OPERATION & MAINTENANCE MANUAL

CK1000

APPLICABLE : GD02-01018～

BOOK CODE : S2GD30002ZE01

IMPORTANT INFORMATION

Thank you for your purchasing KOBELCO crawler crane. Our CK series full-hydraulically operated crawler crane is manufactured based on our long years of experience and expertise. This manual describes the important information about Model CK1000.

Before operating the machine, be sure to thoroughly read this manual to use the machine safely and efficiently.

⚠ WARNING

Do not operate or maintain this machine until you read this manual and understand the instructions.
Improper operation or maintenance of this machine may cause accidents and could result in serious injury or death.
Always keep this manual in the operators cab.
If it is missing or damaged, place an order to a KOBELCO distributor for a replacement.
If you have any questions, please consult your KOBELCO distributor.

■ SAFETY INFORMATION

Most accidents, which occur during operation, are due to neglect of precautionary measures and safety rules.
Sufficient care should be taken to avoid these accidents.
Erroneous operation, lubrication or maintenance services are very dangerous and may cause injury or death of personnel.
Thus, precautionary measures, or notes, written in this manual should be read and understood by personnel before starting each task.
Operation, inspection, and maintenance should be carefully carried out, and safety must be given the first priority.
Messages of safety are indicated with ⚠ marks. The safety information contained in this manual is intended only general safety information.
Messages of safety appear in this manual and on the machine. All messages of safety are identified by the words "DANGER", "WARNING" and "CAUTION".
These words mean the following:

⚠ DANGER ..... Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING ..... Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

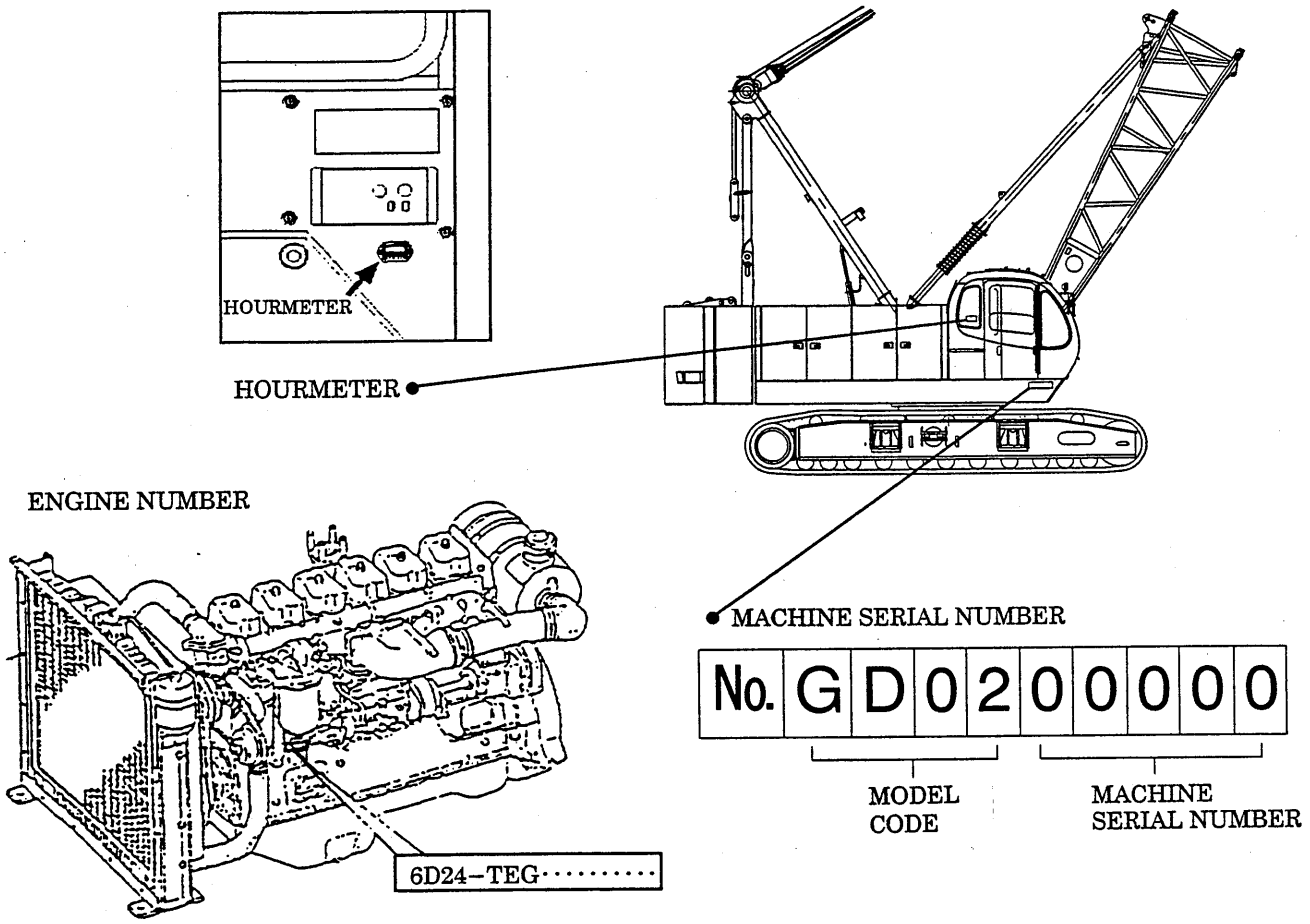
⚠ CAUTION ..... Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against possible damage to the machine and its components.

N O T E ..... Supplementary explanation.

It is very difficult for us to forecast every danger that may occur during operation. However, safety can be ensured by operating this machine according to methods recommended by KOBELCO.
While operating machine, be sure to perform work with great care, so as to not damage the machine, or let accidents occur.
Please continue studying this manual until proper operation is completely understood.

■ MACHINE SERIAL NUMBER

When you order repair parts and when you need repair or service of the machine, always inform us the machine serial number stamped on the name plate and the total number of hours indicated on the hourmeter which is located in the gauge.



■ ENTER MACHINE SERIAL NUMBER OF THIS MACHINE

MACHINE MODEL	CK1000	MACHINE SERIAL NO.	GD02	ENGINE NO.	6D24-TEG

■ WARRANTY

The terms under which this machine is guaranteed are clearly defined in the accompanying WARRANTY. Trouble and damage occurred during the terms of guarantee shall be repaired at no cost to the purchaser according to the warrant description if the trouble or damage is recognized to be our responsibility.

However, if you use the machine contrary to the instructions of this manual, the WARRANTY does not cover any damage to the machine.

■ REPAIR PARTS

When servicing and repairing the machine, be sure to use genuine parts in order to make the machine performance display sufficiently.

Since the important security parts are prepared to ensure safety and to protect the machine from an serious accident, be sure to replace them every specified period of time.

■ EXPLANATION OF WARNING LABELS

Since the warning labels are installed in the machine and indicated with the three stages in the same way as the warning description, confirm the positions and contents of all warning labels first.

Put them to the practical use to secure safety when operating, checking and performing maintenance.

● HANDLING OF WARNING LABELS

(1) When the warning label is damaged or stained, order it to the designated service shop.

(2) Do not remove the warning labels.

(3) When the surface of the warning label is soiled and difficult to be seen, wipe it cleanly.

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⚠ CAUTION

DON'T CRUSH.
IMPORTANT PART
INSIDE.

FP20T01064P1

⚠ DANGER

NEVER FORGET TO ENGAGE
GANTRY CONNECTION PINS

TO AVOID FALLING OF BOOMS. GANTRY CONNECTION PINS MUST BE ENGAGED WHEN GANTRY IS AT HIGH POSITION. ALSO. LOWER PARTS OF TENSION BARS MUST BE CONNECTED TO REVOLVING FRAME OR COUNTERWEIGHT WHEN GANTRY IS AT LOW POSITION.

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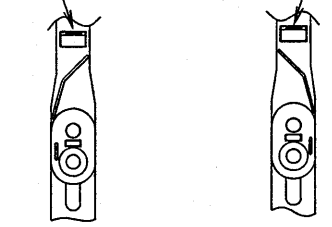

DETAIL E (R.H.)

DETAIL E (L.H.)

⚠ DANGER

DEATH OR INJURY MAY RESULT IF
MACHINE, LOAD, OR LOAD LINE TOUCHES OR COMES CLOSE TO ELECTRICAL LINES.
ALWAYS MAINTAIN A CLEARANCE OF AT LEAST 10 FEET (3 METERS) BETWEEN THE CRANE OR THE LOAD BEING HANDLED AND POWERLINES.

UNLAWFUL TO PLACE ANY PART OF
THIS MACHINE OR LOAD WITHIN 10 FEET (3 METERS) OF HIGH VOLTAGE LINES OF 50,000 VOLTS OR LESS.
GREATER CLEARANCES ARE REQUIRED FOR HIGHER VOLTAGES. SEE YOUR LOCAL, STATE, AND FEDERAL REGULATIONS.

ALWAYS NOTIFY ELECTRIC COMPANY IF
THERE ARE ELECTRIC LINES IN THE AREA WHERE MACHINE WILL BE WORKING.

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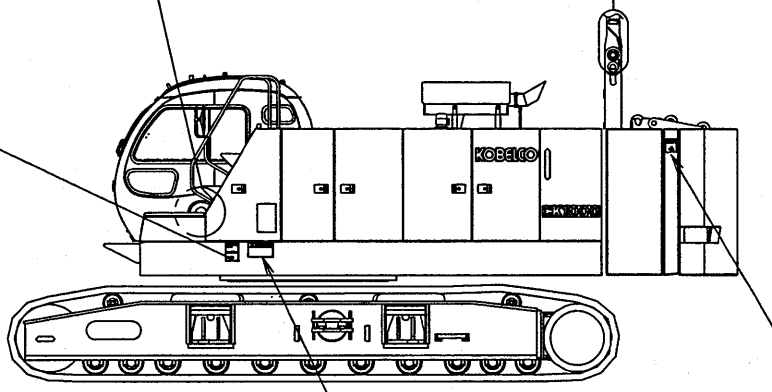

⚠ DANGER

STABILIZE REMOVED
COUNTERWEIGHT

AVOID INJURE: AFTER REMOVING THIS COUNTERWEIGHT, LAY IT DOWN, SO THAT IT WILL NOT FALL OVER.

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GG20T01124P1

⚠ WARNING

AVOID EXPLOSION WHEN
HANDLING ACCUMULATOR

THIS CASE IS CHARGED WITH HIGH PRESSURE NITROGEN GAS. NEVER ATTEMP TO WELD, GAS-CUT, PUT ON FIRE, NOR DISASSEMBLE THE CASE TO AVOID EXPLOSION.

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⚠ DANGER

STAY AWAY FROM MACHINE
IF CLOSE TO POWER LINES.
MACHINE, LOAD AND GROUND MAY
BECOME ELECTRIFIED AND DEADLY.

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ACCUMULATOR
CHARGING GAS PRESSURE.
3.4~3.7Mpa
(35 ~38 Kg/cm²)

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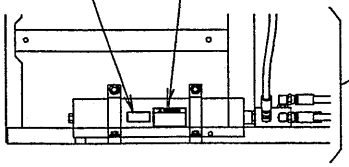

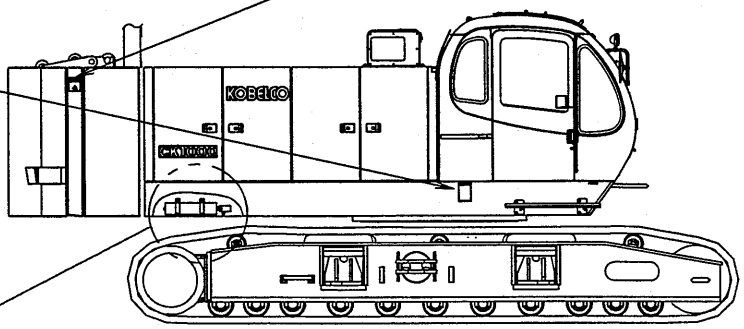

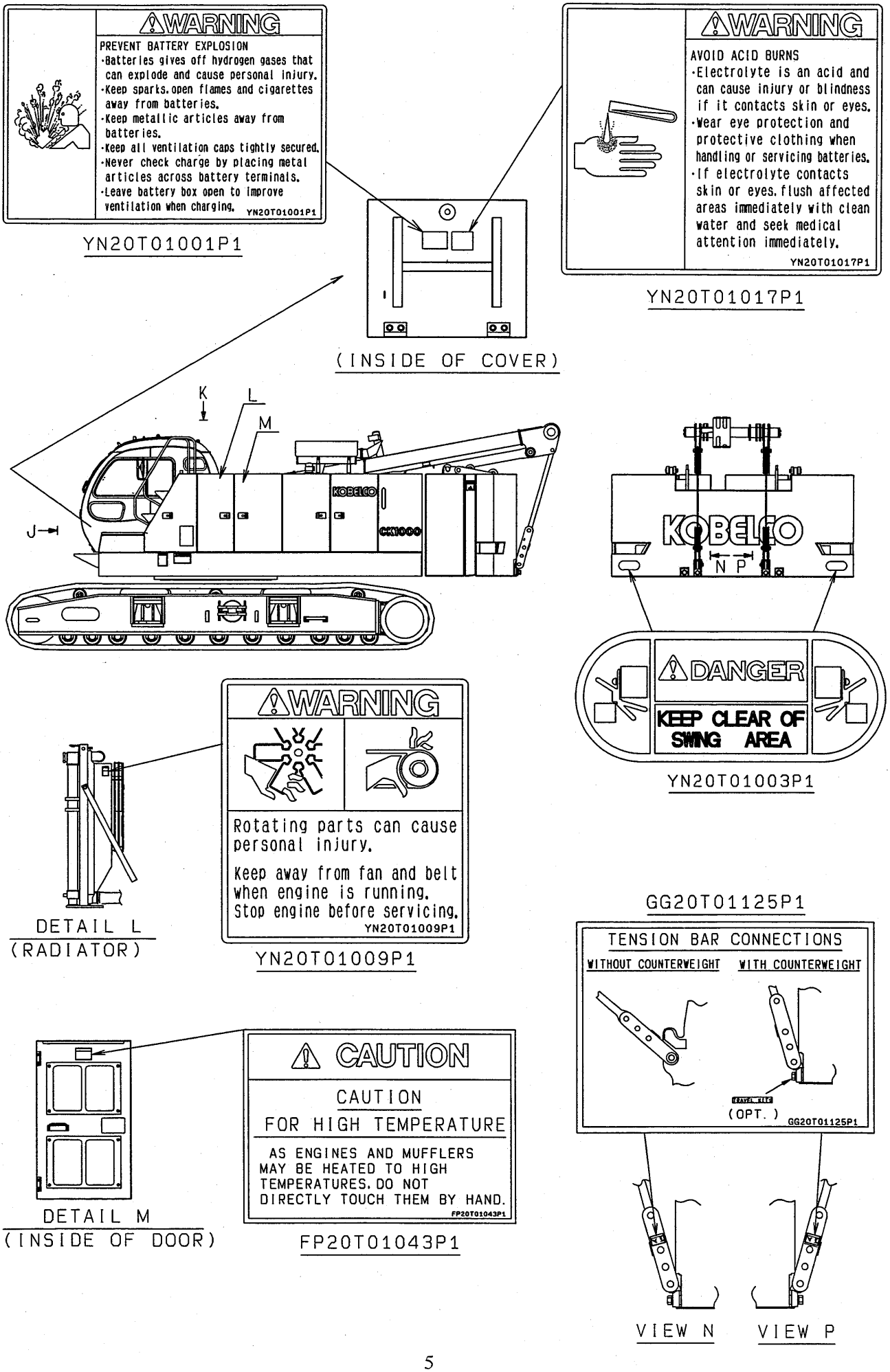

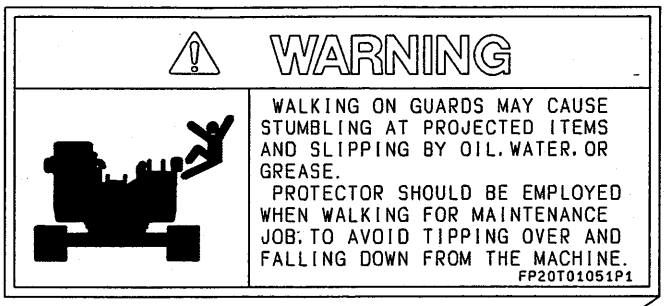

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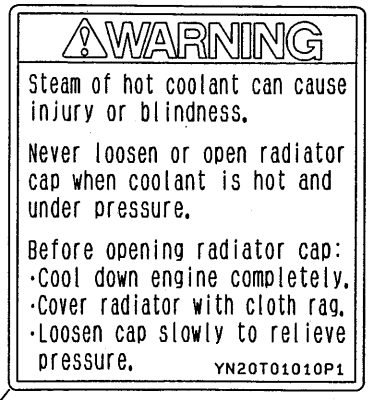

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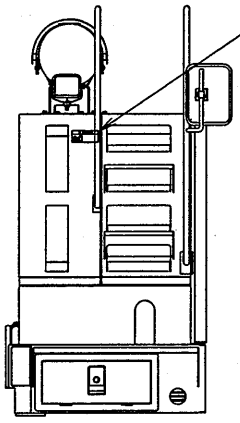

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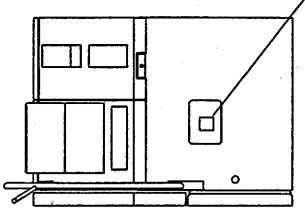

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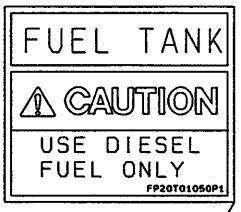

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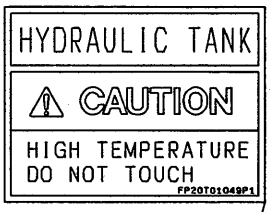
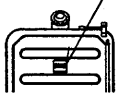
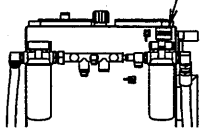
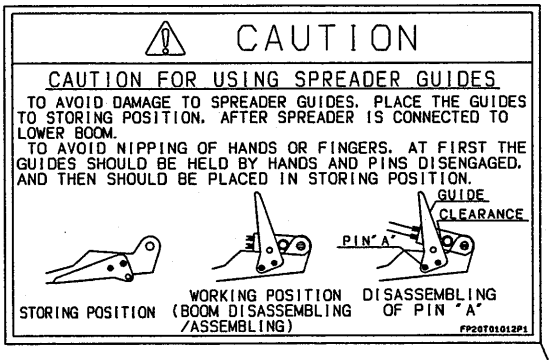




FUEL TANK



HYDRAULIC TANK



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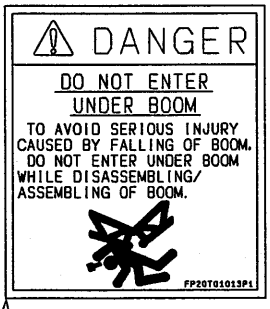

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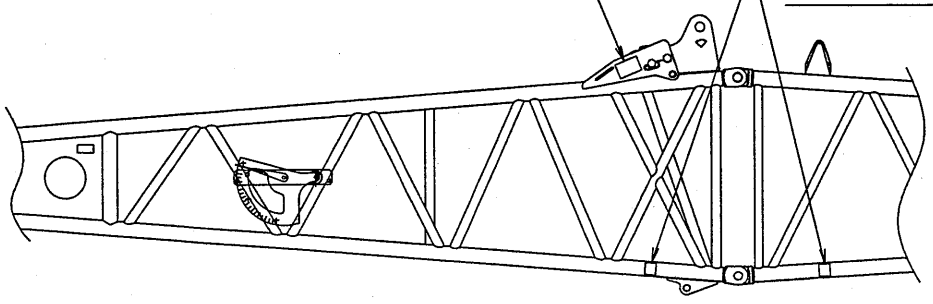

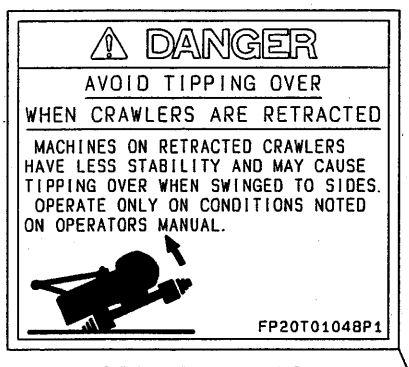

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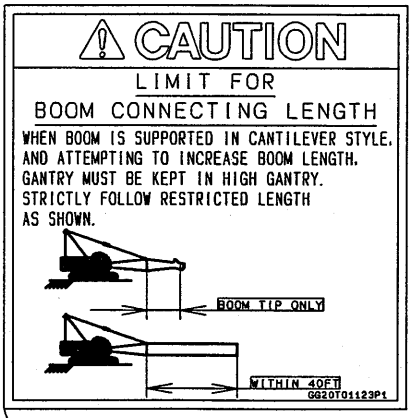

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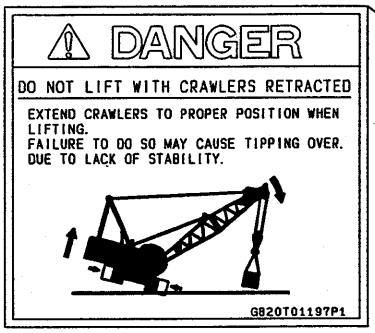

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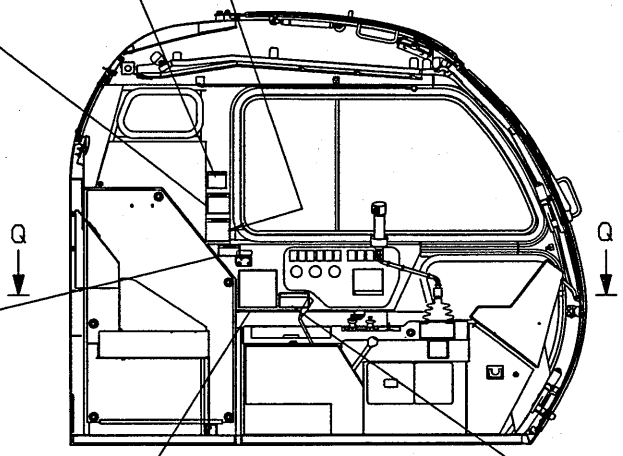

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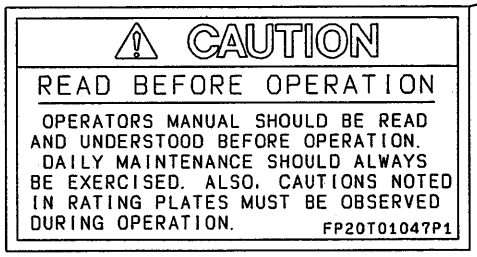

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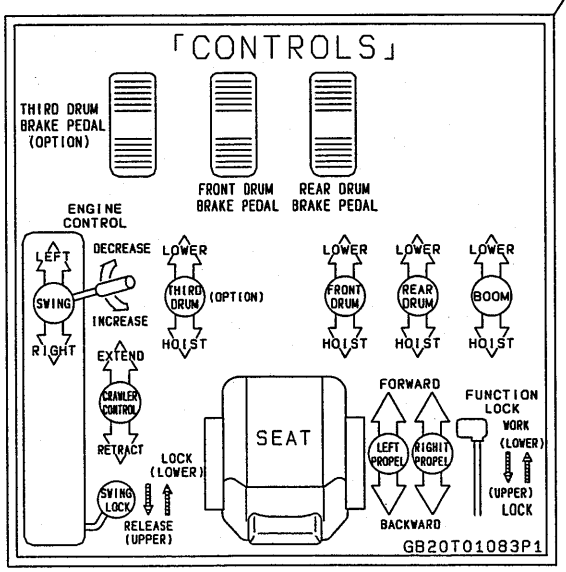

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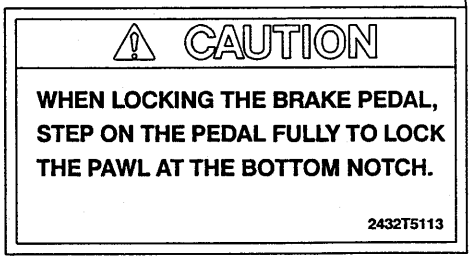

2432T5113

⚠ DANGER

DEATH OR INJURY MAY RESULT IF
MACHINE, LOAD, OR LOAD LINE TOUCHES
OR COMES CLOSE TO ELECTRICAL LINES.
ALWAYS MAINTAIN A CLEARANCE OF
AT LEAST 10 FEET (3 METERS)
BETWEEN THE CRANE OR THE LOAD
BEING HANDLED AND POWERLINES.

UNLAWFUL TO PLACE ANY PART OF
THIS MACHINE OR LOAD WITHIN 10 FEET
(3 METERS) OF HIGH VOLTAGE LINES OF
50,000 VOLTS OR LESS.
GREATER CLEARANCES ARE REQUIRED
FOR HIGHER VOLTAGES. SEE YOUR LOCAL,
STATE, AND FEDERAL REGULATIONS.

ALWAYS NOTIFY ELECTRIC COMPANY IF
THERE ARE ELECTRIC LINES IN THE AREA
WHERE MACHINE WILL BE WORKING.

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⚠ CAUTION

THIS MACHINE CONTAINS ALLOY AND HEAT TREATED STEELS. DO NOT WELD OR APPLY HEAT WITHOUT CHECKING WITH YOUR AUTHORIZED DEALER. UNAUTHORIZED MODIFICATIONS MAY WEAKEN THE MACHINE.

2432T4671

2432T4671

⚠ CAUTION

DO NOT LIFT PEOPLE WITH THIS CRANE FAILURE TO DO SO MAY CAUSE SERIOUS INJURY.

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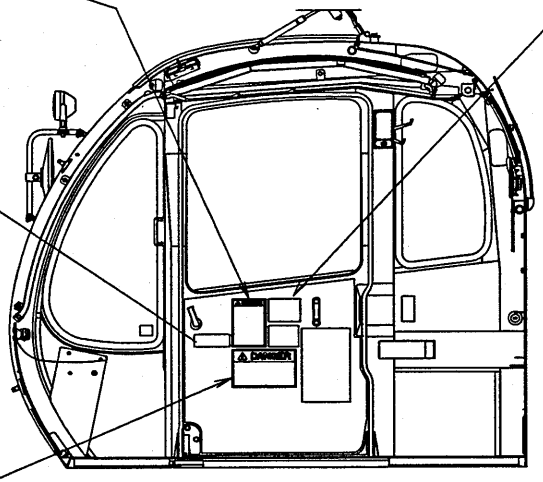
2432T4668



RIGHT SIDE OF CAB

⚠ DANGER

STAY AWAY FROM MACHINE
IF CLOSE TO POWER LINES.
MACHINE, LOAD AND GROUND MAY
BECOME ELECTRIFIED AND DEADLY.

