damage	△	◎
Large towing force	◎	◎

◎ : Excellent ○ : Good △ : Normal

While the rubber tracks demonstrate many advantages thanks to its performance characteristic to the material, it has a weak point in strength.
Therefore, we would like you to sufficiently understand the characteristics of the rubber tracks and to respect prohibited operations and observe the cautions on handling so that the life of the rubber tracks can be extended and its advantages exercised.
Be sure to read “6.12.1.1 [3] Prohibited operations” and “6.12.1.1 [4] Cautions in using rubber tracks” before use.

[2] WARRANTY

Verification of proper tension of the rubber tracks, maintenance of rubber tracks, and damage caused by the fault of customers such as not respecting prohibited operation or not observing cautions in working, for example, “worked at the site where there were objects that may tear the rubber blocks, such as steel plates, U-shaped gutters, corners of bricks, corners of sheer broken stones and rocks, reinforcing steels, and iron scraps”, are not covered by warranty.

[3] Prohibited operations

The following operations are prohibited.

- Working and slewing on the ground with broken stones, hard rock ground with great irregularity, reinforcing steels, iron scraps, and near the edge of the steel plates will damage the rubber tracks.
- Locations where there are many large and small stones, such as river beds, stones will pass under the machine and may damage the rubber tracks. In extreme cases, the rubber tracks may come off.
- Keep the oil and chemical solvents away from the rubber tracks.
  If these materials come into contact with the rubber tracks, wipe off immediately.
  Do not travel over road surfaces where the oil has built up.
- Do not enter hot areas such as open fires, steel plates left under the blazing sun, or recently poured asphalt.
- Keep the rubber tracks indoor where there is no direct sunlight or rain when storing them for long time (3 months or more).

[4] Cautions in using rubber tracks

⚠ WARNING

Not observing these cautions will cause serious accidents or damage to the rubber tracks.

Keep the following in mind during operation.

- Avoid making spin turns on concrete surfaces. Avoid making sudden steering whenever possible, since it will cause early wear or defect on the rubber tracks.
- Do not operate the machine in a way that the edge of the rubber tracks is pressed against the concrete and walls.
- Avoid steering at a location with very uneven ground.
  Travel over bumps straight on or at a right angle.
  Going over a bump diagonally may result in the rubber tracks coming off.
- The rubber tracks slip very easily on a wet steel plate or snowed
  and frozen surfaces. Be especially careful not to slip when operating on the slope.
- Avoid using the rubber tracks whenever possible depending on the material to be worked on.
  If it is necessary to use the rubber tracks on the materials listed below, make sure to wash thoroughly after use.
  - Avoid the operation on the material crushed and yielding oil (such as soy beans, corns, rapeseed cake, etc.)
  - Handling salt, ammonium sulphate, potassium chloride, potassium sulfate or concentrated superphosphate corrodes the bonding at the cored bar section.
- Salt corrodes the bonding at the cored bar section. Avoid using the machine on the beach whenever possible.
- The operation in the very cold land changes the material of the rubber tracks, shortening its life.
  Use the rubber tracks in the range of -25°C to +55°C, due to the physical property of the rubber.
- When handling food such as salt, sugar, wheat, and soybeans, some pieces of wire or rubber may be mixed in the food if there is any deep scratch on the rubber tracks.
  Use the rubber tracks after repairing the cracked rubber.
- Always use the rubber tracks at appropriate tension to prevent the rubber track from coming off.
  Loose tension will allow the rubber tracks to come off.

6.12.2 Replacing, inspecting, and adjusting the wire rope

⚠ WARNING

When replacing the wire rope, be sure to wear thick, leather work gloves.

IMPORTANT

- **When measuring the diameter of the wire rope, do so where the sheave repeatedly passes through, and make the measurement from three directions and take the average. (Leave an interval and make the measurement in several places, not just one place.)**
- **Even if you are not using it for anything else, do not use an old wire rope.**
- **When replacement of the boom and jib telescoping wire rope is necessary, contact us or our sales service agency.**

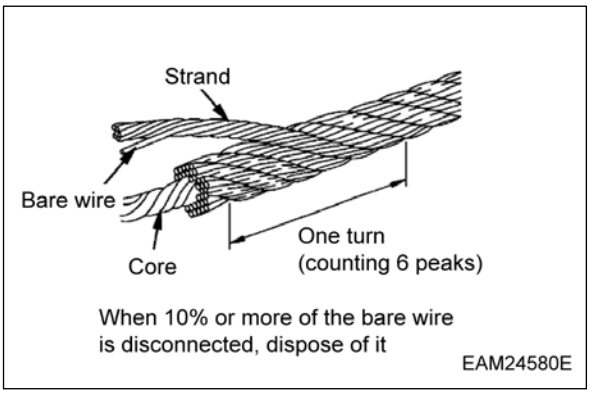
[1] Wire rope nominal dimensions

- Winch wire rope:
  IWRC6 x WS (26) SP φ 8 x 62 m
- No. 3 extending wire rope:
  IWRC6 x P/Fi (29) 0/0 φ 10 x 9.71 m
- No. 4 extending wire rope 1:
  IWRC6 x P/Fi (29) 0/0 φ 8 x 5.45 m
- No. 4 extending wire rope 2:
  IWRC6 x P/Fi (29) 0/0 φ 8 x 5.24m
- No. 5 extending wire rope:
  IWRC6 x P/Fi (29) 0/0 φ 10 x 6.07m
- Retracting wire rope:
  IWRC6 x P/Fi (29) 0/0 φ 9 x 20.31 m
- Jib extending wire rope:
  IWRC6 x P/Fi (29) 0/0 φ 7 x 4.18 m
- Jib retracting wire rope:
  IWRC6 x P/Fi (29) 0/0 φ 7 x 4.24 m

[2] Wire rope replacement criteria

Wire ropes suffer metal fatigue over time. When any of the following conditions apply, replace the wire rope.

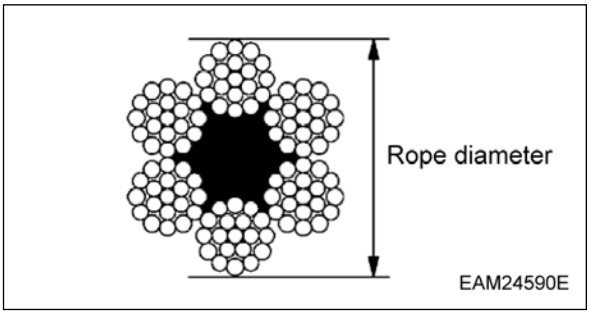
- Within one turn (counting 6 peaks) of the wire rope, when 10% or more of the bare wire of the bare wire (excluding the filler wire) number is disconnected.
- 20% or more within 5 turns of the wire rope



☞ If 9 or more bare wires for use with the winch have disconnected, perform a replacement.

☞ If 13 or more bare wires for use with the jib and boom have disconnected, perform a replacement.

- When the wire rope diameter has worn by 7% or more of the nominal diameter.



(1) Rope diameter

☞ Replace a wire rope of diameter 10 mm when the diameter has worn down to 9.4 mm.

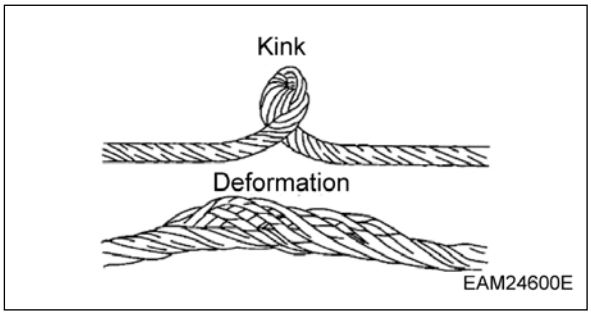
☞ Replace a wire rope of diameter 9 mm when the diameter has worn down to 8.4 mm.

☞ Replace a wire rope of diameter 8 mm when the diameter has worn down to 7.5 mm.

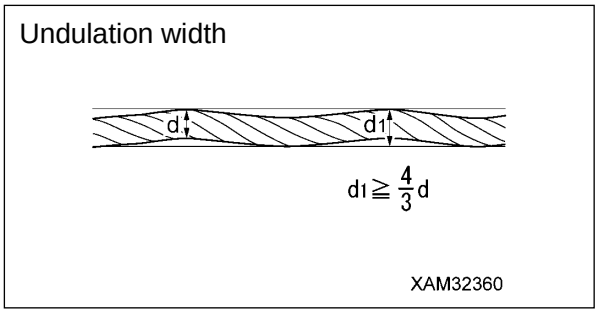
☞ Replace a wire rope of diameter 7 mm when the diameter has worn down to 6.6 mm.

- When either of the following is observed due to corrosion:
  - Pitching has occurred on the wire surface, and it has become pockmarked
  - Wires have lost tension due to internal corrosion

- As a result of the form collapsing, the following is observed:
  - Strands that are kinked



  - When the width of an undulation exceeds 4/3d within a section that is 25 times the nominal diameter d



  - When a wire rope is flattened by local crushing and the minimum diameter does not exceed 2/3 of the maximum diameter
  - A rope in which core wires or the rope core is exposed
  - A rope that is extremely bent
  - A rope appearing like a cage
  - A rope in which a strand has intruded
  - A rope in which one or more strands are loose
  - A rope with wires that are noticeably sticking out
- A rope with a faulty end socket
- Affected by heat or sparks

[3] Taking off the winch wire rope

Take off the wire rope according to the following procedure.

1. When removing the winch wire rope, refer to section “5.7.3 Setting the outriggers,” and be sure to set up the outriggers at the maximum extension.

2. Set up the machine on hard, firm level ground.

3. Referring to the section with the procedure “5.8.4 Work posture of the crane,” put the crane in the working position.

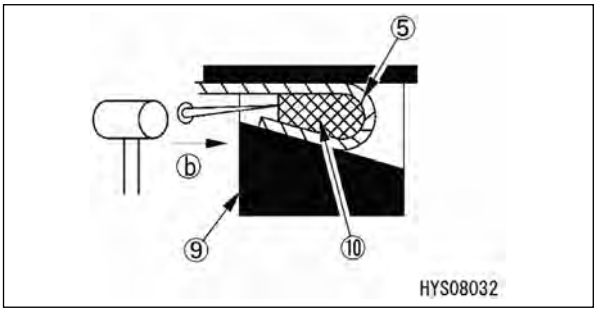
4. When a hook block is mounted, remove it referring to “5.9.8 Jib—Detaching a single-fall hook block” and “5.9.12 Boom—Detaching a 4-fall hook block.”

5. While pulling the wire rope, move the winch lever to “Down” (push forward), and wind the wire rope (5) off the winch drum.

6. When the winch drum’s wire rope has been wound off, remove the terminal of the wire rope (5) fixed to the winch drum (9) in the following way.

1. Prepare a 4- to 6-mm round pole and put it against the rope wedge (10).

2. Tap the round pole lightly in the arrow direction (b), then remove the rope wedge (10).



7. Wind up all of the remaining wire rope (5).

[4] Correcting twisted winch wire rope

⚠ WARNING

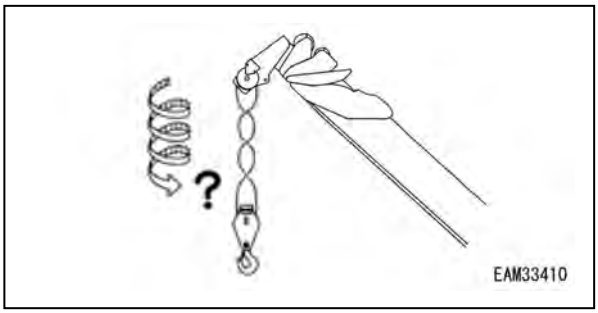
Always wear thick leather work gloves when handling the wire rope.

IMPORTANT

- **Change the hook direction of the wire rope (inverse the hook block side and winch drum side) periodically to extend the life of the wire rope.**
- **Do not hoist or lower while the hook block is on the ground. Otherwise, the wire rope may become tangled on the winch drum.**

Straighten twisted winch wire rope using the following procedure:

1. With the hook in normal position, note the twisting direction and number of twists.



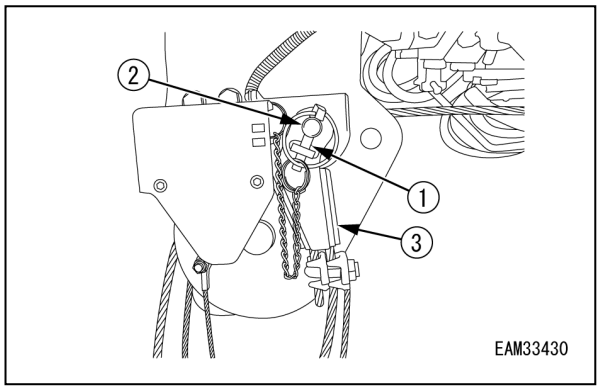
2. Operate the transmitter's S3 lever on the "contraction" side (pull it toward you) and fully contract the boom.

3. Operate the transmitter's S1 lever on the "lowering" side (push it forward) and lower the boom angle to approximately 20 degrees.

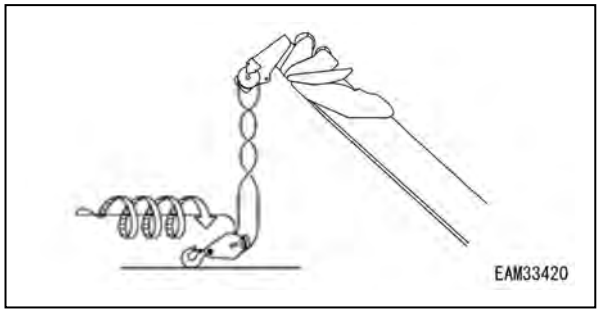
4. Operate the transmitter's S2 lever on the "wind down" side (push it forward), and after hoisting down the hook block to the brink of contacting the ground, operate the S1 lever on the "lowering" side (push it forward) and lower the hook block to the ground, and after that, lower the boom to the maximum.

5. Turn the Starter Switch to the "OFF" position to stop the machine.

6. Remove the linchpin (1) and then the wedge socket pin (2), and remove the wedge socket (3) from the boom head.



7. Install the wire rope end by forcibly twisting "n" (number of falls of wire rope) times the number of twists of the hook block in the opposite direction (the opposite direction to which the wedge socket tries to return naturally when you release your hand from it) to the hook block twisting checked in Step 1.



8. Start the machine, operate the transmitter's S1 lever on the "raising" side (push it forward), and set the boom derricking angle to the maximum.

9. Operate the transmitter's S3 lever on the "extension" side (push it forward) and set the boom length to the maximum length.

10. Operate the transmitter's S2 lever on the "hoist up" or "hoist down" side, hoist up the hook block, and repeatedly hoist down several times.

11. Roll in the winch drum in an orderly manner with tension applied to the wire rope.

12. Repeat the above steps until twisting of the hook is eliminated.

Replace the wire rope with a new one if the twisting is not corrected by the above steps.

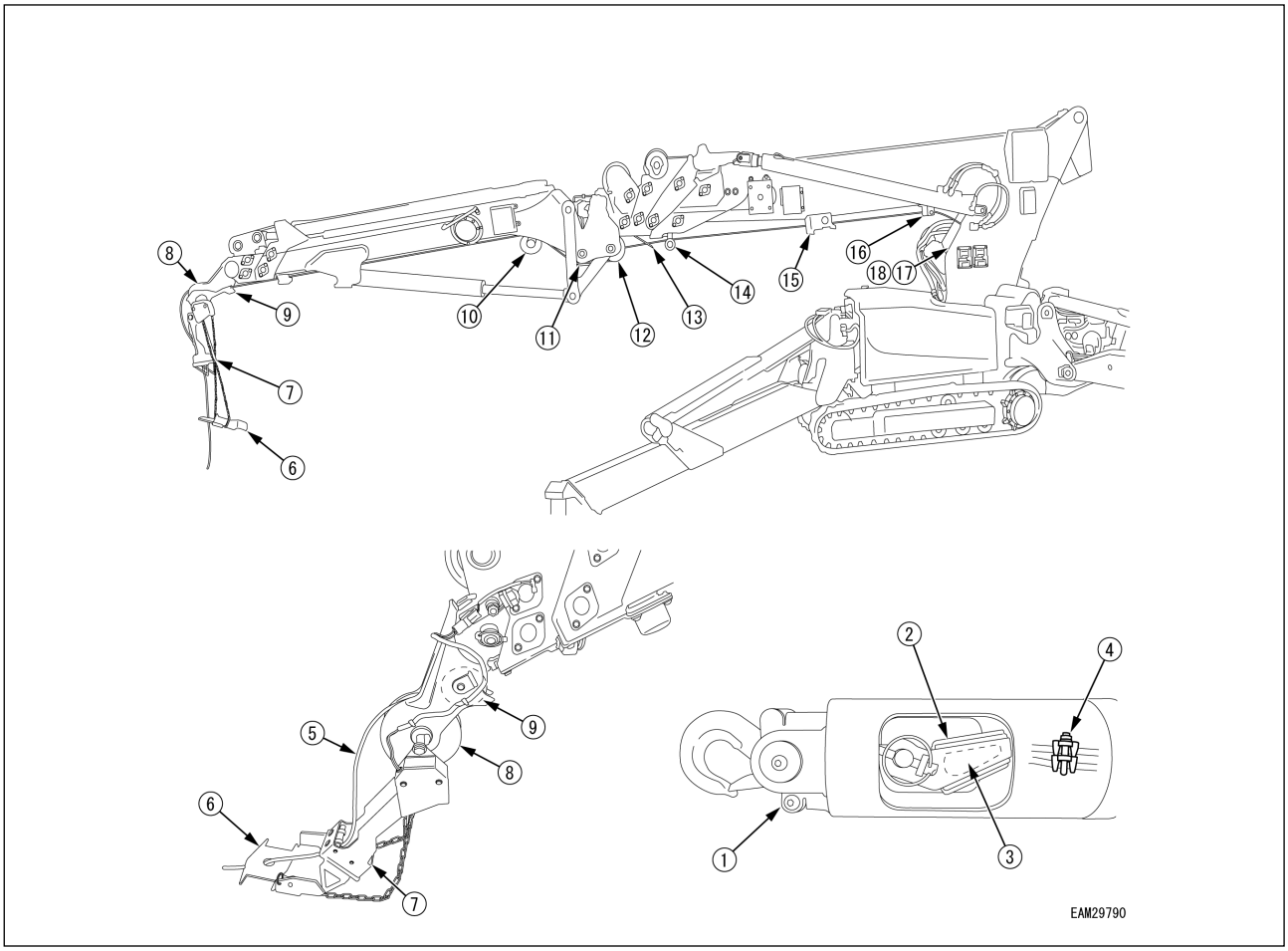
[5] Putting on the winch wire rope

⚠ WARNING

When putting on the rope wedge that fixes the wire rope, do so correctly and securely. Since if the wire rope comes off during the crane operation, it may cause a serious accident.

IMPORTANT

- **For the procedure in this section, it is assumed that the winch and winch-related parts are attached.**
- **When hoisting up the wire rope, be careful that the winch drum does not wind in an irregular manner.**
- **When putting on a new rope, wind the wire rope on to the winch drum while a load is applied. If a load is not applied, the wire rope will fall and cause disorderly winding. After the wire rope has been further hoisted up, set the boom and jib to the maximum extension and furthest up state, suspend a load (2.9 to 4.9 KN (300 to 500 kg)), repeatedly hoist up and hoist down the hook block several times to get the rope accustomed to it.**
- **The wire rope is wound into a coiled state. When hoisting up the wire rope, be careful that no kinks occur. In addition, when extending the wire rope from the winch drum, be sure to turn the wire rope body and unravel it.**



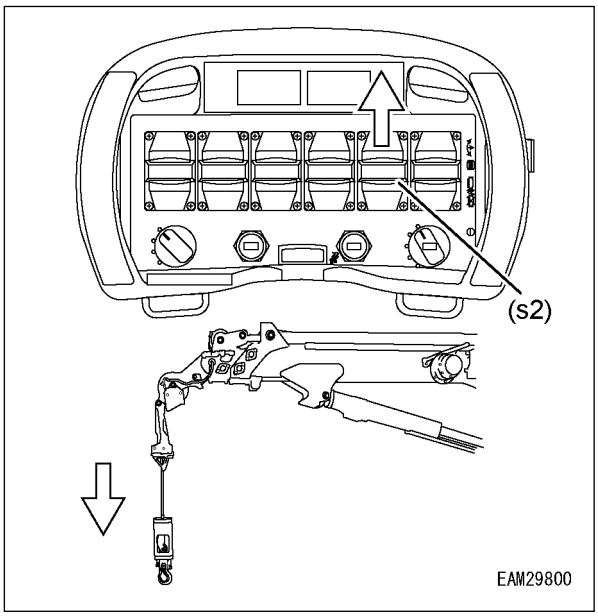
(1) Single fall hook block
(2) Wedge socket
(3) Rope wedge (for the hook)
(4) Wire clip
(5) Wire rope
(6) Protective weight
(7) Stowing cam
(8) Jib winch head top sheave
(9) Jib winch head snap sheave
(10) Jib snap sheave
(11) Boom head sheave (front)
(12) Boom head sheave (back)
(13) Wire guide
(14) Boom snap sheave
(15) Wire guide
(16) Idler
(17) Winch drum
(18) Rope wedge (for the drum)

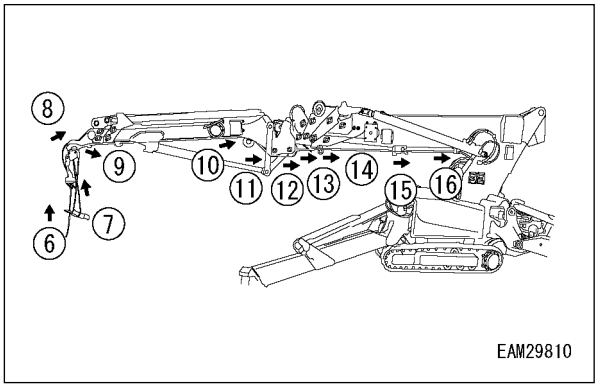
1. Referring to section “5.8.4 Work posture of the crane,” when the crane has been set in the working position, put the boom and jib in a level state.

☞ To make the work easier, lower the jib as required.

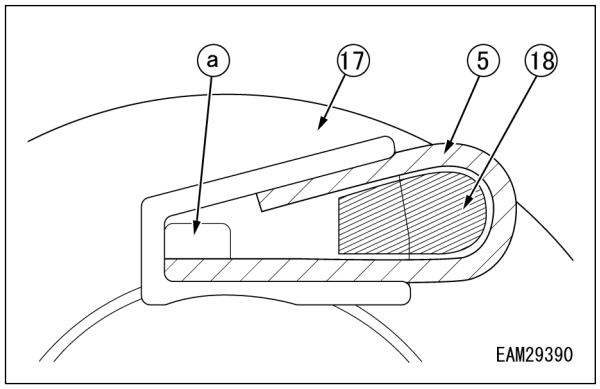
2. While pulling the wire rope (5) so that it does not wind in an irregular manner, move the S2 lever (s2) to the “Wind down” side and pass through in the following order.

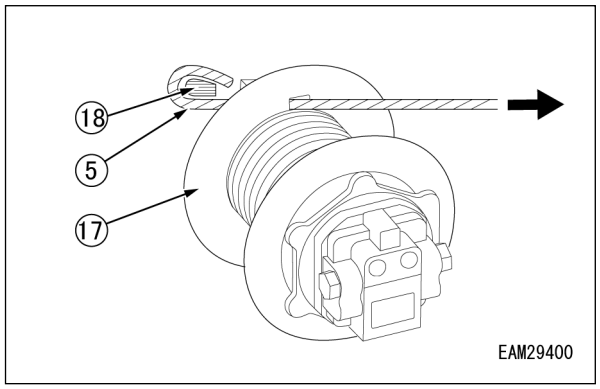
- Protective weight’s (6) hole
- Stowing cam’s (7) hole
- Top of the jib winch head’s top sheave (8)
- Bottom of the jib winch head’s snap sheave (9)
- Top of the jib’s snap sheave (10)
- Bottom of the boom head’s sheave (front) (11)
- Top of the boom head’s sheave (back) (12)
- Inside the wire guide (13)
- Bottom of the boom’s snap sheave (14)
- Inside the wire guide (15)
- Top of the idler (16)

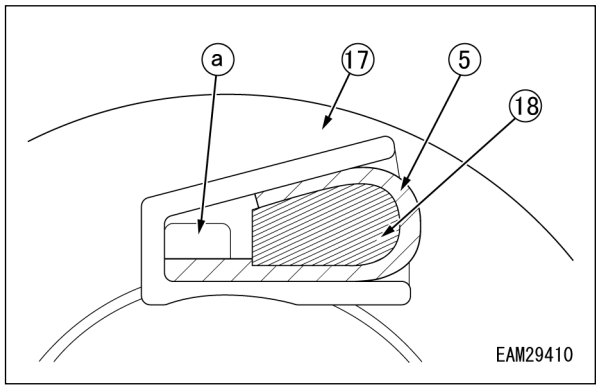




3. Pass the wire rope (5) through the winch drum’s (17) rope attachment hole (a), then fix the wire rope (5) to the winch drum (17) in the following way.



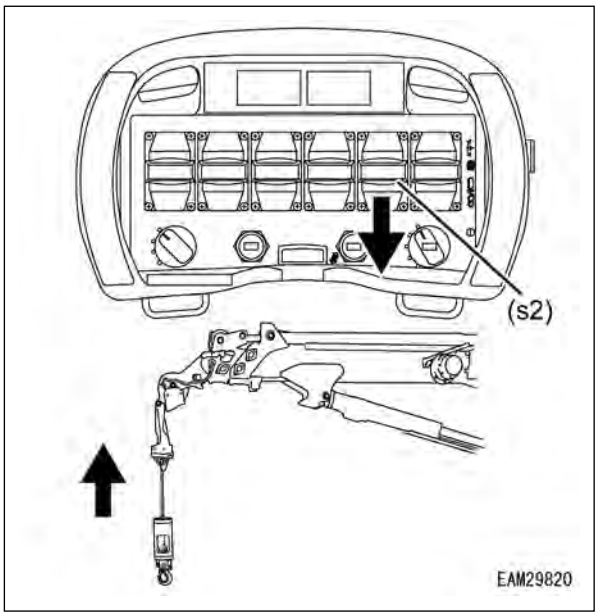




1. Pass the wire rope (5) into the winch drum (17) in a loosened state.

2. Insert the rope wedge (18) into the position shown in the diagram and place the wire rope (5), then strongly pull it in the direction of the arrow. When doing this, adjust the length of the wire rope (5) so that the tip of the wire rope (5) does not protrude from the wire attachment hole (a) of the winch drum (9).

4. Pull the S2 lever (s2) slowly to the “Hoist up” side, and wind on to the winch drum (17) while applying tension to the wire rope (5).

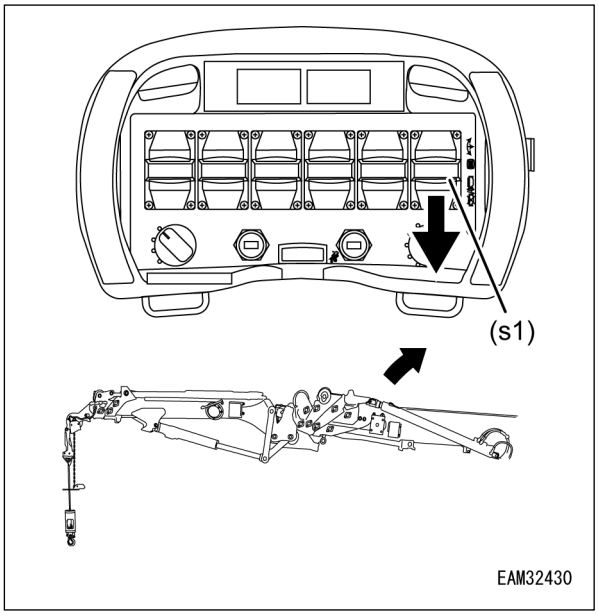


☞ If it is wound on without applying tension in the wire rope (5), disorderly winding may occur.

5. Attach the hook block referring to the section “5.9.7 Jib—Attaching a single-fall hook block.”

6. Lay the S1 lever (s1) in front of you to raise the boom so that the hook block is raised until it is lifted from the ground.

☞ Do not operate the winch until the hook block is lifted.



7. Set the boom and the jib to the maximum extension and the maximum raised state, and set the winch drum (17) wire rope (5) to about 3 to 4 winds remaining.

8. Move the S2 lever (s2) slowly to the “Hoist up” side, and wind on to the winch drum (17) while applying tension to the wire rope (5).

9. Set the boom and jib to the maximum extension and the maximum raising state, suspend a weight (2.9 to 4.9 kN) (300 to 500 kg), hoist up the hook block, repeatedly wind down several times, and get used to the rope.

[6] Inspecting the boom telescoping wire rope

⚠ WARNING

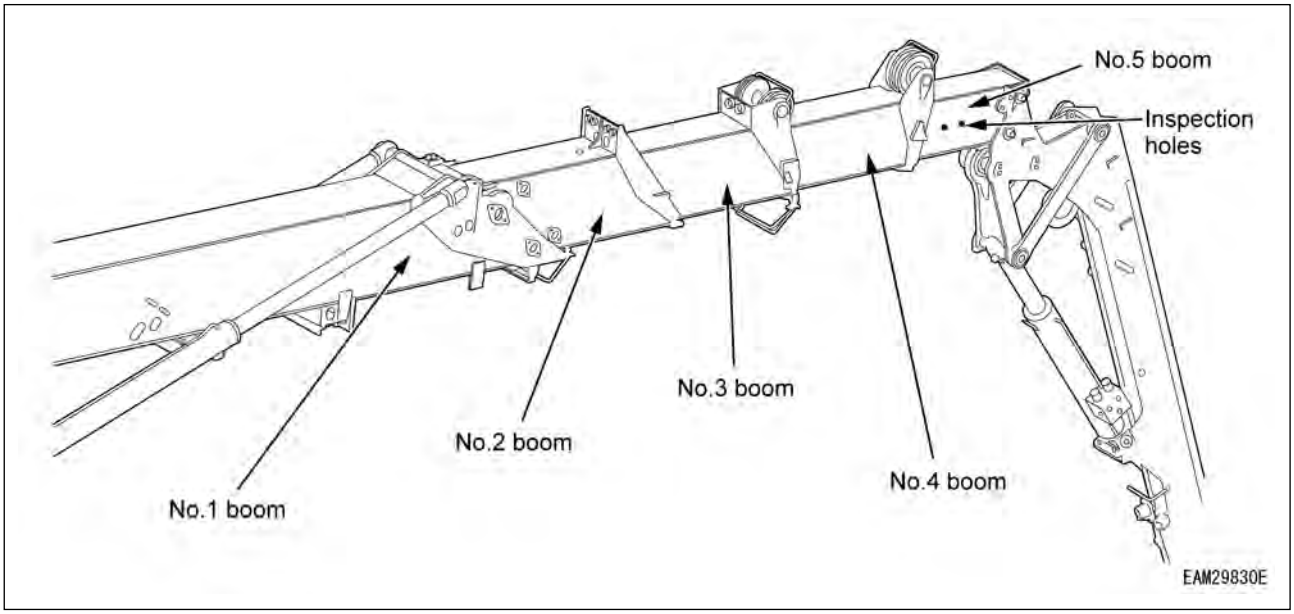
When inspecting or adjusting the wire rope, be sure to use thick, leather work gloves.
Be sure to adjust the boom telescoping wire rope accurately according to the procedure. If the adjustment is defective due to an omission in the procedure, there is the danger of the jib or suspended load falling.

IMPORTANT

- **Even if the adjustment is made, if the indicator does not come between the two standard holes, replace the retraction wire rope.**
- **When replacing the retraction wire rope, do not replace it yourself, instead, contact us or our sales service agency to carry out the replacement.**

If the boom extending wire rope ends up in the state shown in the diagram, adjust it.

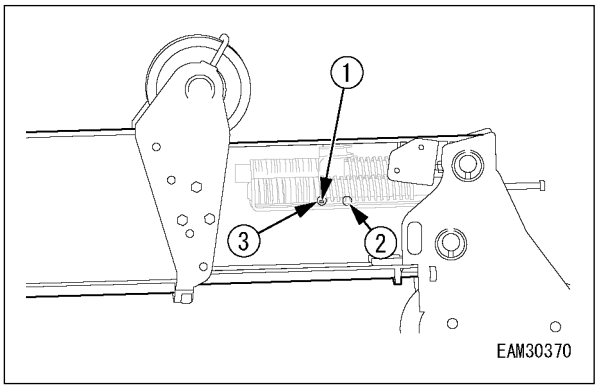
1. Put the boom in a level state and extend the boom to the point where two retracting wire tension inspection holes of either the left or right side of the No. 5 boom are visible.



2. Check that the retracting wire tension indicator (white) comes to the center of the retracting wire tension adjustment standard position.

- The adjustment standard position is the inspection hole of the rear side of the boom.
- Even if the retracting wire tension indicator is not aligned with the standard hole position, if it is between the limit hole positions, then no adjustment is necessary.
  If the retracting wire tension indicator is not aligned with the limit hole position, then an adjustment is necessary.
- When making the adjustment, do so with the standard hole position as the target.
- Even if it is not possible to make the adjustment so that the indicator comes to the center of the standard hole position, it is not a problem if an adjustment can be made so that the indicator comes between the standard hole position and the limit hole position.
  However, the wire replacement time is near. Carefully conduct the daily inspections and the inspections before workings.

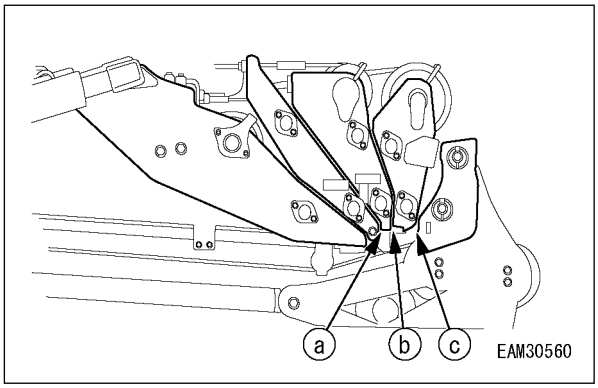
- Regarding the indicator's position refer to section "6.12.2 [6] Adjusting the boom retracting wire rope and retracting wire tensioner" and make the adjustment.



3. Set the boom in a level state and check that the extending wire rope's central part is hanging down during the boom retraction operation. If it is hanging down, referring to section "6.12.2 [5] Adjusting the boom extending wire rope," make the adjustment.

4. Set the boom to a level state, and check that there are gaps of 3 mm or less in the following three places when fully retracted. If the gaps are greater than 3 mm, refer to section "6.12.2 [6] Adjusting the boom retracting wire rope and retracting wire tensioner," and make the adjustment. If the gap is "0 (zero)," refer to section "6.12.2 [5] Adjusting the boom extending wire rope" and make the adjustment.

- The No. 2 and No. 3 boom gap (gap (a) in the following diagram)
- The No. 3 and No. 4 boom gap (gap (b) in the following diagram)
- The No. 4 and No. 5 boom gap (gap (c) in the following diagram)



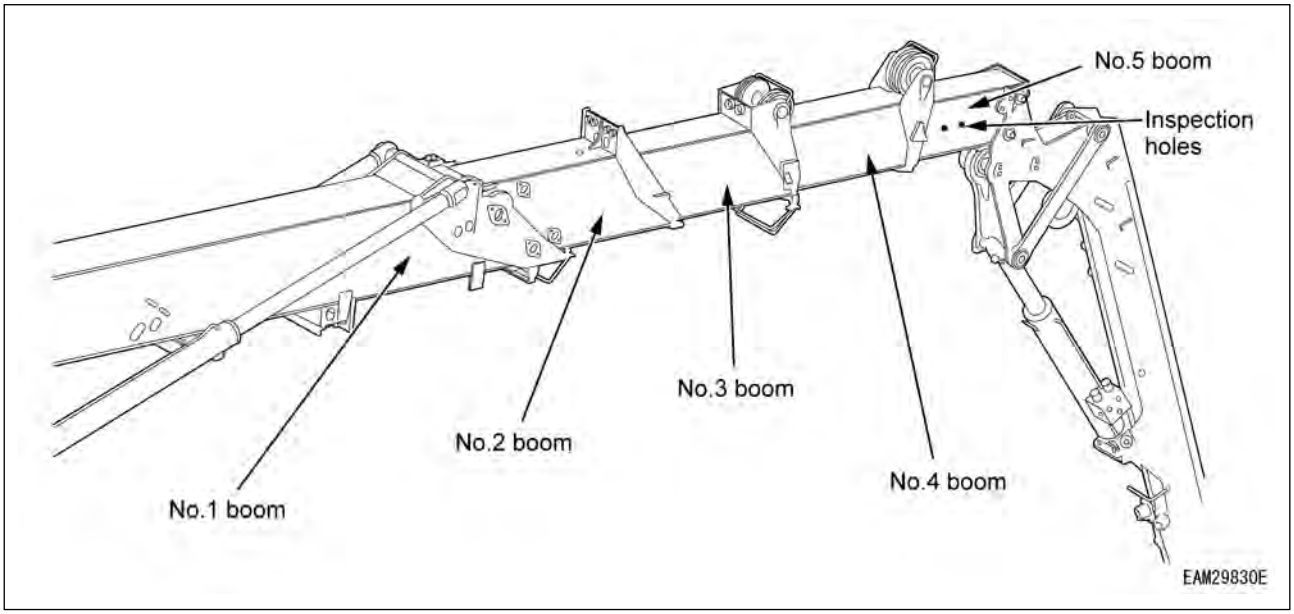
[7] Adjusting the boom extending wire rope

IMPORTANT

When adjusting each wire rope, be careful not to overextend the wire rope.

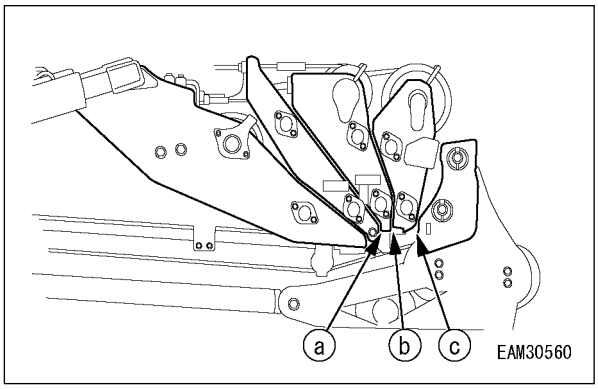
One No.5 boom extending wire rope, two No. 4 boom extending wire ropes, and two No. 3 boom extending wire ropes are used. There is an adjustment procedure for these wire ropes, so be sure to follow the adjustment procedure.

1. Fully retract the boom and set it in a level state, and at the same time extend the telescoping boom approximately 2 m.



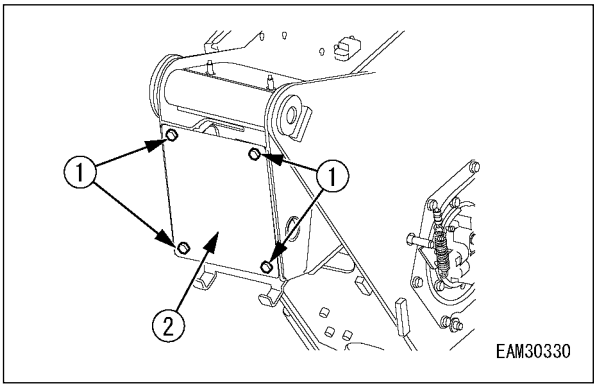
2. Retract the boom slowly to a stowed state. In this state, measure the gaps (a), (b), and (c), and make the following judgments.

- If at least one of the gaps (a), (b), or (c) is 3 mm or more, make the adjustment according to “6.12.2 [6] Adjusting the boom retracting wire rope and retracting wire tensioner.”
- If at least one of the gaps (a), (b), (c) is “0 (zero),” adjust the target wire rope according to section 3 to 5 of the procedure, “Adjusting No. 3 to 5 boom extending wire rope.”



3. Adjusting No. 3 boom extending wire rope

1. Remove the four attachment bolts (1) at the boom rear end, then take off the cover (2).

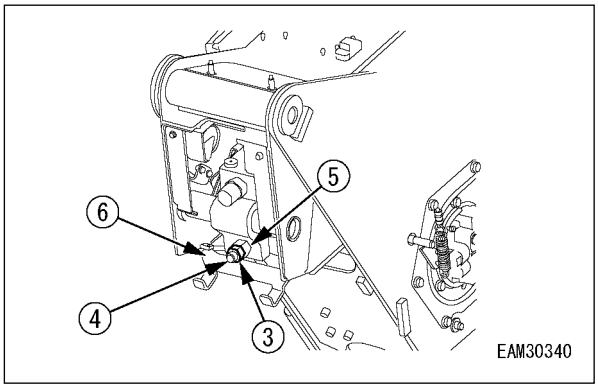


2. Loosen the lock nut (3) of the No. 3 boom extending wire rope, then tighten the adjustment nut (5) in the direction (clockwise) of the extension of the No. 3 extending wire rope (4) up to the point just before the No. 3 boom starts to extend.

3. Fix the adjustment nut (5) of the No. 3 boom extending wire rope with the lock nut (3).

4. Adjust the angle so that the extension wire bracket (6) is horizontal.

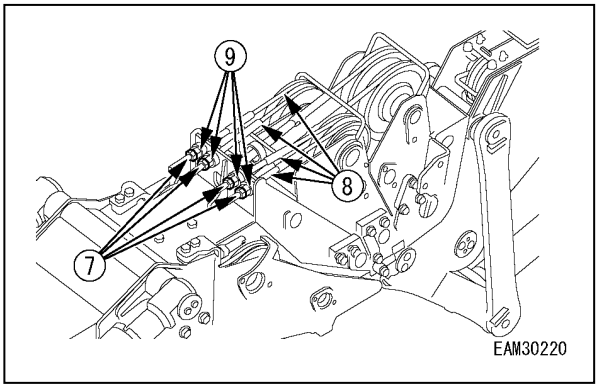
5. After completing the adjustment, attach the boom rear end cover (2) with the four attachment bolts (1).



4. Adjusting the No. 4 boom extending wire rope

1. Loosen the lock nut (7) of the No. 4 boom extending wire rope, then tighten the adjustment nuts (9) evenly in four places on the left and right in the direction (clockwise) of the extension of the No. 4 extending wire rope (8) up to the point just before the No. 4 boom starts to extend.

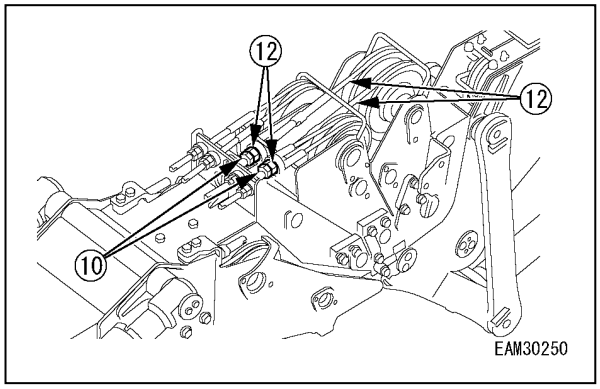
2. Fix the adjustment nut (9) of the No. 4 boom extending wire rope with the lock nut (7).



5. Adjusting the No. 5 boom extending wire rope

1. Loosen the lock nut (10) of the No. 5 boom extending wire rope, then tighten the adjustment nuts (12) evenly on the left and right in the direction (clockwise) of the extension of the No. 5 extending wire rope (11) up to the point just before the No. 5 boom starts to extend.

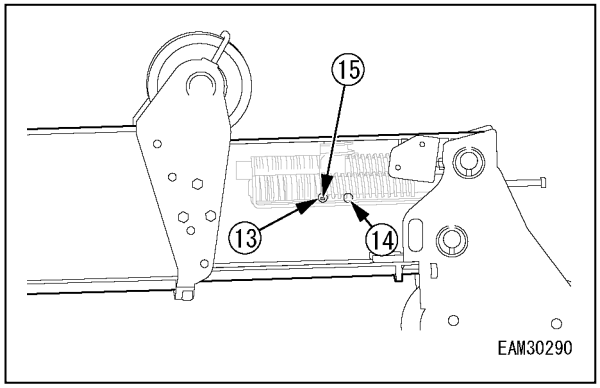
2. Fix the adjustment nut (12) of the No. 5 boom extending wire rope with the lock nut (10).



6. After adjusting each extending wire rope, extend the boom until two of the No. 5 boom side retracting wire tensioner inspection holes on either the left or right are visible.

7. Check that the retracting wire tension indicator (15) comes to the center of the retracting wire tension adjustment standard position.

- The adjustment standard position is the inspection hole (13) of the rear side of the boom.
- If the indicator's position differs from the standard position, follow the section "Adjusting the boom retracting wire rope and the retracting wire tensioner" to make the adjustment.



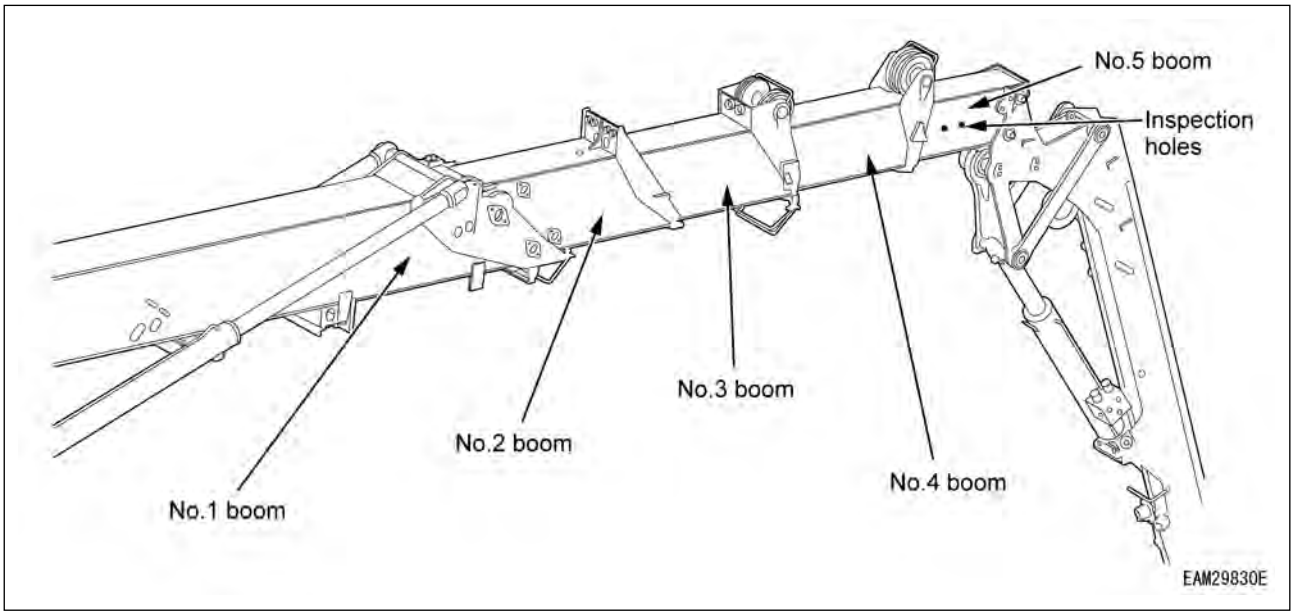
[8] Adjusting the boom retracting wire rope and retracting wire tensioner

IMPORTANT

When adjusting each wire rope, be careful not to overextend the wire rope.

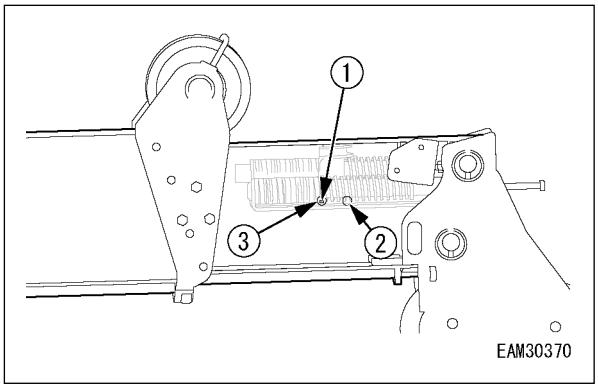
One retracting wire rope and one retracting wire tensioner are used. There is an adjustment procedure for this wire rope and this wire tensioner, so be sure to follow the adjustment procedure.

1. Similarly to when making the inspection, set the state so that two of the retracting wire tension inspection holes and the retracting wire tension indicator are visible.



2. Check the position of the indicator (1) in this state and make the following judgments.

- If the indicator (1) is in the limit hole position (2), loosen the retracting wire rope. Adjust the tension of the wire rope according to procedure 3, “Adjustment when the retracting wire rope is loose.”
- If the indicator (1) is on the boom rear side from the standard position (3), then the retracting wire rope is overextended. Adjust the wire rope to loosen it according to procedure 4, “Adjustment when the retracting wire rope is overextended.” Be careful to avoid overextension as it puts a load on the wire.

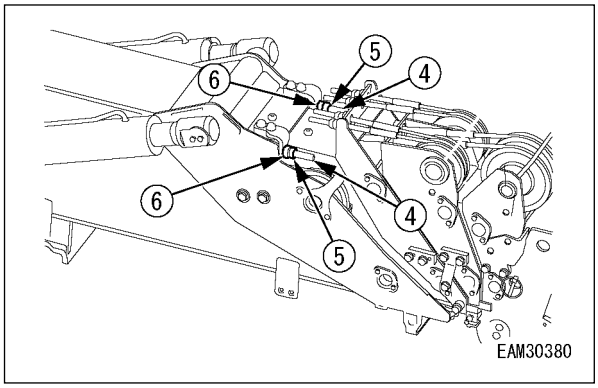


3. Adjustment when the retracting wire rope is loose

1. Loosen the lock nut (5) of the retracting wire rope (4), then tighten the adjustment nut (6) evenly left and right in the direction (clockwise) of the extension of the retracting wire rope (4).

2. Check the indicator’s position (1) from the retracting wire tension inspection hole (2) (3), and after tightening the adjustment nuts on both sides by five turns (10 mm), extend the boom 2 m and then fully retract it. Extend to the inspection position and repeat until it comes to the center of the adjustment standard position (the boom rear side inspection hole).