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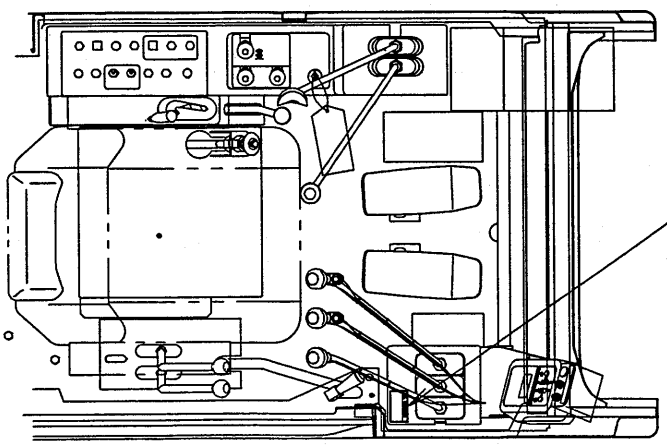

SECTION Q-Q

⚠ DANGER

CRANE WORK SHOULD BE EXERCISED
ON 「NEUTRAL BRAKE MODE」.
OPERATIONS ON 「FREE FALL MODE」
MAY CAUSE FALLING OF LOADS
DUE TO OPERATIONAL ERROR.

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TABLE OF CONTENTS

1. SAFE OPERATING PRACTICES FOR MOBILE CRANES

INTRODUCTION

Because cranes have the ability to lift heavy loads to great heights, they also have a potential for accidents if safe operating practices are not followed. This book will help you prevent accidents which could result in injury, death, or property damage.

General safe practices for working on machinery must be followed as well as the safe operating practices recommended here.

OPERATOR'S RESPONSIBILITY

The operator is the best safety feature in any crane. Safety must always be the operator's most important concern. He must refuse to operate when he knows it is unsafe and consult his supervisor when safety is in doubt.

He must read and understand the Operator's Manual and see that the machine is in proper order before operating.

He must understand how to read the rating plate and know that his machine can safely lift each load before attempting to lift it.

He must never lift a load without knowing the length of the boom, the weight of the load, and the load radius or boom angle.

Never attempt to operate the crane at conditions exceeding those shown on the rating chart. Such operation can cause tipping or structural failure of the crane which can result in damage, injury, or death.

He must be alert, physically fit, and free from the influences of alcohol, drugs, or medications that might affect his eyesight, hearing, reactions, judgement.

He must see that unnecessary people, equipment, and material are kept out of the work area. The area around the machine should be properly barricaded.

When an operator's vision is restricted or when operating in hazardous places such as near electrical power lines or around people, a signalman must be used. Because the operator is not always in the best position to judge distances and can not see all parts of the jobsite, a signalman may also be necessary at other times. Operators must understand standard crane signals and take signals only from designated signalmen.

SIGNALMAN'S RESPONSIBILITY

The primary duty of a signalman is to assist the operator in safe and efficient operation. Operators depend on designated signalmen to assist them in making movements without endangering people or property.

Signalmen must have a clear understanding of the work to be done so that they can safely coordinate each job with operators and other crew members.
Signalmen must place themselves where they can be clearly seen and where they can safely observe the entire operation.
Standard crane signals must be used unless other methods of signaling such as two way radios or flags have been agreed upon.

RESPONSIBILITIES OF ALL CREW MEMBERS

Any unsafe condition or practice must be corrected or reported to the job supervisor.

Everyone who works around the crane, including riggers and oilers, must obey all warning signs and watch out for his own safety and the safety of others. Crew members setting up machines or handling loads are expected to know proper machine erection and rigging procedures.

Watch for hazards during operations and alert the operator and signalmen of dangers such as power lines, the unexpected presence of people, other equipment or unstable ground conditions.

MANAGEMENT RESPONSIBILITY

See that operators are trained, competent, physically fit and, if required, licensed. Good vision is required, as are good judgment, coordination and mental ability. Any person who lacks any of these qualities must not be allowed to operate a crane.

Signalmen must have good vision and sound judgment, know standard crane signals and be able to give signals clearly. They must have enough experience to be able to recognize hazards and signal the operator to avoid them.

Riggers must be trained to determine weights and distances and to select proper lifting tackle. Rigging is a complex subject far beyond the scope of this booklet. It is management's responsibility to employ qualified riggers.

Crew members must be given specific safety responsibilities and instructed to report any unsafe conditions to their supervisors.

PLANNING THE JOB

Most accidents can be avoided by careful job planning. The person in charge must have a clear understanding of the work to be done and equipment capabilities. He must consider all dangers at the jobsite, develop a plan to do the job safely, and then explain the plan to all concerned. Factors such as these should be considered:

- What crew members are needed and what responsibilities will they be given?
- What is the weight of the load to be lifted, the lift radius, boom angle, and the rated capacity of the crane;
- How will the signalmen communicate with the operator?
- What equipment is required to do the job safely? Is a crane the best equipment for the job?
- How can the equipment be safely transported to the jobsite?
- Are there gas lines, electrical power lines or structures which must be moved or avoided?
- Is the surface strong enough to support the machine and load?
- How will loads be rigged?
- What special safety precautions must be taken if a crane must travel with a suspended load or if more than one crane is needed to lift a load?
- Are unusual weather conditions such as winds or extreme cold expected?

- What steps will be taken to keep unnecessary people and equipment safely away from the work area?
- How can the crane by positioned to use the shortest boom and radius possible?

OPERATOR'S CHECK LIST

The operator must make a safety check before starting to work each day to see that the machine is in proper order. Some things to check are:

- Check the machine log book to see that periodic maintenance and inspections have been performed and all necessary repairs made.
- Check the operation of the boom hoist kickout, boom angle indicator, back up alarms, and other safety devices.
- Carefully inspect load bearing parts such as wire rope, (load lines, boom hoist cable, suspension lines), boom, outriggers, hooks, and rigging.
- Inspect the crane for any missing bolts, nuts or pins and any cracked or broken components.
- Be sure no unauthorized field modifications have been made, such as, counterweights increased or decreased and booms that have been improperly repaired.
- Check for fuel and hydraulic oil leaks.
- After starting the engine, check all gauges for proper readings.
- Test all controls for proper operation.
- Check brakes and clutches. Test load brakes by lifting a load a few inches off the ground and holding it.

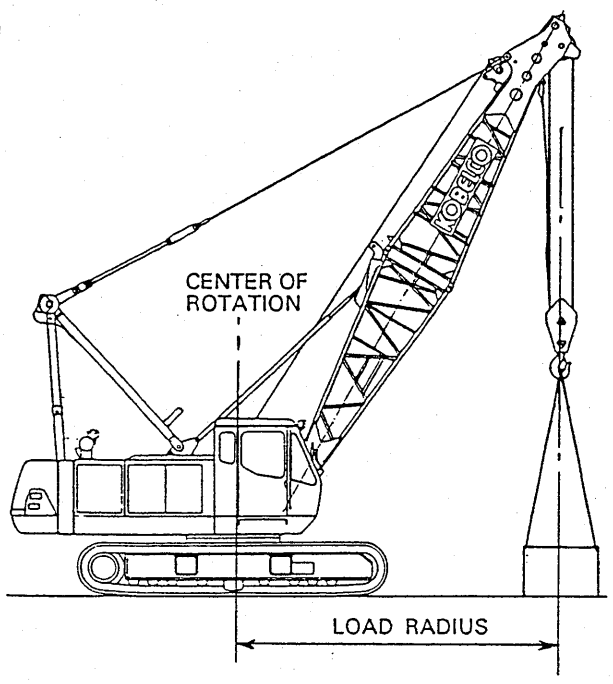
OPERATING PRECAUTIONS

The following recommendations represent our experience in regard to the most likely causes of personal injury and damage to equipment. Careful observance of the following recommendations will prevent the majority of common accidents.

1. Mistakes in calculating lifting capacity can cause accidents.

Several factors must be considered including:

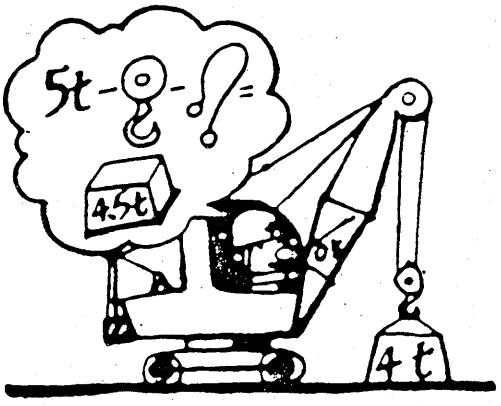
A. Load radius (the distance between the center of the crane rotation to the center of the load). Note that the radius will increase when the load is lifted.



B. Weight of the load, hook, and rigging.

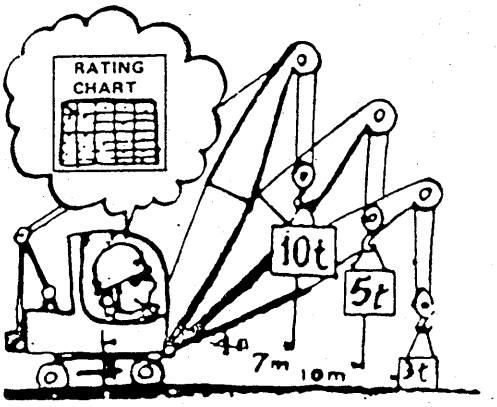
C. Boom length, jib, parts of line, and operating area (side, rear).

Use the next lower rated capacity when working at boom lengths or radii between the figures on the rating chart. It is dangerous to guess the capacity for boom lengths or radii between those listed on the rating plate.

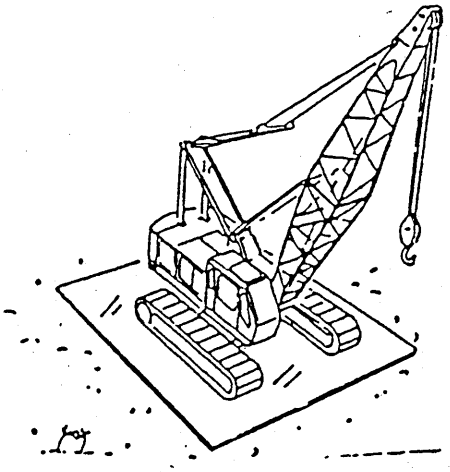


Trying to lift a load without knowing whether it is within the rated capacity while expecting the crane to start to tip to warn of an overload is very dangerous and should never be done. Cranes may suddenly tip over or collapse if the load is too heavy.

Always operate within the rated capacity. The operator must reduce the load under adverse field conditions until, in his judgment, the machine can safely handle the lift. (See Operating Precautions #3, 10, 16, 19, 27 and 28.)

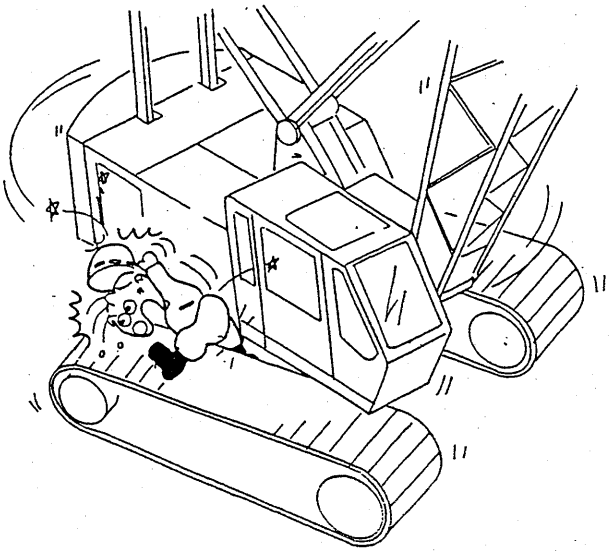


2. Cranes may tip over or collapse if the operating surface cannot support their weight. Timber mats, steel plates or concrete rafts may be needed under crawlers to distribute the load under the crane so that the bearing strength of the ground is not exceeded.
Determine the load bearing capacity of the ground or other surface on which machines will be operating. Be sure cranes are adequately supported. Avoid soft or unstable ground, sand, areas with high water tables, and partially frozen ground. When machines are working near trenches, the trenches should be shored or sloped to prevent cave-ins or slides.

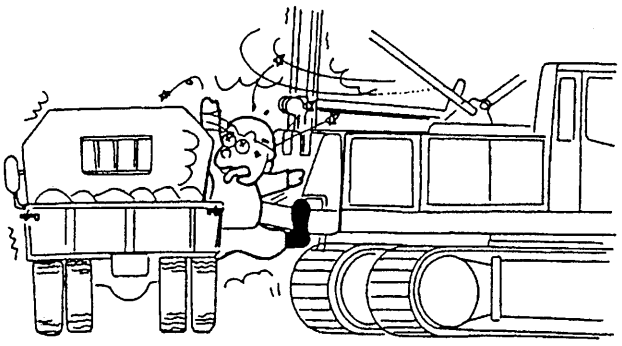


3. The rated capacity of a crane is determined with the crane leveled within 1% of grade (1 foot drop or rise in 100 foot distance). Out of level more than 1% will drastically reduce the lifting capacity.
Be sure cranes are level.

4. People can be crushed by the scissors-like action of the upper rotating on the lower.

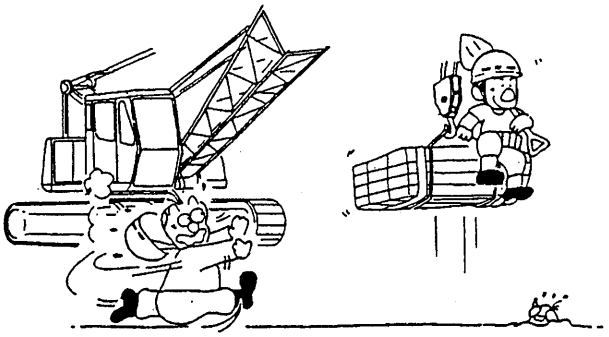


Stay away from rotating cranes. Erect barricades to keep people away. Take the time to determine that these areas are clear before swinging.



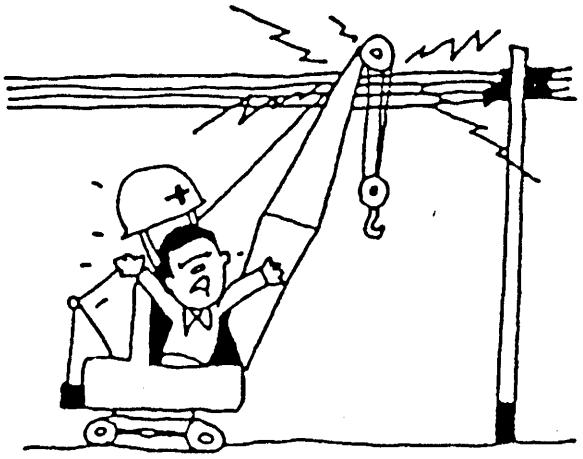
5. People can be crushed by the rear (counterweight) of the machine if there is not enough room for it to swing.
Position machines so that people cannot be trapped between the counterweight and other obstructions.

6. Many people have been injured when riding crane hooks or loads or while being lifted in manbaskets. They have no control over how they are handled and no protection from impacts or falls. Small mistakes can be fatal.



Never permit anyone to ride loads, slings, hooks, etc., for any reason.

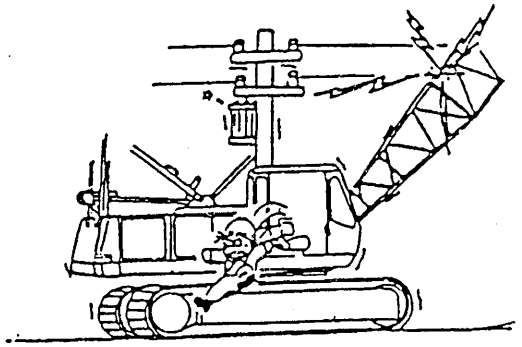
7. WORKING AROUND UTILITIES
If it is suspected that utility lines such as gas, water, phone or electrical power are in the work area, contact the local utility authority for line location BEFORE beginning work in the area. Use extreme caution around electrical power lines. Keep a sufficient distance away from electrical lines during operation. See chart below for minimum distances.



LINE VOLTAGE	Minimum Distance - m (ft)
0 - 50,000	3.0 m (10) or more
50,000 - 200,000	4.5 m (15) or more
200,000 - 350,000	6.0 m (20) or more
350,000 - 500,000	7.5 m (25) or more
500,000 - 750,000	10.5 m (35) or more
750,000 - 1,000,000	13.5 m (45) or more

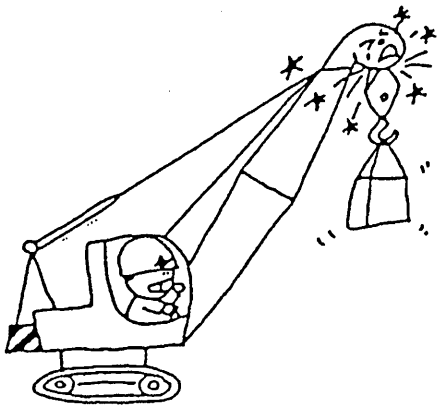
Careful planning and supervision offer better protection than any known hardware. Insulated boom cages, proximity warning devices, and insulating links have limitations and can fail without warning. Insulated boom cages and links only protect part of the crane and can break down electrically if contaminated with dust and water. Operation of proximity warning devices can be affected by different arrangements of power lines, the movement of trucks, materials, and the crane itself, and other influences. Relying on any of these devices could be dangerous because users may think they are providing protection when in fact they are not.

If any part of the crane or rigging contacts a high voltage line, the safest procedure for the operator is to stay at his post until the contact is cleared, or the power has been shut off. Do not allow anyone on the ground to touch the machine. If the operator must leave the machine, he should jump off, rather than climb off.

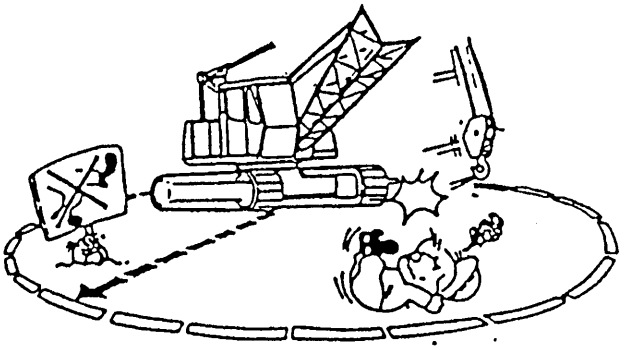


8. The load line can break if the hook block contacts the end of the boom. This is called "two blocking". Two blocking, for example, can be caused by hoisting the hook into the end of the boom or lowering the boom without paying out load line. Two blocking can pull jibs and lattice booms over backwards or cause structural damage at boom or jib points.

Always keep space between the hook block and boom point. Lower the hook when lowering the boom.

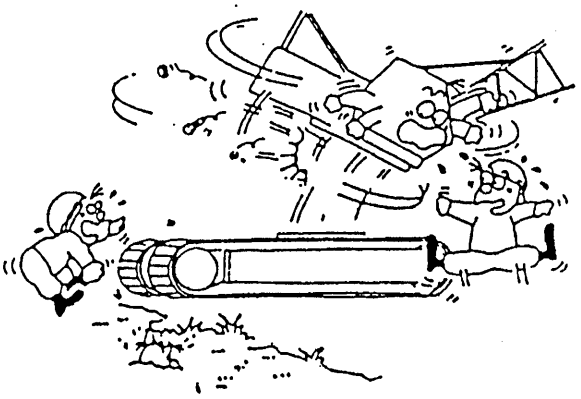


9. People can be injured if the hook, boom, load or outriggers are moved when personnel are nearby. Make sure everyone is clear before moving the hook, boom, load or outriggers. Do not move loads over people. Do not allow the load to bump or catch on anything.

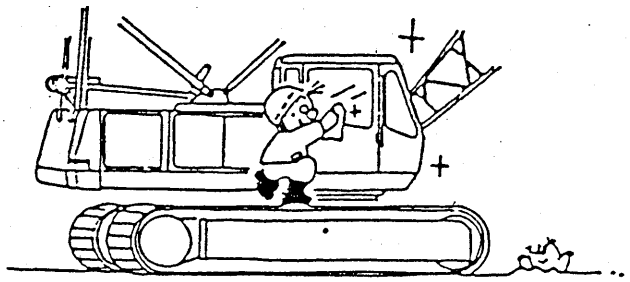


10. Rapid swings or sudden starts and stops can cause the hook and attached load to swing out of control.

Always start and stop movements smoothly and swing at speeds that will keep the load under control.



11. Dirty windows, darkness, bright sunlight, fog, rain and other conditions can make it difficult for the operator to see.



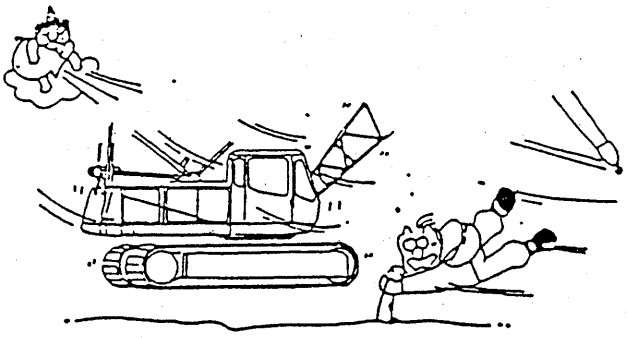
Keep windows clean. Do not operate if you cannot see clearly enough to operate safely. Replace cracked or broken glass as soon as possible.

There are several specific safety signs on your machine. Their exact location and description of the hazard are reviewed in this section. Please take the time to familiarize yourself with these safety signs.

Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part.

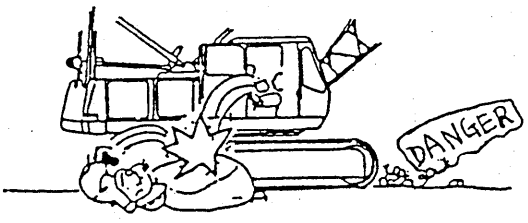
12. Even light winds can blow loads out of control, collapse booms, or tip cranes. Winds aloft can be much stronger than at ground level.



Do not lift loads if winds crate a hazard. Lower the boom if necessary.

Moderate winds may create a hazard for long booms or loads with large surface areas.

13. Carelessness in getting on and off equipment can result in serious injuries.

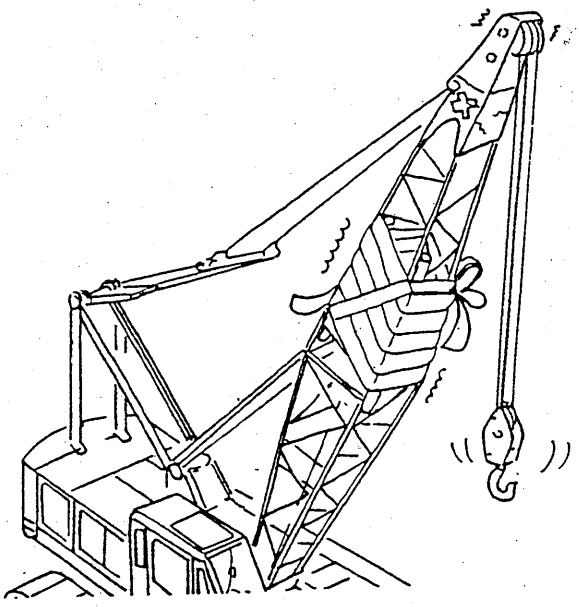


Always wait until the machine has stopped. Do not jump on or off. Always use both hands and make sure you have good footing.

14. Slippery floors and steps, tools, trash, or other loose items can cause falls.
Keep the machine clean and dry.

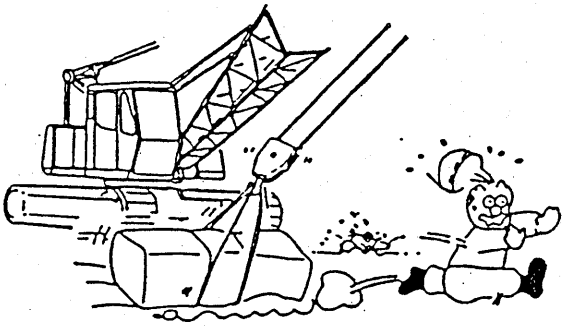
15. Damaged crane booms may collapse. Lattice type booms will be weakened by damaged chords, bent or missing lacings, or cracked welds.
Inspect the crane boom daily for damage. Do not use damaged booms.

> **⚠ CAUTION**
>
> Due to the high strength steels used in booms, and jibs special repair procedures are required. Consult your local authorized KOBELCO distributor for instructions.

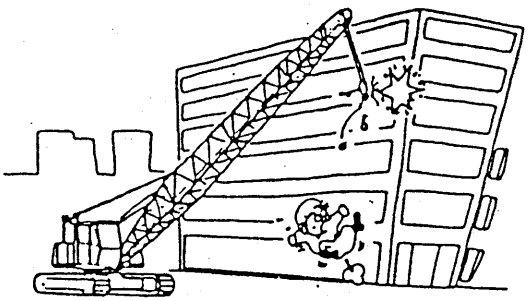


16. Crane booms can collapse if side loaded (pulled sideways). Typical causes of side loading are rapid starts and stops while swinging, dragging a load sideways, winds, or lifting when the crane is not level.

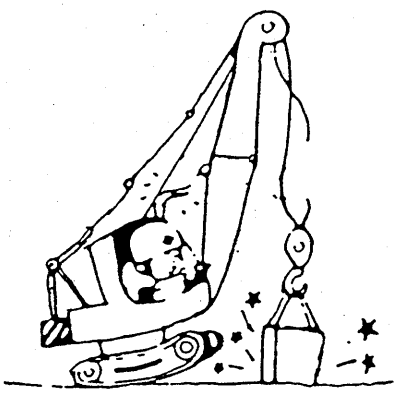
Take care to avoid side loading.



17. If the load strikes the boom or the boom hits a building or other object, the boom may collapse.
Never let the load or any other object contact the boom.



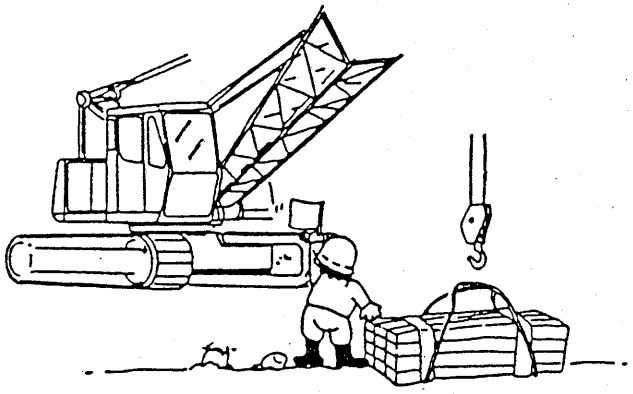
18. Boom suspension lines will stretch when the load is lifted and contract when the load is released. At high boom angles this may be enough to pull the boom backwards over the crane or collapse the boom stops. When releasing loads be sure the boom never tightens against the backstops. Release loads slowly booming out if necessary while releasing.



19. The load will swing out of control if it is not directly beneath the boom point when lifted. This can side load the boom and may cause the crane to tip or collapse.

Always place the boom point directly above the load when lifting. Make certain all personnel stand clear of the load as it is lifted.

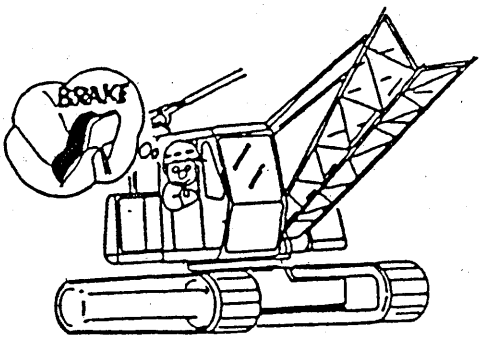
20. Trying to lift a load which is stuck, frozen or attached to something else may result in tipping, boom collapse or other damage.
Be sure that loads are free before lifting.