3. Fix the adjustment nut (6) of the retracting wire rope with the lock nut (5).

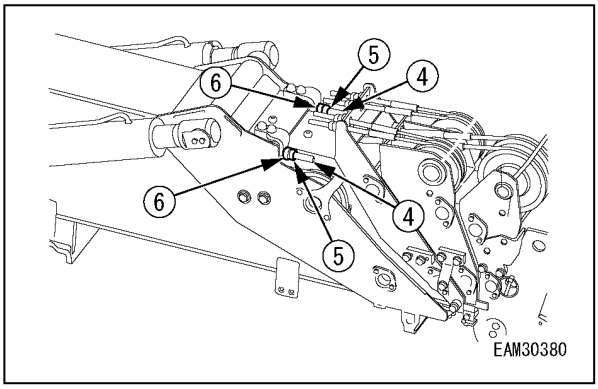


4. Adjustment when the retracting wire rope is overextended

1. Loosen the lock nut (5) of the retracting wire rope, then tighten the adjustment nut (6) evenly left and right in the direction (counterclockwise) in which the retracting wire rope (4) is loosened.

2. Check the indicator's position (1) from the retracting wire tension inspection hole (2) (3), and after loosening the adjustment nuts on both sides by five turns (10 mm), extend the boom 2 m and then fully retract it. Extend to the inspection position and repeat until it comes to the center of the adjustment standard position (the boom rear side inspection hole).

3. Fix the adjustment nut of the retracting wire rope with the lock nut.



⚠ CAUTION

The adjustment of the wire tensioner's tension when loaded is completed.
Do not tighten (loosen) the tensioner's bolts carelessly. Doing so will change the tension and may lead to sagging of the wire and damage.

IMPORTANT

- **Do not disassemble the retracting wire tensioner.**
- **A powerful spring is assembled in the retracting wire tensioner. So, if the tensioner is carelessly disassembled, the spring will fly out and may cause a serious personal injury or accident.**
- **If disassembly or repair are necessary, Contact us or our sales service agency to request repairs.**

5. After adjusting the retracting wire rope, perform the boom retraction operation to put it in a fully retracted state, and if the gaps (a), (b), and (c) of each of the boom ends are 0 mm, follow the section "Adjusting the boom extending wire rope" to extend each wire and adjust so that there is a gap of 3 mm or less in each boom.
If the gaps (a), (b), and (c) of each boom are not 3 mm or less despite adjusting the retracting wire rope and the retracting wire tensioner, loosen each of the boom extending wires and adjust so that the gaps are 3 mm or less.

6. Adjustment to loosen the No. 3 boom extending wire rope

1. Remove the four attachment bolts at the boom rear end, then take off the cover.

2. Loosen the lock nut of the No. 3 boom extending wire rope, then loosen the adjustment nut in the direction (counterclockwise) in which the No. 3 extending wire rope loosens until the gap (a) is
3 mm or less. If the nut does not change even if loosened by one turn (2.5 mm), telescope the boom by around 2 m.

3. Fix the adjustment nut of the No. 3 boom extending wire rope with the lock nut.

4. After completing the adjustment, attach the boom rear end cover with the four attachment bolts.

7. Adjustment to loosen the No. 4 boom extending wire rope

1. Loosen the lock nut of the No. 4 boom extending wire rope, then loosen the adjustment nut evenly in four places on the left and right in the direction (counterclockwise) in which the No. 4 extending wire rope loosens until the gap (b) is 3 mm or less. If the nut does not change even if loosened by five turns (8.75 mm), telescope the boom by around 2 m.

2. Fix the adjustment nut of the No. 4 boom extending wire rope with the lock nut.

8. Adjustment to loosen the No. 5 boom extending wire rope

1. Loosen the lock nut of the No. 5 boom extending wire rope, then loosen the adjustment nut evenly left and right in the direction (counterclockwise) in which the No. 5 extending wire rope loosens until the gap (c) is 3 mm or less. If the nut does not change even if loosened by five turns (8.75 mm), telescope the boom by around 2 m.

2. Fix the adjustment nut of the No. 5 boom extending wire rope with the lock nut.

9. After the extending wire has been loosened, confirm that the retracting wire tensioner indicator comes to the adjustment standard position.
If it does not come to the standard position, follow the section "6.12.2 [6] Adjusting the boom retracting wire rope and retracting wire tensioner" to adjust it.

10. If the gaps (a), (b), and (c) are not 3 mm or less despite adjusting each extending wire, extend the extending wires and adjust so that the gaps are 3 mm or less.

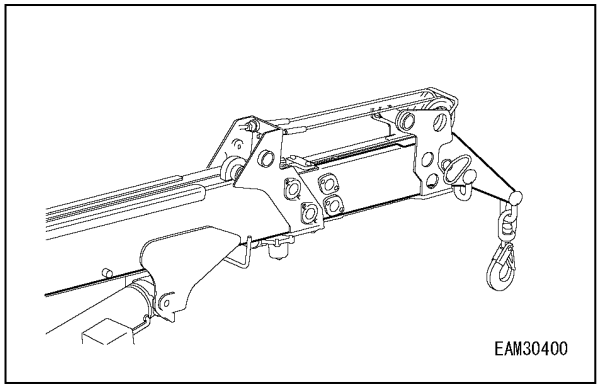
[9] Inspecting the jib telescoping wire rope

⚠ WARNING

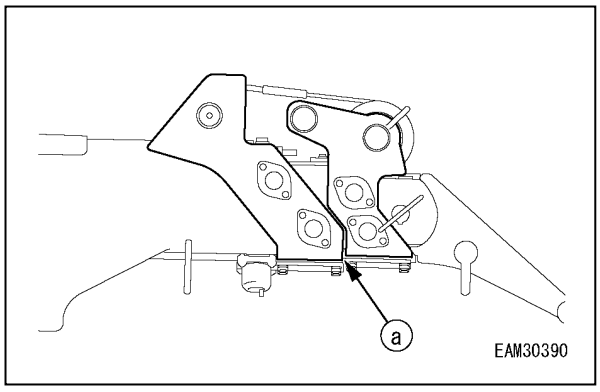
When inspecting or adjusting the wire rope, be sure to use thick, leather work gloves.
Be sure to adjust the jib telescoping wire rope accurately according to the procedure. If the adjustment is defective due to an omission in the procedure, there is the danger of the jib or suspended load falling.

If the jib extending wire rope ends up in the state shown in the diagram, adjust it.

1. Set the jib and boom in level states and check that the extending wire rope's central part is hanging down during the jib retraction operation. If it is hanging down, referring to the wire rope adjustment section, make the adjustment.



2. Set the jib and boom in level states and check that the gap between the No. 2 and No. 3 jibs (gap (a) in the diagram below) is 5 mm or more when the jibs are fully retracted. If the gap is 5 mm or more, referring to section "6.12.2 [7] Inspecting the jib telescoping wire rope," make the adjustment.



[10] Adjusting the jib telescoping wire rope

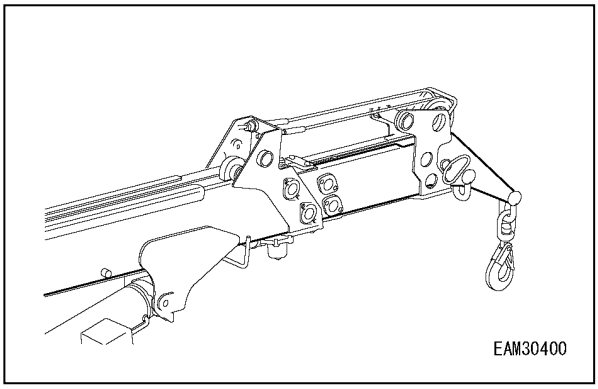
IMPORTANT

When adjusting each wire rope, be careful not to overextend the wire rope.

One jib extending wire rope and one retracting wire rope are used.

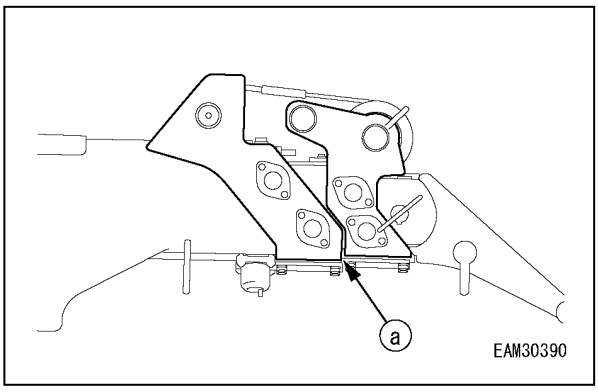
There is an adjustment procedure for these wire ropes, so be sure to follow the adjustment procedure.

1. Fully retract the jib and set it in a level state, and at the same time extend the telescoping jib approximately 2 m.



2. Stow the boom slowly to a stowed state. In this state, measure gap (a) and make the following judgments.

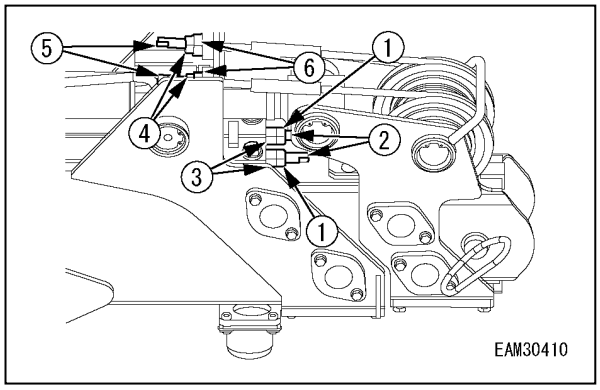
- If gap (a) is 5 mm or more, make the adjustment according to the procedure 3 section, “Adjusting the No. 3 jib retracting wire rope.”
- If gap (a) is “0 (zero),” make the adjustment according to the procedure 4 section, “Adjusting the No. 3 jib extending wire rope.”



3. Adjusting the No. 3 jib retracting wire rope

1. Loosen the lock nut (1), then tighten the adjustment nut (3) evenly left and right in the direction (clockwise) in which the No. 3 jib retracting wire rope (2) extends until gap (a) is zero.

2. After conducting the operations and adjustments of sections 1 and 2 of the procedure, if the No.3 jib retracting wire rope is sagging and gap (a) is 5 mm or more, redo the adjustment.

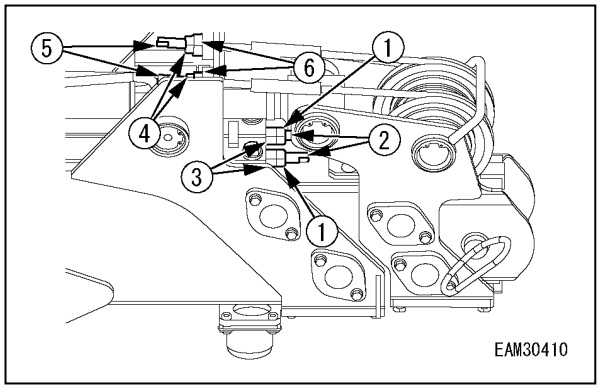


4. Adjusting the No. 3 jib extending wire rope

1. Loosen the lock nut (4), then tighten the adjustment nuts (6) evenly on the left and right in the direction (clockwise) in which the No. 3 extending wire rope (5) extends up to the point just before the No. 3 jib starts to extend.

2. Additionally, tighten the adjustment nut (3) of the No. 3 jib retracting wire rope one turn more both left and right.

3. Fix the adjustment nuts of the No. 3 jib retracting and extending wire ropes respectively with lock nuts.



6.13 REGULAR MAINTENANCE

6.13.1 Maintenance after the initial 10 hours

Perform the following maintenance after the first 10 hours of operation of a new vehicle.

[1] Greasing the machine parts

For details of how and where the maintenance is conducted, refer to section “6.13.4 [1] Greasing the machine parts.”

6.13.2 Maintenance after the initial 50 hours

Perform the following maintenance after the first 50 hours of operation of a new vehicle.

[1] Replacing the engine oil and the engine oil filter cartridge [engine specification / engine and electric specification]

For details of how and where the maintenance is conducted, refer to sections “6.13.5 [2] Replacing the engine oil [engine specification / engine and electric specification]” and “6.13.6 [1] Replacing the engine oil filter cartridge [engine specification / engine and electric specification].”

[2] Replacing the oil in the hydraulic oil tank

For details of how and where the maintenance is conducted, refer to section “6.13.11 [1] Replacing the oil in the hydraulic oil tank.”

[3] Replacing the hydraulic oil return filter

For details of how and where the maintenance is conducted, refer to section “6.13.9 [1] Replacing the hydraulic oil return filter.”

[4] Fan belt tension inspection and adjustment [engine specification / engine and electric specification]

For details of how and where the maintenance is conducted, refer to section “6.13.5 [4] Fan belt tension inspection and adjustment [engine specification / engine and electric specification].”

6.13.3 Maintenance after the initial 250 hours

Perform the following maintenance after the first 250 hours of operation of a new vehicle.

[1] Replacing the oil inside the slewing speed reducer case

For details of how and where the maintenance is conducted, refer to section “6.13.11 [2] Replacing the oil inside the slewing speed reducer case.”

[2] Replacing the oil inside the travel motor speed reducer case

For details of how and where the maintenance is conducted, refer to section “6.13.11 [3] Replacing the oil inside the travel motor speed reducer case.”

[3] Replacing the oil inside the winch speed reducer case

For details of how and where the maintenance is conducted, refer to section “6.13.11 [4] Replacing the oil inside the winch speed reducer case.”

[4] Air cleaner hose inspection [engine specification / engine and electric specification]

For details of how and where the maintenance is conducted, refer to section “6.13.6 [2] Air cleaner hose inspection [engine specification / engine and electric specification].”

[5] Inspecting the radiator hose and clamp band [engine specification / engine and electric specification]

For details of how and where the maintenance is conducted, refer to section “6.13.6 [3] Inspecting the radiator hose and clamp band [engine specification / engine and electric specification].”

6.13.4 Maintenance to be conducted every 50 hours

[1] Greasing the machine parts

IMPORTANT

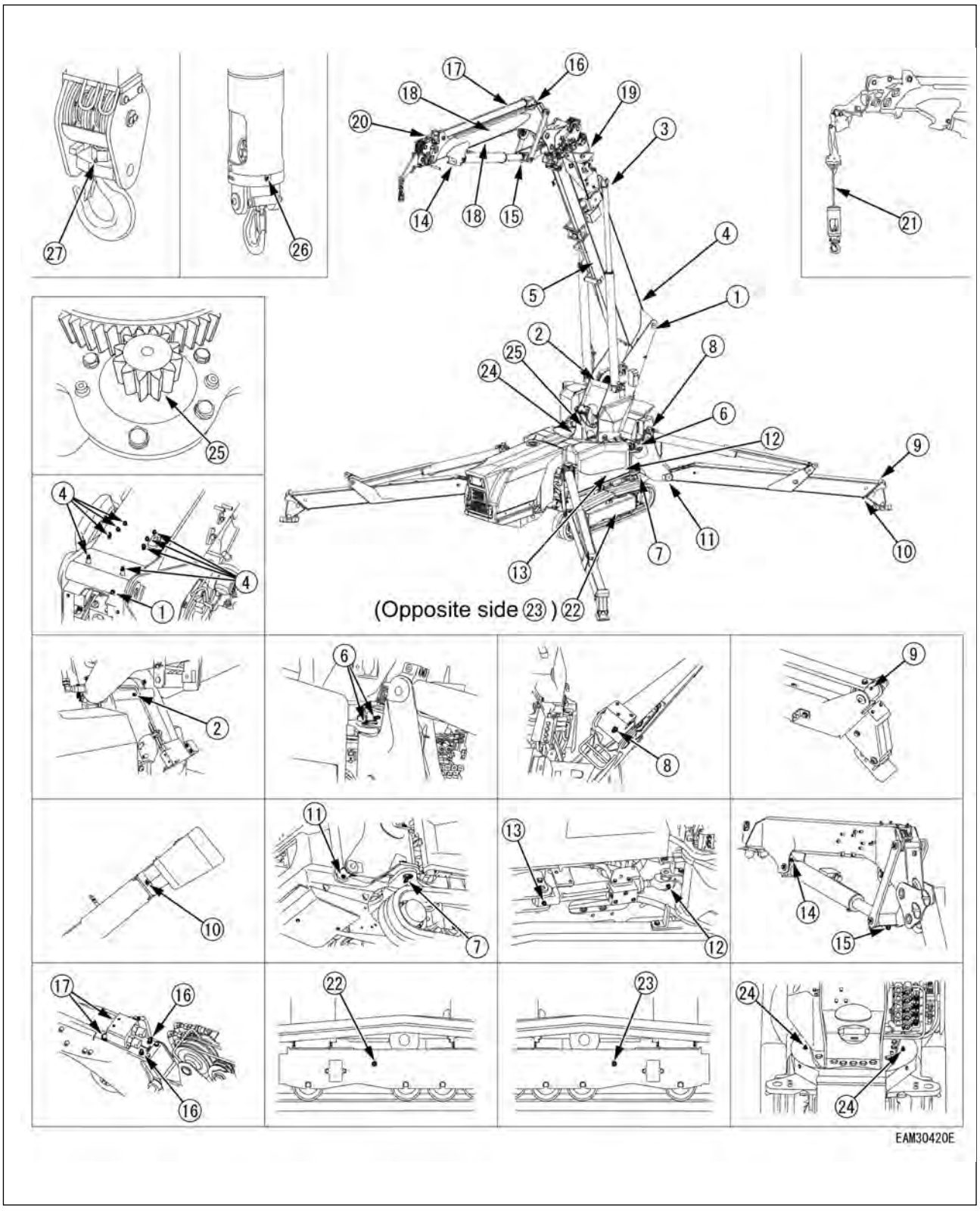
- **The type of grease used varies depending on the area to be greased. If the wrong grease is applied, the lifespan of the machine may be reduced.**
- **Use the genuine products for the jib and boom greases. If greases other than the genuine products are used, it may not be possible to perform the telescoping operation.**
- **Up to 100 hours of operation of a new vehicle with its initial familiarity, apply grease every 10 hours.**

• Use the types of grease in the following table depending on the area to be greased.

No.	Greasing area		Type
1	Boom attachment pin	1 places each	Lithium grease
2	Boom derrick cylinder bottom attachment pin		
3	Boom derrick cylinder rod side attachment pin		
4	Boom slide plate greasing	Total of 8 places	Neo grease (boom grease)
5	Both sides and the bottom of the boom	No. 2 to No. 5 boom	
6	Outrigger rotary shaft (shaft top)	Total of 8 places	Lithium grease
7	Outrigger rotary shaft (shaft bottom)		
8	Outrigger cylinder bottom attachment pin	4 places each	
9	Outrigger cylinder rod side attachment pin		
10	Outrigger ground detection pin		
11	Outrigger attachment pin		
12	Outrigger rotary cylinder bottom attachment pin		
13	Outrigger rotary cylinder top attachment pin		
14	Jib derrick cylinder bottom attachment pin	1 places each	
15	Jib derrick cylinder top attachment pin		
16	Jib slice plate greasing (top)	Total of 2 places	Neo grease (boom grease)
17	Jib slide plate greasing (needle nozzle)	Total of 2 places	
18	Both sides, the top, and the bottom of the jib and boom	No. 2 and No. 3 boom	
19	Boom extending and retracting wire ropes	Total of 3	Rope grease
20	The jib and boom extending and retracting wire ropes	Total of 1	
21	The hoist up wire rope	Total of 1	
22	Variable gauge cylinder rod side attachment pin	1 places each	Lithium grease
23	Variable gauge cylinder bottom attachment pin		
24	Slewing bearing	Total of 2 places	
25	Slewing gear	Outer circumference	
26	Single-fall hook block	1 places each	
27	4-fall hook block		

1. Using the grease gun, insert the grease from the grease plugs indicated with arrows (detailed reference in the greasing parts described below) in the above table, “No. 1 to 3, 6 to 15, 22 to 24, 26 27.”
2. After greasing, wipe up all the old grease pushed out.
3. When greasing each outrigger cylinder, referring to section “5.7.3 Setting the outriggers,” set up the outriggers.
4. When greasing the derrick cylinder’s attachment pin and the boom upper slide plate, referring to section “5.8.7 Derricking the boom,” raise the boom a little.
5. When applying grease to both sides and the bottom of the boom and to the wire rope, referring to section “5.8.9 Telescoping the boom,” extend the boom.
6. In order to prevent wear and rusting of the wire rope, apply rope grease. When applying the grease, first remove dirt from the rope surface.

[Greasing part details]



[2] Inspecting the fuel hose and clamp band [engine specification / engine and electric specification]

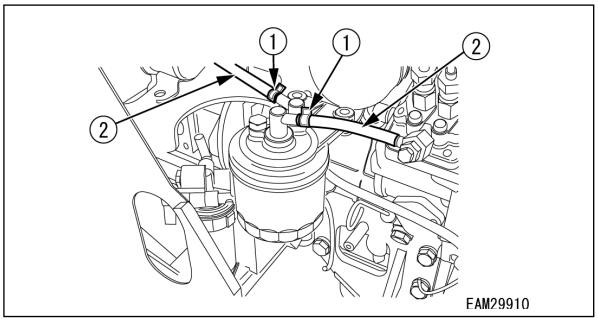
⚠ WARNING

- **After stopping the engine, inspect the fuel pipe and replace it if there is any damage.**
- **If the fuel hose is damaged, it may cause a fire.**
- **If the fuel hose is dirty, it may cause the fuel ejection pump to malfunction.**

⚠ CAUTION

Other than when removing air, be sure to close the air removal plug of the fuel ejection pump. Otherwise, it may cause the engine to stop.

1. Stop the machine on firm level ground.
2. Referring to section “6.9 COVERS,” take off the engine cover.
3. If the clamp band (1) is loose, apply engine oil to the band’s screw and firmly tighten the band.



4. If the rubber fuel hose has worn, replace it every two years and tighten the band (1).
5. Before 2 years have passed, if the fuel hose (2) and the clamp band (1) are worn or damaged, replace or repair them simultaneously, referring to the section “6.13.14[3] Fuel hose and clamp band replacement [engine specification / engine and electric specification].”
6. Referring to section “6.9 COVERS,” re-attach the engine cover.

6.13.5 Maintenance to be conducted every 100 hours

[1] Inspection of oil quantity inside the winch speed reducer case and replenishment

⚠ WARNING

- **Immediately after operating the engine, the oil is hot. Do not remove the inspection port’s plug straight away, but wait for the oil to cool.**
- **During the inspection of the oil quantity and the replenishment, be sure to stop the engine,**

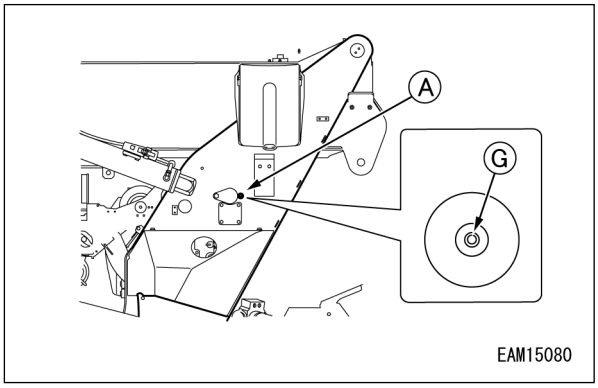
IMPORTANT

- **When rotating the winch, cancel the hook block stowing.**
- **For details of the oil to be used, refer to section “6.5.1 Use of fuel and lubricating oil depending on temperature.”**
- **After checking and replenishing the oil, use sealing tape or similar as a leak stop by adhering it to the screw part of the oil quantity inspection plug, and securely tighten the screw.**

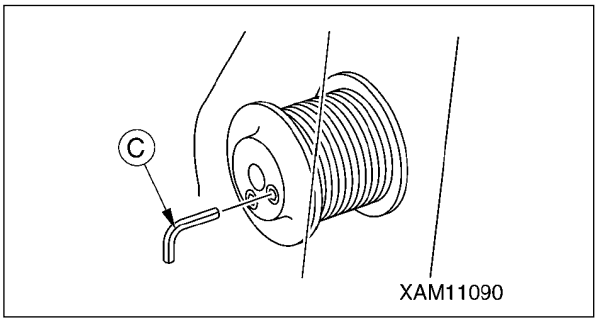
・Hex wrench for removing the plug 4 mm

1. Stop the machine at a level location.
2. Move the No. 4 outrigger as needed so that the inspection part of the winch speed reducer case of the post side is visible.

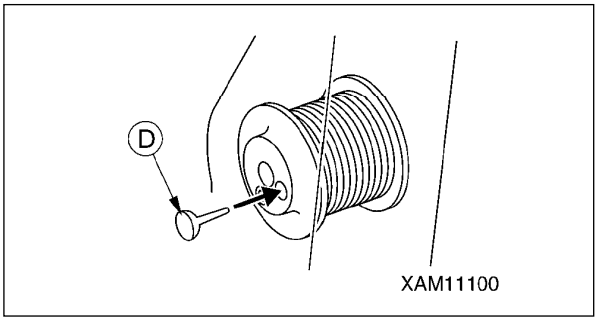
3. Slowly rotate the winch and stop it when the oil quantity inspection plug (G) in the post side's inspection hole (A) position is in the viewing position.



4. Using the hex wrench (C), turn and loosen the oil quantity inspection plug (G) and check that the gear oil oozes out.



5. When the result of the inspection is that the gear oil does not ooze out of the oil quantity inspection plug (G) part, slowly turn and remove the oil quantity inspection plug (G) and replenish the gear oil using the oil pump (D), etc.