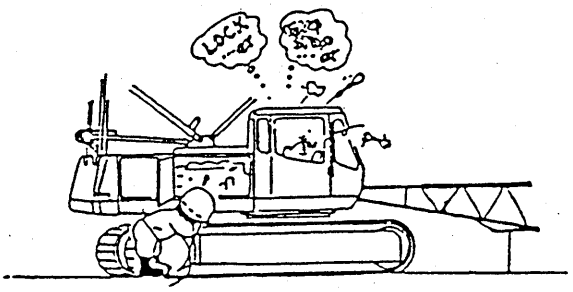
21. If there is not enough wire rope on the drum the rope can snap loose.

Keep at least two full wraps of wire rope on drums when operating.

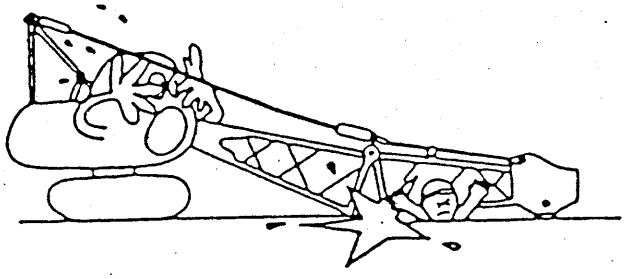
22. Foot pedal brake locks are furnished on some cranes to allow the operator to rest his legs when suspending the load for short periods of time.
Keep your feet on the pedals while foot pedal brake locks are in use. Brakes may cool allowing the load to fall.



23. Trying to repair or adjust equipment with a suspended hook or load or with the boom raised could release machinery and let it move unexpectedly.
Always lower the load to the ground and the boom onto proper cribbing before doing maintenance or repair work.

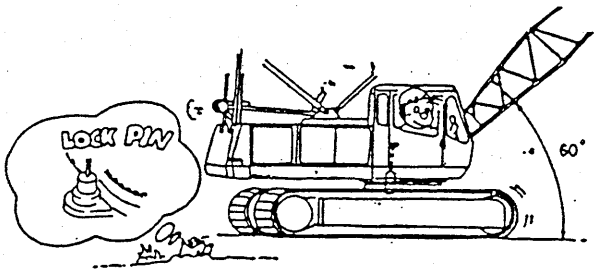


24. Pressure in hydraulic systems can be retained for long periods of time. If not properly released before maintenance people attempt to work on the hydraulic systems, this pressure can let machinery move or cause hot oil and hose ends to shoot out at high speed.
Release system pressure before attempting to make adjustment or repairs.

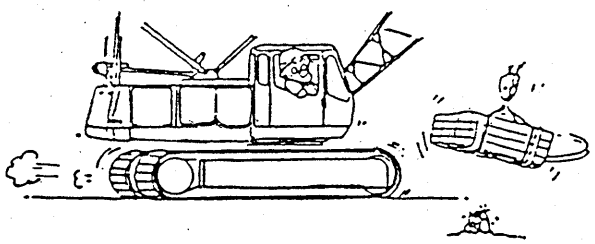


25. Pin-connected booms and jibs may fall if not properly supported when removing pins.
Make sure both ends of each boom and jib section are supported and the boom suspension lines completely slacked off before removing pins. Never stand on, inside, or under booms or jibs during assembly or disassembly.

26. As with all heavy equipment, care must be taken when cranes are driven (traveled), whether on or off the jobsite.
Watch for people, electrical power lines, low or narrow clearances, bridge or road load limits, and steep hills or uneven terrain. Use a signalman in close quarters. Know the height, width and weight of your machine. Set swing brake or lock before traveling.

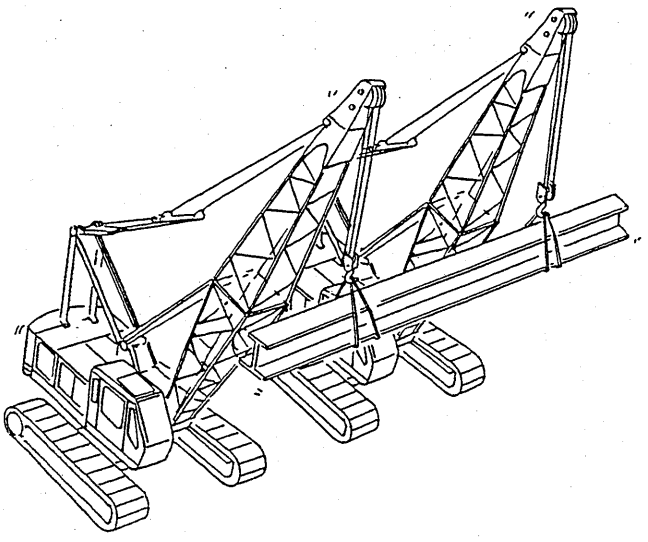


27. Load ratings for cranes are based on the machine being level and operated properly so that dynamic effects of operation do not increase the loadings on the crane. Traveling a crane with a long boom or with a load suspended involves special hazards including the increased possibility of side loading or tipping.



Because of the many variables involved in pick and carry operations, the user must evaluate conditions and take appropriate precautions such as these:

- Follow the travel precautions listed in rule 26.
- Check the rating plate for limitations.
- Position the boom in line with the direction of travel.
- Reduce the maximum load while traveling to reflect operating conditions. The safe load will vary depending on speed, crane, and other conditions.
- Travel slowly and avoid sudden stops and starts.
- Avoid backing away from the load. This could increase the radius and cause the machine to tip over.
- Use tag lines to keep loads under control.
- Keep the load close to the ground.
- Use the shortest boom possible.



28. Using two or more cranes to lift a load involves many hazards not normally encounted in single crane lifts.

Multi-crane lifts must be carefully engineered, keeping the following points in mind.

- Since the load is not freely suspended, careful engineering studies must be made to ensure that the load carried by each machine is less than its rated capacity.
- Make sure slings are arranged to divide the load as planned.
- Review the lifting plan with operators, signalmen and other crew members before beginning the lift.
- Carefully coordinate crane movements through every stage of the lift.
- Avoid boom side loading (see #16).

29. Leaving a machine unattended can be very dangerous. Before leaving his seat, the operator must take the following steps to prevent his machine from moving:

- Lower the load or bucket to the ground. Lower the boom when necessary.
- Set the swing brake or lock.
- Set all drum pawls.
- Set parking brakes.
- Set propel brakes or locks on crawler machines.
- Disengage the engine clutch or shut off the engine.
- Place the junction lock lever in the shut down position.

30. All wire rope must be inspected daily to determine whether it should be replaced.
Wire rope should be replaced when any of the following conditions exist:

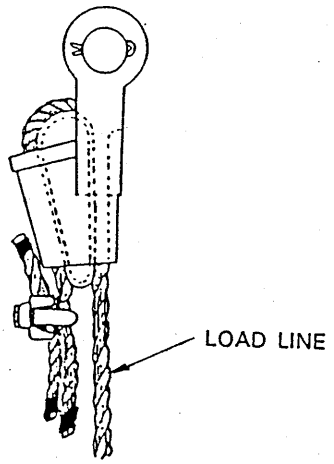
- In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay [for special conditions relating to rotation resistant rope]
- Wear of one-third the original diameter of outside individual wires;
- Kinking, crushing, bird caging, or other damage resulting in distortion of the rope structure;
- Evidence of damage from rust or corrosion.

- Evidence of any heat damage from any cause;
- Reductions from nominal diameter of more than;
  (a) 1/64 in. (0.4 mm) for diameters up to and including 5/16 in. (8.0 mm);
  (b) 1/32 in. (0.8 mm) for diameters 3/8 in. (9.5 mm), to and including 1/2 in. (13.0 mm);
  (c) 3/64 in. (1.2 mm) for diameters 9/16 in. (14.5 mm), to and including 3/4 in. (19.0 mm);
  (d) 1/16 in. (1.6 mm) for diameters 7/8 in. (22.0 mm), to and including 1-1.8 in. (29.0 mm);
  (e) 3/32 in. (2.4 mm) for diameter 1-1/4 in. (32.0 mm), to and including 1-1/2 in. (38.0 mm)
- In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

Never handle wire rope with bare hands.

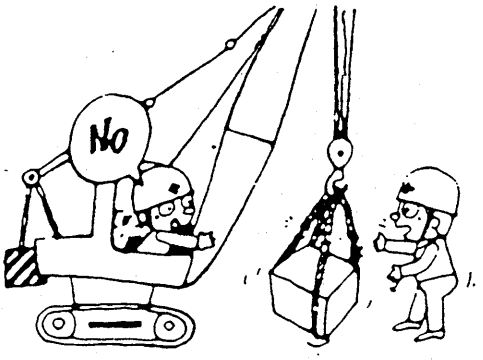
31. Improper wire rope connections may fail under load. Wire rope and connections must be installed properly and inspected daily.

- Wedge sockets should be installed so that the loaded side of the rope is in a straight line with the edge of the socket and not bent by the wedge.
- U-bolt clamps (clips) must not be installed on the loaded side of the load line.

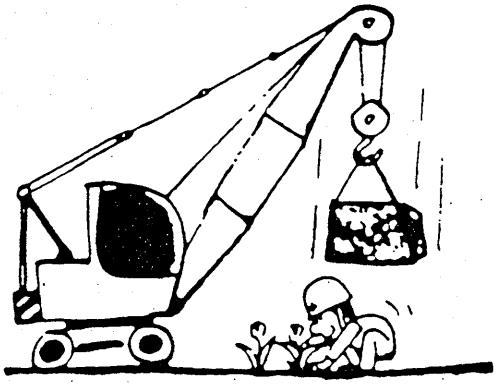


32. The operator or person in charge should see that:

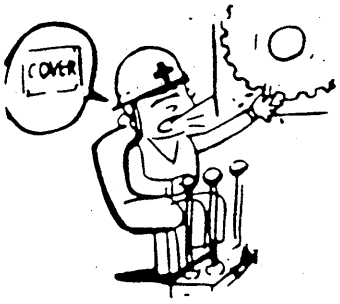
- Loads are well secured before being lifted.
- Slings are not kinked nor damaged. The load is well balanced, and the hook block is adequate for the load to be lifted. Slings are properly arranged on the hook.
- Sudden stops and starts are avoided.
- The hoist line is vertical before starting the lift.
- The crane hook is equipped with a properly functioning retainer latch.



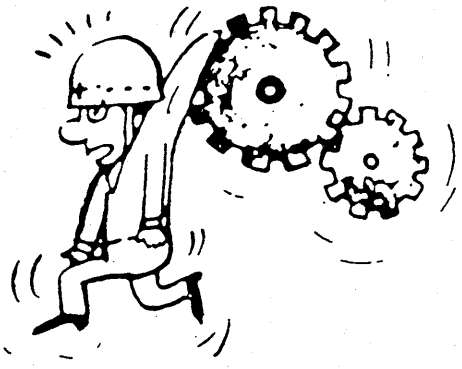
- Crane loads, grapples, or buckets do not pass over the heads of workmen nor in any way endanger their safety. All loose objects must be removed from the load. Non-operating personnel should be warned, or told to leave the immediate area, when making crane lifts.



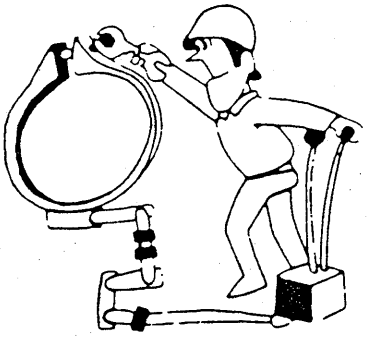
33. Always replace protective guards and panels before operating the machine.



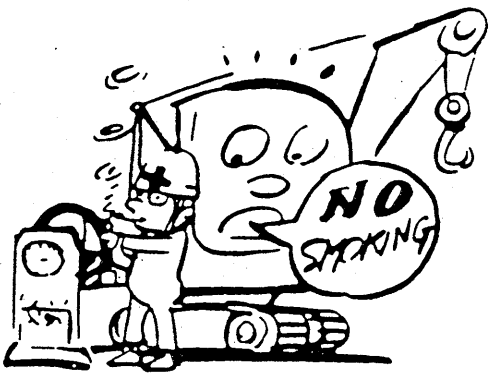
34. Never wear loose clothing rings or other objects which may become entangled in the moving machinery.



35. The operator should test the winch brakes when a load is first lifted, and when the load is only a few inches above its starting position, to assure the ability of the brakes to hold the load while it is aloft.



36. When refueling, be careful not to smoke. Stop the engine, and keep metal funnels in contact with the fuel tank filler pipe to prevent static electrical sparks from igniting the fuel. Turn off cab heater (if equipped) while refueling, and avoid refueling near an open flame.



37. If an overheated condition necessitates an engine shutdown, use extreme care when checking the radiator, if possible, wait for radiator to cool. Use a heavy cloth and gloves to protect yourself while slowly loosening the cap. Wait until the sound and fluid flow stops. Then remove the cap.

38. Be careful where you park your machine. Do not leave it where there is a chance of a bank caving in on it, or in a low spot where heavy rains may wash out the footing.

39. When leaving the crane unattended, always remove keys and lock all cab doors to prevent unauthorized person from tampering with the machine and possibly injuring themselves or others.

MEASURES FOR RADIO TRANSMITTERS

When working in the vicinity of a transmitting antenna for a broadcasting station, the boom could act as a large antenna, and could become electrified. High voltage of electricity may be generated at the hook end, and the hook could become heated. If this happens, do not touch the hook. Electrical shock, or burning could result. Ground personnel should be warned to stay away from the machine.

MEASURE FOR LIGHTNING

1. When lightning storms are generated and lightning bolts are anticipated, immediately take the following steps:
   (1) Stop the work, and lower the load onto the ground. When the boom (or tower) can be lowered, lower it onto the ground.
   (2) Engage the brakes and locks (winch and swing) and stop the engine. Turn off the power source of the load safety device and main switch.
   (3) Advise all personnel to stay away from the surrounding area of the machine.
2. If a lightning strike occurs check the machine before operating it.
   (1) Check for burns and damage.
   (2) Check the electrical devices and load safety device for performance.
   (3) Check each function for abnormality.

MEASURES FOR EARTHQUAKE

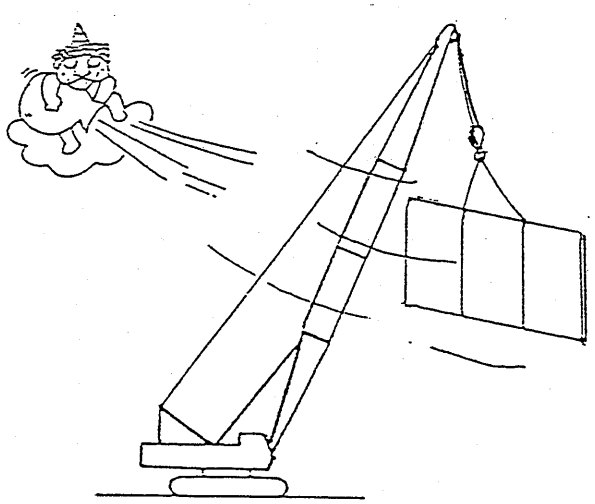
1. When earthquakes occur, immediately take the following step:
   (1) Stop the work, and lower the load and hook onto the ground. When the boom (or tower) can be lowered, lower it onto the ground.
   (2) Engage the brakes and locks (winch and swing), stop the engine, and turn off the electrical power of the main switch and load safety device.
   (3) Advise all personnel to stay away from the surrounding area of the machine.

2. After the earthquake is over, check the machine before operating.
   (1) Check each function for performance.
   (2) Check the electrical devices and load safety device for performance.

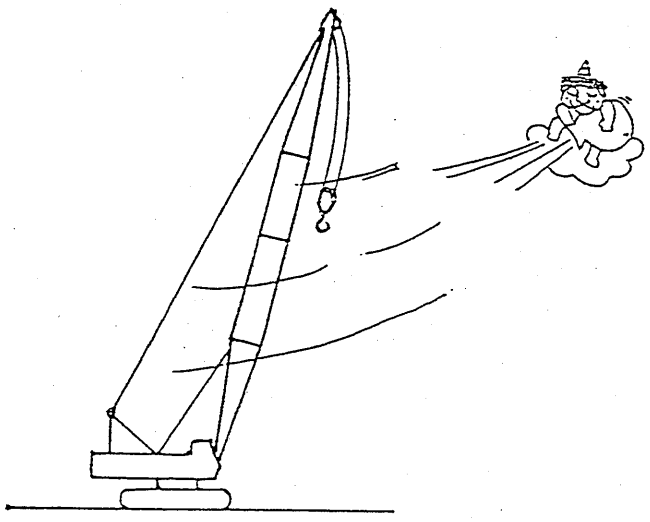
INFLUENCE OF WIND

Influence of the wind on the machine becomes larger in proportion to the size of a lifted load, lifting height, and boom length. Especially, the following cases are very dangerous, so utmost care is necessary for operation.

1) When lifting a load of wide area, against which the wind blows hard, the wind could cause the overturn of the machine and damage to the boom. The wind could also blow the load against the boom, and could cause damage.



2) When the boom is fully raised without a load, the wind could blow the boom backward resulting in an overturn of the machine.



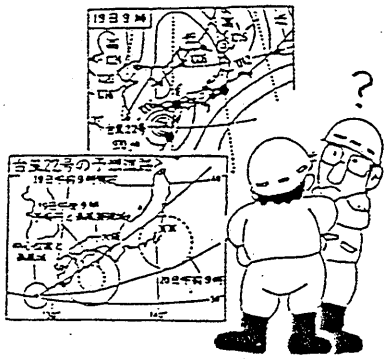
CAUTIONS FOR WIND

When performing crane or tower operation in strong wind, utmost cautions are required according to the wind velocity, machine condition and working environment.

The wind velocity is different on the ground than in the high air. It is also different on flat ground and in city air. Always consider these conditions and take proper measures to meet the situation.

The wind velocity mentioned here means the instantaneous wind speed.

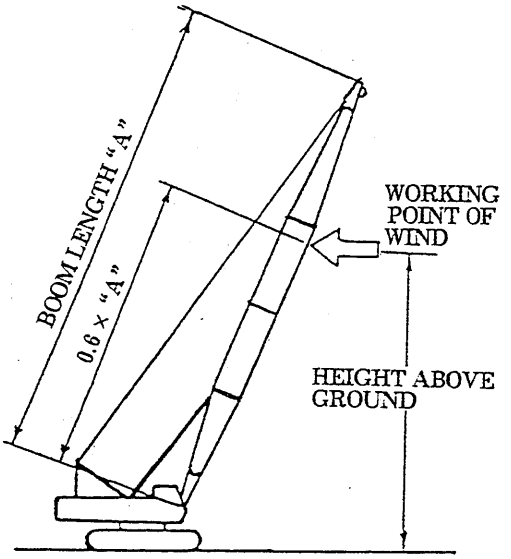
When the wind velocity exceeds 10 m/sec. (33 ft/sec.) stop the work.

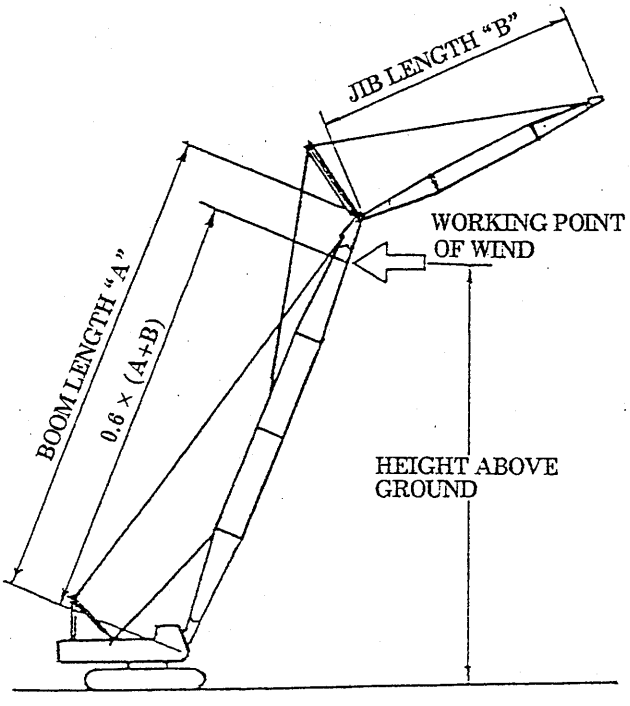


METHOD OF WIND VELOCITY MEASUREMENT

1) If an instantaneous anemometer is provided in the machine, measure the wind velocity with the anemometer provided on the boom tip section or the tower cap.
2) If an instantaneous anemometer is not provided in the machine, the wind velocity given by a weather report can be converted to the instantaneous wind speed.
3) The instantaneous wind speed can be approximated by the Beaufort chart (see next page).

The position where the wind works against the machine is the height above the ground which corresponds to 60% of the boom length at that time.



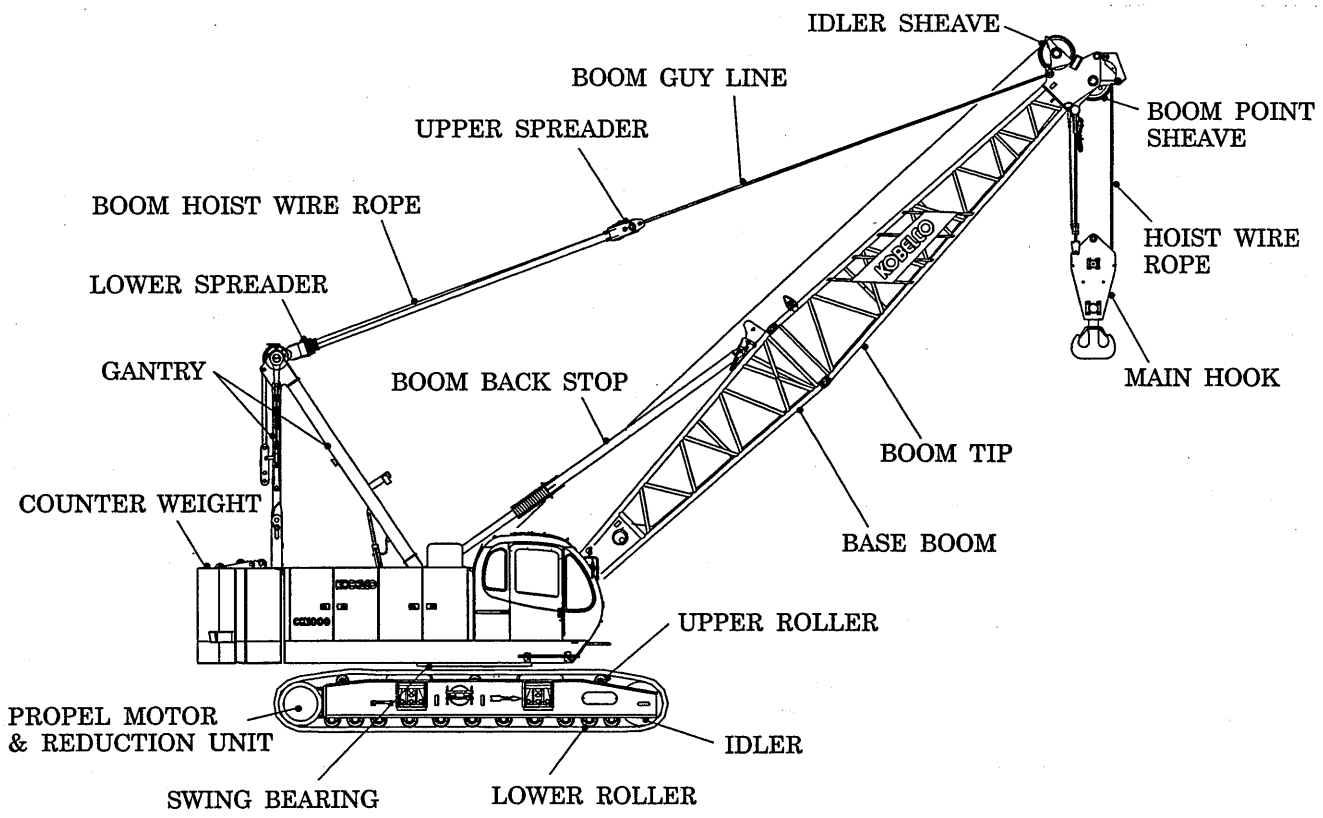


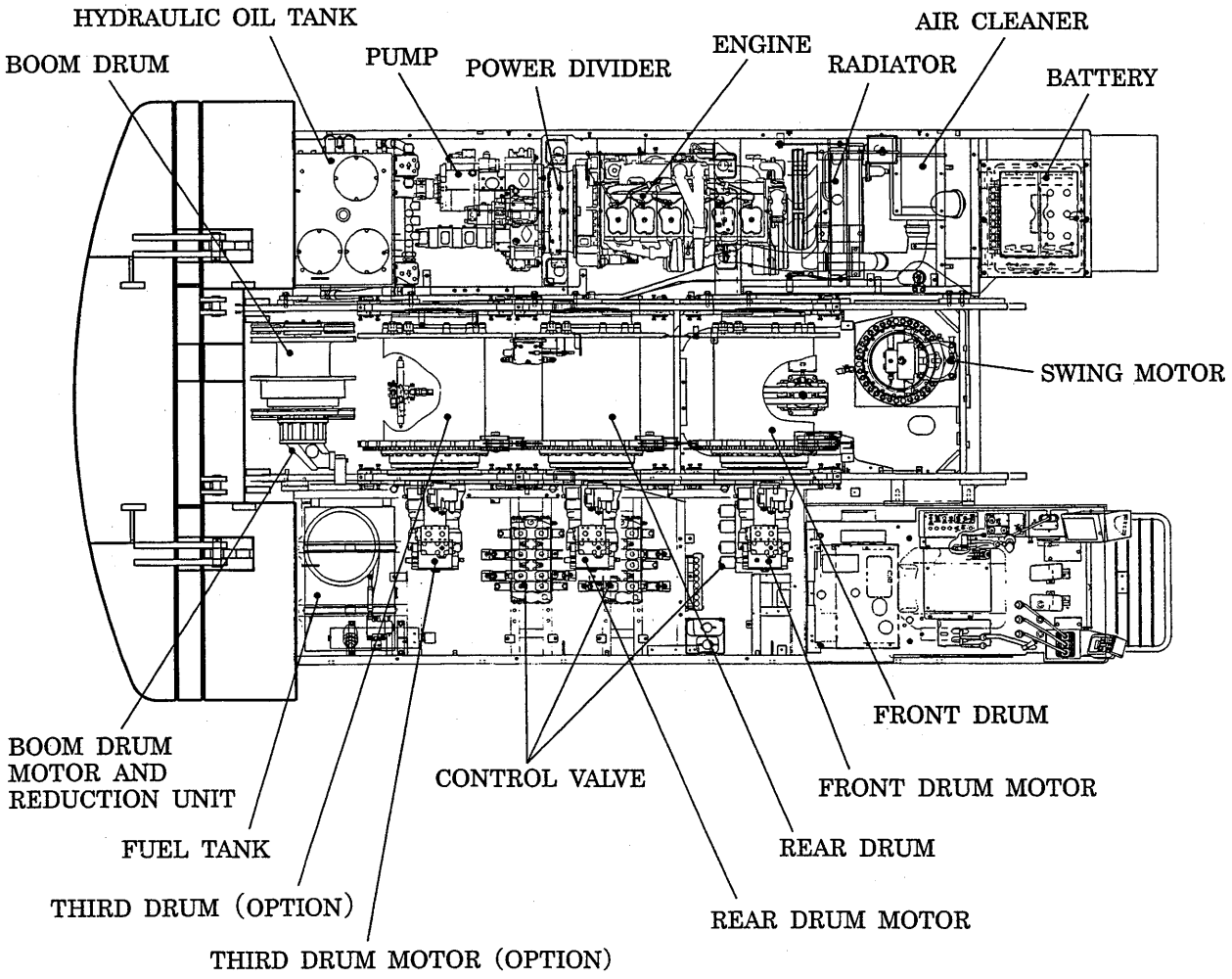
Beaufort wind scale chart

Approximate wind velocity at 10 m height from the open and flat ground	Details
m/sec.	On land
Less than 0.3	Calm, smoke rises vertically.
0.3 to less than 1.6	Smoke drift indicates wind direction, still wind vanes.
1.6 to less than 3.4	Wind felt on face, leaves rustle, vanes begin to move.
3.4 to less than 5.5	Leaves and small twigs constantly moving, light flags extended.
5.5 to less than 8.0	Dust, leaves, and loose paper lifted, twigs move.
8.0 to less than 10.8	Many whitecaps, leaf in small trees begin to sway.
10.8 to less than 13.9	Larger tree branches moving, whistling in wires, hard to walk under an umbrella.
13.9 to less than 17.2	Whole trees moving, resistance felt walking against wind.
17.2 to less than 20.8	Twigs broken, cannot walk against wind.
20.8 to less than 24.5	Slight structural damage occurs, chimney broken, slate blows off roofs.
24.5 to less than 28.5	Seldom experienced on land, trees broken or uprooted, and considerable structural damage.
28.5 to less than 32.7	Scarcely experienced, damages occur in wide areas.
32.7 or more	