6. After replenishing the oil, tighten the oil quantity inspection plug (G) securely.

[2] Replacing the engine oil [engine specification / engine and electric specification]

⚠ WARNING

- **The engine oil pan drain plug is at the bottom of the machine. When discharging the engine oil, set up the outrigger to lift the machine to a convenient height for the job. In this case, place square timber or similar between the left and right crawlers and the ground as a safety measure.**
- **After inspecting the oil quantity and replenishing, securely tighten the oil level gauge. Otherwise, the oil level gauge may come off during operation, and the heated oil may spurt out, resulting in scalding.**
- **Immediately after operating the engine, the parts are hot. Do not replace the oil straight away, but wait until the engine has cooled enough that it can be touched with a bare hand.**

IMPORTANT

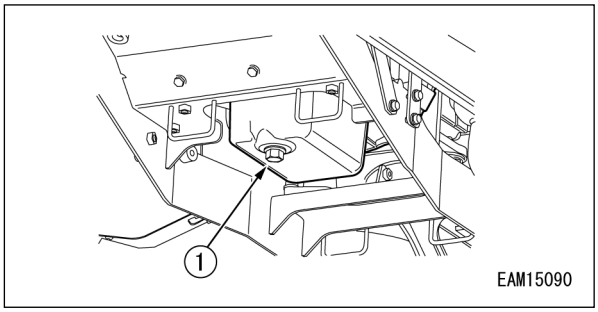
- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature." If oil other than that specified is used, the engine lifespan may be shortened. Be sure to replenish the oil with the indicated oil.**
- **Maintain a suitable quantity of engine oil.**
- **If the engine is completely cooled, the oil cannot be completely discharged. After running the engine a little to warm the oil, drain the oil.**
- **When replenishing the oil, be careful that garbage, etc. does not get in from the oil refill port.**

- **Discharged oil receptacle: prepare a container of capacity 5 ℓ or more.**
- **Oil pan replacement oil quantity: 3.8 ℓ**

1. Stop the machine on firm level ground.

2. Referring to section "5.7.3 Setting the outriggers," set the outriggers and raise the machine to a convenient height for the job.

3. Place the oil discharge receptacle directly beneath the machine bottom drain plug (1).



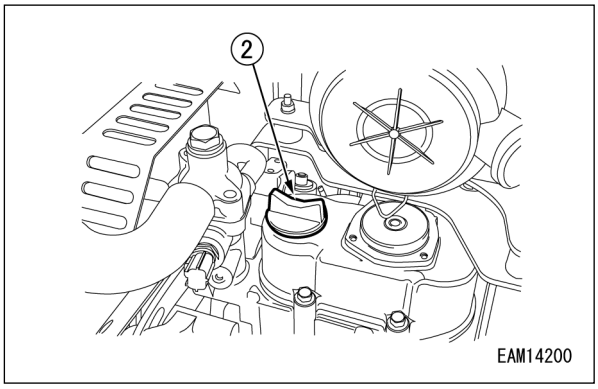
4. To avoid getting covered in oil, slowly turn and remove the drain plug (1) and discharge the oil.

5. Inspect the discharged oil, and if it contains a large quantity of metal powder or foreign matter, contact us or our sales service agency.

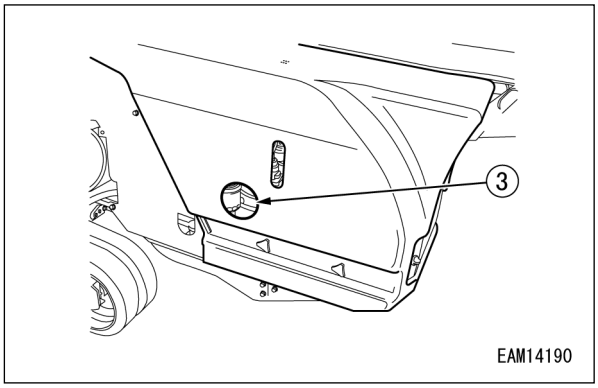
6. Put the drain plug (1) in.

7. Referring to section “6.9 COVERS,” take off the engine cover.

8. Pour in the stipulated amount of engine oil from the oil refill port (2).

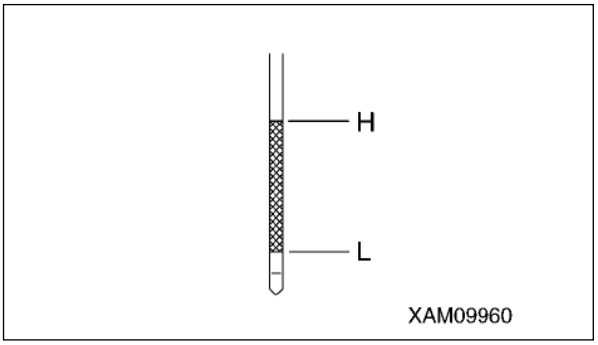


9. Pull out the oil level gauge (3) and wipe off the oil with a waste cloth.



10. Insert the oil level gauge (3) into the oil level gauge hole and pull it out.

11. Confirm that the oil is in the range from “H” to “L” of the oil level gauge (3).



12. After replacing the oil, securely tighten the oil level gauge (3) and the oil refill port cap (2).

13. Referring to section “6.9 COVERS,” re-attach the engine cover.

14. Referring to section “5.7.4 Stowing the outriggers,” stow the outriggers.

[3] Inspecting and cleaning the air cleaner element
[engine specification / engine and electric specification]

⚠ WARNING

- **Do not clean or replace the air cleaner element while the engine is running. Doing so may cause engine malfunction.**
- **When using compressed air to clean the element, there is the danger of garbage flying up into the eyes, so wear safety goggles.**

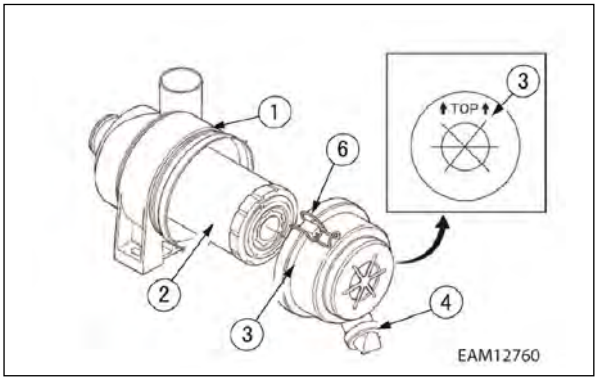
IMPORTANT

- **Clean the air cleaner element every 100 hours, as a rough guide. If the machine has been used in a very dusty place, clean it when performing the inspection after completing a job or before starting a job.**
- **When cleaning the element, do not tap it or knock it with anything.**
- **Do not use damaged items for the element’s fold, gasket, or seal.**
- **If the element is damaged despite the replacement period not being reached, replace it with a new item.**

- **If the standard is to replace the element after one year or cleaning it six times and the element is extremely dirty, then replace it promptly.**
- **Use the genuine product for the element.**

1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Remove the clamps (6) (two places), then take off the dustpan (3).

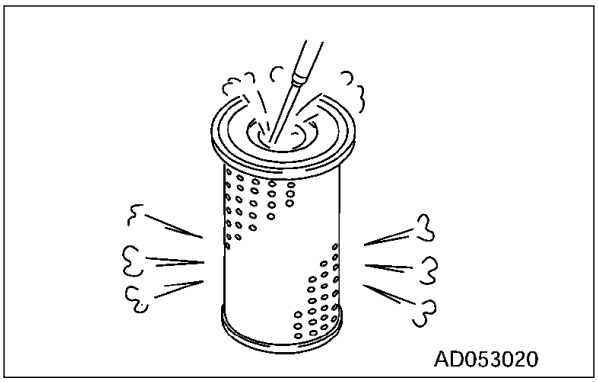


3. Pull out the element (2).

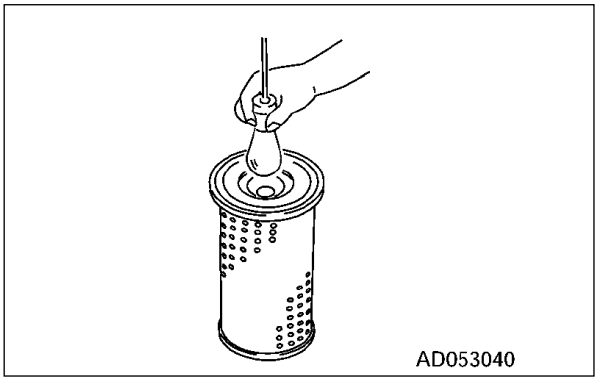
4. Cover the duct hole at the back of the air cleaner body (1) with a clean cloth or tape so that garbage does not enter it.

5. Clean inside the air cleaner body (1).

6. Blow dry, compressed air (0.205 MPa (2 kgf/cm2) or less) from inside the element along the folds. Next, blow the air from the outside along the folds, and then blow once more from the inside.

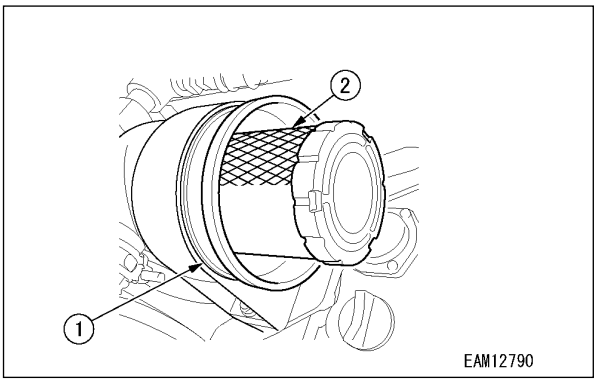


7. After cleaning, light the inside of the element with a light bulb and inspect it, and if there are any small holes or thin areas, replace it.

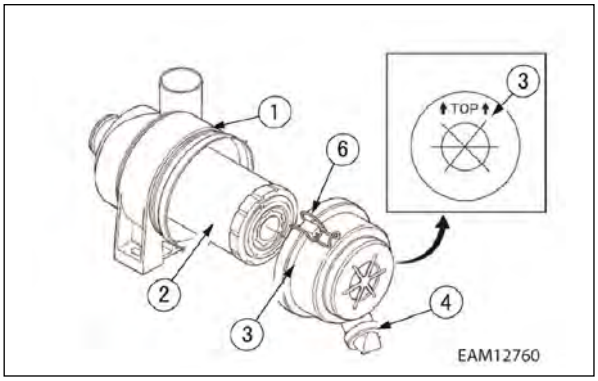


8. Remove the cloth or tape cover packed into the duct hole at the back of the air cleaner body (1).

9. Insert the cleaned element (2) into the air cleaner body (1).



10. Install it so that the TOP position of the dustpan (3) is at the top, then fix it with the clamps (6) (two places).

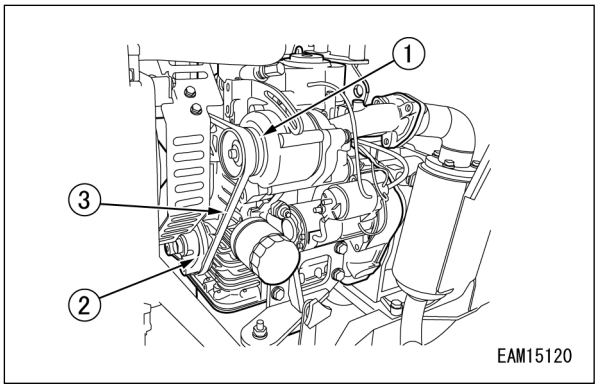


11. Referring to section “6.9 COVERS,” re-attach the engine cover.

[4] Fan belt tension inspection and adjustment [engine specification / engine and electric specification]

[Tension inspection]

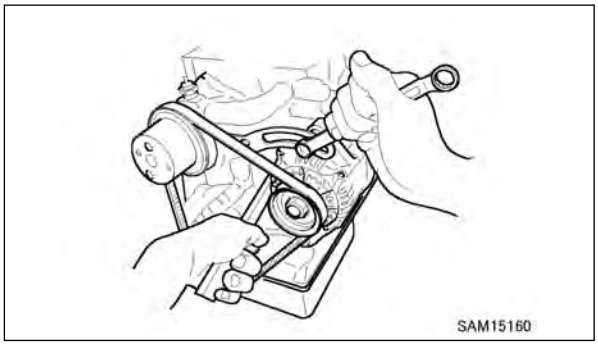
1. Referring to section “6.9 COVERS,” take off the engine cover.
2. Push with a finger on the belt (3) halfway between the crank pulley (2) and alternator pulley (1) (approximately 98 N (10 kgf)) - a 7- to 9-mm deflection is standard.



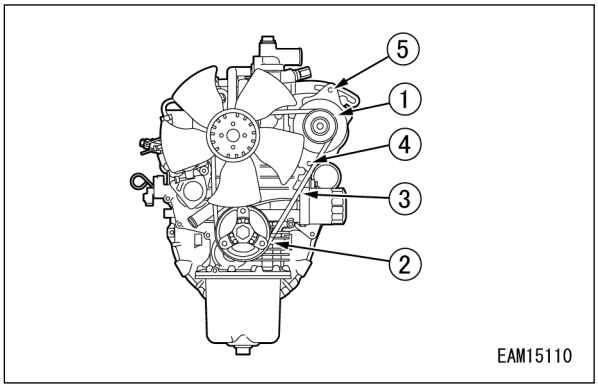
[Tension adjustment]

・Prepare a wooden bar

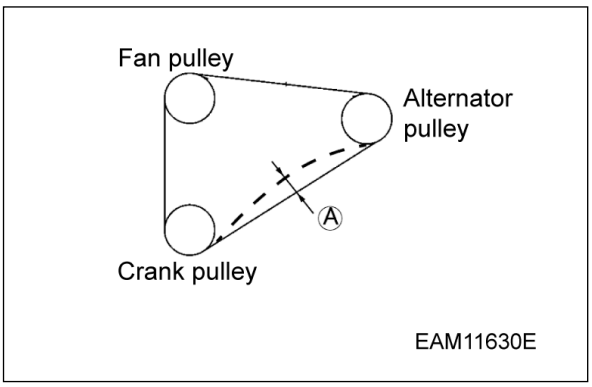
1. Put the bar between the alternator (1) and the cylinder block.



2. Loosen the bottom bolt (4) and the adjustment bolt (5).



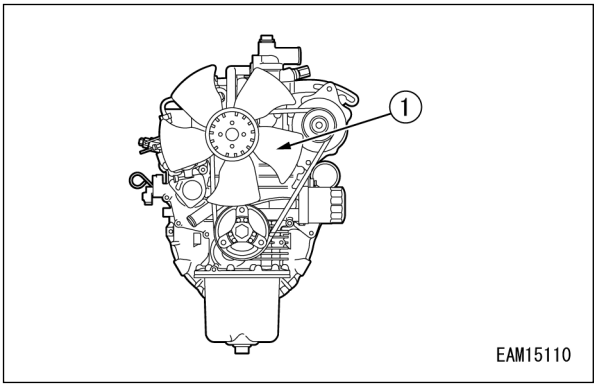
3. Pull the bar toward you, then move the alternator (1) so that the belt’s (3) bend (A) is approximately 7 to 9 mm (approximately 98 N (10 kgf)).



4. First, tighten the alternator’s bottom bolt (4), and next, tighten the adjustment bolt (5) and fix the alternator (1).
5. Inspect each pulley for damage, the V-shaped groove for wear, and the belt for wear. In particular, check carefully that the belt is not touching the bottom of the V-shaped groove.
6. If the belt has stretched and adjustment is no longer possible, or if there are cuts or scratches, then replace the belt.
7. When the belt has been replaced, re-adjust it after one hour of operation.
8. Referring to section “6.9 COVERS,” re-attach the engine cover.

[5] Inspecting the cooling fan for cracks [engine specification / engine and electric specification]

1. Stop the machine on firm level ground.
2. Referring to section “6.9 COVERS,” take off the engine cover.
3. Check that there are no scratches and cracks in the cooling fan blades (1).



4. If there is any damage, replace the parts with new parts.

5. Referring to section “6.9 COVERS,” re-attach the engine cover.

6.13.6 Maintenance to be conducted every 200 hours

[1] Replacing the engine oil filter cartridge [engine specification / engine and electric specification]

⚠ WARNING

- **When replacing the engine oil filter cartridge, set up the outrigger to lift the machine to a convenient height for the job. In this case, place blocks of wood or similar between the left and right crawlers and the ground as a safety measure.**
- **After inspecting the oil quantity and replenishing, securely tighten the oil level gauge. Otherwise, the oil level gauge may come off during operation, and the heated oil may spurt out, resulting in scalding.**
- **Immediately after operating the engine, the parts are hot. Do not replace the oil and filter cartridge straight away, but wait until the engine has cooled enough that it can be touched with a bare hand.**

IMPORTANT

- **Confirm that there is no old packing adhered to the filter unit. If there is, it may cause an oil leak.**
- **For details of the oil to be used, refer to section “6.5.1 Use of fuel and lubricating oil depending on temperature.” If oil other than that specified is used, the engine lifespan may be shortened. Be sure to replenish the oil with the indicated oil.**
- **Maintain a suitable quantity of engine oil.**
- **If the engine is completely cooled, the oil cannot be completely discharged. After running the engine a little to warm the oil, drain the oil.**
- **When replenishing the oil, be careful that garbage, etc. does not enter from the oil refill port.**
- **Do not overtighten as the engine oil filter cartridge packing may deform.**

- Discharged oil receptacle: prepare a container of capacity 5 ℓ or more.

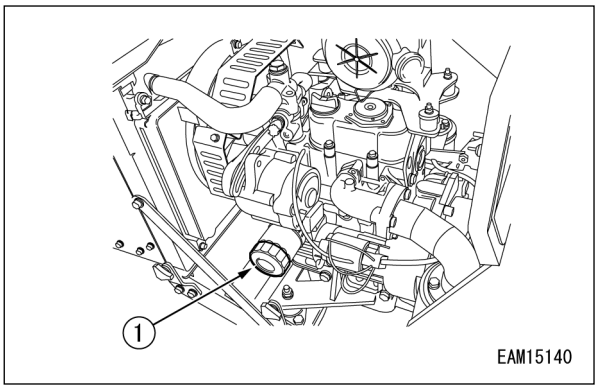
1. Stop the machine on firm level ground.

2. Referring to section “5.7.3 Setting the outriggers,” set the outriggers and raise the machine to a convenient height for the job.

3. Place a receptacle for the discharged oil directly beneath the engine oil filter cartridge at the bottom of the engine.

4. Referring to section “6.9 COVERS,” take off the engine cover.

5. Using the filter wrench, turn the engine oil filter cartridge (1) to the left and take it out.

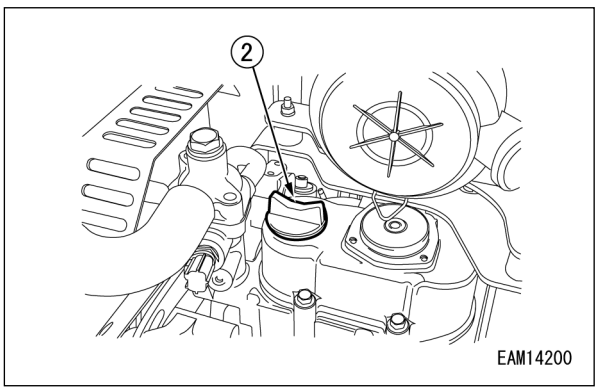


☞ Immediately after the engine has stopped, a large quantity of oil will come out, so take off the engine oil filter cartridge (1) after waiting for about 10 minutes.

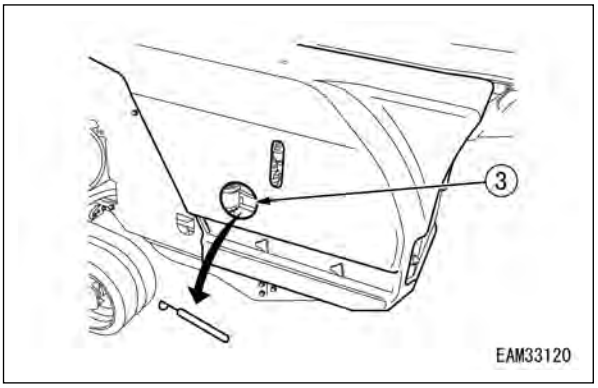
6. Wash the engine oil filter unit, apply clean engine oil to the new engine oil filter cartridge packing area and screw area (it is OK to apply grease thinly), and install it.

☞ When installing the engine oil filter cartridge, once the packing is in contact with the packing surface, without using the filter wrench, tighten it well by hand.

7. After replacing the engine oil filter cartridge (1), pour in the stipulated amount of engine oil from the oil refill port (2).

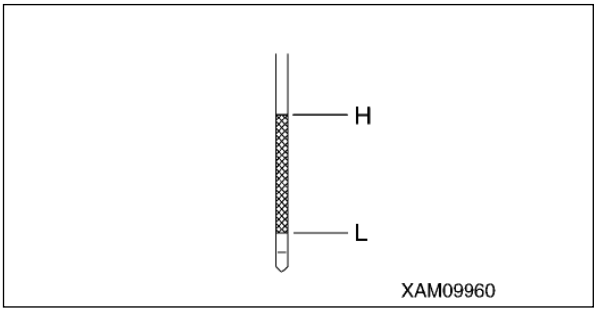


8. Pull out the oil level gauge (3) and wipe off the oil with a waste cloth.



9. Insert the oil level gauge (3) into the oil level gauge hole and pull it out.

10. Confirm that the oil is in the range from “H” to “L” of the oil level gauge (3).



11. After replacing the engine oil filter cartridge, securely tighten the oil level gauge (3) and the oil refill port cap (2).

12. Start the engine, and after letting it idle for around 5 minutes, stop the engine.

13. Inspect the oil quantity again and confirm that the oil is in the range from “H” to “L” of the oil level gauge (3).

14. Referring to section “6.9 COVERS,” re-attach the engine cover.

15. Referring to “5.7.4 Stowing the outriggers,” stow the outriggers.

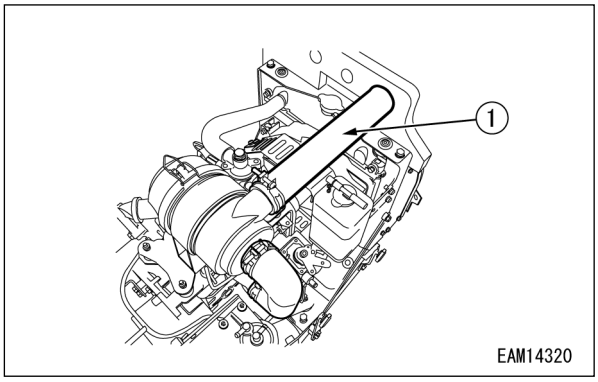
[2] Air cleaner hose inspection [engine specification / engine and electric specification]

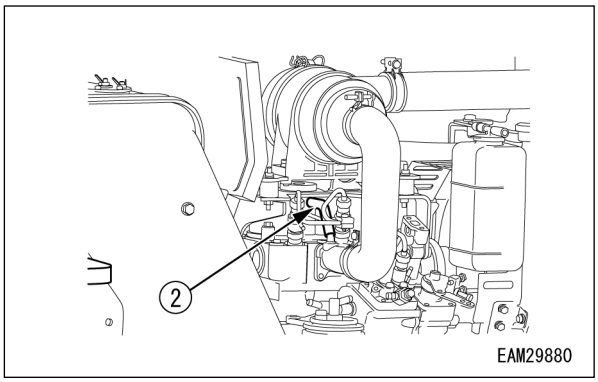
IMPORTANT

- **In order to prevent serious damage to the engine, ensure that dust does not enter the air cleaner hose.**

1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Check that the air cleaner hose (1), the closed breather hose (2), and the clamp band are not damaged. If the air cleaner hose (1), the closed breather hose (2), or the clamp band are damaged, replace them.





3. Confirm visually that there are no cracks or any other defects.

4. If the clamp band is loose, apply oil to the screw area and tighten it securely.

5. Referring to section “6.9 COVERS,” re-attach the engine cover.

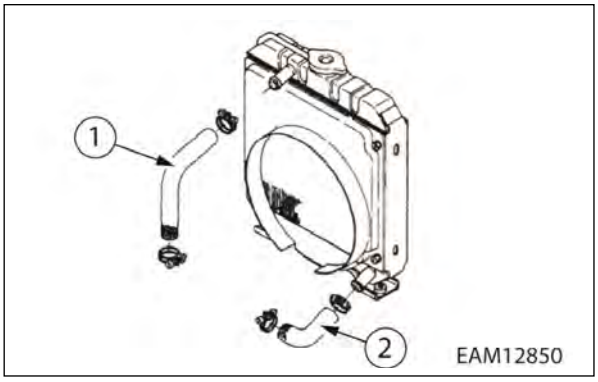
[3] Inspecting the radiator hose and clamp band [engine specification / engine and electric specification]

☞ After 200 hours’ operation or six months, whichever is the earliest, confirm that the radiator hose is appropriately secured.

☞ As a result of the inspection, if it is discovered that the radiator hose is inflated, hardened, or cracked, replace the radiator hose and the hose clamp band even if it is before the regular maintenance period. In addition, replace the radiator hose clamp band every two years, and tighten it securely.

1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Check that the upper hose (1), lower hose (2), and the clamp band are not damaged. If the upper hose (1), the lower hose (2), or the clamp band are damaged, then replace them.



3. If the clamp band is loose, apply oil to the screw area and tighten it securely.

4. Referring to section “6.9 COVERS,” re-attach the engine cover.

[4] Inspecting the outrigger rotation angle

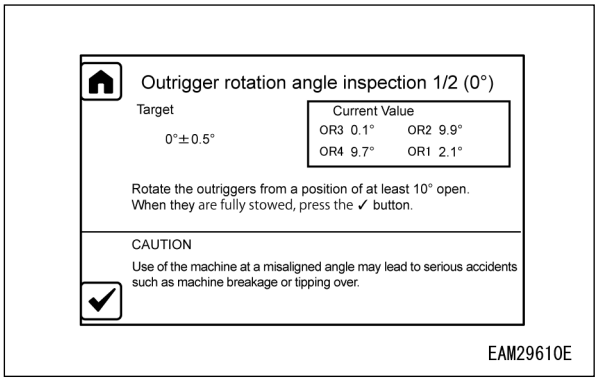
⚠ CAUTION

- **Set up the outriggers after confirming that there is nothing in the outrigger slewing range.**
- **If the machine is used as is with the angle misaligned, it may lead to a serious accident such as the machine breaking or tipping-over.**
- **If the result of the inspection is that the slewing angle is misaligned, stop using the crane and contact us or our sales service agency.**

☞ The target value is displayed on the left of the monitor screen, and the current value of each outrigger's rotation angle is displayed inside the square on the right.
Confirm this display and perform the inspection.
If the current value fits within ± 0.5°, the slewing angle current value display is shown in green.
If the current value does not fit within ± 0.5°, a warning message is displayed in red at the bottom of the screen.

1. If the Inspection guidance on the monitor screen every 200 hours displays, "Inspect the outrigger rotation angle from the user mode outrigger rotation angle inspection," refer to "4.2.3 User mode screen" and move to the outrigger rotation angle inspection screen.
Perform the inspections in the order of the 0° inspection then the 90° inspection.

- **0° inspection**

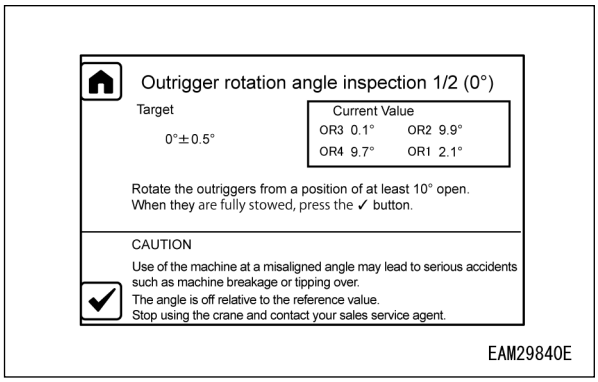


2. Set up the device with the outrigger's rotation angle opened to 10° or more.

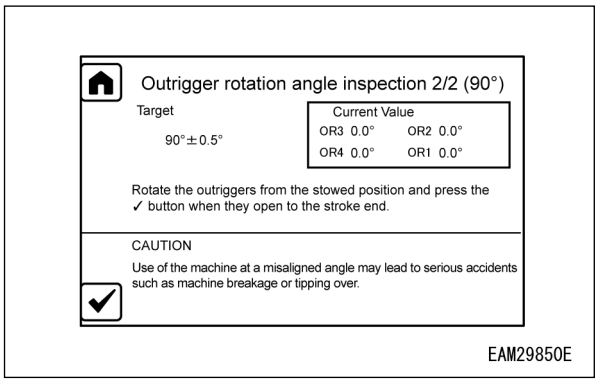
3. Rotate the device from the state in which the outrigger's rotation angle is opened to 10° or more, and completely stow it.

4. If it has been stowed, press the "✓" switch. The inspection result is displayed.

5. If there is no problem with the inspection result, move to the 90° inspection screen.
If the outrigger is misaligned, the screen will not change. In such an instance, please contact us or our sales service agency.



- **90° Inspection**

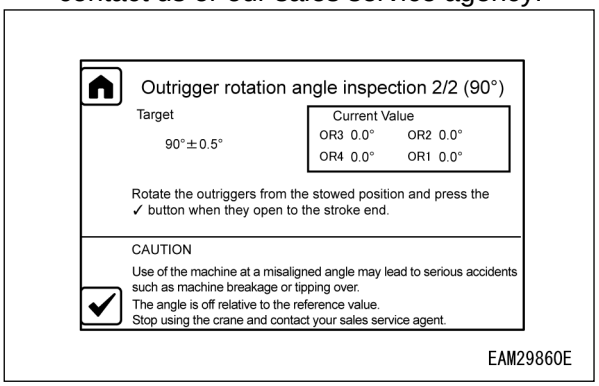


6. Set up the device with the outrigger stowed.

7. Rotate the device from the state in which the outrigger is stowed, then open up to the stroke end.

8. If it has opened up to the stroke end, press the "✓" switch. The inspection result is displayed.

9. If there is no problem with the inspection result, move to the user mode screen.
If the outrigger is misaligned, the screen will not change. In such an instance, please contact us or our sales service agency.



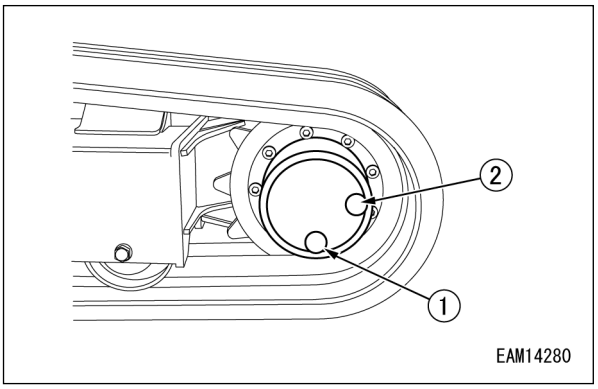
6.13.7 Maintenance to be conducted every 250 hours

[1] Inspection of the quantity of oil inside the travel motor speed reducer case and replenishment

IMPORTANT

- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
- **After checking and replenishing the oil, use sealing tape, O-ring sealing or similar as an oil leak stop by adhering it to the screw part of the oil quantity inspection plug, and securely tighten the screw.**

1. Move the machine forwards and backwards so that the drain plug (1) of the travel motor speed reducer case is directly below.



2. Remove the travel motor speed reducer case's oil quantity inspection plug (2) and inspect to see whether the oil comes out of the plug hole.

3. If there is insufficient oil, pour in gear oil from the plug hole of the oil quantity inspection plug (2).

☞ Pour in the gear oil until the oil is exiting the oil quantity inspection plug hole.

4. After checking and replenishing the oil, securely tighten the oil quantity inspection plug (2).

6.13.8 Maintenance to be conducted every 450 hours

[1] Replacing the fuel filter element [engine specification / engine and electric specification]

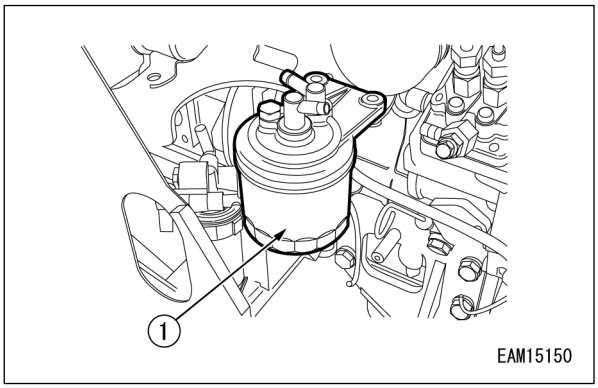
⚠ WARNING

- **When replacing the fuel filter element, be extremely careful about naked flames such as lit cigarettes.**
- **Immediately after operating the engine, the parts are hot. Do not replace the fuel filter straight away, but wait until the engine has cooled enough that it can be touched with a bare hand.**
- **The working to cut off the fuel hose takes place during the job. Prepare a receptacle for the fuel in advance and be careful that the fuel inside the fuel hose does not splatter the surroundings.**

- Fuel receptacle: prepare a container of capacity 1 ℓ or more.

1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Using the filter wrench, turn the fuel filter element (1) to the left and take it out.



3. Wash the fuel filter unit, apply clean fuel to the new fuel filter element packing area and screw area (it is OK to apply grease thinly), and install it.

☞ When installing the fuel filter element, once the packing is in contact with the packing surface, without using the filter wrench, tighten it well by hand.

4. After replacing the fuel filter element, referring to the section “6.14.8 Fuel circuit air removal,” remove the air from the fuel system.

5. Referring to section “6.9 COVERS,” re-attach the engine cover.

[2] Discharging contaminated water and sediment from inside the fuel tank [engine specification / engine and electric specification]

⚠ WARNING

- **Be extremely careful about naked flames such as lit cigarettes.**
- **When discharging the fuel, be sure to stop the engine first. Since, if the fuel is discharged while the engine is running, spilled fuel may be ignited.**
- **After discharging the fuel, tighten the fuel tank drain plug securely.**
- **The fuel tank drain plug is at the bottom of the fuel tank on the right-side side of the machine. When discharging the fuel, set up the outriggers to lift the machine to a height convenient for the job so that the receptacle can be placed under the tank.**
  In this case, if the machine is in an unstable state and sways, insert a support platform under the front and back of the machine to stabilize it.

- Discharged fuel receptacle: prepare a container of capacity 15 ℓ or more.

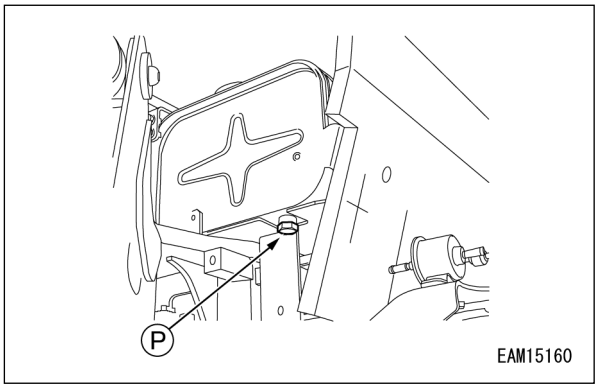
1. Stop the machine at a level location.

2. Referring to section “6.9 COVERS,” take off the right engine cover.

3. Referring to section “5.7.3 Setting the outriggers,” set the outriggers and raise the machine to a convenient height for the job.

4. Place the discharged fuel receptacle directly beneath the fuel tank drain plug (P).

5. To avoid getting covered in oil, slowly turn and remove the drain plug (P) and discharge the oil.



☞ If the fuel does not come out or comes out with difficulty, remove the fuel tank cap.

6. After discharging the fuel, attach and tighten the drain plug (P) securely.

7. Referring to section “6.9 COVERS,” put on the right engine cover.

8. Referring to section “5.7.4 Stowing the outriggers,” stow the outriggers.

[3] Cleaning the cooling system internals [engine specification / engine and electric specification]

⚠ WARNING

- **Immediately after operating the engine, the cooling water is hot, so if the cooling water is discharged straight away, it may cause scalding. Discharge the cooling water only after the engine has cooled.**
- **When the temperature of the water inside the radiator is high, do not remove the cap. Hot water may be ejected. When removing the cap, wait for the water temperature to fall, then slowly turn the cap and release the pressure, and then remove the cap.**
- **When running the engine to clean the cooling system internals, do not stand in front of or behind the machine. Because when the machine suddenly starts moving, it is extremely dangerous.**
- **Antifreeze is combustible, so do not bring it close to fires. When handling antifreeze, do not smoke.**

IMPORTANT

- **Use tap water for the cooling water. When using river or well water or a simple water supply unavoidably, contact us or our sales service agency.**
- **We recommend managing the mixing ratio of antifreeze with an antifreeze concentration gauge.**

☞ Antifreeze lowers the freezing temperature of water and so it prevents the cylinders and radiators being damaged due to the cooling water freezing.

☞ When the temperature is 0°C or below in winter, be sure to mix antifreeze (long life coolant) with the pure water, then fill up the radiator and the reserve tank, or completely discharge the cooling water. (At the time of factory shipment, it contains antifreeze (long life coolant).)

☞ For details on antifreeze types and mixing ratios, refer to section “6.5.1 Note 3 About the coolant”.

☞ If the antifreeze mixing ratio is incorrect and the cooling water freezes in winter, this will cause overheating in the summer.

☞ When using antifreeze, do not insert a radiator cleaning agent.

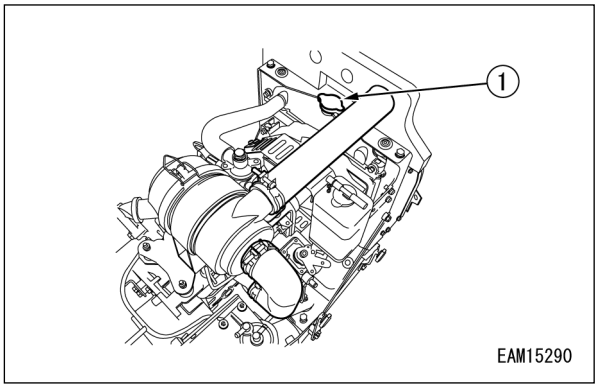
☞ The antifreeze contains anti-rust, so if this is mixed with a cleaning agent, it may generate sediment and have a negative impact on the engine parts.

☞ The valid usage period of the antifreeze (long life coolant) is two years. Be sure to replace it after two years.

- Prepare an antifreeze and water mixture receptacle with a capacity of 10 ℓ or more.
- Prepare a hose for pouring water.

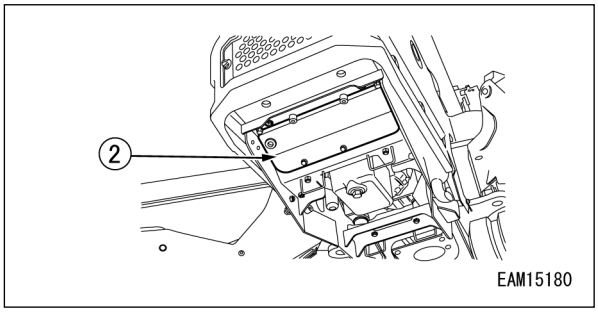
1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Turn the radiator cap (1) slowly until it meets the stopper and release the internal radiator pressure.

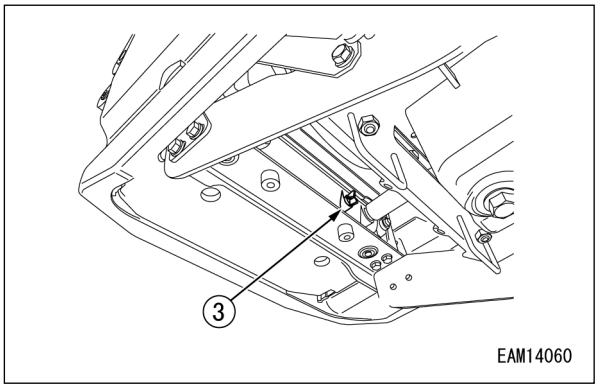


3. When the internal radiator pressure has been released, while further pushing the radiator cap (1), turn it until it meets the stopper and remove the radiator cap (1).

4. Take off the under cover (2).



5. Place a container to receive the cooling water (antifreeze and water mixture) beneath the drain plug (3) at the bottom of the radiator.



6. Open the drain plug (3) and discharge the cooling water. After discharging the water, close the drain valve (3).

7. Pour tap water into the radiator water refill port and fill it up close to the water refill port.

8. Wash it using a cleaning agent.

☞ Regarding the washing method with the cleaning agent, follow the instructions for the cleaning agent.

9. After washing with the cleaning agent, open the drain valve (3) and discharge the cleaning agent. After discharging it, close the drain valve (3).

10. Pour tap water into the radiator water refill port and fill it up close to the water refill port.

11. After opening the drain valve (3), start the engine and put it in a low idling state. Then wash it with running water until the water comes out clean.

IMPORTANT

- **While washing it with running water, adjust the quantity of water being poured in and the quantity of water being discharged so that the radiator is always kept full of water.**
- **While washing it with running water, always monitor to ensure that the hose for pouring the water does not come off the radiator water refill port.**

12. When clean water comes out, stop the engine and stop pouring the water, and discharge the tap water as is. After discharging the tap water, close the drain valve (3).

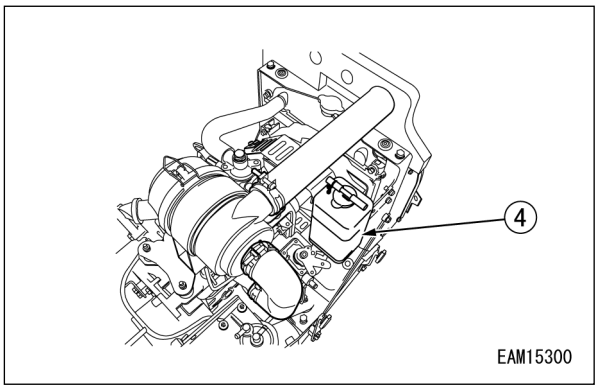
13. Put the under cover (2) on.

14. Pour in the cooling water, which is a mixture of the antifreeze and the tap water, from the radiator water refill port, and fill up to the mouth of the water refill port.

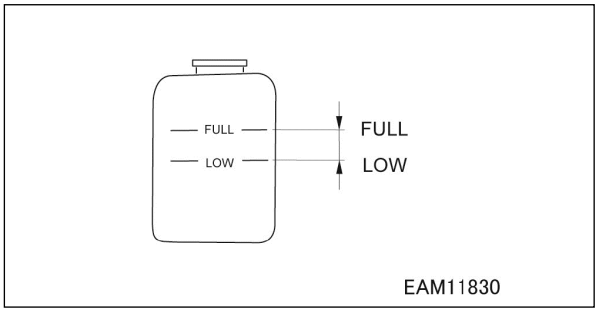
15. With the radiator cap (1) removed, put the engine into an idling state, and remove the air mixed into the cooling system.

16. After stopping the engine and waiting for around three minutes, pour in the tap water from the radiator water refill port until it fills up close to the water refill port, and then close the radiator cap (1).

17. Remove the reserve tank (4) and after discharging the cooling water from inside the tank, wash the inside of the tank.



18. Attach the reserve tank (4) in its original position and refill it with cooling water up to the “FULL” level from the water refill port, then securely attach the cap (5).



19. Referring to section “6.9 COVERS,” re-attach the engine cover.

6.13.9 Maintenance to be conducted every 500 hours

[1] Replacing the hydraulic oil return filter

⚠ WARNING

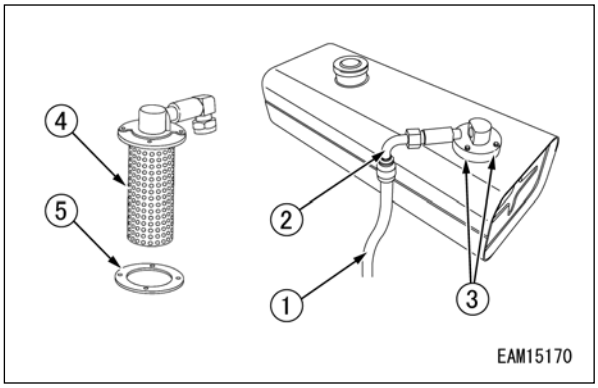
- **Immediately after operation of the machine, each part is hot. So do not replace the filter immediately. Do so only after the oil has cooled down (an oil temperature of 45°C or less).**
- **When the oil refill port cap of the hydraulic oil tank is removed, the oil may gush out. Therefore, slowly turn the oil refill port cap to release the internal pressure, then remove the cap.**
- **The level of the hydraulic oil varies greatly with the oil temperature. Aim for the oil level to come to the “H” position in the level gauge at an oil temperature of 50°C.**
- **When replenishing the oil, do not add it above “H” (the maximum) on the level gauge. If too much oil is added, during travel or crane operation, the oil may spurt out of the oil refill port, resulting in scalding.**
- **After replenishing the oil, securely close the oil refill port cap. Otherwise, the oil refill port cap may come off during operation, and the heated oil may gush out, resulting in scalding.**

IMPORTANT

- **For details of the oil to be used, refer to section “6.5.1 Use of fuel and lubricating oil depending on temperature.”**
- **When checking the quantity of oil, be sure to place the machine in the travel position. If the oil quantity is checked in the operating position, the oil quantity will be judged to be low and too much oil will end up being added.**
- **After replacing the hydraulic oil filter, while the oil is filling up the piping and the oil compressor, do not start the machine for a while.**

- **When replenishing the oil, be careful that garbage, etc. does not enter from the oil refill port.**

1. Stop the machine on firm level ground.
2. Referring to section “5.6.2 Travelling posture of machine,” put the machine in the travel position.
3. Referring to section “6.9 COVERS,” take off the left machinery cover.
4. Remove the hose (1) and the elbow joint (2) from the return filter (4).



5. Remove the four attachment bolts (3), lift up the return filter (4), and take it out.
6. Apply liquid packing to the rubber plate (5), attach the new hydraulic oil return filter (4), and securely tighten the four attachment bolts (3).
7. Re-attach the hose (1) and the elbow joint (2) removed in step 4.
8. Referring to section “6.5.1 Use of fuel and lubricating oil depending on temperature,” replenish the hydraulic oil.
9. Referring to section “6.9 COVERS,” re-attach the left machinery cover.
10. Referring to section “6.14.7 Hydraulic circuit air removal,” remove the air.

[2] Fan belt replacement [engine specification / engine and electric specification]

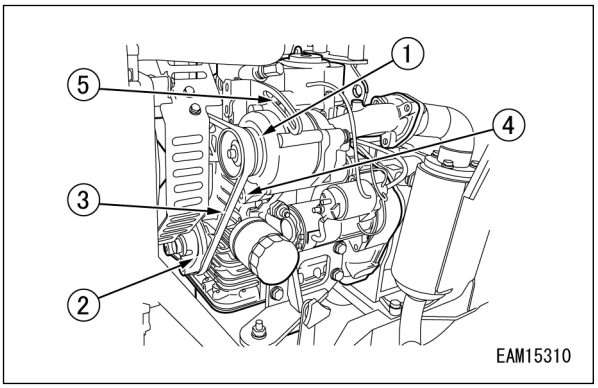
・Prepare a wooden bar.

1. Referring to section “6.9 COVERS,” take off the engine cover.
2. Remove the alternator (1).

IMPORTANT

When removing the alternator, for reasons of safety, we recommend removing the battery wiring.

3. Remove the fan belt (3).



4. Replace the fan belt (3) with a new one.
5. Install the alternator (1).
6. After temporarily installing the bottom bolt (4) and the adjustment bolt (5), using the fan belt and the wooden bar, adjust the tension of the fan belt in a position between the crank pulley and the alternator pulley.
7. Fix the belt protection plate.
8. Re-adjust it after one hour of operation.
9. Referring to section “6.9 COVERS,” re-attach the engine cover.

[Tension adjustment]

・Prepare a wooden bar.

1. Referring to section “6.13.5[4] Fan belt tension inspection and adjustment [engine specification / engine and electric specification],” adjust the tension of the fan belt.

6.13.10 Maintenance to be conducted every 800 hours

[1] Inspecting the valve clearance [engine specification / engine and electric specification]

Special tools and knowledge are required to inspect and adjust the valve clearance, so contact us or our sales service agency.

6.13.11 Maintenance to be conducted every 1000 hours

[1] Replacing the oil in the hydraulic oil tank

⚠ WARNING

- **Immediately after operation of the machine, each part is hot. So do not replace the oil immediately. Do so only after the oil has cooled down (an oil temperature of 45°C or less).**
- **When the oil refill port cap of the hydraulic oil tank is removed, the oil may gush out. Therefore, slowly turn the oil refill port cap to release the internal pressure, then remove the cap.**
- **The level of the hydraulic oil varies greatly with the oil temperature. Aim for the oil level to come to the “H” position in the level gauge at an oil temperature of 50°C.**
- **When replenishing the oil, do not add it above “H” (the maximum) on the level gauge. If too much oil is added, during travel or crane operation, the oil may spurt out of the oil refill port, resulting in scalding.**
- **After replenishing the oil, securely close the oil refill port cap. Otherwise, the oil refill port cap may come off during operation, and the heated oil may gush out, resulting in scalding.**

IMPORTANT

- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
- **When checking the quantity of oil, be sure to place the machine in the travel position. If the oil quantity is checked in the operating position, the oil quantity will be judged to be low and too much oil will end up being added.**
- **After replacing the hydraulic oil, while the oil is filling up the piping and the oil compressor, do not start the machine for a while.**
- **When replenishing the oil, be careful that garbage, etc. does not enter from the oil refill port.**

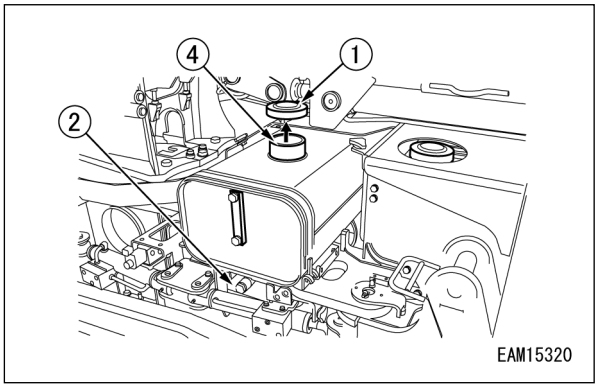
- Discharged oil receptacle: prepare a container of capacity 45 ℓ or more.
- Quantity of oil for replacing the oil in the hydraulic oil tank: 40 ℓ

1. Stop the machine on firm level ground.

2. Referring to section "5.6.2 Travelling posture of machine," put the machine in the travel position.

3. Referring to section "6.9 COVERS," take off the machinery cover.

4. Remove the oil refill port cap (1) at the top of the hydraulic oil tank.



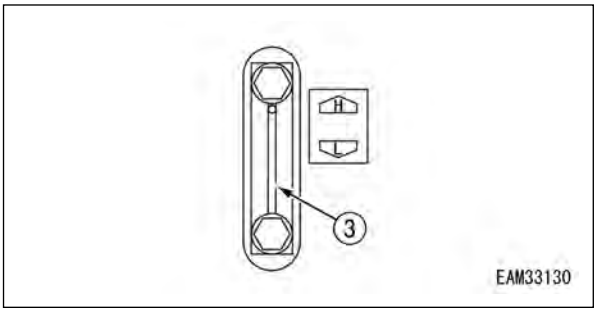
5. Place the oil discharge receptacle directly beneath the drain port cap (2).