2. OPERATION

2.1 TERMINOLOGY OF MACHINE EACH PART





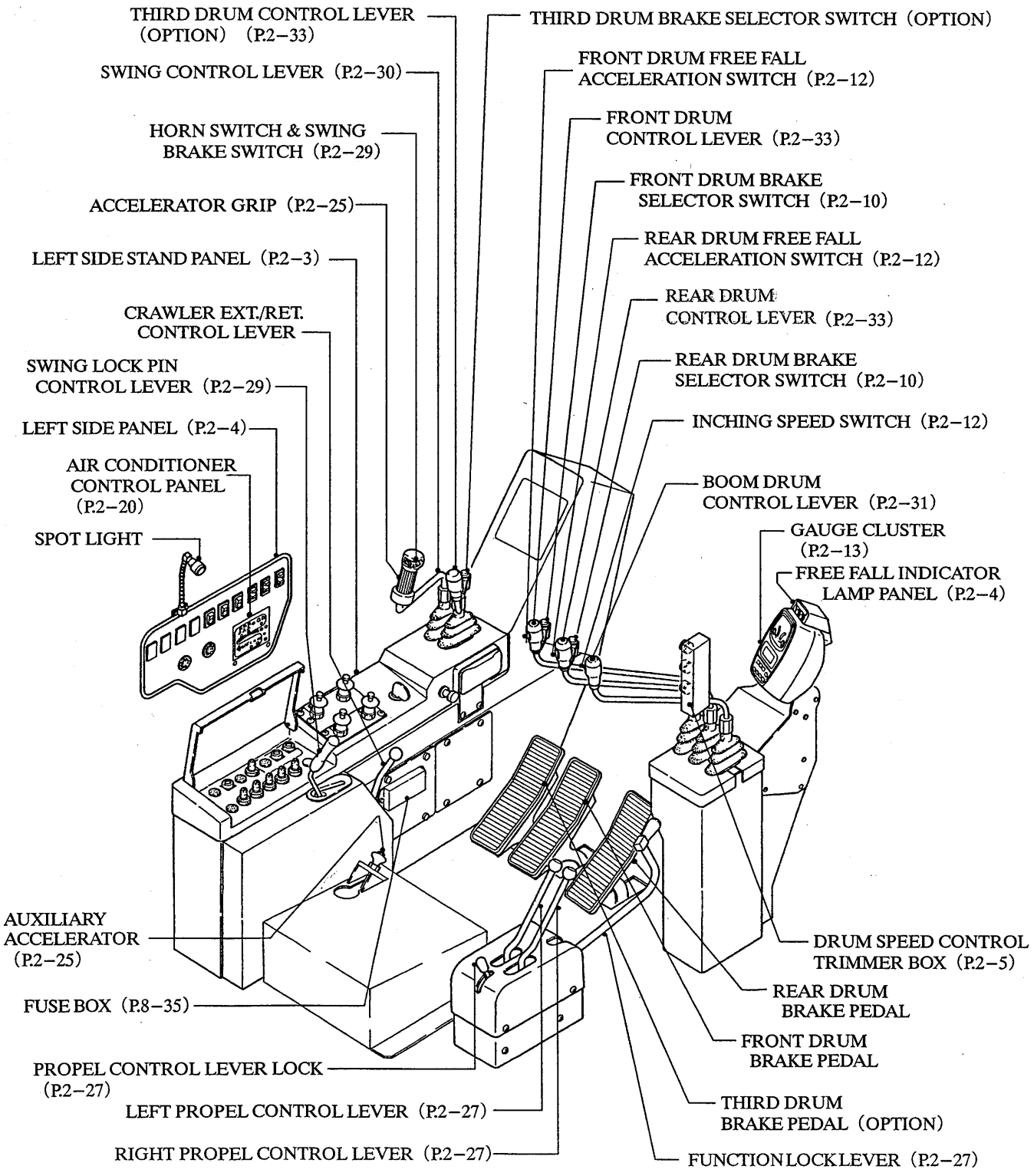
2.2 LOCATIONS AND TERMS OF OPERATING CONTROLS

⚠ WARNING

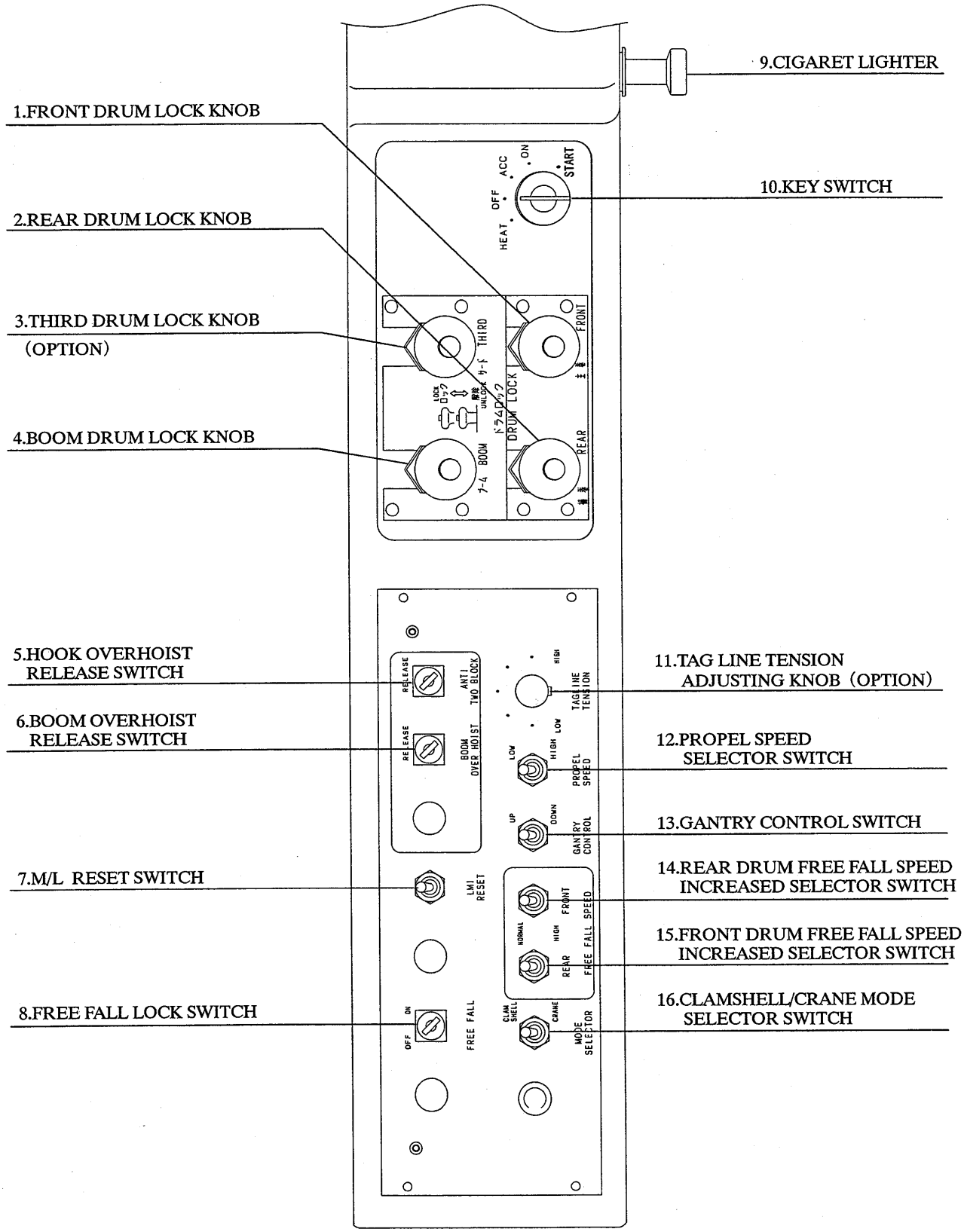
Do not use the devices and equipment provided in this machine for any purpose other than the purposes specified in this manual.
Failure to observe this precaution may result in serious injury or loss of life.

NOTE

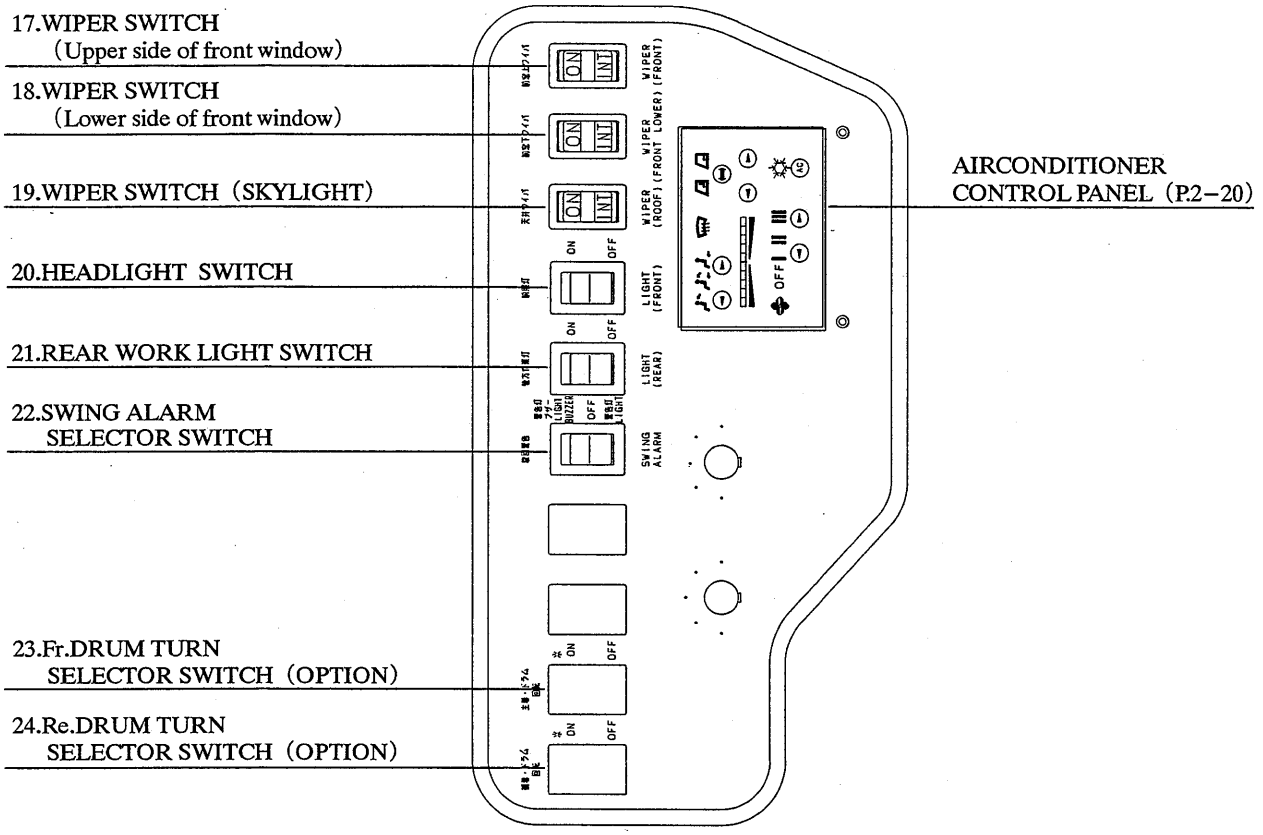
Optional items are also included in this figure.



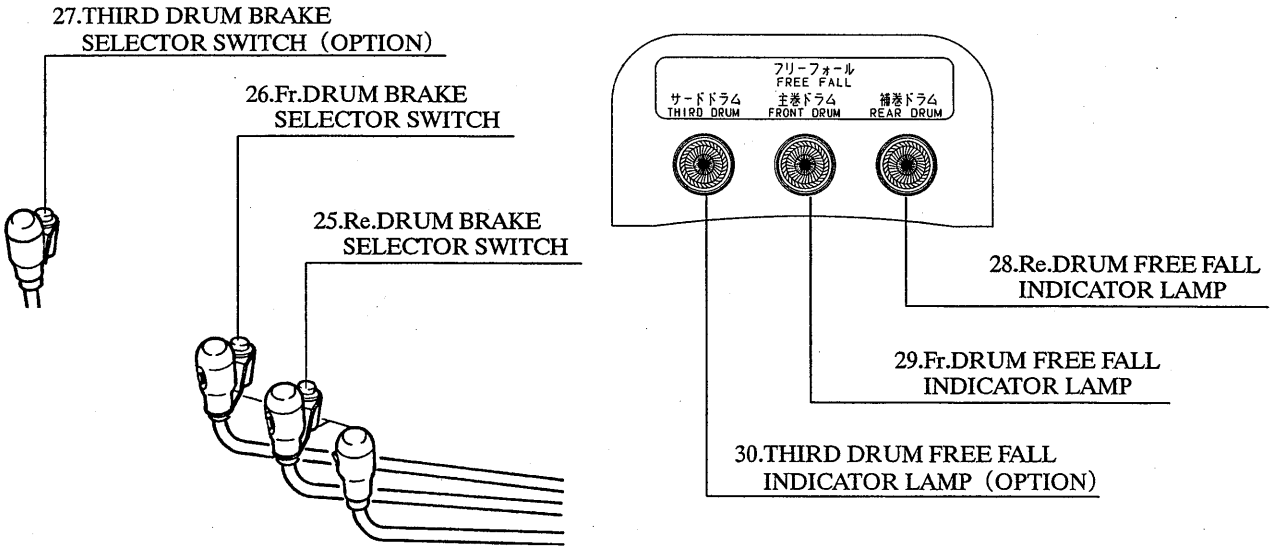
LEFT SIDE STAND PANEL

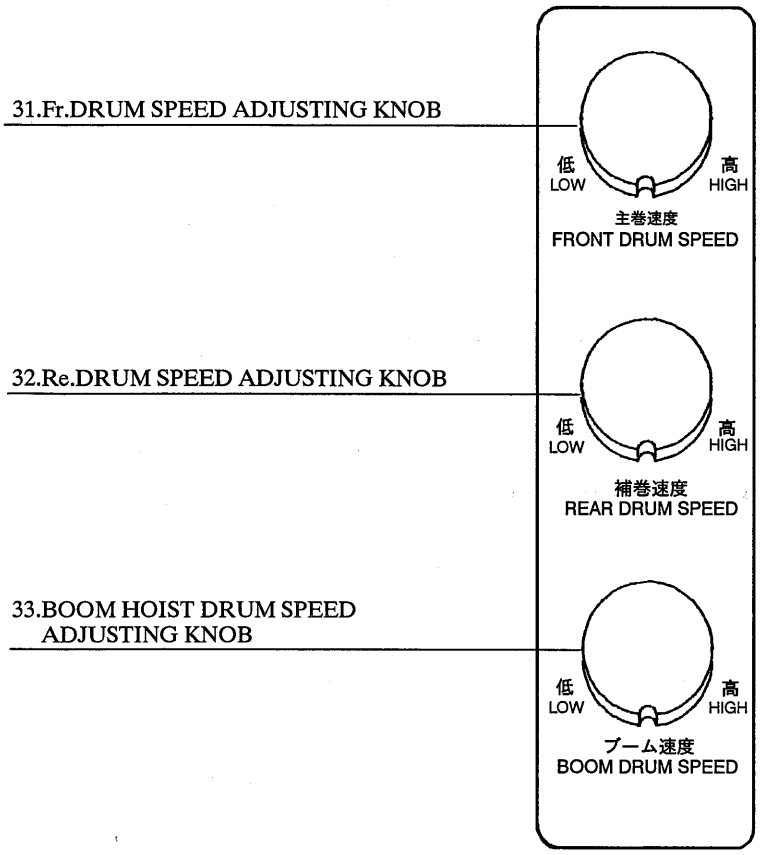


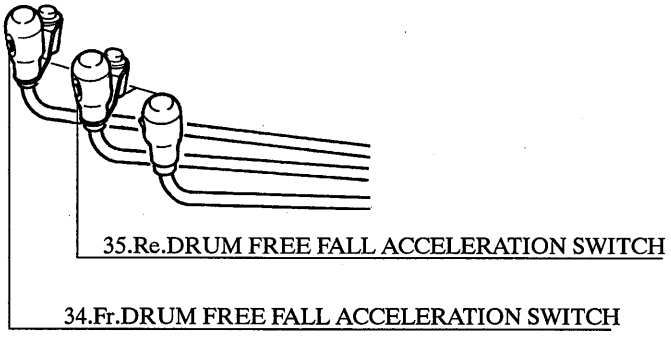
LEFT SIDE PANEL



BRAKE SELECTOR SWITCH AND FREE FALL INDICATOR LAMP





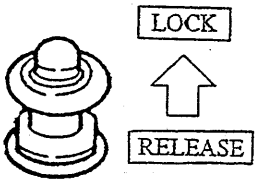


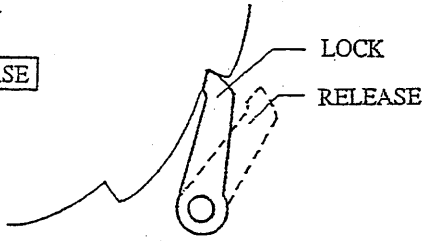
2.2.1 HANDLING OF EACH SWITCH

NOTE
Standard and optional controls for this machine are identified and described in the following list. Therefore the following list contains controls which are not furnished on every machine.

Using method of each switch is shown as follows. For operating method of each lever, see 2.3 CRANE OPERATION.

1. FRONT DRUM LOCK KNOB
2. REAR DRUM LOCK KNOB
3. THIRD DRUM LOCK KNOB (OPTION)
4. BOOM DRUM LOCK KNOB

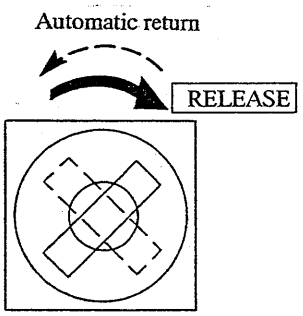




LOCK ..... The drum lock is engaged.
RELEASE ... The drum lock is released.

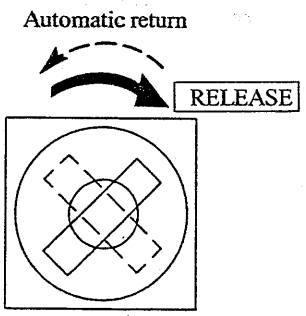
5. HOOK OVERHOIST RELEASE SWITCH

RELEASE ... Only while this switch is turned to the right, automatic stop due to hook overhoist can be released.
The key is automatically returned by releasing.
The key can be taken off in the automatic stop position.



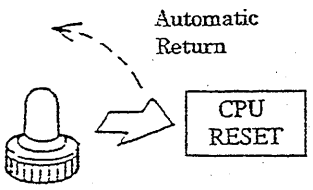
6. BOOM OVERHOIST RELEASE SWITCH

RELEASE ... Only while this switch is turned to the right, automatic stop due to boom overhoist is released.
The key is automatically returned by releasing.
The key can be taken off in the automatic stop position.



7. M/L RESET SWITCH (OPTION)

Operate this switch when the controller of the load safety device (option) is abnormal.
Releasing the switch returns it automatically. Usually it is not required to operate this switch.



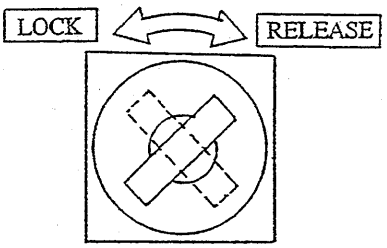
8. FREE FALL LOCK SWITCH

LOCK··· Free falling of the front drum, rear drum and third drum (option) becomes impossible.

RELEASE···Only while this switch is turned to the right, free falling of the front drum, rear drum and third drum (option) can be operated.

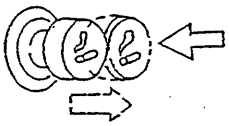
When this switch is set in the LOCK side, even if the brake selector switch is set in the FREE FALL side, free falling cannot be operated.

The key can be taken off in the LOCK side.



9. CIGARET LIGHTER

By pushing this in, it is held in the position, and when it is heated red, it will pop back. Pull it out, and use it.

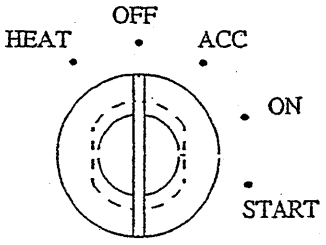


CAUTION

If the lighter knob does not pop up within 30 seconds after it is depressed, the lighter is not operating properly. Pull out the cigaret lighter and take it to the service shop.
Do not install 12 V accessory into the lighter receptacle.

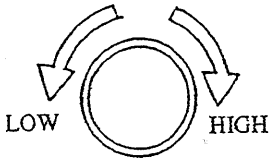
10. KEY SWITCH

HEAT ··· Position to preheat the engine.
OFF ··· Position to stop the engine.
(Position to insert the key and to take it off.)
ACC ··· Position to connect the accessory electrical circuit.
ON ··· Position to connect the electrical circuit for the engine.
START ··· Position to start the engine.



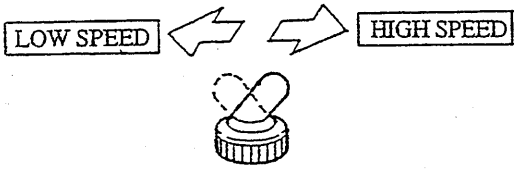
11. TAG LINE TENSION ADJUSTING KNOB
(OPTION)

TURN RIGHT···Tension of the tag line rope becomes stronger.
TURN LEFT ··· Tension of the tag line rope becomes weaker.
Turn left fully when not in use.



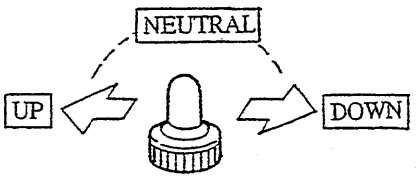
12. PROPEL SPEED SELECTOR SWITCH

HIGH SPEED···High speed is selected
LOW SPEED ···Low speed is selected



13. GANTRY CONTROL SWITCH

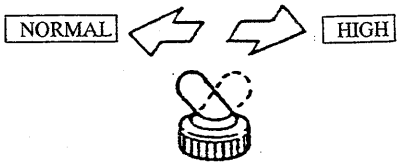
UP ···The gantry is raised up.
DOWN ···The gantry is lowered down.
NEUTRAL···The gantry is held.



14. REAR DRUM FREE FALL SPEED INCREASED SELECTOR SWITCH
15. FRONT DRUM FREE FALL SPEED INCREASED SELECTOR SWITCH

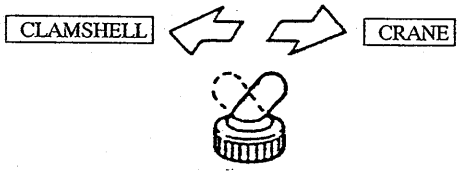
HIGH ..... The FREE FALL ACCELERATION SWITCHES (No. 34 and 35 shown later) are enabled.

NORMAL ... The FREE FALL ACCELERATION SWITCHES (No. 34 and 35 shown later) are disabled.



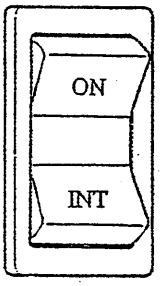
16. CLAMSHELL/CRANE MODE SELECTOR SWITCH

Normally set this switch to the "CRANE" position. When the speed of the wire ropes on the front and rear drums can be hardly synchronized during the clamshell operation at the lever detent position, set it to the "CLAMSHELL" position.



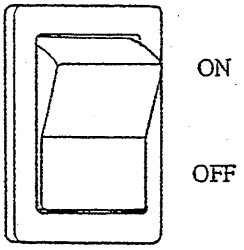
17. WIPER SWITCH (UPPER SIDE OF FRONT WINDOW)
18. WIPER SWITCH (LOWER SIDE OF FRONT WINDOW)
19. WIPER SWITCH (SKYLIGHT)

ON ···The wiper operates continuously.
INT ···The wiper operates intermittently.
By pushing this switch in more from the position of the ON or INT. Washer liquid is squirted out.



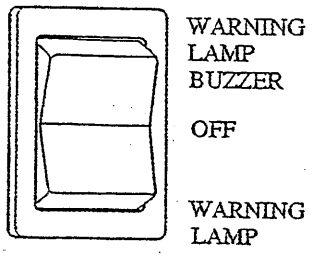
20. HEADLIGHT SWITCH
21. REAR WORKLIGHT SWITCH

ON ···The light is illuminated.
OFF ···The light is put out.



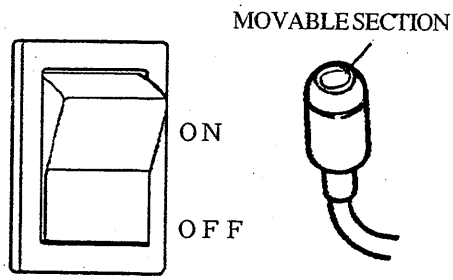
22. SWING ALARM SELECTOR SWITCH

This is used to select the alarm when swinging.
WARNING LAMP BUZZER···The buzzer sounds and the swing flasher goes on and off.
WARNING LAMP ···The swing flasher goes on and off.
OFF ···Nothing operates.



23. FRONT DRUM TURN SELECTOR SWITCH (OPTION)
24. REAR DRUM TURN SELECTOR SWITCH (OPTION)

ON.....The movable section of the grip moves according to the drum rotation speed.
OFF .....Nothing operates.