6. To avoid getting covered in oil, slowly turn and remove the drain port cap (2) and discharge the oil.

7. Inspect the discharged oil, and if it contains a large quantity of metal powder or foreign matter, contact us or our sales service agency.

8. Remove the drain port cap (2).

9. While viewing the oil level gauge (3), pour the hydraulic oil in from the oil refill port (4) up to the level point.



10. After replenishing the oil, set the oil refill port cap (1) and securely close it.

11. Referring to section "6.9 COVERS," re-attach the machinery cover.

12. Referring to section "6.14.7 Hydraulic circuit air removal," remove the air.

[2] Replacing the oil inside the slewing speed reducer case

⚠ WARNING

The drain plug of the slewing speed reducer case is directly below the machine. When discharging the oil, set up the outriggers to lift the machine to a height convenient for the job so that it is possible to get under the machine. In this case, if the machine is in an unstable state and sways, insert a support platform (trestle) under the front and back of the machine to stabilize it.

IMPORTANT

- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
- **When replacing the oil, use sealing tape or similar as an oil leak stop by adhering it to the drain plug and the screw part of the oil refill plug, and securely tighten the screw.**

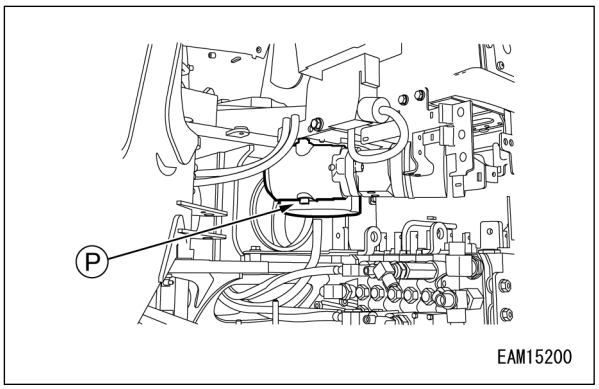
- Discharged oil receptacle: prepare a container of capacity 1 ℓ or more.
- Quantity of oil for replacing the oil inside the slewing speed reducer case: 0.6 ℓ

1. Stop the machine on firm level ground.

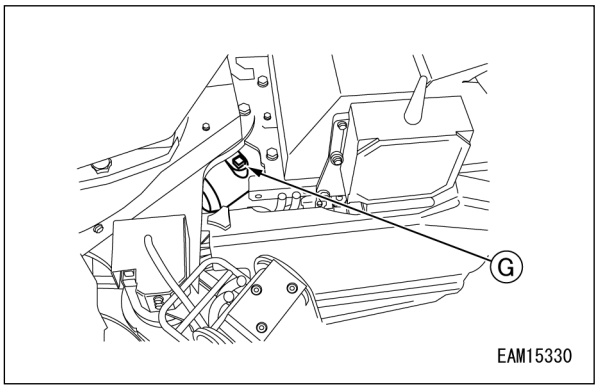
2. Referring to section “5.7.3 Setting the outriggers,” set the outriggers and raise the machine to a convenient height for the job.

3. Referring to section “6.9 COVERS,” take off the operating cover.

4. Place the discharged oil receptacle directly below the drain plug (P).



5. Remove the oil quantity inspection plug (G).



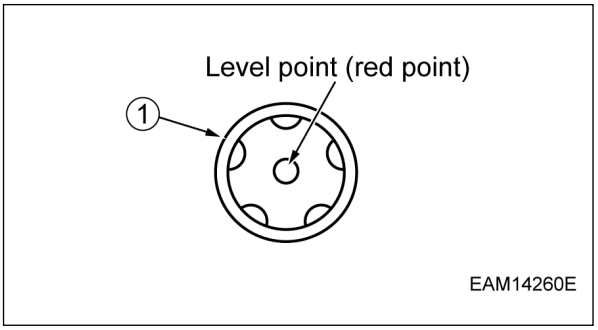
6. To avoid getting covered in oil, slowly turn and remove the drain plug (P) and discharge the oil.

7. Inspect the discharged oil, and if it contains a large quantity of metal powder or foreign matter, contact us or our sales service agency.

8. Securely tighten the drain plug (P).

9. Pour in gear oil from the plug hole of the oil quantity inspection plug (G).

☞ Pour in oil from the oil refill port up to the side gauge’s (1) level point.



10. After replenishing the oil, tighten the oil quantity inspection plug (G) securely.

[3] Replacing the oil inside the travel motor speed reducer case

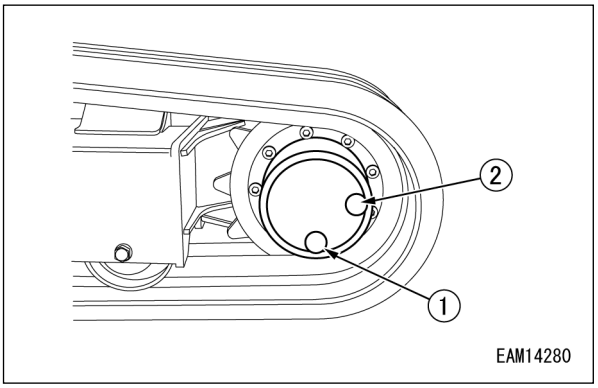
IMPORTANT

- **For details of the oil to be used, refer to section “6.5.1 Use of fuel and lubricating oil depending on temperature.”**
- **After checking and replenishing the oil, use sealing tape or similar as an oil leak stop by adhering it to the drain plug and the screw part of the oil quantity inspection plug, and securely tighten the screw.**

- Discharged oil receptacle: prepare a container of capacity 1 ℓ or more.
- Oil quantity for replacing the travel motor speed reducer case: 0.33 ℓ

1. Stop the machine on firm level ground.

2. Move the machine forwards and backwards so that the drain plug (1) of the travel motor speed reducer case is directly below.



3. Place the discharged oil receptacle directly below the drain plug (1).

4. Remove the oil quantity inspection plug (2).

5. To avoid getting covered in oil, slowly turn and remove the drain plug (1) and discharge the oil.

6. Inspect the discharged oil, and if it contains a large quantity of metal powder or foreign matter, contact us or our sales service agency.

7. Securely tighten the drain plug (1).

8. Pour in gear oil from the plug hole of the oil quantity inspection plug (2).

☞ Pour in the gear oil until the oil is exiting the oil quantity inspection plug hole.

9. After replenishing the oil, tighten the oil quantity inspection plug (2) securely.

[4] Replacing the oil inside the winch speed reducer case

⚠ WARNING

Immediately after operating the engine, the oil is hot. Do not remove the inspection port's or drain port's plug straight away, but wait for the oil to cool.

IMPORTANT

- **For details of the oil to be used, refer to section "6.5.1 Use of fuel and lubricating oil depending on temperature."**
- **When rotating the winch, cancel the hook block stowing.**
- **After replacing the oil, use sealing tape or similar as a leak stop by adhering it to the oil quantity inspection plug and drain plug screw area, and securely tighten the screw.**

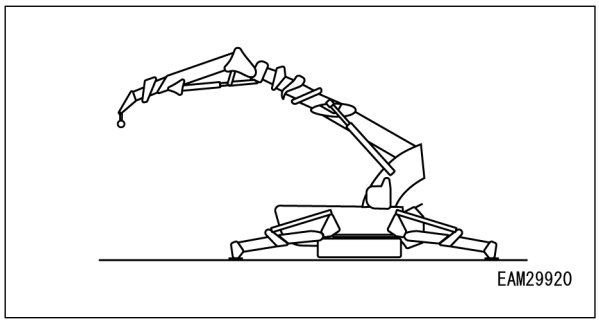
- Discharged oil receptacle: prepare a container of capacity 1 ℓ or more.
- Oil quantity for replacing the oil inside the winch speed reducer case: 0.5 ℓ
- Hex wrench for removing the plug: 4 mm
- Oil removal elbow (use recommended): drain port size Rc1/16 (PT1/16)

1. Stop the machine on firm level ground.

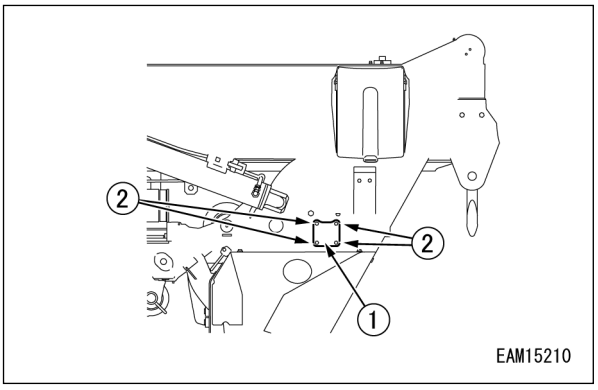
2. Referring to section "5.7.3 Setting the outriggers," be sure to set up the outriggers at their maximum extension.

3. Start the engine using the machine's main starter switch.

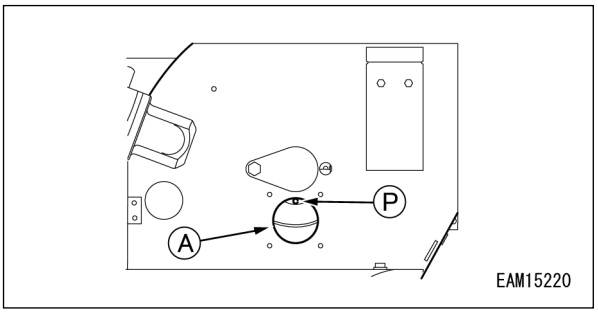
4. Referring to sections "5.8.1 Precautions before operating the crane" and "5.8.2 Precautions before operating the crane," set the equipment up in the position shown in the following diagram.



5. Remove the four attachment bolts (2) and take off the inspection cover (1).

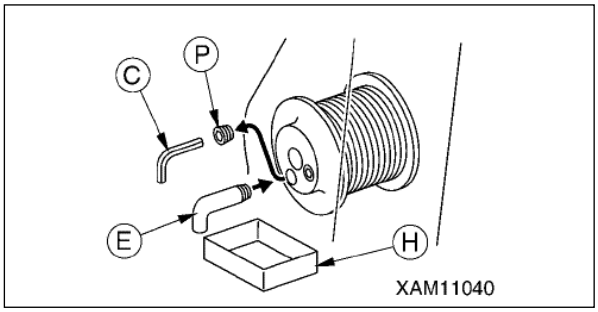


6. Slowly rotate the winch and stop when the drain plug (P) in the winch side's inspection hole (A) position is in the viewing position.



7. Using the hex wrench (C), turn and remove the drain plug (P).

8. Install the oil removal elbow (E) in the screw hole of the drain plug (P).

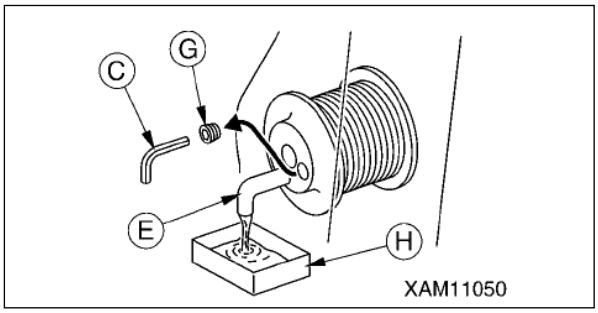


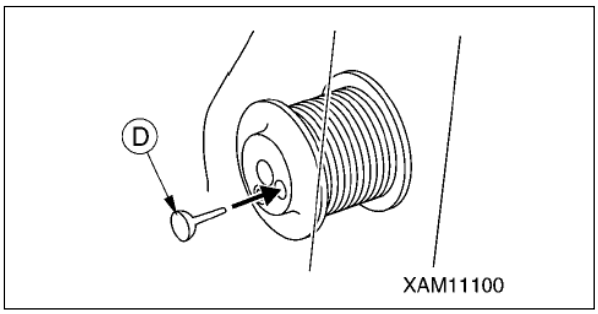
9. Prepare the discharged oil receptacle (H) directly below the elbow (E).

10. Using the hex wrench (C), turn and remove the oil quantity inspection plug (G). The gear oil inside the speed reducer case is discharged.

11. Once the gear oil inside the speed reducer case has been completely discharged, remove the elbow (E), attach the drain plug (P), and tighten it securely.

12. Pour in the stipulated amount (0.5 ℓ) of gear oil using the oil pump (D), etc. from the oil quantity inspection plug (G).





☞ Wipe up any spilled oil.

13. After pouring in the oil, tighten the oil quantity inspection plug (G) securely.

☞ After replacing the oil, do not suspend a load for around five minutes, and operate the equipment without the winch.

6.13.12 Maintenance to be conducted every 1500 hours

[1] Inspecting and cleaning the nozzle [engine specification / engine and electric specification]

Special tools and knowledge are required to inspect, adjust, and clean the nozzle, so contact us or our sales service agency.

6.13.13 Maintenance to be conducted every 3000 hours

[1] Inspecting the fuel ejection pump [engine specification / engine and electric specification]

Special tools and knowledge are required to inspect and adjust the fuel ejection pump, so contact us or our sales service agency.

6.13.14 Maintenance to be conducted every year

[1] Replacing the air cleaner element [engine specification / engine and electric specification]

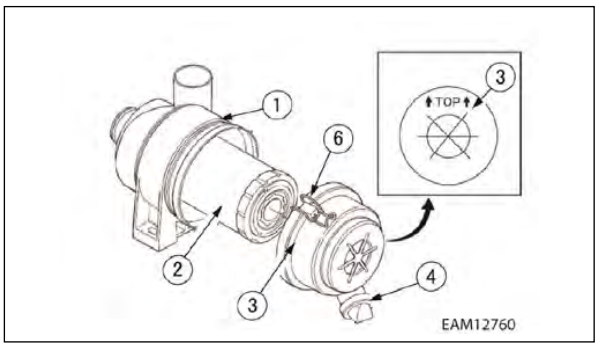
⚠ WARNING

Do not replace the air cleaner element while the engine is running. Doing so may cause engine malfunction.

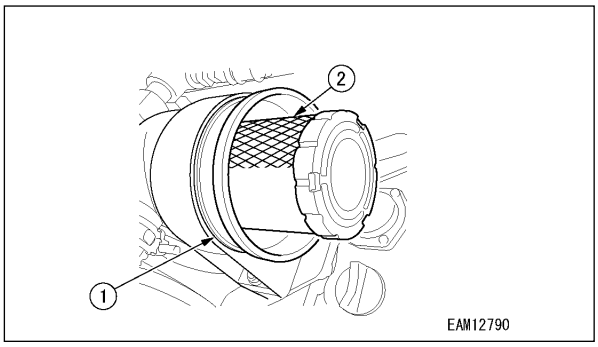
IMPORTANT

- **Replace the air cleaner element every year or after cleaning it six times, as a rough guide. If the machine has been used in a very dusty place or is extremely dirty, replace it promptly.**
- **When replacing the element, do not tap it or knock it with anything.**
- **Do not use damaged items for the element's fold, gasket, or seal.**
- **If the element is damaged despite the replacement period not being reached, replace it with a new item.**
- **Use the genuine product for the element.**

1. Referring to section “6.9 COVERS,” take off the engine cover.
2. Remove the clamps (6) (two places), then take off the dustpan (3).



3. Pull out the element (2).



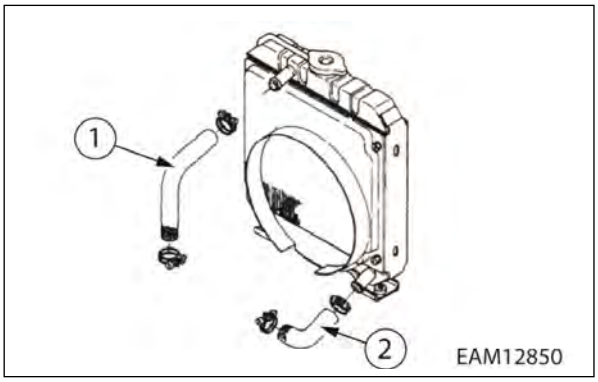
4. Cover the duct hole at the back of the air cleaner body (1) with a clean cloth or tape so that garbage does not enter it.
5. Clean inside the air cleaner body (1).
6. Remove the cloth or tape cover packed into the duct hole at the back of the air cleaner body (1).
7. Insert the new air element (2) into the air cleaner body (1).
8. Install it so that the TOP position of the dustpan (3) is at the top, then fix it with the clamps (6) (two places).
9. Referring to section “6.9 COVERS,” re-attach the engine cover.

6.13.15 Maintenance to be conducted every two years

[1] Replacing the radiator cooling water, the radiator hose, and the clamp bands

When replacing the cooling water, clean the interior of the cooling system.
For details of the maintenance location and method, refer to section “6.13.8 [3] Cleaning the cooling system internals [engine specification / engine and electric specification].”

1. Referring to section “6.9 COVERS,” take off the engine cover.
2. Replace the upper hose (1), lower hose (2), and the clamp bands.



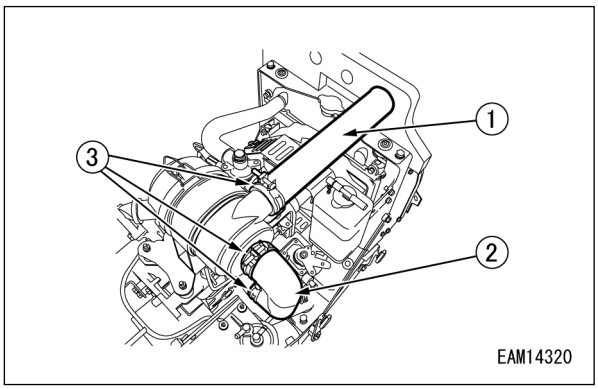
3. Apply oil to the screw area of the clamp band, then tighten the clamp securely.
4. Referring to section “6.9 COVERS,” re-attach the engine cover.

[2] Air cleaner hose replacement [engine specification / engine and electric specification]

When replacing the air cleaner hose, in order to prevent serious damage to the engine, ensure that dust does not enter the air cleaner hose.

1. Referring to section “6.9 COVERS,” take off the engine cover.

2. Loosen the clamp band (3).



3. Remove the air cleaner hose (1), (2) and the clamp band (3).

4. Replace the air cleaner hose (1), (2) and the clamp band (3) with new parts.

5. Tighten the clamp band (3) properly.

6. Referring to section “6.9 COVERS,” re-attach the engine cover.

[3] Fuel hose and clamp band replacement [engine specification / engine and electric specification]

⚠ WARNING

- **If the fuel hose is damaged, it may cause a fire.**
- **If the fuel hose is dirty, it may cause the fuel ejection pump to malfunction.**

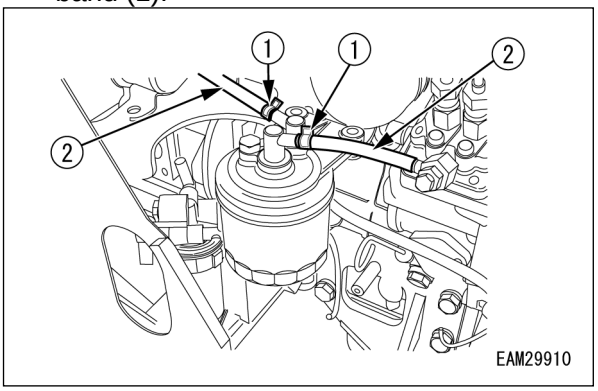
⚠ CAUTION

Other than when removing air, be sure to close the air removal plug of the fuel ejection pump. Otherwise, it may cause the engine to stop.

1. Stop the machine on firm level ground.

2. Referring to section “6.9 COVERS,” take off the engine cover.

3. Replace the fuel hose (2) and the clamp band (1).



4. After the fuel hose (2) and the clamp band (1) have been replaced, referring to the section “6.14.8 Fuel circuit air removal,” remove the air from the fuel system.

5. Referring to the section “6.9 Covers,” attach the engine cover.

6.14 WHAT TO DO WHEN THIS HAPPENS

6.14.1 Non-malfunction phenomena

Phenomena like the following are characteristics of hydraulic equipment and are not malfunctions.

- When the boom has been retracted to the end and the retracting cylinder has relieved on the retraction side, a noise occurs from near the valve.
- A noise is emitted from the break valve when the slewing starts or finishes.
- When descending a steep slope at low speed, a noise is emitted from the travel break valve.

6.14.2 When the fuel has run out [engine specification / engine and electric specification]

When starting the engine after the fuel has run out, after refueling, referring to the section “6.14.8 Fuel circuit air removal,” remove the air and then start the engine.

- If air is mixed into the fuel system, it will cause starting difficulties and engine failure. When the fuel tank is empty, or when the water has been removed from the fuel or the filter element has been replaced, etc., be sure to remove the air.

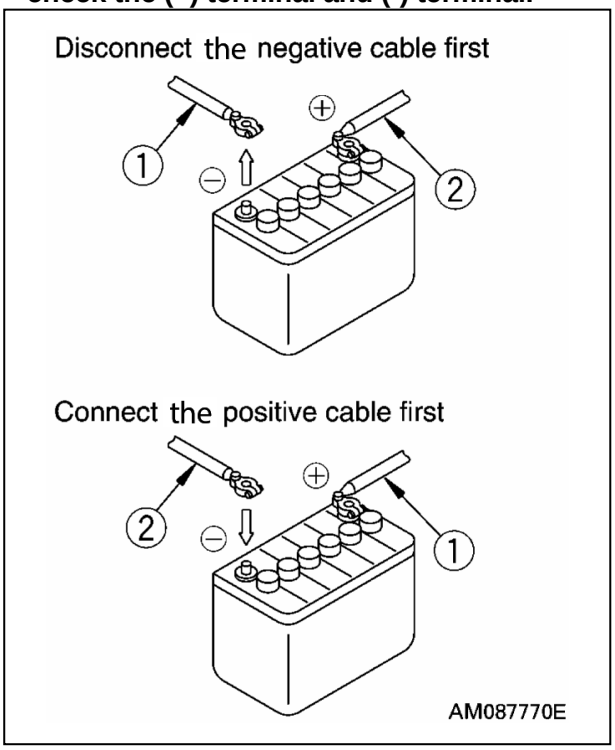
6.14.3 Battery Handling [engine specification / engine and electric specification]

When handling the battery, observe the following points.

⚠ WARNING

- **Inspect and handle the battery with the engine stopped and the starter switch in the “OFF” position.**
- **Wipe clean dust that has been deposited on the battery’s top surface with a damp cloth or similar.**
- **The battery generates hydrogen gas, so there is the risk of explosion.**
- **Refrain from actions such as bringing close flames like lit cigarettes or causing sparks.**
- **The battery fluid is dilute sulfuric acid, so it will affect clothes and skin.**
  If you get the battery fluid on clothes or skin, wash it off immediately with large quantities of water.
  If you get the battery fluid in an eye, wash it with water immediately and after that get treatment from a doctor.
- **When handling the battery, wear protective goggles and rubber gloves.**
- **When removing the battery cable, do so from the earth side (usually the (-) terminal side), and when attaching, do so from the opposite (+) terminal.**
  If a tool, etc. contacts between the (+) terminal and the machine, there is the danger of sparks being generated.
- **If the battery terminal is loose, there is the danger of sparks being generated or of explosion due to poor contact. When attaching the terminal, tighten it securely.**

- **When replacing the battery, fix the battery so that it does not move. If the battery is not fixed so that it does not move, then the terminal will be loose and there is the danger of sparks being generated.**
- **When removing or installing the battery, check the (+) terminal and (-) terminal.**



6.14.3.1 Battery handling cautions

⚠ CAUTION

- **Always be careful that the battery does not enter an electrical discharge condition. If it enters a discharge condition, do not charge it in a panic, but promptly measure the battery fluid's specific gravity and charge the battery as required. Always keep the battery in optimal condition so that its lifespan is long.**
- **In periods when the temperature is high, conduct the battery fluid quantity inspection earlier than the regular inspection and maintenance period.**
- **In periods when the temperature is low, the battery performance falls significantly, so keep the charging ratio close to 100% as much as possible and be careful about heat retention in preparation for starting the machine the next morning.**
- **When replenishing the distilled water, do so before starting a job the next morning to prevent freezing.**

6.14.3.2 Removing and installing the battery

IMPORTANT

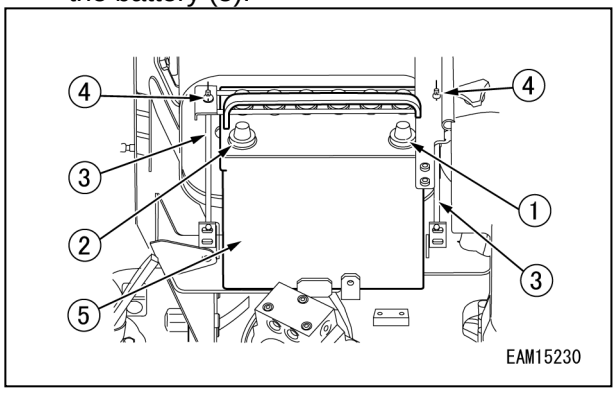
After installing the battery, confirm that the main body of the battery does not move. If it does move, then re-fix it.

[1] Removal

1. Referring to section "6.9 COVERS," take off the left machinery cover.

2. When removing the battery cable, remove from the (-) terminal (1) on the earth side and next separate the (+) terminal (2).