25. REAR DRUM BRAKE SELECTOR SWITCH
26. FRONT DRUM BRAKE SELECTOR SWITCH
27. THIRD DRUM BRAKE SELECTOR SWITCH (OPTION)

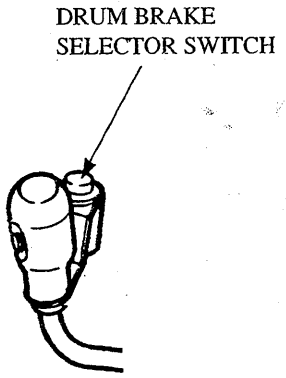
For the details of the free fall operation, refer to the "2.4 FREE FALL OPERATION".

(1) FREE FALL MODE

To select the free fall mode, set the free fall lock switch to the "RELEASE" position, fully depress the drum brake pedal, and push the switch.
Then, the free fall indicator lamp lights up to show that the free fall mode is selected (braking can be actuated with the brake pedal).

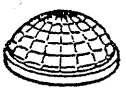
(2) NEUTRAL BRAKE MODE

To select the neutral brake mode, fully depress the drum brake pedal, and push the switch again.
Then, the free fall indicator lamp goes out (braking is automatically actuated).



28. REAR DRUM FREE FALL INDICATOR LAMP

This lamp lights up when the rear drum is in free fall mode.



RED COLOR LAMP

29. FRONT DRUM FREE FALL INDICATOR LAMP

This lamp lights up when the front drum is in free fall mode.

RED COLOR LAMP

30. THIRD DRUM FREE FALL INDICATOR LAMP (OPTION)

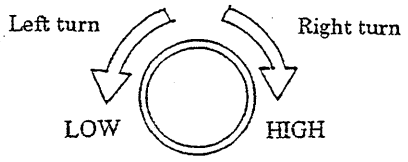
This lamp lights up when the third drum is in free fall mode.

RED COLOR LAMP

31.FRONT DRUM SPEED ADJUSTING KNOB.
32.REAR DRUM SPEED ADJUSTING KNOB.
33.BOOM HOIST DRUM SPEED ADJUSTING KNOB.

Right turn···The rotating speeds of the front drum, rear drum and boom hoist drum are accelerated.

Left turn ···The rotating speeds of the front drum, rear drum and boom hoist drum are decelerated.



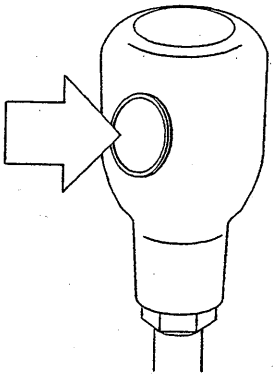
34. FRONT DRUM FREE FALL ACCELERATION SWITCH

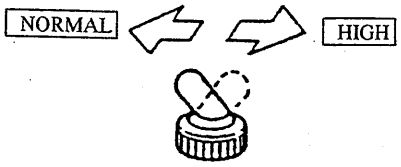
35. REAR DRUM FREE FALL ACCELERATION SWITCH

When these switches are pushed while the rear and front drum free fall speed increased selector switches, 14 and 15, are set to the "HIGH" position, and the lever is in the neutral position during the free fall mode, the free fall speed can be increased only when these switches are pushed.

Use them when the clamshell operation mode is selected.

- Acceleration of the clamshell bucket opening (the opening duration is shortened)
- Acceleration of the free fall of light-weight loads such as a bare hook block without a load (the falling duration is shortened)





FREE FALL INCREASED SELECTOR SWITCH

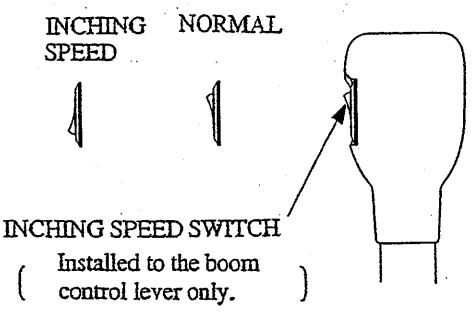
CAUTION

Do not use these switches during the free fall of heavy-weight loads.
Otherwise, a great shock may occur when the free fall speed is changed.

36. INCHING SPEED SWITCH

INCHING SPEED··· The front drum, rear drum, boom hoist and propel speeds are lowered to about 1/3 of the normal speeds.

NORMAL···Normal speed.



2.2.2 GAUGE CLUSTER

1. TERMINOLOGIES AND FUNCTIONS

ENGINE COOLING WATER TEMPERATURE GAUGE
This gauge indicates the engine cooling water temperature.
While the pointer is in the white area, the temperature is normal.
If the pointer is in the red area, reduce the engine speed to lower the cooling water temperature, and wait until the pointer returns to the white area.

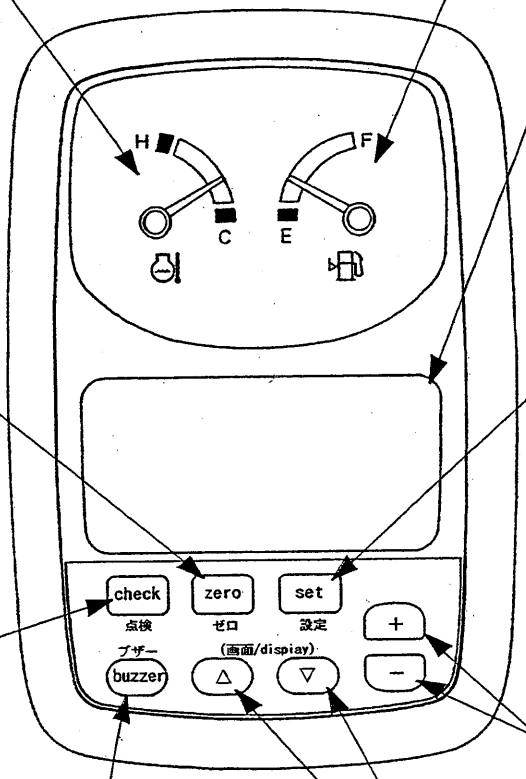
FUEL GAUGE
The fuel level is indicated with the pointer.
F → Full (400 L)
E → Empty

MULTI-DISPLAY (LIQUID CRYSTAL DISPLAY)
The current status of the machine is displayed.

ZERO SWITCH
① To reset the engine oil change interval, push this switch.
② To reset the lifting height indicator (optional) , push this switch.
③ When this switch is pushed for 2 seconds while faulty statuses are displayed, the display screen returns to the normal status (flashing display) .

SETTING SWITCH
① To set the engine oil change interval and the number of the wire rope wraps on the drum, push this switch.
② When this switch is pushed while the normal display screen is flashing (the zero switch is pushed while faulty statuses are displayed) , the screen returns to the fault indicator display screen.

CHECK SWITCH
After this switch is pushed for 5 seconds while the engine oil change interval is displayed, the displayed values can be adjusted.



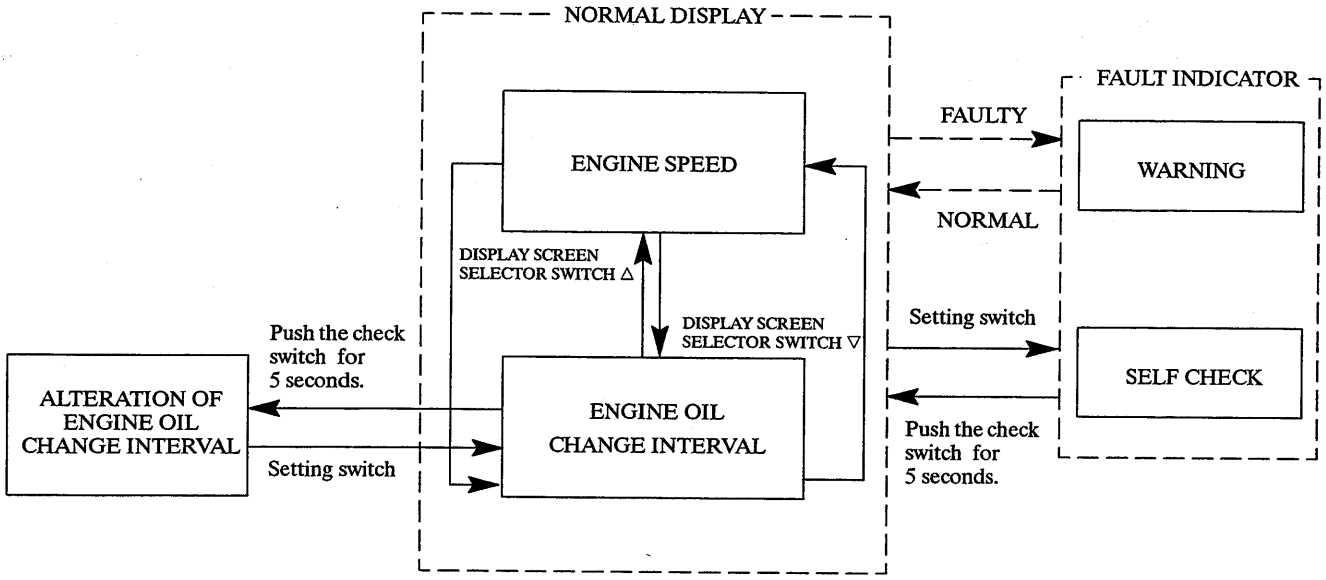
ADJUSTER (+, -) SWITCHES
The engine oil change interval and the number of the wire rope layers on the drum can be adjusted with these switches.

BUZZER SWITCH
The buzzer can be stopped when this switch is pushed while the buzzer sounds (other than the buzzer sounds emitted when the engine oil pressure is decreased) .

DISPLAY SCREEN SELECTOR (△, ▽) SWITCHES
The multi-display screens can be selected by pushing these switches.

2. CONFIGURATION OF MULTI-DISPLAY (LIQUID CRYSTAL DISPLAY)

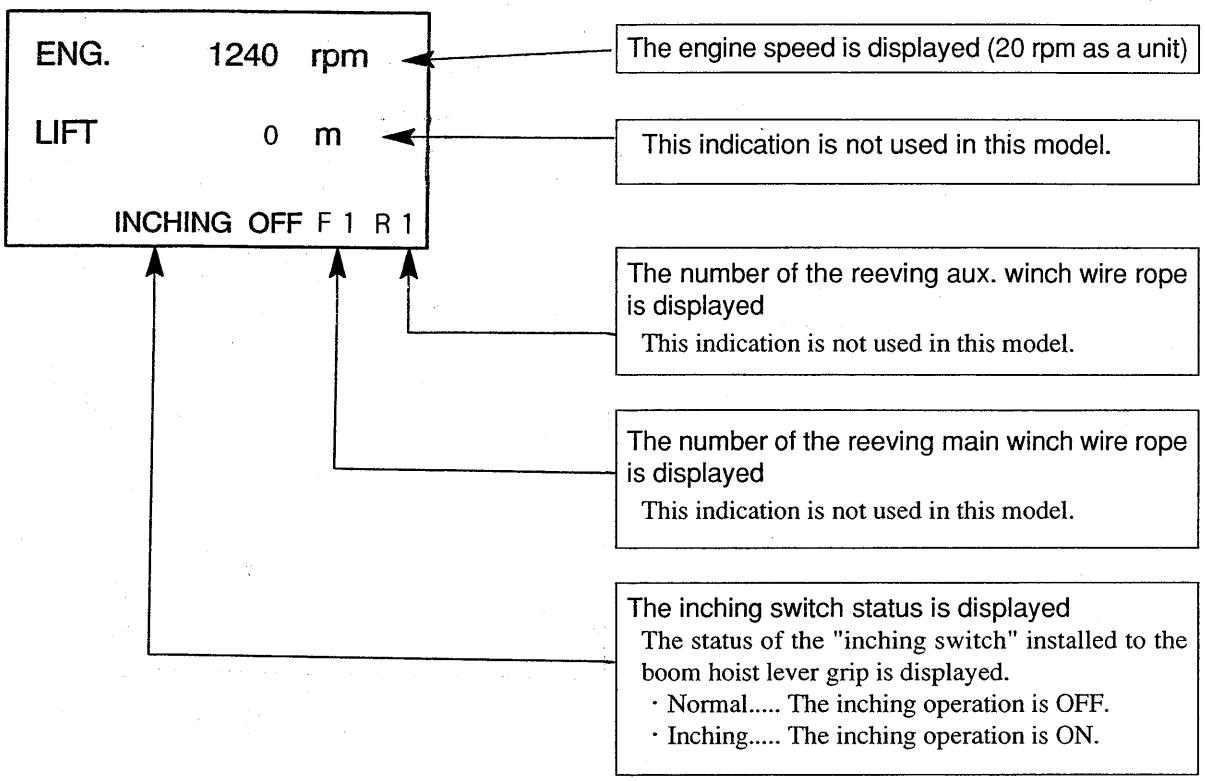
The display screen can be switched by pushing the display screen selector switches, check switch, setting switch, and the zero switch.



3. NORMAL DISPLAY

(1) ENGINE SPEED AND LIFTING HEIGHT DISPLAY SCREEN

When the engine key is set to the "ON" position while there is no fault, this screen appears.
If any faulty status is displayed, refer to the page 2-16.

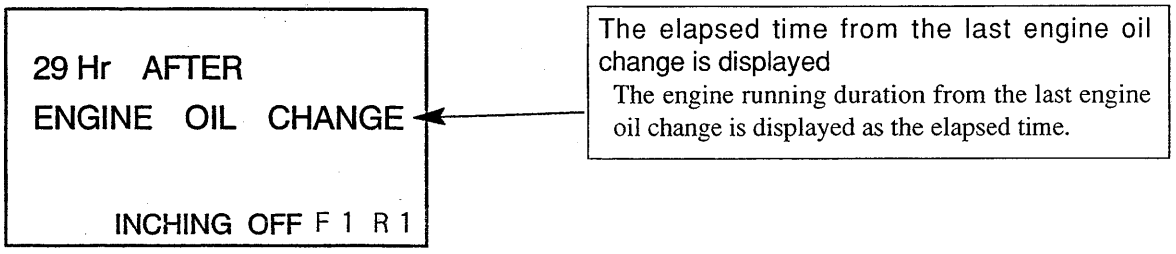


☞ Note 1: The lifting height gauge is not provided, the lifting height is always displayed as "0 m".

Note 2: The number of the reeving setting switch is not provided, the number of the reeving is always displayed as "1".

(2) ENGINE OIL CHANGE INTERVAL DISPLAY SCREEN

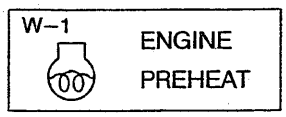
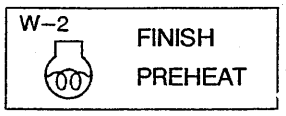
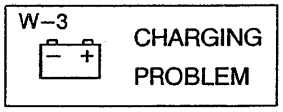
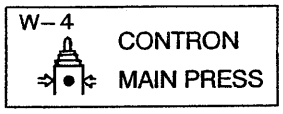
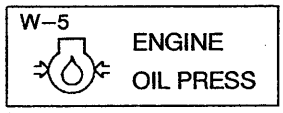
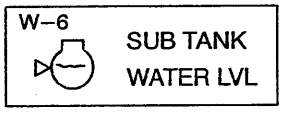
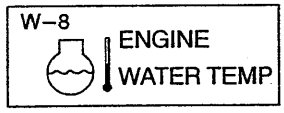
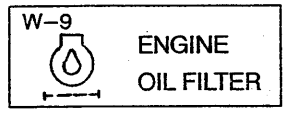
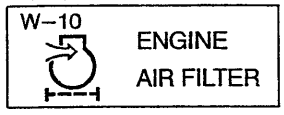
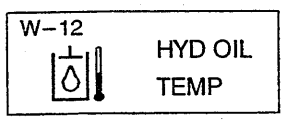
When the "▽" display screen selector switch is pushed, the display screen below appears.



4. FAULT INDICATOR DISPLAY

When a fault occurs, the corresponding fault indicator display appears.

(1) WARNING DISPLAY

Displayed items	Descriptions and remedies	Buzzer
	Turn the starter key counterclockwise to the "HEAT" position to preheat the engine. When the message of "FINISH PREHEAT" is displayed, start the engine.	
	The engine preheat is complete. Start the engine.	
	The charging circuit is malfunctioned. Consult with your nearest KOBELCO service shop.	
	The control primary pressure is abnormal. Stop the operation at once, and consult with your nearest KOBELCO service shop.	
	The engine oil pressure is abnormal. Stop the engine at once, and consult with your nearest KOBELCO service shop.	◎
	The cooling water level in the sub tank of the radiator is insufficient. Refill the subtank with cooling water.	
	The cooling water temperature is excessively high. Idle the engine to lower the water temperature, and consult with your nearest KOBELCO service shop.	○
	The engine oil filter is clogged. Replace the filter.	
	The engine air cleaner is clogged. Clean or replace the element.	
	The fuel level is insufficient. Refuel.	
	The hydraulic oil temperature is excessively high. Adjust the engine speed to the medium level to lower the oil temperature, and consult with your nearest KOBELCO service shop.	

Displayed items	Descriptions and remedies	Buzzer
W–13 FR–WINCH OIL TEMP	The temperature of clutch cooling oil of the front drum is excessively high. Idle the engine at a high speed to lower the oil temperature. If this item frequently appears during normal operations, consult with your nearest KOBELCO service shop. At the same time, inform the KOBELCO service shop of the details of the operation (lifting load, free fall distance, speed, and duration).	○
W–14 RE–WINCH OIL TEMP	The temperature of clutch cooling oil of the rear drum is excessively high. Idle the engine at a high speed to lower the oil temperature. If this item frequently appears during normal operations, consult with your nearest KOBELCO service shop. At the same time, inform the KOBELCO service shop of the details of the operation (lifting load, free fall distance, speed, and duration).	○
W–15 WINCH FILTER	The winch cooling line filter is clogged. Replace the filter cartridge. This item may appear during cold weather even when the filter is not clogged. If the item disappear during warm-up, the cartridge does not need to be replaced.	○
W–16 SV FR–SAFETY ESM ON	The front drum emergency solenoid is actuated. The free fall operation of the front drum is impossible. The status may be returned by setting the key switch to the "OFF" position, and setting it to the "ON" position again a short while later. If the status cannot be returned by performing the steps above, consult with your nearest KOBELCO service shop.	
W–17 SV RE–SAFETY ESA ON	The rear drum emergency solenoid is actuated. The free fall operation of the rear drum is impossible. The status may be returned by setting the key switch to the "OFF" position, and setting it to the "ON" position again a short while later. If the status cannot be returned by performing the steps above, consult with your nearest KOBELCO service shop.	
W–18 SV 3RD–SAFETY EST ON	The third emergency solenoid is actuated. The free fall operation of the third drum is impossible. The status may be returned by setting the key switch to the "OFF" position, and setting it to the "ON" position again a short while later. If the status cannot be returned by performing the steps above, consult with your nearest KOBELCO service shop.	
W–19 HOOK RAISE STOP REL.	The hook block Anti-two-block (overhoist) stop status is released. Stop the release, and operate in the normal status.	△
W–20 BOOM RAISE STOP REL.	The boom overhoist stop status is released. Stop the release, and operate in the normal status.	△
H–1 CPU MECHATRO FAILURE	The CPU is malfunctioned. Consult with your nearest KOBELCO service shop.	○

* Buzzer alarms

◎: the buzzer repeatedly sounds for 0.2 seconds, with 0.3 seconds of intermittence (the buzzer sounds cannot be stopped with the buzzer switch).

○: the buzzer repeatedly sounds for 0.5 seconds, with 0.5 seconds of intermittence (the buzzer can be stopped with the buzzer switch).

△: the buzzer repeatedly sounds for 0.2 seconds, with 0.3 seconds of intermittence, and stop after 5 seconds.

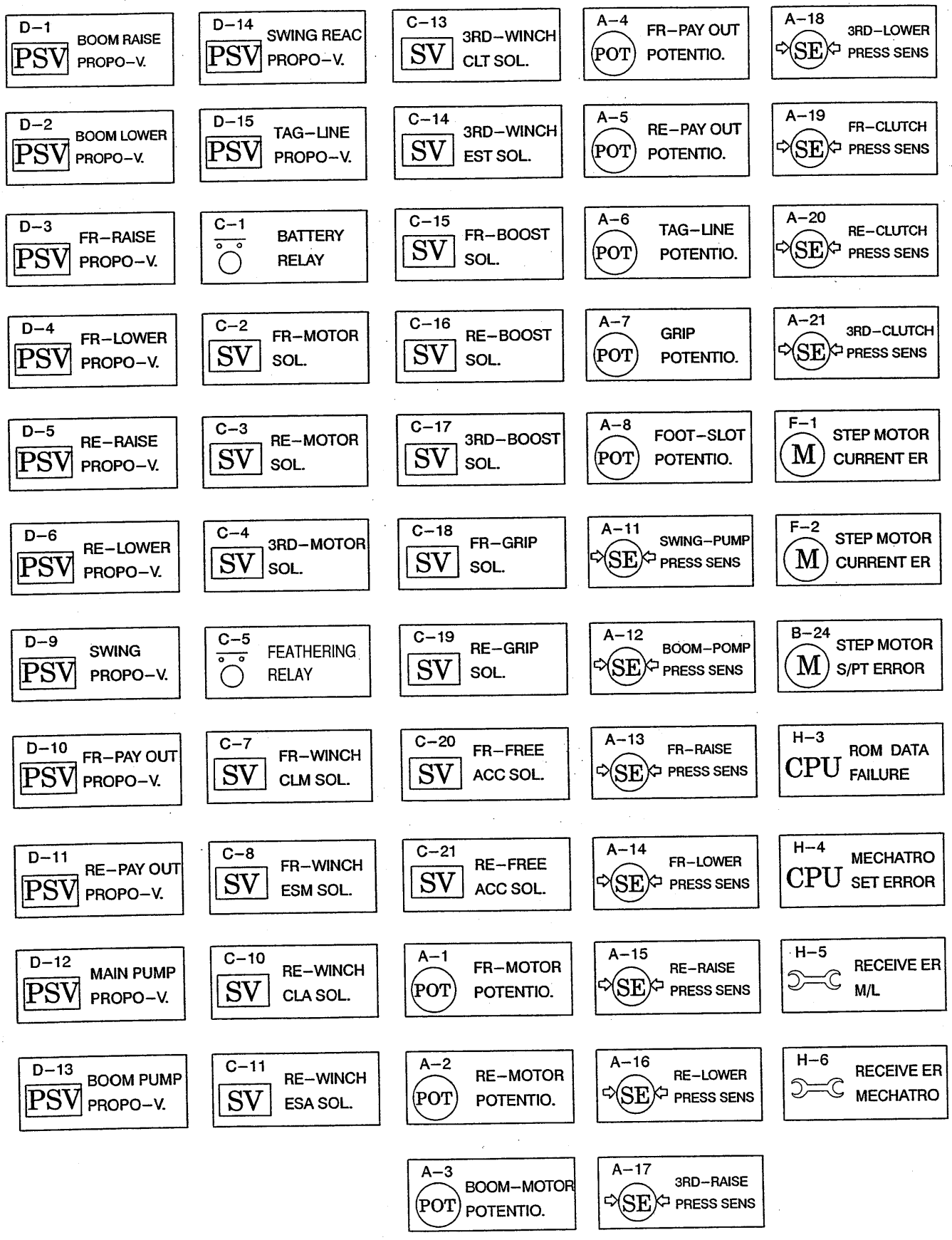
Blank: the buzzer does not sound.

(2) WARNING DISPLAY (SELF CHECK)

If the solenoid valve or the center is malfunctioned, the display screens below appear.

When there are some malfunctions, they will be displayed by turns.

When these display screens appear, inform your nearest KOBELCO service shop of the display screen number (the number on the upper left corner of the display screen).



(3) RETURN TO NORMAL DISPLAY SCREEN WHILE FAULT INDICATOR DISPLAY SCREEN APPEARS

When a fault occurs, first, a fault indicator display screen appears.

To return to the normal display when in this status, perform the steps described in the right.

While the fault indicator display screen appears, push the zero switch for more than 2 seconds.

↓

The normal display screen flashes.

↓

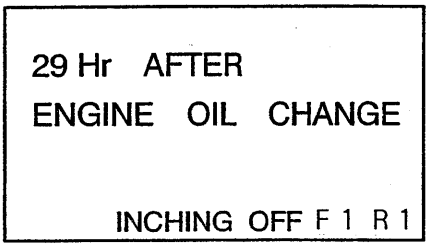
When the setting switch is pushed while the normal display screen is flashing, the fault indicator display screen returns.

☞ If the fault occurred is corrected while the normal display screen is flashing, the screen enters the lit status automatically.

5. ALTERATION OF ENGINE OIL CHANGE INTERVAL

Reset to "0" the engine oil change interval when the oil change is complete.

① Display the "Engine oil change interval display screen".



② Push the check switch for more than 5 seconds. Then, the displayed oil change interval flashes.

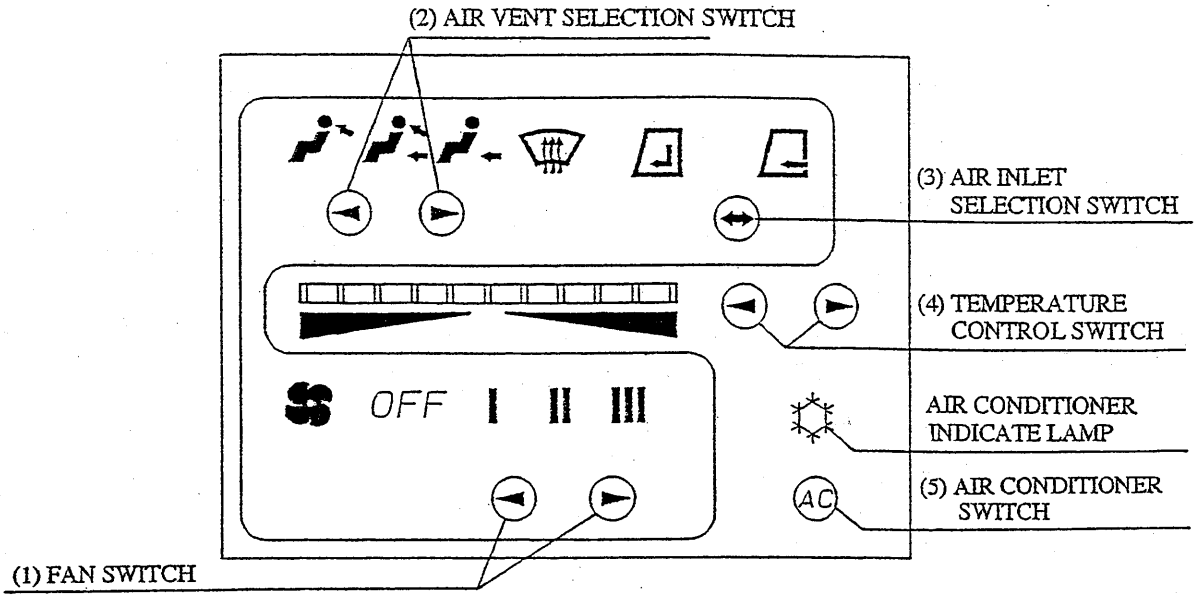
③ When the zero switch is pushed for more than a second, the oil change interval is reset to "0".
To set to the interval other than "0", whenever the adjuster "+" switch is pushed, the displayed oil change interval increases by 1. The interval can be continuously increased by pushing this switch.
Whenever the adjuster "-" switch is pushed, the displayed oil change interval decreases by 1. The interval can be continuously decreased by pushing this switch.

④ Push the setting switch after adjusting the value. The alteration is complete, and the screen returns to the normal status.

⑤ If no alteration is required, select another display screen with the display screen selector switches without pushing the setting switch.
Then, the alteration will be canceled.

2.2.3 HANDLING THE AIR CONDITIONER

1. CONTROL PANEL



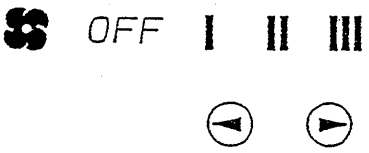
(1) FAN SWITCH

The switches control the air conditioner ON/OFF function and the blower speed.

I position -------- Low

II position -------- Medium

III position -------- High

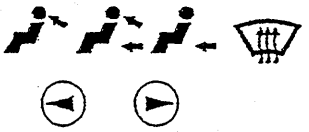


(2) AIR VENT SELECTION SWITCH

These switches control the open/close position of each air vent.

Select the desired air flow mode from the three mode position.

The selected position is always shown by a lamp.



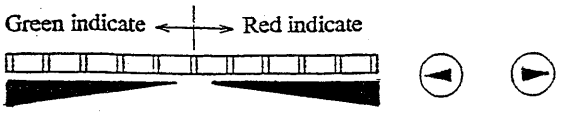
(3) AIR INLET SELECTION SWITCH

This switch selects the open or close position of air inlet.

	When this position is selected, the air inlet is closed which causes the air to recirculate inside the cab.
	When this position is selected, the air inlet is opened which allows fresh air to be introduced into the cab.

(4) TEMPERATURE CONTROL SWITCH

These switches control the temperature of air coming out of the air vents to any of five levels during heating (red label) and cooling (green label).



1. Push the left switch (◀), and the range of the GREEN lights decrease and the air temperature goes down.

2. Push the right switch (▶), and the range of the LED lights increase and the air temperature goes up.

(5) AIR CONDITIONER SWITCH

This is used to turn ON and OFF the cooling function during cooling or dehumidification heating.
Push once to change over from ON/OFF to OFF/ON.
When the switch is turned ON, the lamp on the upper part of the switch lights up.

2. CAUTION WHEN USING

① Flash air should be introduced into the cab, when the air conditioner is used for long time.

② Do not lower the temperature more than necessary.

3. CHECK AND SERVICE

When the filter is clogged, wind volume is decreased, and capacity of the air conditioner is lowered.

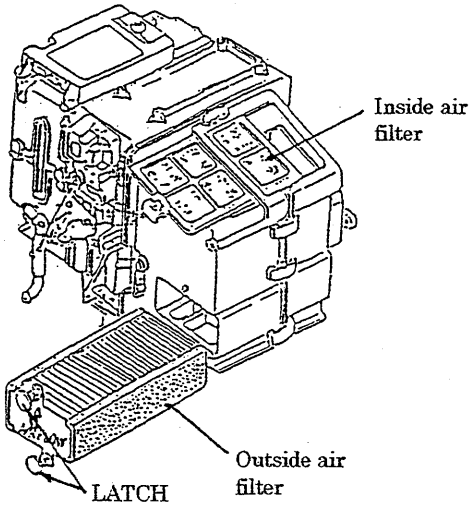
Check the filter, and clean or replace if it is dirty.

① INSIDE AIR FILTER

Removal : Lightly raise up the filter hook, then draw it out to this side.

② OUTSIDE AIR FILTER

Removal : Remove the latches located in the two place, top and bottom, then draw the outside air filter out to this side.

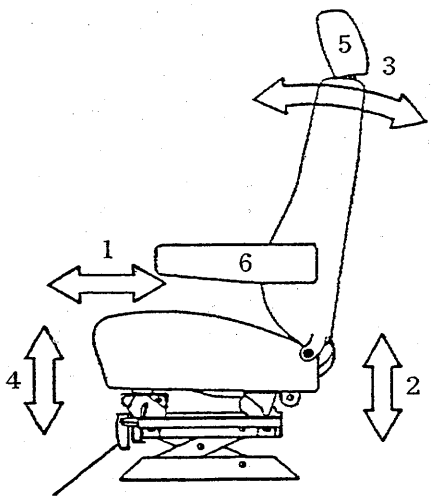


2.3 CRANE OPERATION

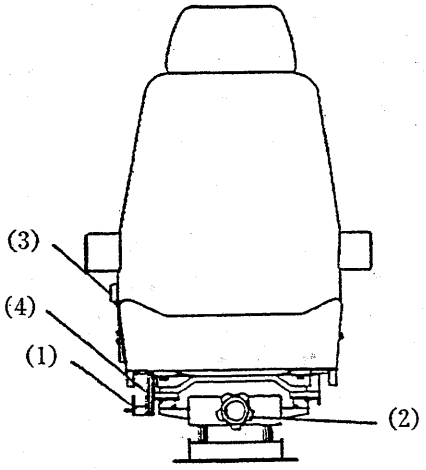
2.3.1 ADJUSTING THE OPERATOR'S SEAT

CAUTION

Operator's seat should be adjust so that operator can control brake pedal securely.



1. ADJUSTING BACK AND FORTH
   Pull the lever (item no.1) to adjust the seat back and forth in 7 steps within 140mm of range. After adjusting, release lever to fix the seat.
2. ADJUSTING HEIGHT
   Turn the handle (item no.2) to adjust the seat so that the height becomes the most suitable position.



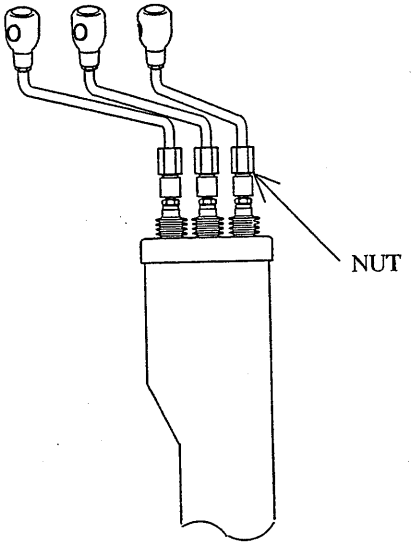
3. ADJUSTING RECLINING CONDITION
   Pull the lever (item no.3) to set the back of the seat to the most suitable angle. After adjusting, release the lever to fix the back.
4. ADJUSTING TILTING ANGLE
   Pull the lever (item no.4) to set the seat tilting angle to the most suitable angle. After adjusting, release the lever to fix the seat.
5. HEADREST
   This can be removed.
6. ARMREST
   The armrest can be turn 180 ° backward.

2.3.2 ADJUSTING THE CONTROL LEVER DIRECTION

By loosening the nut, the control lever can be adjusted for its direction. Adjust it to the most suitable position. After adjusting, secure the lever with the nut.

CAUTION

Nut must be retightened before using crane.



2.3.3 STARTING AND STOPPING THE ENGINE

1. STARTING THE ENGINE

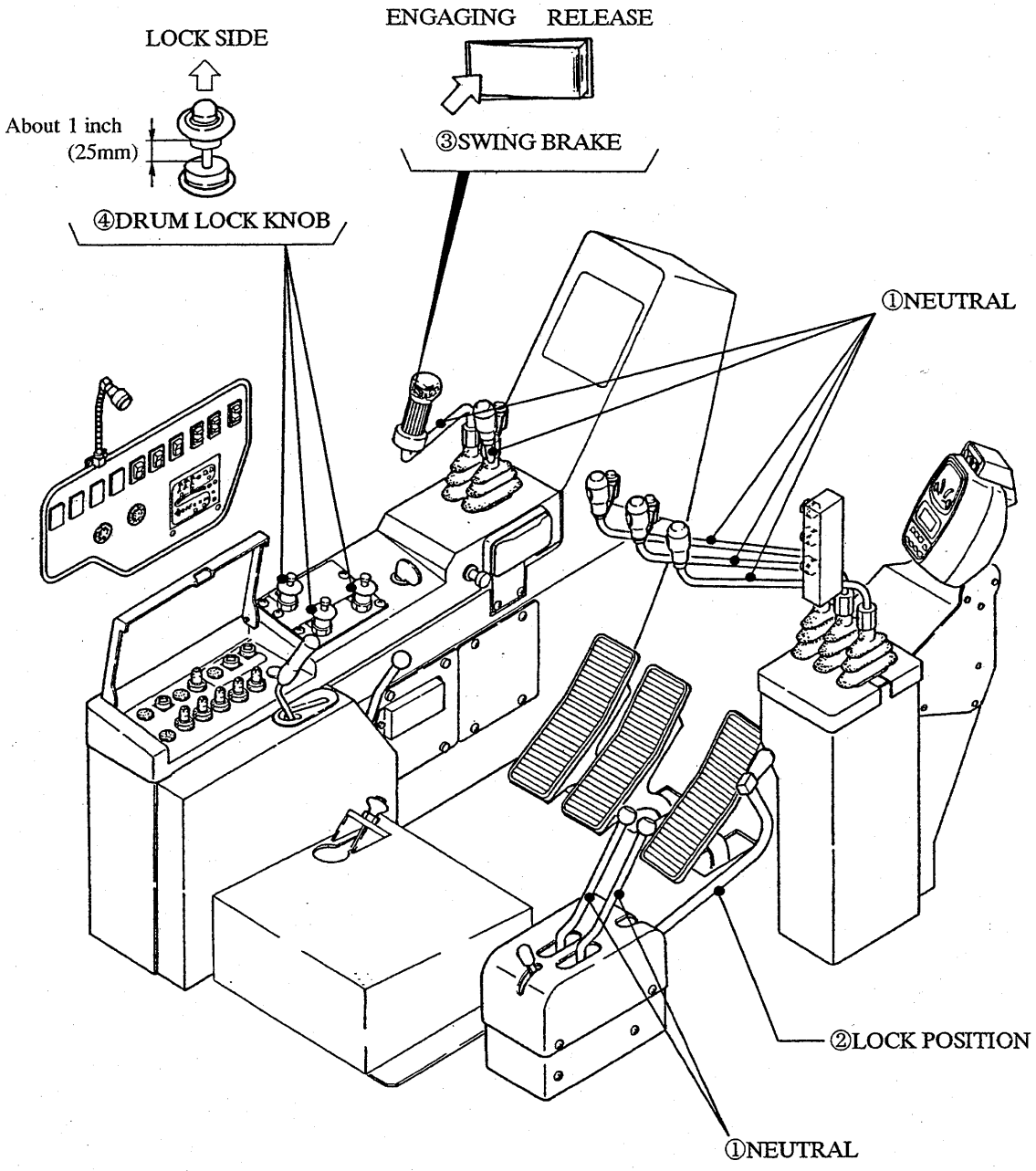
Before starting the engine, set the control levers and switches as follows:

① Boom hoist, front drum, rear drum, swing and propel control levers ---------- Neutral

② Function lock lever ---------- Lock position

③ Swing brake switch ---------- Engaging side

④ Front drum, rear drum and third drum lock knobs ---------- Lock side

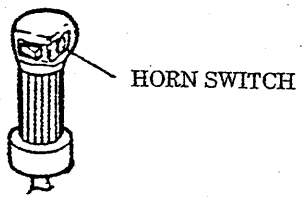


⚠ WARNING

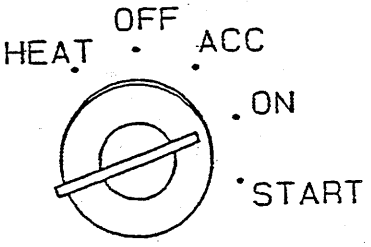
Sound the signal horn to warn the surrounding personnel before starting the engine.
Failure to observe this precaution may result in serious injury or loss of life.

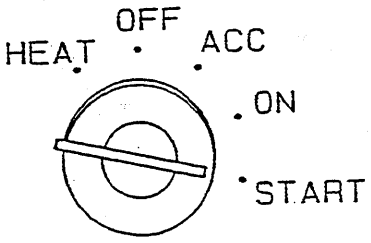
(1) Turn the key switch 2 steps to the right (ON position).

(2) By turning the key switch one step more to the right (START position), the engine starts. After the engine starts, immediately release the key. The key returns to the ON position automatically.
When the brake selector switches of the front drum , rear drum and third drums are set in the FREE FALL side, the engine cannot start.
Do not allow the starter to run more than 15 seconds continuously. If the engine does not start within 15 seconds, release the key and wait for more than 20 seconds, then start the engine again.



(3) When it is difficult to start the engine due to low atmosphere temperature, turn the key to the left (HEAT position) to preheat the engine, then start the engine.
The standard preheating time is 15 to 20 seconds. Do not preheat for more than 40 seconds continuously.

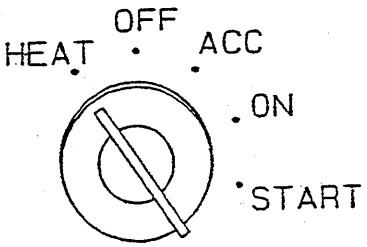




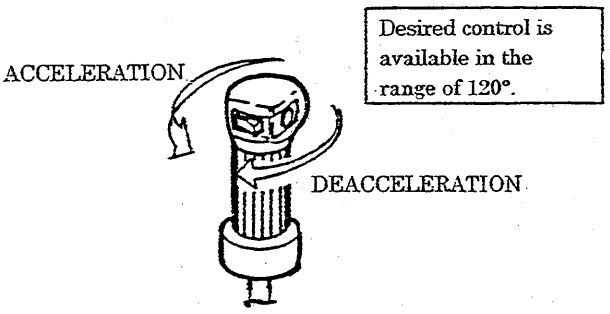
(4) After the engine starts, immediately, check the monitor for abnormality. If the readings are improper, stop the engine immediately, and determine the cause.

NOTE

- The alarm sounds are temporarily emitted, and all the lamps on the controller for load safety device light up immediately after starting the engine.
  Then, the machine is in the operation status. The alarm sounds stop, and the lamps become unlit.
- Warm up the engine for approx. five minutes after it is started.

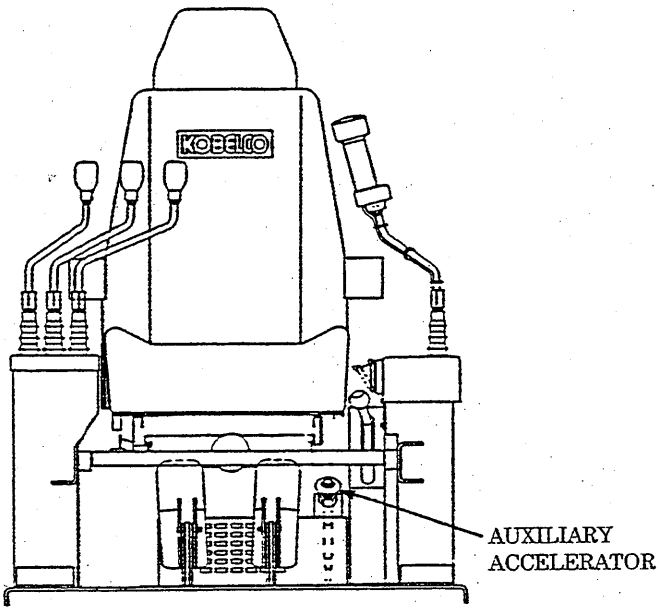


(5) To adjust the engine speed, use the accelerator grip.
If it is impossible to adjust the engine speed with the use of the accelerator grip, adjust by using the auxiliary accelerator located under the operator's seat.
Auxiliary accelerator is only for emergency use when electric accelerator system is in trouble.



CAUTION

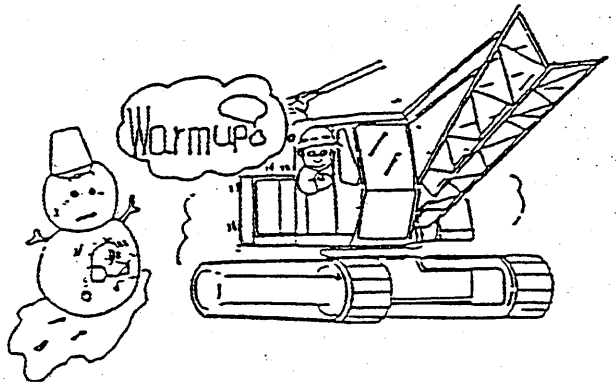
Do not operate auxiliary accelerator when the system works properly.
Failure to observe this precaution may result in damage to the system.



2. ENGINE WARMING OPERATION
Allow the engine to run at less than middle engine speed for 5 to 10 minutes with no load. Make the warming operation time twice in a cold area.

CAUTION

If the crane is operated immediately without warming up the engine, the engine and the hydraulic components will be worn out earlier than usual or will become damaged.



3. STOPPING THE ENGINE

Before stopping the engine, set the control levers and switches as follows:

① Boom hoist, front drum, rear drum, swing and propel control levers ---------- Neutral

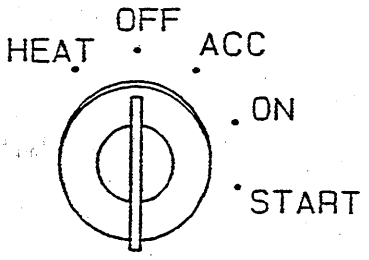
② Function lock lever ---------- Lock position

③ Swing brake switch ---------- Engaging side

④ Front drum, rear drum and third drum lock knobs ---------- Lock side

(1) Allow the engine to run at a low speed for approx. 5 minutes with no load before stopping the engine.

(2) Turn the key switch to the OFF position (2 steps to the left).

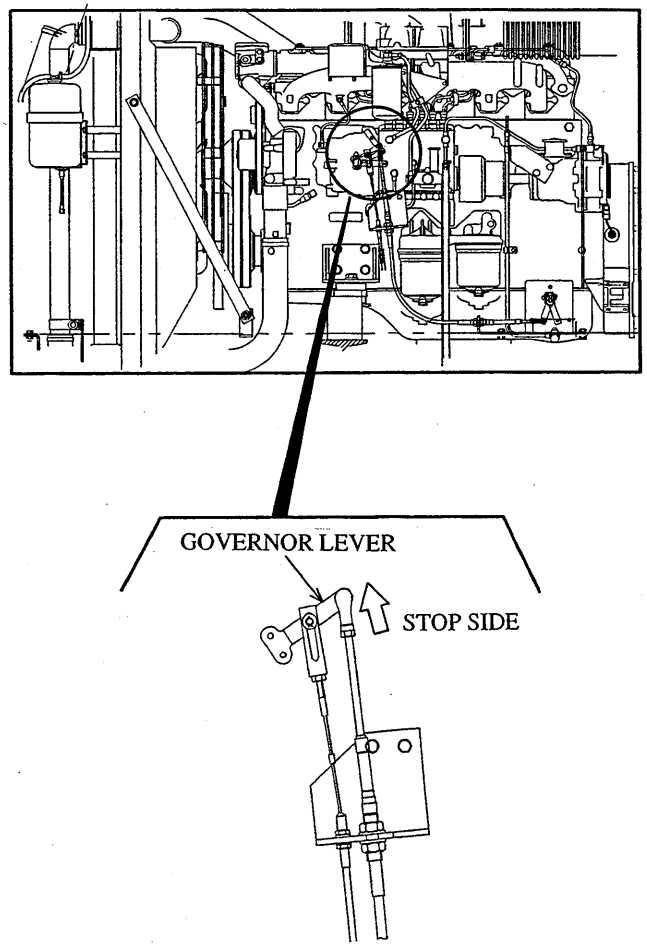


4. EMERGENCY STOPPING THE ENGINE

If the engine cannot be stopped with the key switch, open the left-hand guard, and shift the governor lever to the "Stop" side.

⚠ DANGER

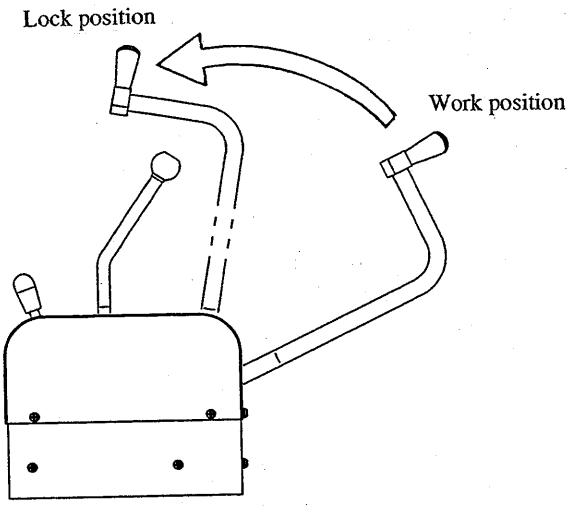
Be sure to wear gloves to avoid burns.



2.3.4 FUNCTION LOCK LEVER

When leaving the operator's seat, be sure to place this lever in the LOCK position.

When this lever is placed in the LOCK position, the machine does not operate even if any control lever is operated carelessly.



⚠ DANGER

Do not set the function lock lever to the "LOCK" position during operation.
Otherwise, all the operation functions are suddenly stopped, causing extreme danger.
Failure to observe this precaution may result in serious injury or loss of life.

When operating the machine, place the function lock lever in the WORK position.

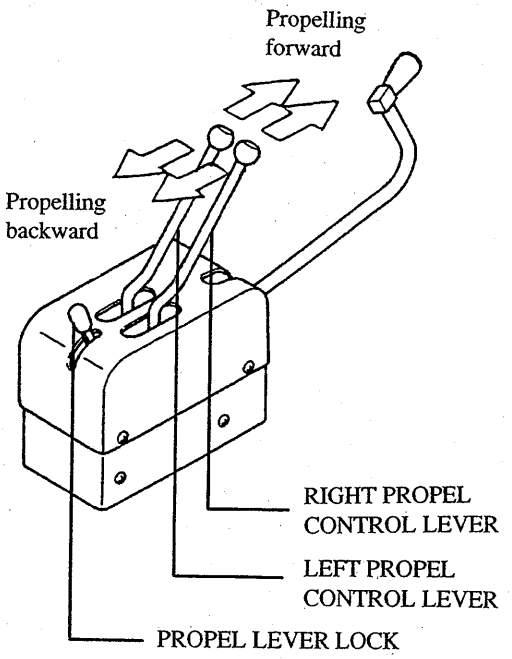
2.3.5 PROPELLING OPERATION

⚠ DANGER

Before propelling the machine strictly observe the following procedures.

- Confirm that people and obstacles are kept out of the propelling area.
- Before propelling the machine, sound the horn to warn the surrounding people.
- Especially be careful, when the boom is long, when the boom angle is large, when ground is uneven, or when a load is lifted.
- For stability of propelling, see page 9-7.
- Use a signal person to direct operation.

Failure to observe this precaution may result in serious injury or loss of life.



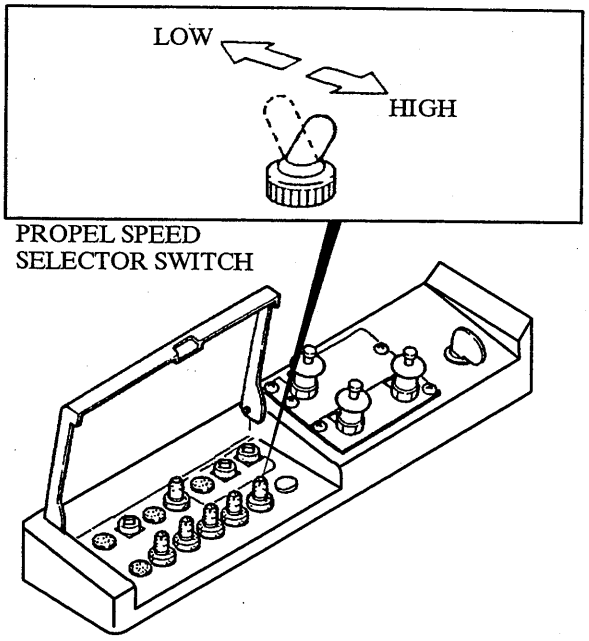
Propel speed is regulated by turning the accelerator grip and by proportionally pushing and pulling the propel control levers, and in addition, high propel speed and low propel speed by operating the propel speed selector switch.

High speed - Use this speed on a good condition of ground.

Low speed -- Use this speed when a tractive force is required on a bad condition of ground.

① When the propel speed selector switch is placed in the HIGH SPEED side, pivot turn and counterrotate turn cannot be operated because propel load is large.

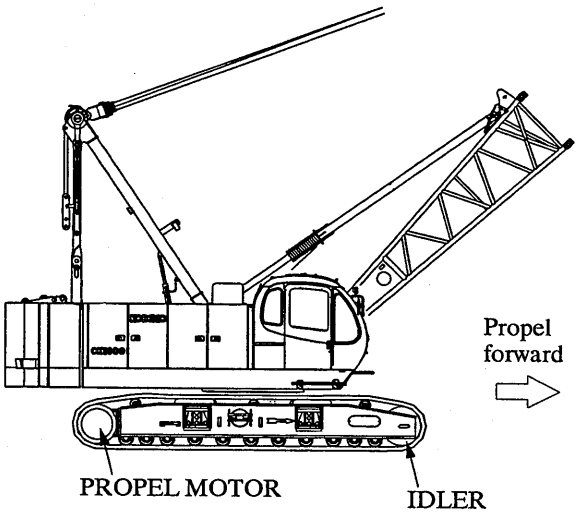
② Since the machine may propel partially on a rough terrain, adjust propelling by the stroke of the propel control levers.



Propelling forward is propelling toward the idler side, and propelling backward is propelling toward the propel motor side. When the cab positions in the propel motor side, propelling operation only is reverse, so be careful.

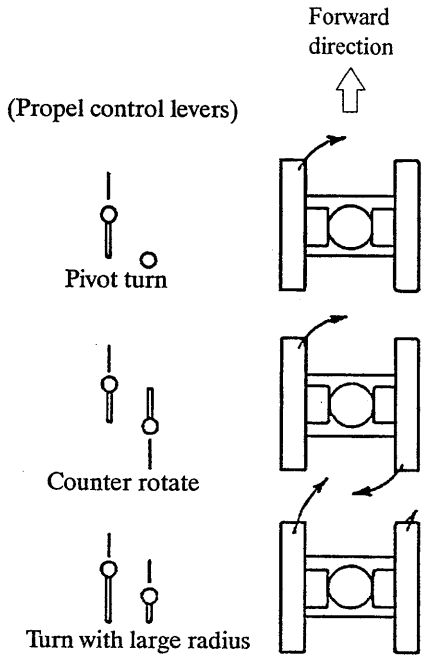
(1) Release the propel control lever lock.

(2) By operating the left and right propel control levers, propelling forward, propelling backward, pivot turn, counterrotating and turn with large radius can be operated.



WARNING

Do not start or stop travel or steering functions suddenly.
Extreme care is required when hoisting or lowering load during propelling.
Failure to observe this precaution may result in serious injury or loss of life.