3. Remove the wing nut (4), remove the battery attachment bracket (3), and take out the battery (5).



[2] Installation

1. For the installation, perform the removal procedure in reverse.

2. For the battery cable, connect the (-) terminal (1) on the earth side last.

6.14.4 When the battery has discharged [engine specification / engine and electric specification]

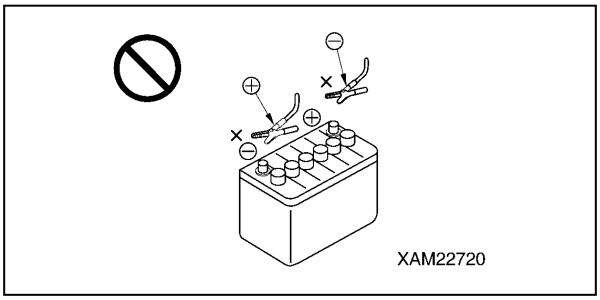
6.14.4.1 Cautions when charging the battery

⚠ WARNING

If a mistake is made in the battery handling when charging it, there is the danger of the battery exploding.
Follow "6.14.3 Handling the battery [engine specification / engine and electric specification]" and the user manual attached to the charger, and strictly comply with the following items.

⚠ CAUTION

- **When charging the battery with it mounted as is, charge it only after removing the battery terminal wiring. If an abnormal voltage is applied to the alternator, there is the risk of damage.**
- **Adjust the charger's voltage to match the voltage of the battery to be charged. If the voltage is set incorrectly, it may cause an explosion due to the charger overheating and catching fire.**
- **Set the charging current to a value of "1/10" or less of the battery's rated capacity. In the case of high-speed charging, set it at or below the battery's rated capacity value. If the charging current is excessive, there is the danger of fire ignition and explosion due to fluid leak or fluid depletion.**
- **Firmly fix the charger's (+) side charging clip to the battery's (+) terminal and then firmly fix the charger's (-) side charging clip to the battery's (-) terminal.**
- **When connecting the charger's charging clips, be careful not to connect the (+) terminal and the (-) terminal the wrong way round. Doing so will cause damage to the alternator, etc.**



- **During charging, remove all the fluid plugs and release the generated gas.**
- **If the battery overheats (the fluid temperature exceeds 45°C), temporarily stop charging.**
- **Once the charging is complete, stop charging promptly.**
  Continuing charging after the charging is complete will cause
  (1) Battery overheat
  (2) Reduction in the battery fluid volume
  (3) Battery defects
- **If the battery fluid freezes, do not charge the battery or start the engine using a separate power source. Doing so may cause the battery fluid to ignite and an explosion to occur.**
- **When conducting battery handling other than the battery fluid volume inspection or the specific gravity measurement, do so only after removing the battery cable.**

6.14.4.2 Starting up using a booster cable

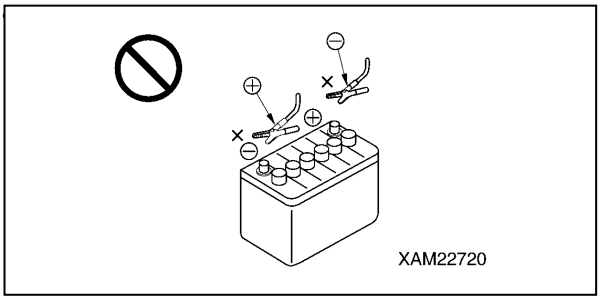
When starting the engine using a booster cable, do so as follows.

[1] Cautions when connecting or removing the booster cable

⚠ CAUTION

If a mistake is made in the method of connecting the booster cable, it may cause a fire, so strictly comply with the following points.

- **Do not reverse connect (i.e., connect (+) and (-), and (-) and (+)) when connecting the booster cable.**
- **When starting using the booster cable, wear protective goggles and rubber gloves.**
- **When starting using another machine, be careful not to connect the working machine and the broken-down machine.**
  Hydrogen gas is generated by the battery, so there is the danger of an explosion due to sparks coming near to the battery.
- **Do not make a mistake in connecting the booster cable.**
  In addition, when the final connection is made, sparks are generated, so make this connection in a location as far away as possible from the battery.
- **When removing the booster cable, ensure that the booster cable clips do not come into contact with each other nor with the machine.**



IMPORTANT

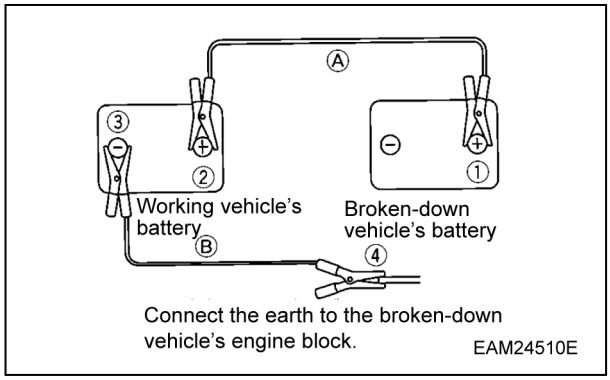
- **Use a booster cable and clips with thicknesses appropriate to the battery size.**
- **Use a battery for the working machine with the same capacity as the battery of the broken-down machine.**
- **Check that the cable and clips are not damaged or corroded.**
- **Connect the clips firmly.**
- **Check that the operation levers of both the working machine and the broken-down machine are in the "neutral" position.**

[2] Connecting the booster cable

Set the starter switches of both the working machine and the broken-down machine to "OFF."

Connect the booster cable as follows in the numerical order shown in the diagram.

1. Connect the booster cable's (A) clip to the (+) terminal of the broken-down machine.
2. Connect the booster cable's (A) other clip to the (+) terminal of the working machine.
3. Connect the booster cable's (B) clip to the (-) terminal of the working machine.
4. Connect the booster cable's (B) other clip to the frame of the broken-down machine.



[3] Starting the engine

⚠ CAUTION

Check that the operation levers of both the working machine and the broken-down machine are in the "neutral" position.
In addition, if there is a safety lock lever, check that it is in the locked position.

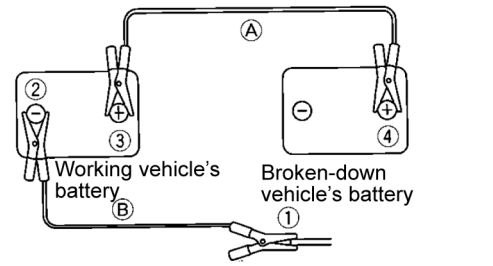
1. Check that the clip is firmly connected to the battery terminal.
2. Start the working machine's engine and run it flat out (at the maximum RPM).
3. Turn the starter switch key of the broken-down machine to "START," and start the engine.
   If the engine does not start, leave it for a minute or longer, then try again.

☞ For details of the engine startup method, refer to section “5.4.2 Starting the machine (engine specification / engine and electric specification).”

[4] Removing the booster cable

Once the engine has started, remove the booster cable according to the reverse procedure to the connection procedure.

1. Remove the booster cable’s (B) clip that is connected to the broken-down machine’s engine block.
2. Remove the booster cable’s (B) clip that is connected to the working machine’s (-) terminal.
3. Remove the booster cable’s (A) clip that is connected to the working machine’s (+) terminal.
4. Remove the booster cable’s (A) clip that is connected to the broken-down machine’s (+) terminal.



6.14.5 When the battery has discharged [battery specification]

Check the items described in the safety edition, and once you have fully understood them, use the battery.

6.14.5.1 Lithium-ion battery usage cautions

⚠ CAUTION

- **Do not cause a large impact such as dropping it or banging it. Because external or internal damage may cause an accident or malfunction.**
  Even if no problems are visible to the eye, there may be internal damage, so definitely do not use a lithium-ion battery that has suffered an impact.
- **Use the battery in a place where it will not come into contact with water or sea water, etc., and in an environment in which waterproofing measures are implemented.**
- **When washing the vehicle, definitely do not perform high-pressure washing.**
- **The emergency stop state will cause the lithium-ion battery to discharge, so be sure to turn the starter switch to “OFF” when stopping the machine for a long time.**
- **If using the battery in an environment at an altitude exceeding 1000 m, the lithium-ion battery cooling performance will fall, so be careful when using it.**

6.14.5.2 Cautions when charging the lithium-ion battery

For details of the lithium-ion battery charging method, refer to “5.11 Charging the battery (battery model).”

⚠ DANGER

- **Do not charge the battery with a charger other than that the machine comes equipped with. Incorrect charging may result in electrolyte fluid leak, abnormal heating, smoking, or the battery bursting or catching fire.**
- **Do not charge the battery where there is a risk of the battery coming into contact with rain or water.**
- **Check that there is no water or dust, etc. adhering to the charging port, the power supply cord, or the plug.**
- **Check that there is a short circuit breaker in the device on the power supply side.**

- Charge the lithium-ion battery when its charge is low.
- When conducting a job over a long period, charge the battery sufficiently in advance.
- When the temperature is low, the charging may not begin immediately. In this case, wait for a while in the charging start state,

☞ If the lithium-ion battery has discharged, handle it as described in “6.14.5.3 Action when the lithium-ion battery is drained.”

6.14.5.3 Action when the lithium-ion battery is drained

⚠ DANGER

If the machine is in the state immediately after stopping due to the lithium-ion battery running out, the machine can be temporarily operated by setting the moment limiter override switch to “ON.”
This operation cancels the safety device, so only use it in an emergency such as a stowing working.

⚠ CAUTION

- **When the machine has stopped due to the lithium-ion battery running out, take one of the following actions to prevent overdischarge and performance deterioration.**
- **Promptly charge the battery within one hour as a rough guide.**
- **If charging cannot be performed, disconnect the lithium-ion battery to prevent using it up, and move promptly to a location where charging is possible.**
  If the charge is used up to the point of overdischarge, the lithium-ion battery will malfunction (it will require replacement).
- **In a place where there is no charging device, consider moving to where there is charging device, and stop the working early and be sure to charge the battery.**

For details of long-term stowage, refer to “6.14.10 Long-term stowage [battery specification].”

6.14.6 Operation in an emergency

[1] Moment limiter override switch

⚠ DANGER

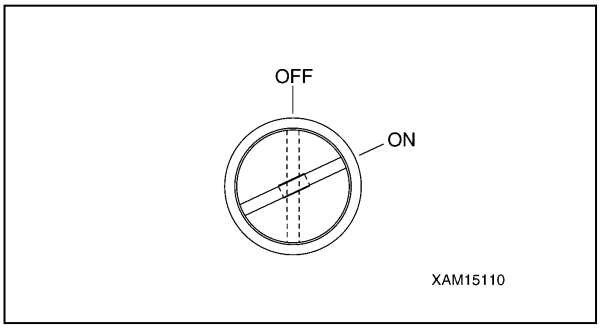
The moment limiter override switch is a function that disables the moment limiter function and each of the interlocks.
For 3 minutes after turning this switch ON (canceled), the moment limiter does not cause an automatic stop and the crane is in an extremely dangerous condition. If the crane job is continued in this condition, it may cause a serious accident, such as the suspended load falling, boom damage, or the machine tipping-over, which could lead to death or serious injury.
Only use this switch when the moment limiter is broken down or the crane is being load tested. During normal crane workings, take out the switch's key.
In particular, definitely do not use it any of the following ways.

- **When the load is hoisted, do not wind up the hook block with this switch turned to ON (Override).**
  Even if the weight of the load exceeds the rated total load, the moment limiter will not detect it. This may cause an accident such as the suspended load falling, the boom and jib breaking due to the winch wire rope snapping, or the machine tipping-over.
- **During the crane job, if it is detected that the moment limiter has exceeded the rated total load, after automatically stopping the operation, while this switch is set in the ON (canceled) position, do not perform dangerous lateral operations. Doing so may cause the boom and jib to break or to tip-over, etc.**
- **When stowing the hook block, use the hook stowing switch. If the moment limiter override switch is used to perform an operation to wind up the hook block, it may cause damage to the boom and jib or the hook block, cutting of the wire rope, the load to drop, etc.**

⚠ CAUTION

- **When the override switch is ON, the boom will lower to under 0° (level). When the boom angle is less than 0° (level) and the outriggers are stowed, the boom and outriggers will come into contact with each other, potentially causing damage to the machine.**
- **If you slew widely with the jib stowed, the jib and cover will come into contact with each other, causing possible damage.**

Only use the moment limiter override switch when the moment limiter has malfunctioned or the crane load test is being conducted.

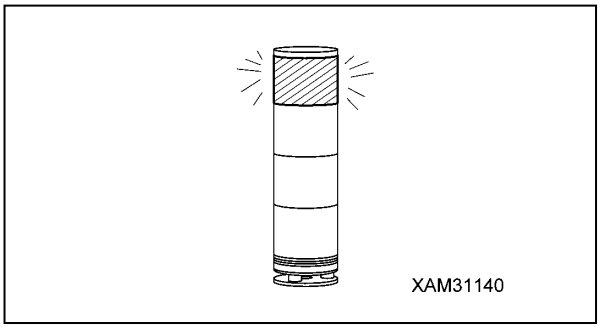


- ON (Override) : insert the key into the switch, and if it is turned to "ON" once, the moment limiter stop function is canceled.
- OFF (normal) : the key can be pulled out in this position.

☞ If the moment delimiter function is canceled, the machine is in the following state.
- The working status lamp blinks red.
- The switch box LED lights up.
- The buzzer sounds intermittently.
- Compared to when the crane action speed is OFF (normal), it is limited to a low speed.
- According to the battery specification, the motor speed at 1,700 rpm.

Once the switch is turned to ON, even if it is returned to the OFF position, if three minutes have not passed, the moment limiter stop function is in a canceled state.

However, depending on the state of the machine main body, these operations may vary.



If the starter switch key is turned to OFF, the override function is also turned OFF (normal).

6.14.7 Hydraulic circuit air removal

☞ For details of starting the machine, refer to "5.4 STARTING THE MACHINE." As required, refer to "5.6.4 Starting (forward and backward) and stopping the machine."

IMPORTANT

- **After completing the air removal, once the engine has been stopped, after keeping it off for five minutes or more, operate it. By doing this, the air bubbles in the oil inside the tank will be released.**
- **After completing the working, check that there are no oil leaks, and wipe clean any spilled oil.**

Conduct the air removal in the following order.

1. Wait until the oil fills the piping and the hydraulic equipment, and then start the engine. After the engine has started, continue low idling operation for 10 minutes.

2. Operate the winch motor and the travel motor for a while, move each crane operation lever a little, and slowly operate each cylinder and the winch motor. 4 or 5 times, repeat the return operation of the boom derricking cylinder and the boom telescoping cylinder to the stroke end.

3. Extend the outriggers, and with the machine in an unraised state, 4 or 5 times, repeat the return operation of the outrigger cylinders to the stroke end.

6.14.8 Fuel circuit air removal

IMPORTANT

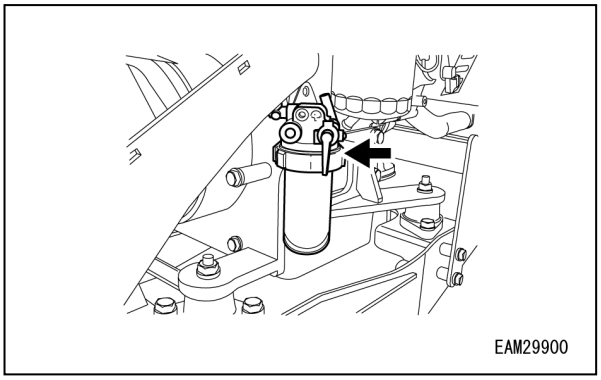
When the fuel runs out and the engine is not used for a long period, when the fuel filter and the fuel hose have been replaced, be sure to remove the air before starting the engine.

⚠ CAUTION

Other than when removing air, be sure to close the air removal plug of the fuel ejection pump. Otherwise, it may cause the engine to stop.
Conduct the air removal in the following order.

1. Referring to section "6.9 COVERS," take off the engine cover.

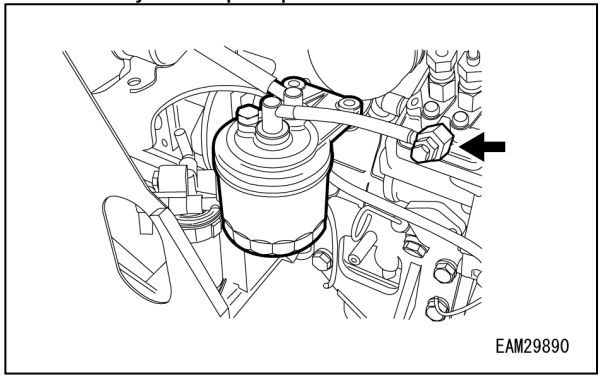
2. Fill the tank with fuel and open the water separator lever.



3. Loosen the water separator's air removal plug by rotating it 2 or 3 times.

4. Once the fuel coming out of the plug stops bubbling, tighten the plug.

5. Open the air removal plug at the top of the fuel ejection pump.



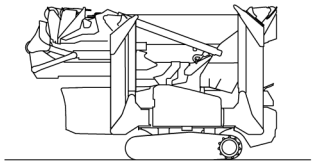
6. Once the fuel coming out of the plug stops bubbling, re-tighten the air removal plug.

6.14.9 Long-term stowage [engine specification / engine and electric specification]

6.14.9.1 Pre-stowage procedure

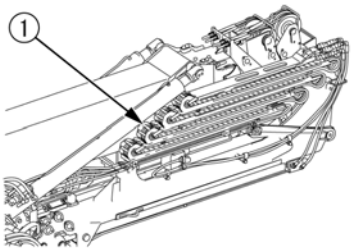
IMPORTANT

During long-term stowage, put the machine in the "travel position" shown in the following diagram, in order to protect the cylinder rod. (prevents the cylinder rod from rusting)
For details of the travel position, refer to "5.6.2 Travelling posture of machine."



⚠ CAUTION

- **Do not stow with the cable bear (1) extended.**
- **If snow builds up on the cable bear (1) and it freezes, then it may cause damage.**



When storing the machine long term, stow in the following way.

- After washing and cleaning each part, stow them indoors.
  When they are left outdoors unavoidably, choose flat ground that is not subject to flooding or other natural disasters, and cover them.
- Fill the fuel tank. This prevents moisture gathering.
- Fill the oil, grease, and replace the oil without omission.
- Apply grease to the exposed parts of the hydraulic cylinder's piston rod.
- Remove the minus terminal from the battery and cover the battery or remove it from the machine and stow it.
- When the temperature falls to 0°C or below, add antifreeze to the cooling water. For details of the mixing proportion of antifreeze, refer to section "6.13.8 [3] Cleaning the cooling system internals [engine specification / engine and electric specification]."

6.14.9.2 Handling during stowage

⚠ WARNING

- **When the machine is run indoors unavoidably, open a window or entrance and ventilate the room well to prevent gas poisoning.**

- During long-term stowage, run the machine once a month, prevent the oil film of lubricating parts running out, and at the same time as performing anti-rusting operation, charge the battery.
- When operating the crane, wipe off the grease applied to the exposed parts of the hydraulic cylinder's piston rod.

6.14.9.3 Post-stowage handling

⚠ WARNING

- **During long-term stowage, if the anti-rust operation is not conducted once a month, before using the machine again, contact us or our sales service agency.**

After storing the machine for a long period, when using it again, first conduct the following treatments.

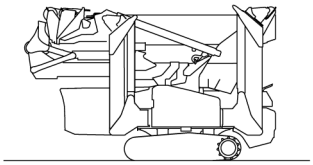
- Remove the drain plugs from the fuel tank, the hydraulic oil tank, and the engine oil pan, and discharge any water contaminated in them.
- Fill the oil, grease, and replace the oil without omission.
- Wipe off the grease applied to the exposed parts of the hydraulic cylinder's piston rod.
- Remove the battery cover (when it has been removed from the machine and stowed, install it in the machine), check the battery fluid quantity, and after checking the specific gravity, connect the battery cable from the (+) side.
- Conduct the inspection performed before starting a job and sufficiently conduct the warming-up operation, then carefully inspect each part of the machine.

6.14.10 Long-term stowage [battery specification]

6.14.10.1 Pre-stowage procedure

IMPORTANT

- **During long-term stowage, put the machine in the "travel position" shown in the following diagram, in order to protect the cylinder rod. (Prevention of rusting of the cylinder rod during stowage)**
  For details of the travel position, refer to section "5.6.2 Travelling posture of machine."
- **Charge the lithium-ion battery to 50% or more charged.**



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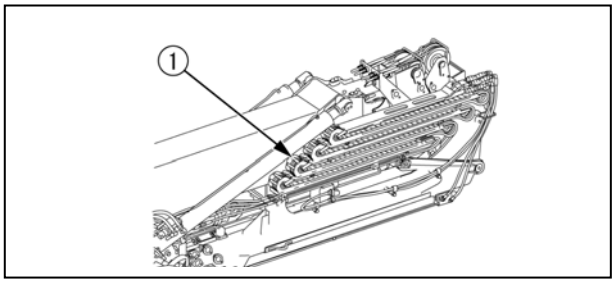
⚠ CAUTION

- **Do not stow with the cable bear (1) extended.**
- **If snow builds up on the cable bear (1) and it freezes, then it may cause damage.**



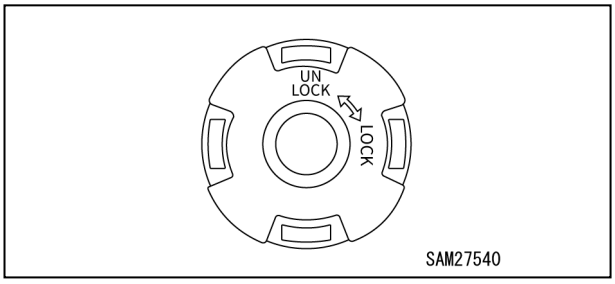
When storing the machine long term, stow in the following way.

- After washing and cleaning each part, stow them indoors.
  When they are left outdoors unavoidably, choose flat ground that is not subject to flooding or other natural disasters, and cover them.

- Grease and replace the oil without omission.
- Apply grease to the exposed parts of the hydraulic cylinder's piston rod.

To ensure long life for the lithium-ion battery, we recommend that the following conditions are fulfilled when storing the battery.

- Avoid charging of 95% or more and 10% or less
- An ambient temperature of 35°C or less
- Avoid direct sunlight
- No condensation
- Disconnected



6.14.10.2 Handling during stowage

⚠ CAUTION

- **During long-term stowage, run the machine once a month, prevent the oil film of lubricating parts running out, and perform the anti-rusting operation.**
- **When operating the crane, wipe off the grease applied to the exposed parts of the hydraulic cylinder's piston rod.**
- **When storing the machine for a long period again, apply grease to the exposed parts of the hydraulic cylinder's piston rod.**
- **After the anti-rusting operation, to avoid overcharging of the lithium-ion battery, charge the battery to around 50% charged.**

6.14.10.3 Post-stowage handling

⚠ WARNING

- **During long-term stowage, if the anti-rusting operation is not conducted once a month, before using the machine again, contact us or our sales service agency.**
- **During the long-term stowage, if the machine stops working without the lithium-ion battery being charged 50% once a month, contact us or our sales service agency.**

After storing the machine for a long period, when using it again, first conduct the following treatments.

- Remove the drain plug from the hydraulic oil tank, and discharge any water contaminated in it.
- Grease and replace the oil without omission.
- Wipe off the grease applied to the exposed parts of the hydraulic cylinder's piston rod.
- Charge the lithium-ion battery.
- Conduct the inspection performed before starting a job and sufficiently conduct the warming-up operation, then carefully inspect each part of the machine.

6.14.11 Handling in cold weather [engine specification / engine and electric specification]

6.14.11.1 Preparations for the cold

If the temperature is low, problems such as difficulty starting up will occur, so proceed in the following way.

[1] Lubricating oils and greases

Replace the lubricating oil for each piece of equipment to a low viscosity oil.
For details of the specified viscosity, refer to "6.5.1 Use of fuel and lubricating oil depending on temperature."

[2] Cooling water

⚠ WARNING

- **Antifreeze is combustible, so do not bring it close to flames.**
- **When handling antifreeze, do not smoke.**
- **Antifreeze is harmful. Try not to get it on clothes or the skin, but if by chance you do, wash it away well with clean water and go to a doctor for treatment.**
- **When handling cooling water with antifreeze added that has been discharged when replacing the cooling water and when making repairs, either request a specialized company to do it or contact us or our sales service agency. Antifreeze is harmful, so do not wash it down a drain or scatter it on the ground.**

IMPORTANT

Definitely do not use methanol-, ethanol-, or propanol-based antifreeze.

For details of the replacement period for the cooling water and the mixing proportion of antifreeze, refer to "6.13.8 [3] Cleaning the cooling system internals [engine specification / engine and electric specification]."

[3] Battery

⚠ WARNING

- **The battery generates combustible gas and there is a danger of explosion, so do not bring flames close to the battery.**
- **The battery fluid is a hazardous material. Try not to get it in the eyes or on the skin, but if by chance you do, wash it away with a large quantity of water and go to a doctor for treatment.**
- **If the battery fluid freezes, do not charge the battery or start the engine using a separate power source. There is the risk of explosion.**
- **Battery fluid is harmful, so do not wash it down a drain or scatter it on the ground.**

If the temperature drops, the battery performance will fall.

If the charge is low, there is the risk of the battery fluid freezing, so make sure the battery is charged to near 100% as much as possible, and be careful about heat retention in preparation for starting the next morning.

☞ For the battery charge, measure the specific gravity and convert using the following table.

		Fluid temperature (°C)			
		20	0	-10	-20
Battery charge (%)	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

[4] Cautions after completing the job

In order to prevent adherents such as mud or water or stuff around the feet freezing to the equipment so that it does not work the next morning, observe the following points.