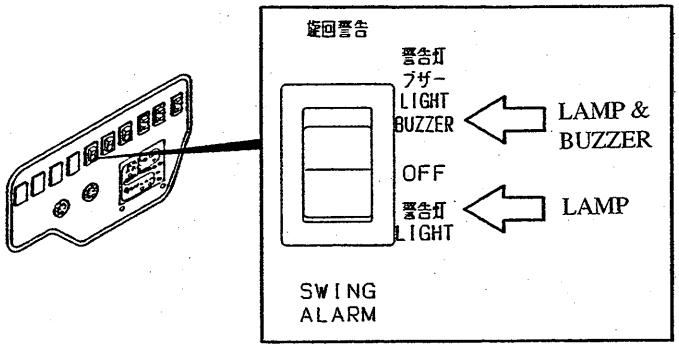


2.3.6 SWINGING OPERATION

DANGER

- Before initiating any swing operations, ensure the area in the swing path of the hook and/or load, as well as the tail swing area, is clear of all obstructions and personnel.
- Sound horn to warn personnel.
- For stability of swinging, see page 9-7.

Failure to observe this precaution may result in serious injury or loss of life.

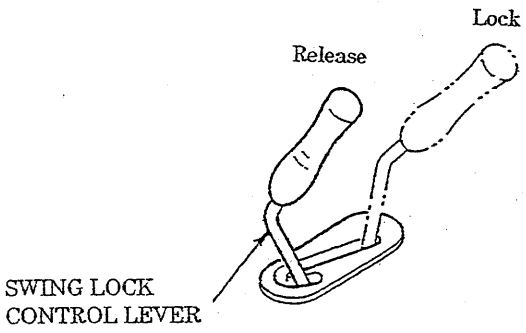


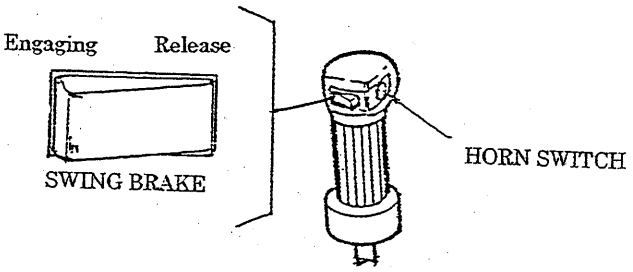
SWING ALARM SELECTOR SWITCH

Swing speed is regulated by turning the accelerator grip and by proportionally pushing and pulling the swing control lever.

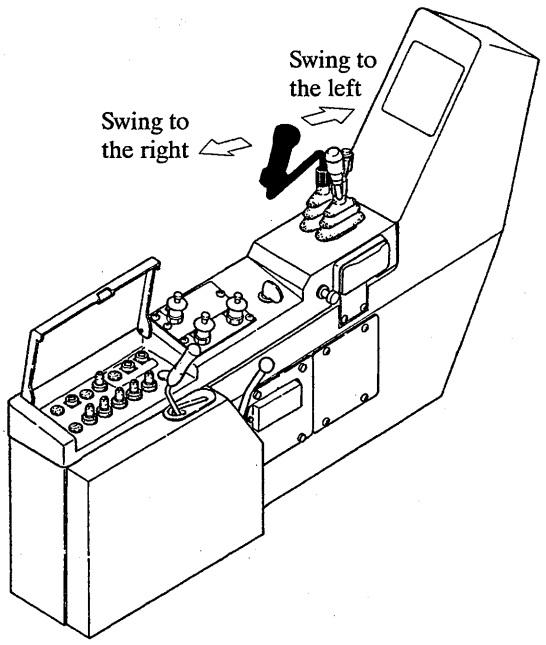
(1) According to working condition, select the alarm with the swing alarm selector switch.

(2) Release the swing lock pin and swing brake.





(3) Push the swing control lever forward to swing the upper to the left, and pull the lever to backward this side to swing the upper to the right. To stop the swing motion, slowly move the lever in the opposite direction.



⚠ CAUTION

- Avoid rapid swings or sudden starts and stops.
- After the swing motion has been completely stopped, engage the swing parking brake.

⚠ WARNING

- Do not use the swing parking brake for the purpose of stopping the swing motion.
- Always check to ensure that the load is hanging free and directly under the boom tip before swinging.

Failure to observe this precaution may result in serious injury or loss of life.

(4) When pausing operations, orient the machine straight ahead, and then, actuate the swing lock.

⚠ CAUTION

The actuation of the swing lock and swinging operation with the machine other than in the swing lock posture (when the machine does not oriented straight ahead) may lead to the damaged machine.

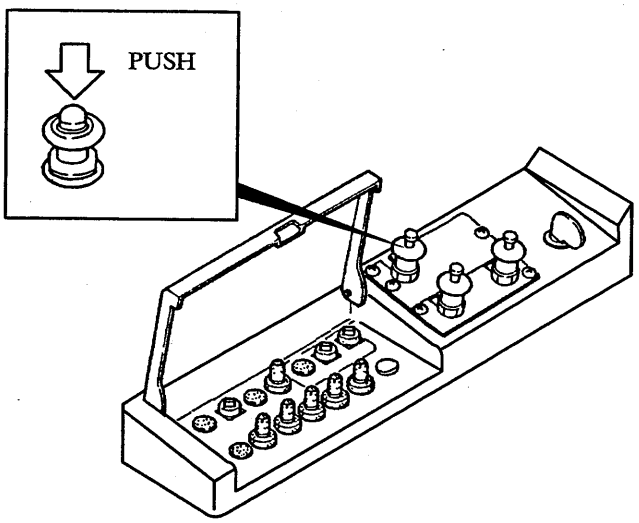
2.3.7 BOOM RAISING/LOWERING OPERATION

⚠ WARNING

Before operating the boom ensure the area above and beneath the boom is clear of all obstructions and personnel.
Failure to observe this precaution may result in serious injury or loss of life.

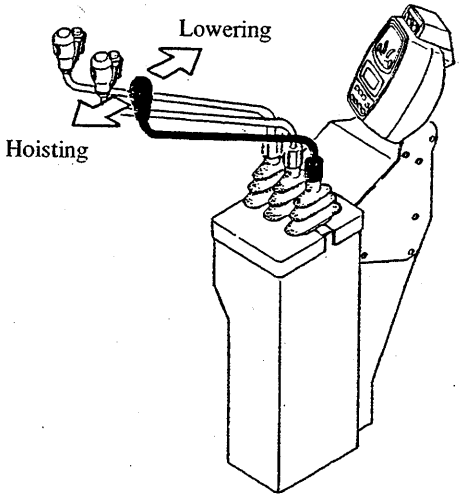
(1) Release the drum lock.

(2) Push the boom hoist control lever forward to lower the boom, and pull the lever toward this side to raise the boom.

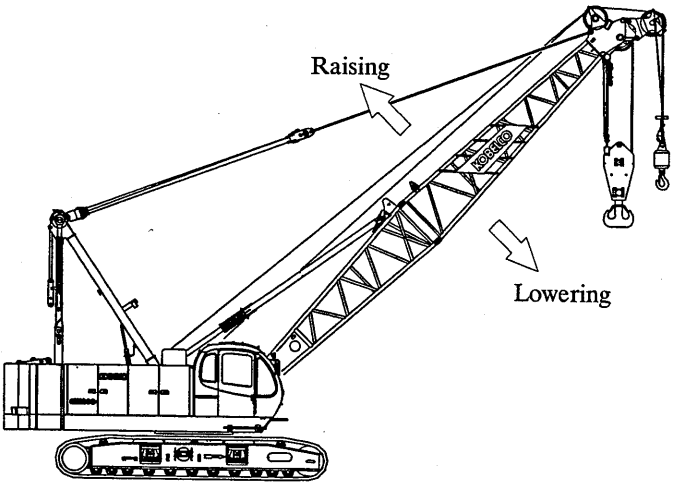


⚠ WARNING

The load line can break if the hook block contacts the end of the boom. This is called "two blocking". Two blocking can be caused by lowering the boom without paying out load line. Two blocking can pull jibs and lattice crane booms over backwards or cause damage to the tip.
Always keep adequate space between the hook block and boom point. Lower the hook when lowering the boom.
Failure to observe this precaution may result in serious injury or loss of life.



When the boom is not lowered even by operating the boom hoist control lever to the boom lowering side, it is considered that the drum lock is engaged in the ratchet of the drum. In this case, move the boom hoist control lever to the boom raising side slightly, then move the lever to the lowering side again.

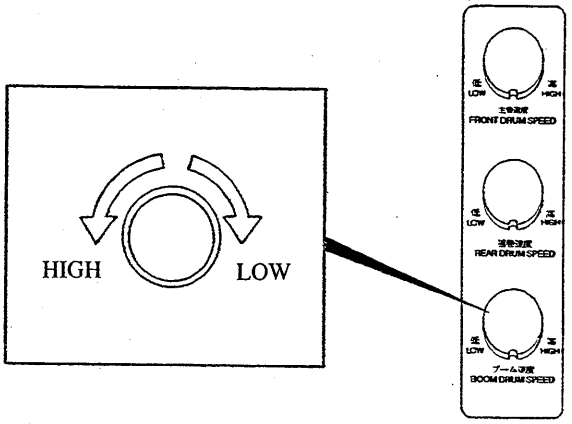


⚠ DANGER

Do not actuate the drum lock while the boom is lowered. Otherwise, the drum or drum lock may be damaged.

(3) According to the working condition, adjust the speed of the drum with the drum speed adjusting knob.

(4) Be sure to stop the engine, and engage the drum lock before leaving the operator seat.
To engage the drum lock, push and hold the button, and then fully pull the knob up.



2.3.8 HOOK RAISING/LOWERING OPERATION

⚠ WARNING

When making lifts, strictly follow the capacity charts supplied by the manufacturer for determining the loads that can be handled. Follow good operating practice and all procedures as outlined in this manual when attempting to lift any load.
Failure to observe this precaution may result in serious injury or loss of life.

Raising and lowering speed is regulated by turning the accelerator grip and by proportionally pushing and pulling the drum control lever, and in addition, the maximum raising and lowering speed of the drum by operating the drum speed adjusting knob.

(1) Ensure that the "Neutral brake" mode is selected.
- (The free fall lock switch is set to the "Lock" position)
- (The free fall indicator lamp goes out)

(2) Release the drum lock.

⚠ DANGER

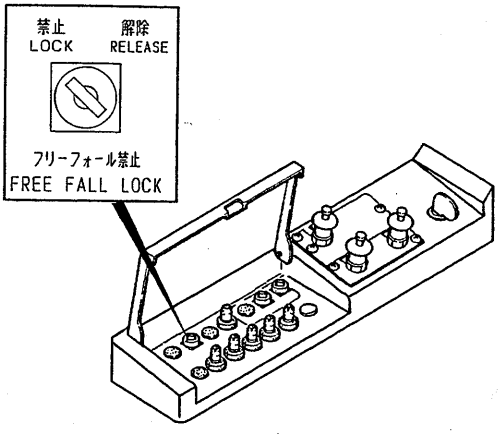
Before releasing the drum lock. confirm that the drum brake mode is in the NEUTRAL BRAKE MODE. If not, move the switch to the NEUTRAL BRAKE MODE.
Failure to observe this precaution may result in serious injury or loss of life.

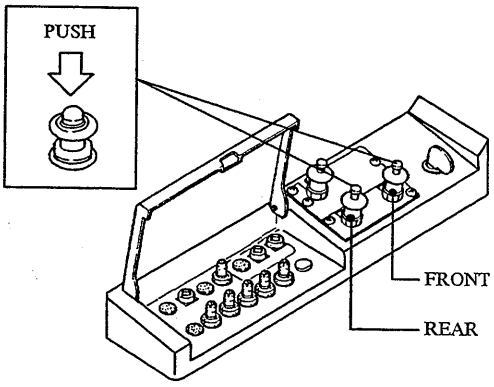
When the hook is not lowered even by operating the drum control lever to the lowering side, it is considered that the lock is engaged in the ratchet of the drum.
In this case, slightly operate the control lever to the raising side, then operate to the lowering side again.

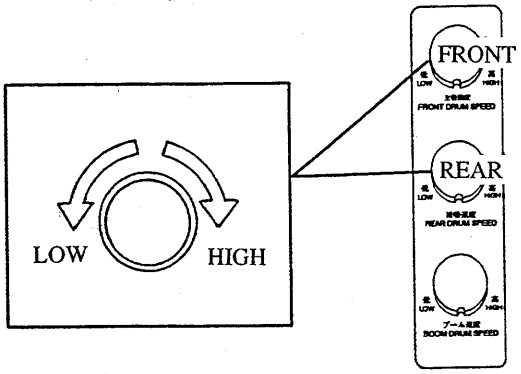
(3) According to working condition, adjust the maximum speed of the drum with the drum speed adjusting knob.

⚠ WARNING

The load line can break if the hook block contacts the end of the boom. This is called "two blocking". Two blocking can be caused by lowering the boom without paying out load line. Two blocking can pull jibs and lattice crane booms over backwards or cause damage to the tip.
Always keep adequate space between the hook block and boom point. Lower the hook when lowering the boom.
Failure to observe this precaution may result in serious injury or loss of life.







(1) RAISING

Pull the drum control lever toward this side to raise a load.

(2) LOWERING

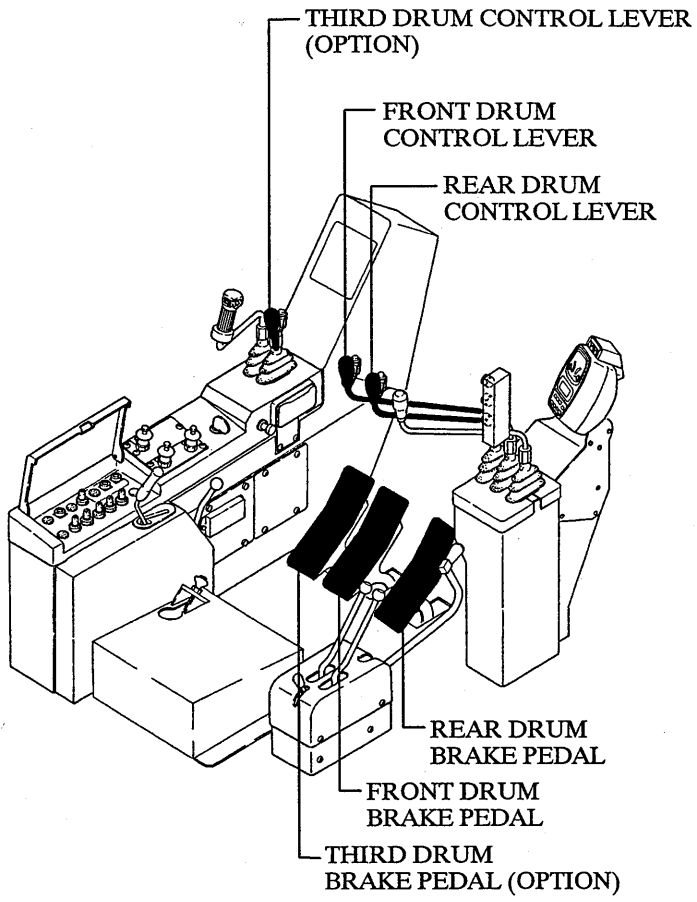
Push the drum control lever forward to lower the load.

(3) STOPPING

When the drum control lever is returned to the neutral position, the automatic brake operates to stop the load.

When the load is held in the air for a long time, engage the drum lock.

To engage the drum lock, push and hold the button, and then fully pull the knob up.



DANGER

Do not actuate the drum lock while the boom is lowered. Otherwise, the drum or drum lock may be damaged.

WARNING

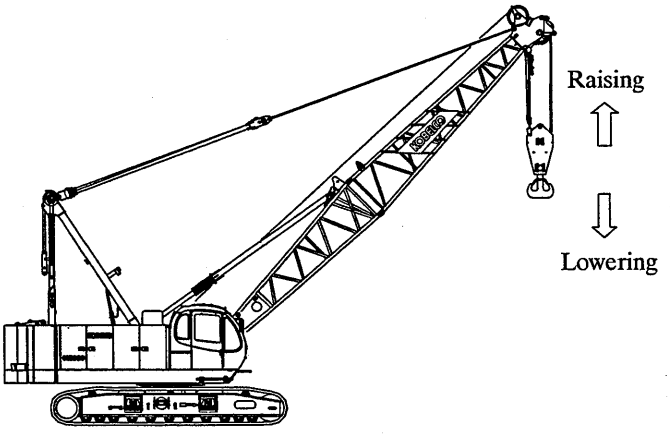
Always keep your foot on the brake pedal even when the neutral brake is used so that the foot pedal can be operated at any time.
Failure to observe this precaution may result in serious injury or loss of life.

NOTE

The 1st speed of the front drum and 2nd speed of the rear drum cannot be operated simultaneously due to the limitations of hydraulic system.

NOTE

The inching of the raising/lowering using the brake pedal together with the drum control lever is impossible because of the brake system.

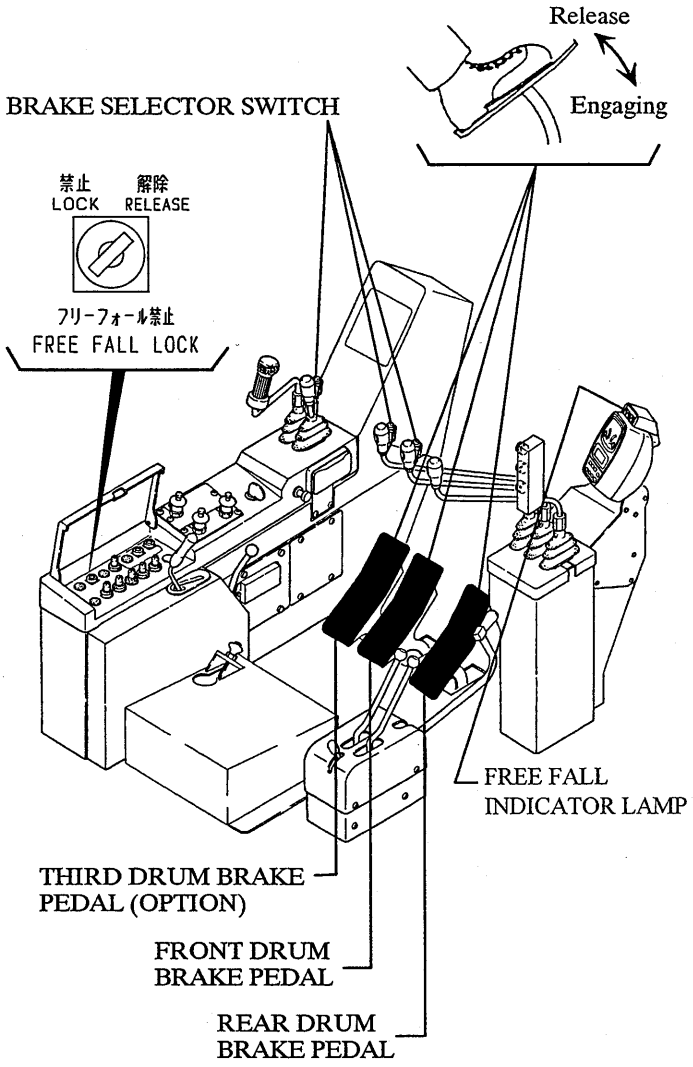


2.4 FREE FALL OPERATION

⚠ DANGER

- Do not perform operations in the FREE FALL mode until you have confirmed that the brake is functioning properly and will hold the load that will be lifted.
- Do not release your foot from the brake pedal when operating in the FREE FALL mode.
- Do not apply the foot brake suddenly, and avoid abrupt stops when lowering the hoist line while operating in the FREE FALL mode.
- Do not use the drum lock to stop the lowering of the hoist line while operating in the FREE FALL mode.
- Do not operate the lever while the load is being lowered during the free fall mode.
- Do not overheat the brake by operating in the FREE FALL mode repeatedly at high heights.

Failure to observe these precautions may result in serious injury or loss of life.



The use of the free fall must be limited to the excavating operations with the bucket.

When lifting or lowering the bucket during the FREE FALL mode, be sure to follow the procedures below.

(1) Set the "Free fall lock switch (with key)" in the left side stand to the "Release" position.

(2) Set the control lever to the neutral position, and with the brake pedal depressed fully, push the brake selector switch at once. The free fall indicator lamp lights up to indicate that the brake is in the free fall condition.

- When the machine enters the FREE FALL mode, a slight reaction to the brake pedal occurs.
- When the depressed brake reaches to the specified position, the brake pedal slightly vibrates. If the brake pedal is depressed further from this position, the brake is actuated.

(3) Raising

Pulling the drum control lever toward this side, the raising is possible even while the brake pedal remains depressed.

(4) Lowering (Power Lowering)

After pushing the drum control lever forward, the lowering is possible even while the brake pedal remains depressed.

(5) Stopping

Depress the brake pedal, and return the drum control lever to the neutral position. The bucket is stopped.

When the load is held in the air for a long time, with the NEUTRAL BRAKE mode, engage the drum lock.

(6) Free fall

① Depress the brake pedal fully.

② Return the drum control lever to the neutral position.

③ Slowly release the brake pedal to free fall the bucket.

④ Lowering speed is adjusted by adjusting the brake pedal depressing.

⚠ DANGER

Before operating the foot brake at free fall position, be sure to confirm that the brake is functioning by depressing the brake pedal to the full-stroke.
Failure to observe this precaution may result in serious injury or loss of life.

(7) Switching from "FREE FALL MODE" to "BRAKE MODE"

While the "FREE FALL MODE" is selected, set the drum control lever to the neutral position, and fully depress the brake pedal. Then, push the brake selector switch on the control lever again.

The free fall indicator lamp goes out to indicate that the "BRAKE MODE" is selected.

NOTE

- When a light bucket is lowered during the free fall mode in cold weather, the lowering speed may be rather slow. In that case, while engaging the drum lock, winch down to warm up the hydraulic oil (perform this step for approx. five minutes).
- The feel of brake operation may be changed after the hydraulic oil is changed. In that case, contact your nearest KOBELCO service shop.

FREE ⇔ BRAKE MODE SWITCHING		
	BRAKE → FREE	FREE → BRAKE
FREE FALL LOCK SWITCH	RELEASE	RELEASE
DRUM CONTROL LEVER	NEUTRAL	NEUTRAL
BRAKE PEDAL	DEPRESS	DEPRESS
BRAKE SELECTOR SWITCH	PUSH (ONCE)	PUSH (ONCE)
FREE LAMP	LIGHT UP	GOES OUT
MODE	FREE	BRAKE

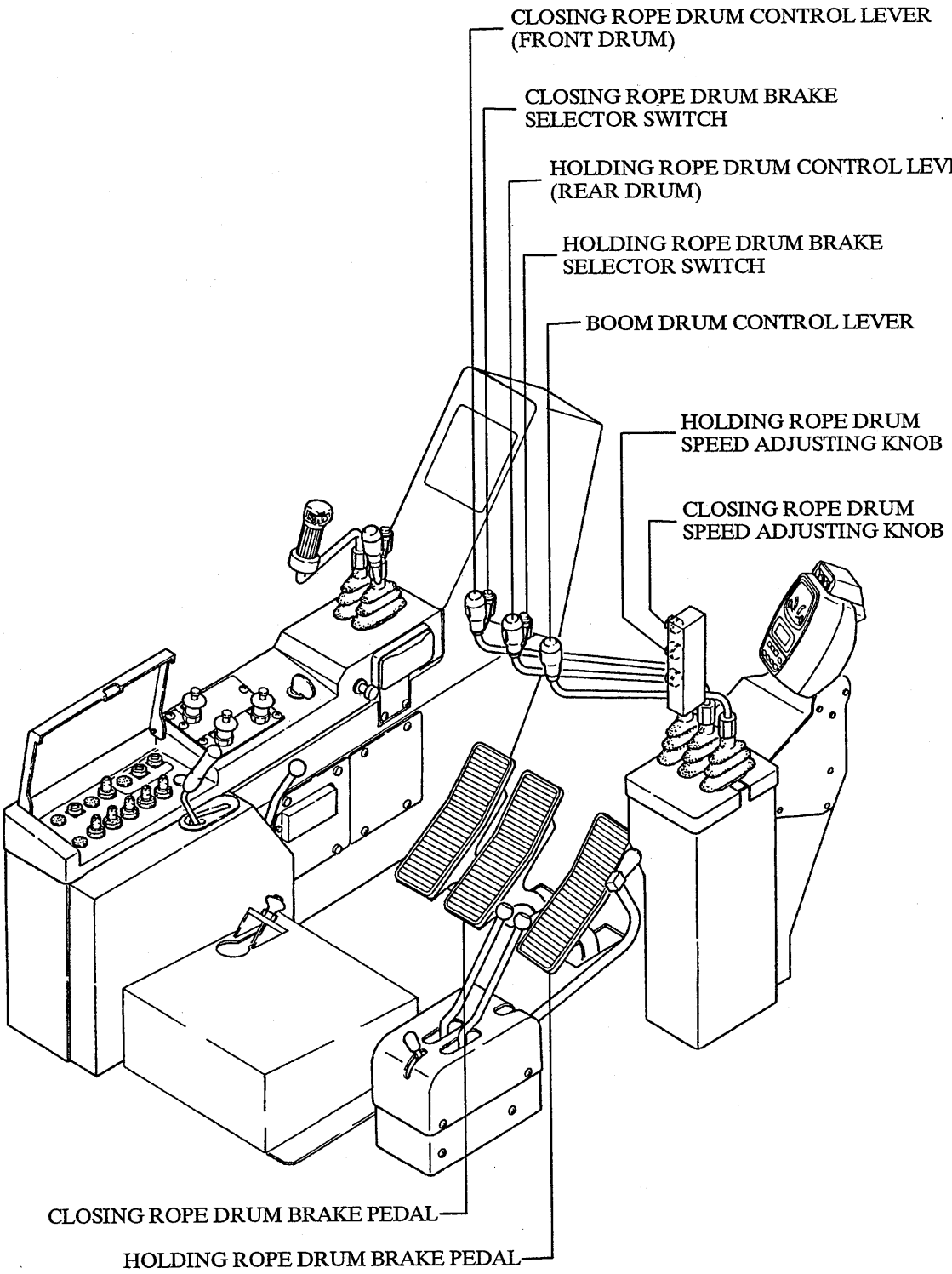
⚠ CAUTION

FREE FALL ACCELERATION SWITCH

Do not use the free fall acceleration switch during the free fall of heavy-weight loads. Otherwise, a great shock may occur when the free fall speed is changed.

2.5 CLAMSHELL OPERATION

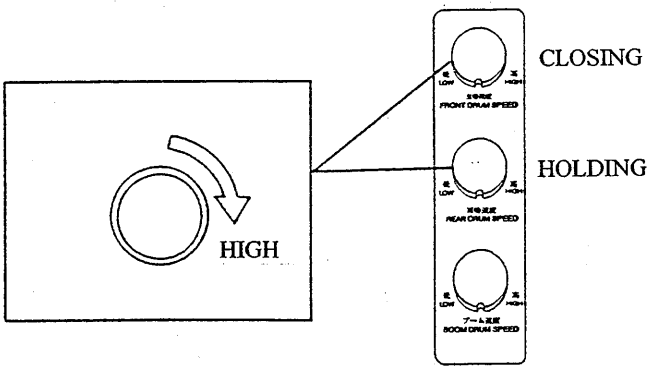
In clamshell operation, the control levers and brake pedals are called with the designations shown in the following figure.