- Knock off mud or water stuck to the machine.
- In particular, if mud, etc. together with drops of water gets inside the seal of the surface of the hydraulic cylinder's piston rod, then the seal will be damaged.

- Park the vehicle on hard, dry ground.
  If there is no such location, lay down planks on the ground and park the vehicle on the planks. Doing this prevents the ground and undercarriage freezing, enabling the machine to start immediately the next morning.
- Open the fuel tank's drain valve and discharge the water that has collected in the fuel system to prevent freezing.
- Fill the fuel tank. This prevents water drops forming in the space inside the tank due to changes in the temperature.
- The battery suffers a significant drop in performance if the temperature is low.
  The battery should either be covered or removed from the machine and put in a warm place, then re-installed the next morning.
- When the surface of the battery fluid is low, replenish the distilled water before starting the job the next morning.
  To prevent freezing overnight, do not replenish it after completing the job.

[5] When the cold weather has passed

When the season has changed and the temperature has become warmer, proceed in the following way.

- For details of the lubricating oils for each piece of equipment, refer to "6.5.1 Use of fuel and lubricating oil depending on temperature," and switch to items of the specified viscosity.

6.14.12 Handling in the cold weather [battery specification]

6.14.12.1 Preparations for the cold

IMPORTANT

If the temperature is low, then the oil flow is poor and the machine performance falls, so proceed in the following way.

[1] Lubricating oils and greases

Replace the lubricating oil for each piece of equipment to a low viscosity oil.
For details of the specified viscosity, refer to "6.5.1 Use of fuel and lubricating oil depending on temperature."

[2] Lithium-ion battery

The operating ambient temperature of the battery unit is down to -20°C, but when the temperature is low, the battery performance may fall.

[3] Cautions after completing the working

In order to prevent adherents such as mud or water or stuff around the feet freezing to the equipment so that it does not work the next morning, observe the following items.

- Knock off mud or water stuck to the machine.
- In particular, if mud, etc. together with drops of water gets inside the seal of the surface of the hydraulic cylinder's piston rod, then the seal will be damaged.

- Park the vehicle on hard, dry ground.
  If there is no such location, lay down planks on the ground and park the vehicle on the planks. Doing this prevents the ground and undercarriage freezing, enabling the machine to start immediately the next morning.

[4] When the cold weather has passed

When the season has changed and the temperature has become warmer, proceed in the following way.

For details of the lubricating oils for each piece of equipment, refer to "6.5.1 Use of fuel and lubricating oil depending on temperature," and switch to items of the specified viscosity.

6.15 TROUBLESHOOTING

- For procedures marked with a ★ in the column of procedures, be sure to contact us or our sales service agency.
- When you come across a defect or cause that you think is not specified in this chapter, contact us or our sales service agency.
- When an error code is displayed on the monitor, refer to “6.16.3 Monitor error codes,” and prioritize the handling described there.
- If the monitor is not displaying properly, stop using the crane immediately and contact us or our sales service agency.

6.15.1 Machine main body (common)

Defect phenomenon	Main cause	Procedure
The operating speed of the travel, slewing, boom or hook block is slow.	Insufficient hydraulic oil	Refer to “6.11.2 [6] Inspection of the quantity of oil in the hydraulic oil tank and replenishment,” and adjust the hydraulic oil to the specified amount.
The pump is generating a strange noise. (air suction)	Insufficient hydraulic oil	Refer to “6.11.2 [6] Inspection of the quantity of oil in the hydraulic oil tank and replenishment,” and adjust the hydraulic oil to the specified amount.
The hydraulic oil temperature is too high.	Insufficient hydraulic oil	Refer to “6.11.2 [6] Inspection of the quantity of oil in the hydraulic oil tank and replenishment,” and adjust the hydraulic oil to the specified amount.
	Loose fan belt	Adjust the tension in the fan belt or replace it (★).
	Clogging of the oil cooler fin	Refer to “6.11.2 [2] Inspecting and cleaning the fin [engine specification / engine and electric specification],” and clean the fin.
The crawler has come off.	The crawler is too loose.	Refer to “6.11.3 [1] Inspecting and adjusting the rubber track tension,” and adjust the tension.
The sprocket is suffering abnormal wear.		
The rated total load value is low.	The outrigger’s extension angle is not standard.	Adjust the outrigger’s extension angle and extension range to the target values.
	The outrigger’s extension range is short.	

6.15.2 Electrical component-related [engine specification / engine and electric specification]

Defect phenomenon	Main cause	Procedure
The light is dim.	Wiring defect	★Inspect and repair looseness and disconnection in the terminal.
The light is flashing.	Wiring defect	★Inspect and repair
Even though the engine is working, the monitor's charge warning will not disappear.	Alternator defect	Replacement (★)
	Wiring defect	Inspection / repair (★)
	Loose or damaged fan belt	Adjust the tension in the fan belt or replace it (★).
A strange sound is emitted from the alternator.	Alternator defect	Replacement (★)
The glow lamp will not light up.	Wiring defect	Inspection / repair (★)
	ECU output failure	Replacement (★)
	Lamp defective	Replacement (★)
The monitor does not appear.	Monitor signal defective	Turn the starter switch to OFF once, then turn it ON again.
	Wiring defect	Inspection / repair (★)
	Fuse blown	Replacement
	Monitor defective	Replacement (★)
The monitor display is freezing	Monitor signal defective	Turn the starter switch to OFF once, then turn it ON again.
	Monitor defective	Replacement (★)
The monitor does not turn off even if the starter switch is turned to OFF.	Monitor signal defective	Turn the disconnect switch OFF once and disconnect the power supply.
	Wiring defect	Inspection / repair (★)
	Monitor defective	Replacement (★)

6.15.3 Electrical component-related [battery specification]

Defect phenomenon	Main cause	Procedure
The light is dim.	Wiring defect	★Inspect and repair looseness and disconnection in the terminal.
The light is flashing.	Wiring defect	★Inspect and repair
The monitor does not appear.	Monitor signal defective	Turn the starter switch to OFF once, then turn it to START again.
	Wiring defect	Inspection / repair (★)
	Fuse blown	Replacement
	Monitor defective	Replacement (★)
The monitor display is freezing	Monitor signal defective	Turn the starter switch to OFF once, then turn it to START again.
	Monitor defective	Replacement (★)
The monitor does not turn off even if the starter switch is turned to OFF.	Monitor signal defective	Turn the disconnect switch OFF once and disconnect the power supply.
	Wiring defect	Inspection / repair (★)
	Monitor defective	Replacement (★)
	Charging	This is not a defect.
The lithium-ion battery is dead.	Power supply disconnection defect	Contact us or our sales service agency.
	Short-circuited	
	Left without charging	
	Overuse of the override	
Even if the starter switch is ON, the power is not turned on	The starter switch has never been set to START	Set the starter switch to START once

6.15.4 Engine-related [engine specification / engine and electric specification]

Defect phenomenon	Main cause	Procedure
An engine hydraulic oil warning is displayed while the engine is running.	Insufficient or too much engine oil	Refer to “6.5.1 Use of fuel and lubricating oil depending on temperature,” and adjust the oil to the specified amount.
	Clogging of the engine oil filter	Refer to “6.13.6 [1] Replacing the engine oil filter cartridge [engine specification / engine and electric specification],” and replace the filter.
	Defect with the pressure switch	Replacement (★)
An engine water temperature warning is displayed while the engine is running.	Insufficient cooling water	Refer to “6.11.2 [1] Cooling water quantity inspection and replenishment [engine specification / engine and electric specification],” and adjust the cooling water to the specified amount.
	Clogging of the radiator fin	Refer to “6.11.2 [2] Inspecting and cleaning the fin [engine specification / engine and electric specification],” and clean the fin.
	Water leak from the cooling system	Inspection / repair (★)
	Loose or damaged fan belt	Adjust the tension of the fan belt or replace it (★).
	Accumulation of garbage or water scale inside the cooling system	Refer to “6.13.8 [3] Cleaning the cooling system internals [engine specification / engine and electric specification],” and clean the cooling system.
The starter turns, but the engine does not start.	Insufficient fuel	Refer to “6.5.1 Use of fuel and lubricating oil depending on temperature,” and replenish the fuel.
	Air contaminating the inside of the fuel system	Referring to “6.14.8 Fuel circuit air removal,” remove the air
	Fuel defective	Replace with the specified fuel.

Defect phenomenon	Main cause	Procedure
The starter turns, but the engine does not start.	Clogging of the fuel filter	Refer to “6.13.8 [1] Replacing the fuel filter element [engine specification / engine and electric specification],” and replace the filter element.
	Fuel ejection pump or nozzle defect	Replace the pump or the nozzle (★).
	Compression defect (valve clearance defect)	Adjust the valve clearance (★).
The starter does not turn, even though the starter switch is turned.	Wiring defect	Inspection / repair (★)
	Fuse blown	Replacement
	Starter defect	Replacement (★)
	Insufficient or defective battery charging	Charge the battery or replace it (★).
The starter pinion repeatedly goes in and out (it flops around).	Insufficient battery charging	Charge the battery.
	Safety relay defect	Replacement (★)
The starter stops before the engine starts.	Insufficient or defective battery charging	Charge the battery or replace it (★).
	Wiring defect, ring gear / pinion defect	Inspect and replace (★)
The exhaust gas is white.	Fuel defective	Replace with the specified fuel.
	The fuel ejection pump is in a defective state.	Inspection / repair (★)
	Combustion or abnormal consumption of the engine oil	Inspection / repair (★)
The exhaust gas is black.	Fuel defective	Replace with the specified fuel.
	Clogging of the air cleaner	Refer to “6.13.5 [3] Inspecting and cleaning the air cleaner element [engine specification / engine and electric specification],” and clean the element.
	The fuel ejection pump is in a defective state.	Inspection / repair (★)
	Large gap in the intake and exhaust throttle valve	Adjustment (★)
	Fuse blown	Replacement
The engine stops during operation.	Clogging of the fuel filter	Refer to “6.13.8 [1] Replacing the fuel filter element [engine specification / engine and electric specification],” and replace the filter element.
	Insufficient fuel	Refer to “6.5.1 Use of fuel and lubricating oil depending on temperature,” and replenish the fuel.
	Wiring defect	Inspection / repair (★)
	Sensor defect	Inspect or replace (★)
	Crushing or dislodging of the hose	Inspect or replace (★)

6.15.5 Lithium-ion battery-related [battery specification]

Defect phenomenon	Main cause	Procedure
Cannot be charged	・The disconnect is set to “UNLOCK.”	・The disconnector is set to “LOCK”
	・Power supply cable defect	・Replace the cable
	・The breaker on the device side is set to “OFF.”	・Check the breaker
	・When starting charging, the starter switch is set to “OFF.”	・Set the starter switch to START
	・The charging plug is not inserted properly.	・Check the charging plug
	・BMU defect	★Inspection, replacement
	・Controller defect	★Inspection, replacement
	・Overdischarge	★Inspection, replacement
	・Charger malfunction	★Inspection, replacement
	・Harness malfunction	★Inspection, replacement
	・Power supply voltage is low	・Check the device, the power supply, and the voltage Shorten the extension cable.
	・The temperature is low	・Run the electricity for a while until the charger has warmed up
The battery and controller are hot.	・The work load is high	・Lower the work load and open the work interval
	・Working at a high altitude	・Move to a lower altitude
	・The outside temperature is high	・Conduct the procedure for low temperatures
	・The warming-up operation mode is set to “ON”	・Set the warming-up operation mode to “OFF”
	・The cooling fan is malfunctioning	★Inspection and repair
	・The controller is malfunctioning	★Inspection, repair, and replacement
	・The battery is malfunctioning	★Inspection, repair, and replacement

6.15.6 Motor-related [battery specification]

Defect phenomenon	Main cause	Procedure
Even if the operation lever is operated with the starter switch in the ON position, the motor does not start up.	・Battery capacity failure	・Recharging the battery
	・Overheating	・Lower the hydraulic oil temperature, the motor temperature, and the motor controller temperature
	・The emergency stop switch is in the ON position	・Set the emergency stop switch to the OFF position
	・Wiring defect	★Inspection, repair, replacement
	・The controller is malfunctioning	★Inspection, repair, replacement
	・The starter switch has never been set to START	・Set the starter switch to START once
The motor stops during operation.	・Idling stop state with no operations (normal)	
	・Overheating	・Lower the hydraulic oil temperature, the motor temperature, and the motor controller temperature
	・Insufficient battery capacity	・Recharging the battery
	・The electric motor is malfunctioning	★Inspection, repair, replacement
	・The controller is malfunctioning	★Inspection, repair, replacement
There is no motor output or the output is gradually falling	・The battery capacity is falling	・Recharging the battery
	・The controller is malfunctioning	★Inspection, repair, replacement
During operation, strange noises and vibrations are generated from around the motor	・The motor and pump fixing bolts are loose	★Inspection, replacement
	・The motor or the pump is malfunctioning	★Inspection, replacement
During operation, the motor is hot	・The work load is high	・Lower the work load and open the work interval
	・Working at a high altitude	・Move to a lower altitude
	・The outside temperature is high	・Conduct the procedure for low temperatures
	・The warming-up operation mode is set to ON	・Set the warming-up operation mode to OFF
	・The cooling fan is malfunctioning	★Inspection, repair
	・The controller is malfunctioning	★Inspection, repair, replacement

6.15.7 Electric motor-related [engine and electric specification]

Defect phenomenon	Main cause	Procedure
Even if the switch is set to the START position, the motor does not start	・Wiring or power supply defect ・The breakers are OFF ・The stator winding is disconnected	・Check the wiring ・Set the breakers to ON ★Inspection, repair, replacement
The motor stops during operation.	・Control panel error (the red lamp is lit) ・The control panel is malfunctioning ・The power unit is malfunctioning	・Check the supplied power (voltage, phase) ★Inspection, repair, replacement ★Inspection, repair, replacement
There is no motor output or the output is gradually falling	・Phase loss of the power on the power supply facility side ・The motor wiring is loose	・Check the power (voltage, phase) on the power supply facility side ・Inspect the motor terminal box connection
The cabtyre cable becomes hot	・The cabtyre cable wire diameter is small ・The cabtyre cable is about to break	・Check that the voltage of the power on the power supply facility side is the specified value ・Replace with cabtyre cable that matches the specification
During operation, strange noises and vibrations are generated from the power unit	・The motor wiring is disconnected ・The motor and pump fixing bolts are loose ・The coupling fixing bolts are loose ・Dirt is adhered to the coupling ・Clogging of the hydraulic oil tank strainer and element	・Inspecting the motor terminal box ・Inspection, replacement ・Inspection, replacement ・Cleaning ・Cleaning, replacement
During operation, the power unit becomes hot	・The ambient temperature is high ・The ventilation is poor ・Overloading ・Frequent starting ・The electric motor is malfunctioning	・Use in an environment that matches the specification ・Inspection, cleaning ・Lighten the load ・Reduce the number of starts ★Inspection, repair, replacement
The control panel's malfunction lamp (red) is lit	・The control panel is malfunctioning	★Inspection, repair, replacement
The breaker trips (power supply box or control panel)	・Overloading ・Connected in reverse phase ・Short circuit, etc.	★Inspection, repair, replacement

6.15.8 Radio controller device-related

6.15.8.1 Before troubleshooting

☞ Before conducting troubleshooting on the next page and after, check the following inspection items in the order shown.
By performing simple measures such as changing the operation method or replacing the battery, it may sometimes be possible to eliminate an abnormal phenomenon.

☞ After conducting the following inspection items and the troubleshooting on the next page and after, if the abnormal phenomenon has not been eliminated, contact us or our sales service agency to request repairs.
In addition, in the case of electrical-related malfunction of this device, set the power supply to "OFF" with the transmitter's emergency stop switch, and it will be possible to operate the crane by manual operation on the machine main body side.

Inspection item	Cause and handling
Is the transmitter lock disabled?	Disable the transmitter lock.
Is the crane being operated with the emergency operation on the machine main body side?	If the crane works, there is a defect with this device. If the crane does not work, perform the troubleshooting for the machine main body side.
Is the power supply inserted in the transmitter and the main key switch?	If the power supply is not inserted, insert the power supply.
Is the emergency stop switch on?	Turn "OFF" the transmitter / machine main body side emergency stop switch.
Does the mode match wanting to move the outrigger / crane / travel changing switch?	Correctly switch the outrigger / crane / travel changing switch.
Is the transmitter's status LED lit green?	If the LED is blinking red, replace the battery with a battery that is fully charged.
Is the transmitter deformed or damaged?	If the transmitter is deformed or damaged, repair it or replace it.
Are all the transmitter's operation levers in the neutral position?	If there are any defects with the operation levers or the operation switches, repair them or replace them.
Has the receiver's internal fuse blown?	Check whether the fuse has blown or not, and if it has blown, investigate the cause and replace the fuse.

6.15.8.2 Radio-controller device defects

- When performing troubleshooting: be sure to check the receiver's monitor LED and the transmitter's status LED (D1); determine what the cause might be according to the conditions applicable to that display; and, take the appropriate measure.
- If the defect is not fixed even after performing "procedure 1" in the procedure column, perform "procedure 2."
- For procedures marked with a ★ in the column of procedures, be sure to contact us or our sales service agency.
- When you come across a cause that you think is not specified in the following, contact us or our sales service agency.

Defect phenomenon	Main cause	Procedure
The transmitter does not start up even if the power is turned on.	There are transmitter levers or switches that are not set to neutral.	Take your hands off the levers and switches, and then set all the levers and switches to the neutral state.
	The battery contact is poor due to dirt, etc.	Inspection / cleaning / re-installation
	Insufficient battery capacity	Charge or replace the battery
	The emergency stop switch is pressed	Cancellation of the emergency stop switch
	Transmitter failure	Inspection / repair (★)
A battery warning is issued immediately after the transmitter is started.	The battery contact is poor due to dirt, etc.	Inspection / re-installation
	Insufficient battery capacity	Charge or replace the battery
	Battery failure	Replacement
The crane cannot be operated from the transmitter. (the power is turned on)	The main unit emergency stop switch is pressed.	Cancellation of the main unit emergency stop switch
	A different vehicle's transmitter is being used.	Use the transmitter for this machine.
	The receiver's power is not turned on.	Set the starter switch to ON.
		Inspection / repair (★)
	The receiver's power is turned on, but communication is not established.	Refer to "5.3 STARTING AND STOPPING THE TRANSMITTER," and establish communication.
	Receiver wiring failure	Inspection Repair (★)
	The ID chip (iLOG) has been removed or is broken.	Re-insert the ID chip.
		Inspection / repair (★)
	Radio signal failure	Check the surrounding radio signal.
	Radio signal reception failure	Inspect and repair the antenna. Inspect and repair the antenna cable.
		Try connecting the remote-control cable.
The crane cannot be operated from the transmitter. (The power is turned on and the crane is operated from the emergency operation on the machine main body side)	Radio controller device or wiring failure	Inspection / repair (★)

Defect phenomenon	Main cause	Procedure
The crane is not operated from the emergency operation on the machine main body side.	Malfunction on the machine main body side	Perform troubleshooting of the machine main body side
		Inspection / repair (★)
The receiver's power will not turn on (Even if the starter switch is turned ON, the LED does not light up)	Receiver failure	Inspection / repair (★)
	Fuse blown	Replacement
	Wiring defect	Inspection / repair (★)
	Machine main body failure	Inspection / repair (★)
The radio controller lamp (blue) does not light up	Communication has not been established between the receiver and the transmitter.	Refer to "5.3 STARTING AND STOPPING THE TRANSMITTER," and establish communication.
	Lamp defective	Inspection and repair
	Vehicle controller failure	Inspection / repair (★)
	Wiring defect	Inspection / repair (★)

6.15.9 Safety device-related

Defect phenomenon	Main cause	Procedure
Even in an overloaded state, the crane operation does not stop.	Communication failure, controller failure	Inspect or replace (★)
	Moment limiter override switch failure	Inspect or replace (★)
	Wiring defect	Inspection / repair (★)
	Solenoid valve, controller valve failure	Repair or replacement (★)
Despite not being in an overloaded state, the extension, hoisting up, and lowering do not work.	Wiring defect	Inspection / repair (★)
	Controller failure	Inspect or replace (★)
Even in an overwound state, the extension, hoisting up, and raising operations will not stop (the buzzer is sounding).	Moment limiter override switch failure	Inspect or replace (★)
	Solenoid valve, controller valve failure	Repair or replacement (★)
	Earth failure	Inspection / repair (★)
Even in an overwound state, the extension, hoisting up, and raising operations will not stop (the buzzer is not sounding).	Overwinding prevention device failure	Inspect or replace (★)
Despite not being in an overwound state, the extension, hoisting up, and raising do not work (the buzzer is sounding).	Overwinding prevention device failure	Inspect or replace (★)
	The overwinding detection wire is damaged or entangled.	Inspection, repair, or replacement (★)
	The overwinding detection weight is damaged.	Inspect or replace (★)
	Wiring defect	Inspection / repair (★)
Despite not being in an overwound state, the extension, hoisting up, and raising do not work (the buzzer is not sounding).	Solenoid valve, controller valve failure	Repair or replacement (★)
	Wiring defect	Inspection / repair (★)
The crane operation always stops under certain conditions.	Activation of the work range controls	Cancel the controls
	Failure of the sensors	Adjustment
The tri-colored lamp does not light up.	Wiring defect	Inspection / repair (★)
	Fuse blown	Replacement
	Tri-colored lamp malfunction	Repair or replacement (★)

6.16 DISPLAY OF ERROR CODES AND WARNINGS

⚠ CAUTION

When warnings and error codes are displayed, stop the working immediately. Stop the machine and inspect and deal with the applicable place. If use is continued as is, a serious personal injury accident may be caused due to damage, etc. to the machine.

6.16.1 Warning display

Monitor display	Description
	[Error occurrence] Notifies the user of an error occurrence. Check the error code.
	[Falling engine oil pressure abnormality] Notifies the user of falling engine oil pressure. If the starter switch is set to the “ON” position, it lights up, the engine starts, and it is normal for the light to go out as the engine’s speed increase. During operation, when the light is on, the engine oil pressure falls. Immediately stop the operation, perform an engine oil filter clogging inspection, and inspect the amount of engine lubricating oil.
	[Engine water temperature abnormality] Notifies the user of an abnormality in the engine cooling water temperature. During operation, it is normal for the light to turn off. If the light turns on during operation, then the engine cooling water temperature is exceeding the normal value. Immediately set the engine operation to low idling, then wait until the monitor light goes out (the engine cooling water temperature falls). After that, stop the operation, and check the radiator for water leaks, the radiator core for clogging, the fan belt for damage, and check the fan belt’s tension.
	[Battery abnormality] Notifies the user of an abnormality in the battery charging system. If the starter switch is set to the “ON” position, it lights up, the engine starts, and it is normal for the light to go out as the engine’s revolutions increase. When the light goes on during operation, there is an abnormality in the battery charging system. Immediately stop the operation, check the tension of the fan belt and check the harness.

6.16.2 Message display

The following messages are displayed on the monitor screen depending on the state of the machine.

Message	Display condition
Multiple errors	Several errors have occurred
Error code + error details displayed (the display contents vary depending on the error)	Only one error has occurred
Reset by main key OFF while safety device is deactivated	The moment limiter override switch is ON
The boom raising operation for safe side is now released.	While the transmitter's "Start" button is being pressed during starting and stopping
Stop idling recommended	When the engine/motor is ON, the operation signal will not be detected for five minutes.
Overheating, Motor	The motor temperature is 140°C or more Once the motor temperature is 110°C or below, the message will be cleared.
Overheating, Motor controller	The motor controller temperature is 90°C or more Once the motor controller temperature is 85°C or below, the message will be cleared.
Overheating, Hydraulic oil	The hydraulic oil temperature is 90°C or more Once the hydraulic oil temperature is 85°C or below, the message will be cleared.
EMO release	Using the transmitter, press the emergency stop switch / press the emergency stop switch at the bottom of the monitor Release the emergency stop switch using the radio control transmitter / release with the monitor's ☑ / released by turning the key OFF
Install the outriggers and make the machine body level.	When it is not in a work position (when the ground is undetected, the machine is not level despite being set up), perform the crane operation.

☞ Depending on the monitor settings, there may be cases when it is not displayed. For the display / non-display settings, contact us or our sales service agency.

☞ There are messages other than those described above. If a message is displayed on the monitor screen, check the contents well, and proceed according to the message.

6.16.3 Monitor error codes

If any of the following error codes are displayed, refer to the corresponding handling method and deal with the error. If the error code is not canceled, contact us or our sales service agency to request repairs.

If the error code is displayed, check in the following table and handle it.

Error code	Error contents	Description	Handling method
EC□□	Controller abnormality	A system abnormality and communication abnormality have occurred in the controller.	Stop the machine usage, then contact us or our sales service agency.
ES□□□	Sensor input abnormality	A sensor-related input abnormality has occurred.	
EVOO	Sensor power supply abnormality	The power supply to the sensor is different to the standard value.	
EO□□□	Output abnormality	An output abnormality has occurred.	
EH01	Hydraulic oil temperature abnormality	The state with the hydraulic oil temperature at 95°C or more has continued to occur.	[Engine specification / engine and electric specification] Wait for a while in the idling state without stopping the machine. [Battery specification] Stop the machine.
Codes other than those above □□□−□	Engine abnormality	An engine-related abnormality has occurred.	If a code stated above is displayed at the same time, prioritize handling that one. If the engine abnormality code only is displayed, stop the machine usage, and contact us or our sales service agency.

- For the error code's □□□, the display varies depending on the error occurring.

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1095, Onbegawa, Shinonoi, Nagano City,
Nagano Prefecture, 388-8522 Japan

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