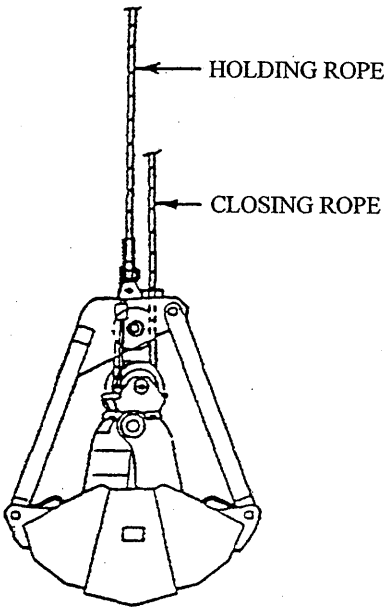


(1) Set the drum speed adjusting knob to the MINIMUM SPEED side.

NOTE

When the drum speed adjusting knob is set to the positions other than the "HIGH" position, closing operation and holding operation do not synchronize.



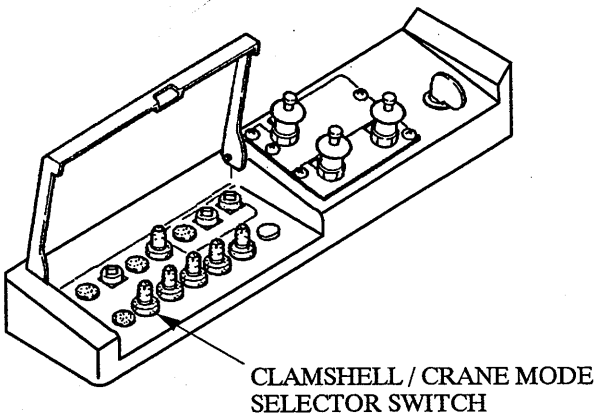


(2) Set the clamshell/crane mode selector switch to the "CLAMSHELL" position.

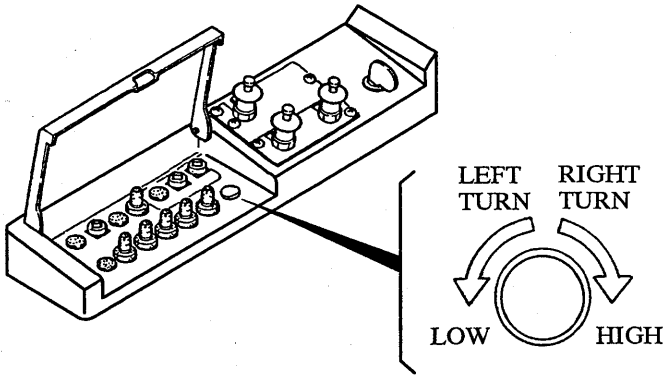
NOTE

If operations are continued with the clamshell/ crane mode selector switch set to the "CRANE" position, the synchronization at the lever detent position may be difficult when a great load is applied.

If the clamshell/crane mode selector switch is set to the "CLAMSHELL" position, the operation speed with a lighter load becomes slower, and the opening and closing motions are synchronized with supporting.



2.6 HANDLING OF HYDRAULIC TAGLINE (OPTIONAL)

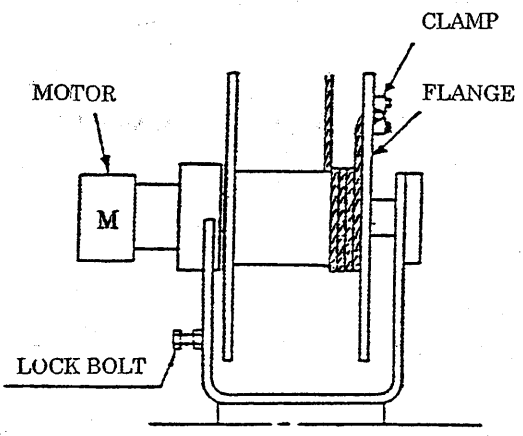


(1) Set the hydraulic selector switch to the tagline position (neutral).

(2) Stop the engine, and set the tagline tension adjusting knob to the lowest setting (fully turn to the left).

(3) Loosen the lock bolt.

(4) Reeve the wire rope end through the outside of the drum flange, and fix it with a clamp.

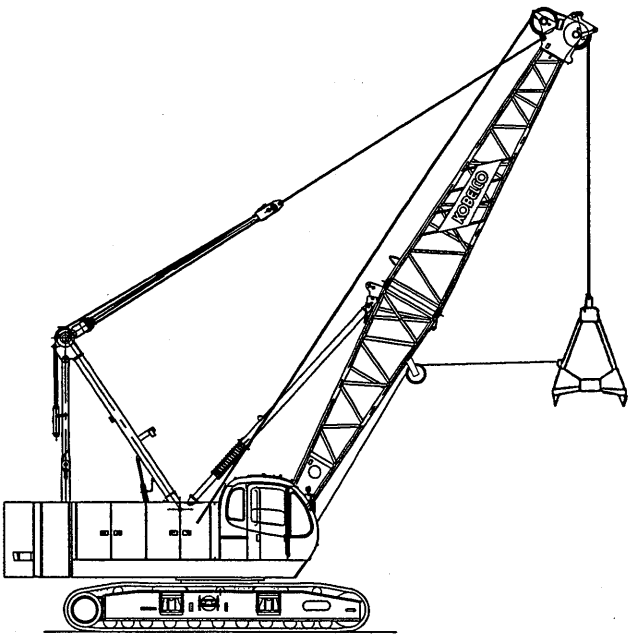


(5) Set the other end of the wire rope to the bucket via the guide sheave.

(6) Confirm that the tagline tension adjusting knob is at the lowest setting (fully turned to the left), and then start and idle the engine.

⚠ CAUTION

Take caution that the tagline rope may be suddenly tensioned or slackened when starting or stopping the engine.



(7) To wind up the rope on the drum, turn the tagline adjusting knob somewhat to the higher setting, while tensioning the wire rope.

(8)Adjust the wire rope tension with the tagline adjusting knob. Be sure to turn it carefully.

Turn to the right ..... Tension increases.
Turn to the left ..... Tension decreases.

☞ When not using the tagline:

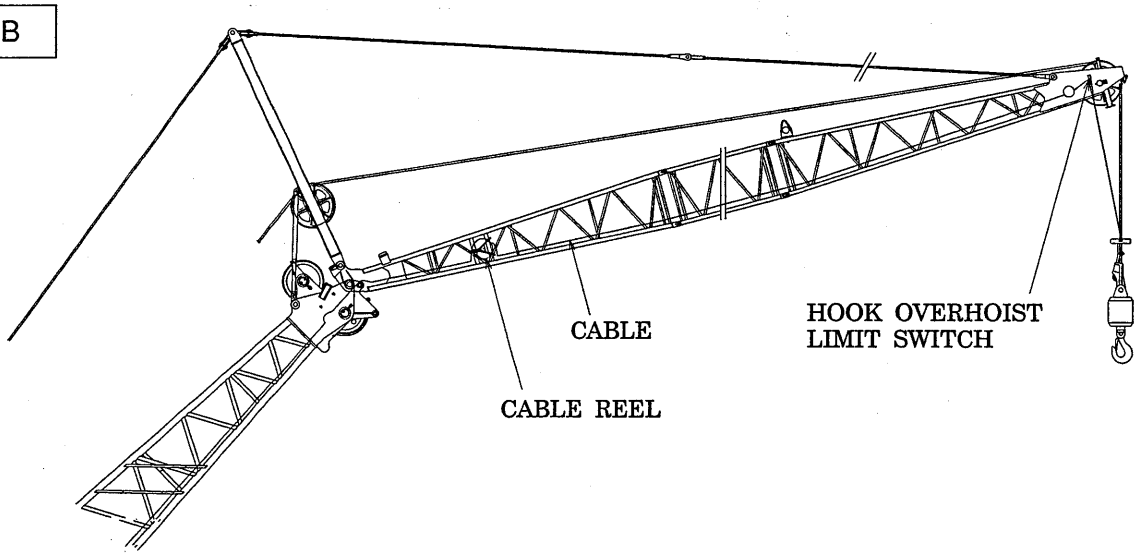
1) Fully wind up the wire rope on the drum, and fix the wire rope end.
2) Set the tension adjusting knob to the lowest setting (fully turn to the left).
3) Fix the drum flange with the lock bolt.

3. SAFETY DEVICE

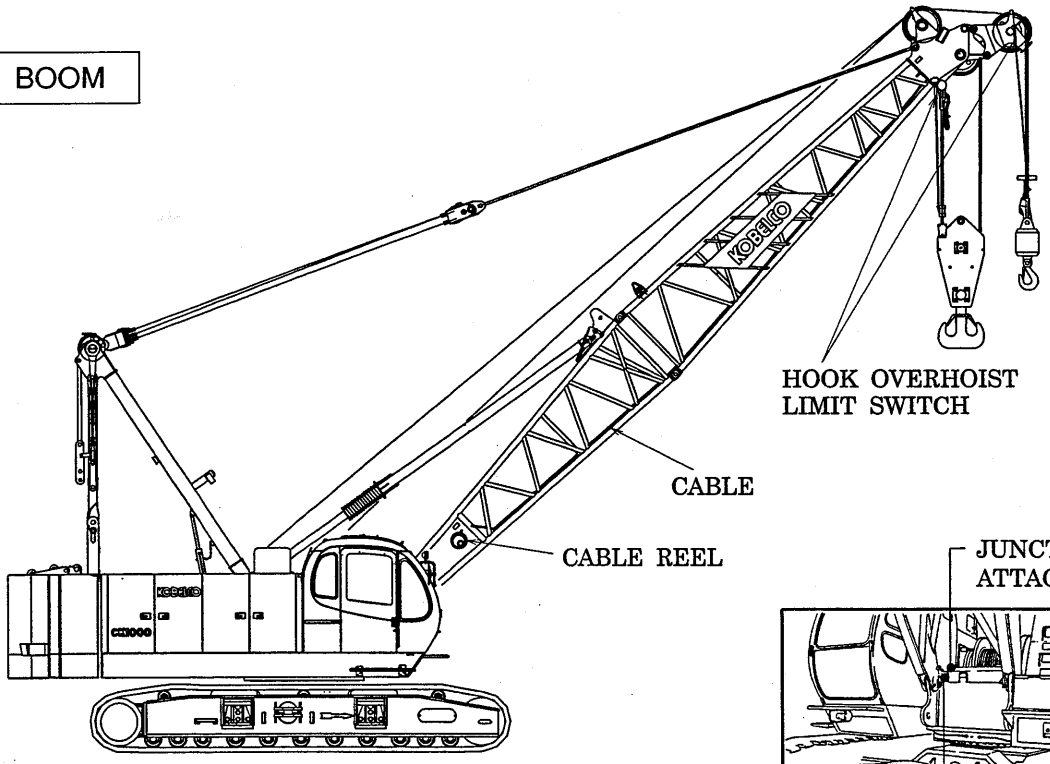
The Overhoist Preventive Device is a safety device which is provided in order to prevent damage to the machine and/or overturn accident due to an overhoist. Therefore, be sure to use this device in order to perform crane operation more safely.

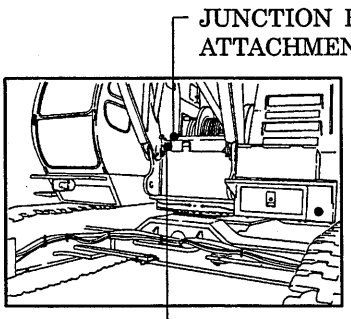
3.1 ARRANGEMENT OF EQUIPMENTS

JIB

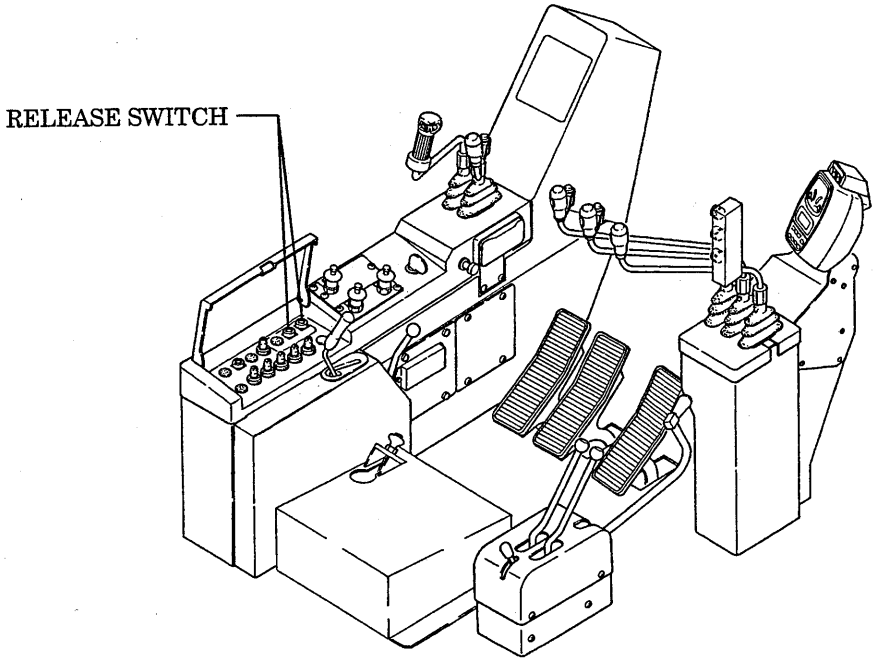


BOOM

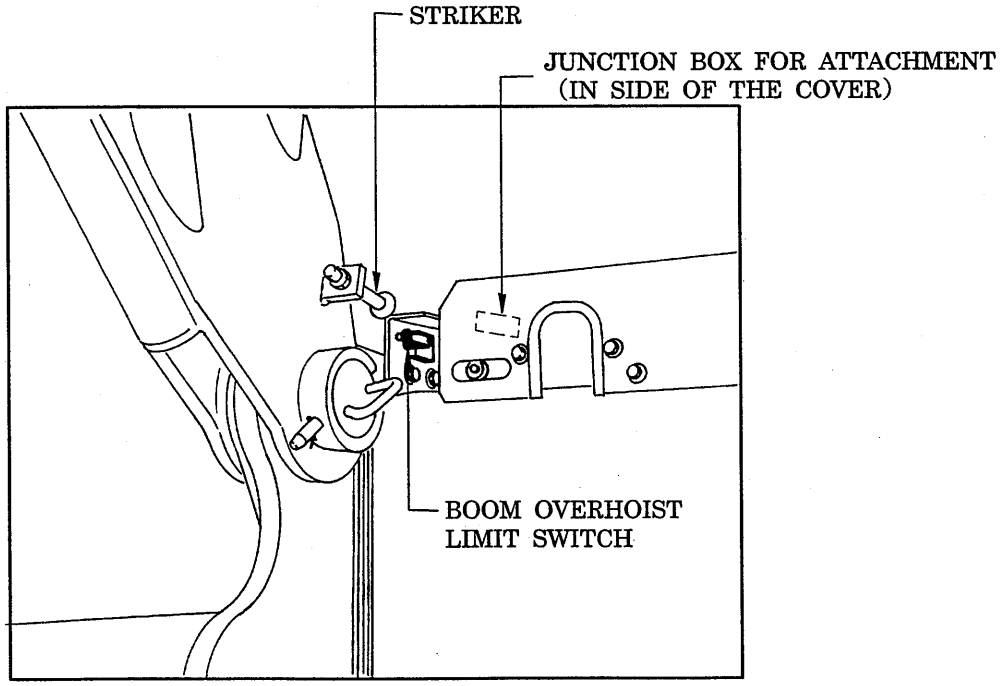




DETAIL OF OPERATOR'S ROOM INSIDE



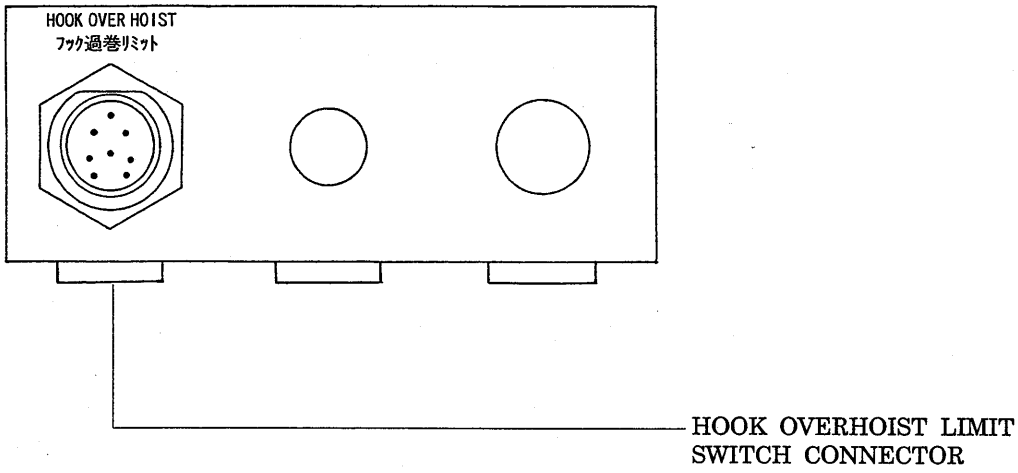
FRONT OF UPPER



3.2 KINDS AND FUNCTIONS OF EQUIPMENTS

ATTACHMENT JUNCTION BOX

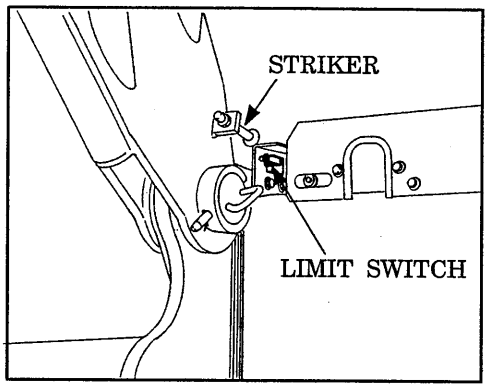
This is the junction of the cable from the attachment detector and the cable in the operator's room.



CRANE BOOM OVERHOIST LIMIT SWITCH

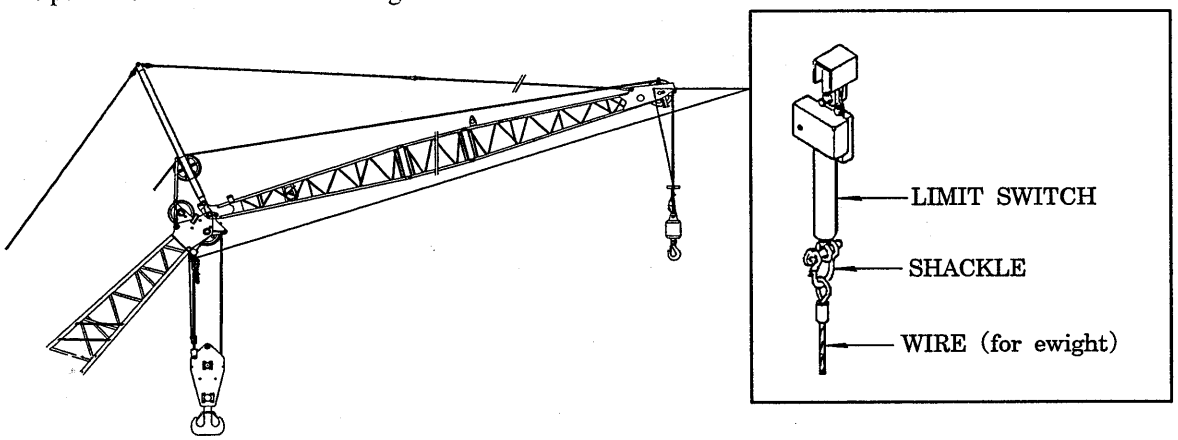
This prevents the boom from overhoisting.

When the boom hoist operation is stopped by the boom overhoist limit switch, the stop function cannot be released by the boom overhoist limit switch.



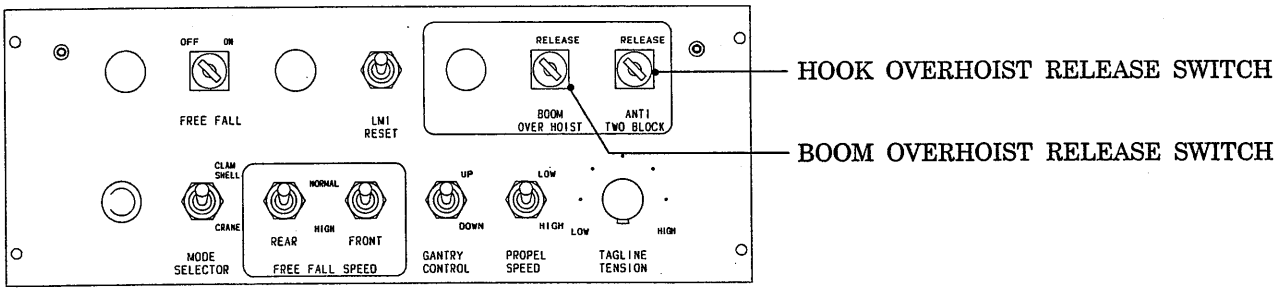
HOOK ANTI-TWO-BLOCK (OVERHOIST) LIMIT SWITCH

This prevents from hook overhoisting.



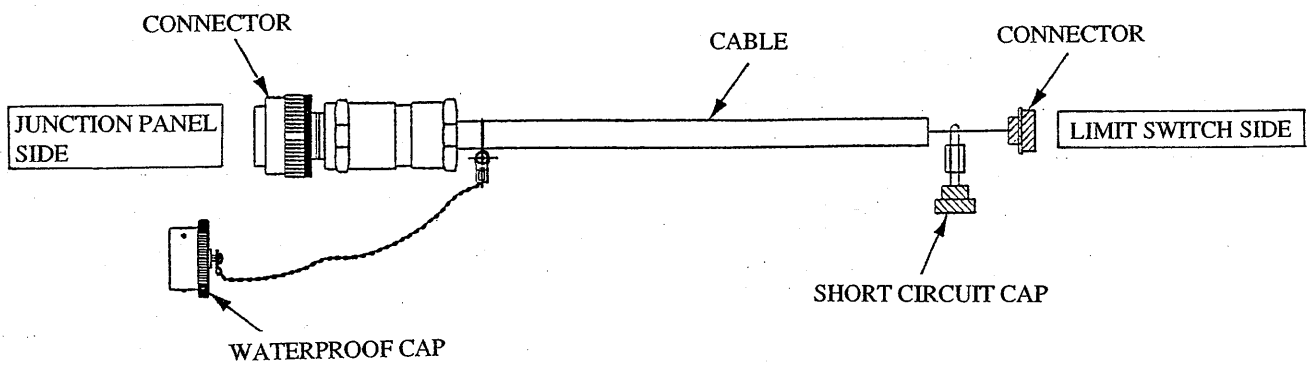
RELEASE SWITCH

This is used to release automatic stop.

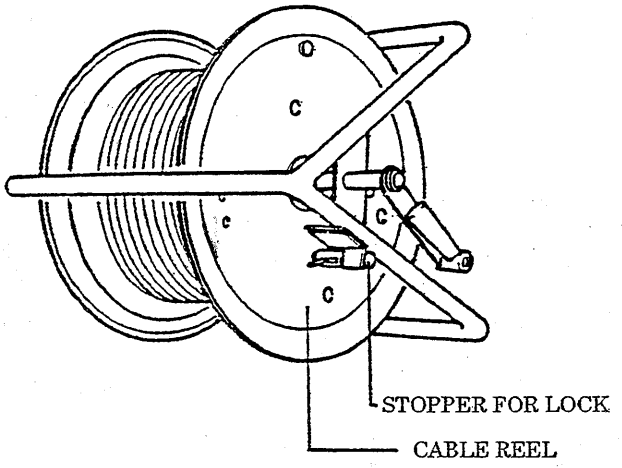


CABLE FOR HOOK ANTI-TWO-BLOCK (OVERHOIST) LIMIT SWITCH

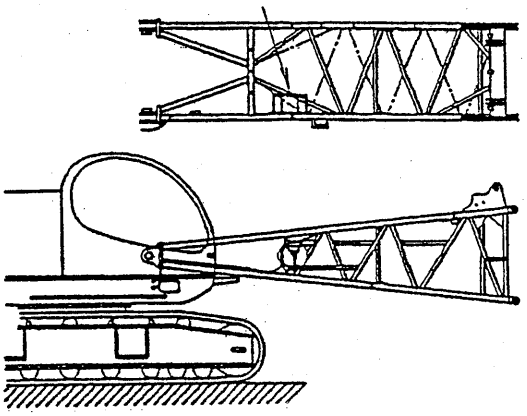
This cable connects the limit switch and the relay panel.



CABLE REEL



CABLE REEL FOR HOOK OVERHOIST



3.3 CONNECTING PROCEDURE OF WIRING

3.3.1 CRANE ATTACHMENT

1. CONNECTING PROCEDURE

⚠ CAUTION

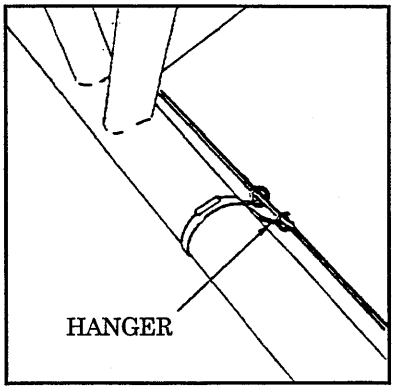
The cable should be handled with care in order to avoid damage.

When assembling the basic machine and attachment, connect the connectors as follows. And, when disassembling, disconnect the connectors in the reverse order.

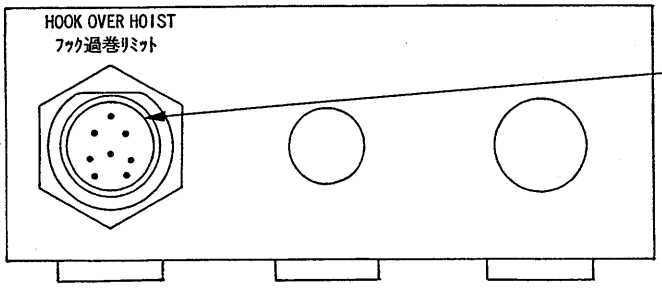
When connecting the connectors, in order to prevent water from entering,

1. Tighten with hands fully securely.
2. Connect the removed caps each other, too.
3. After disconnecting, install the cap securely.

Fix the junction cables and cables for the limit switches to the boom and jib with the hangers.



(1) CONNECTING JUNCTION BOX FOR ATTACHMENT



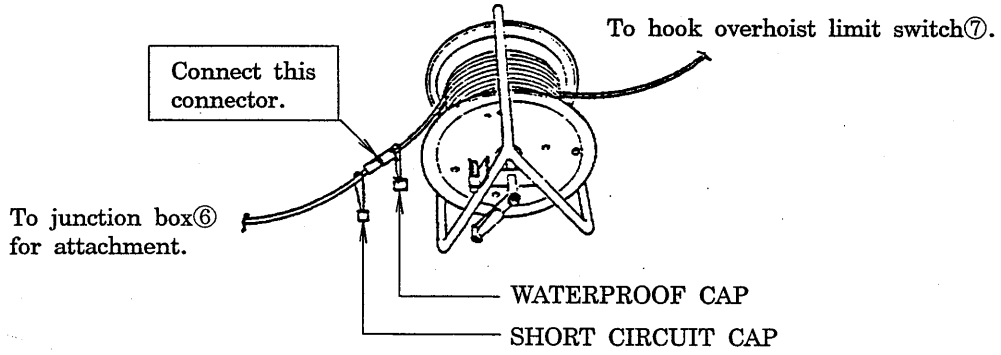
Connect cable for hook overhoist limit switch.

(2) CONNECTING CABLE REEL

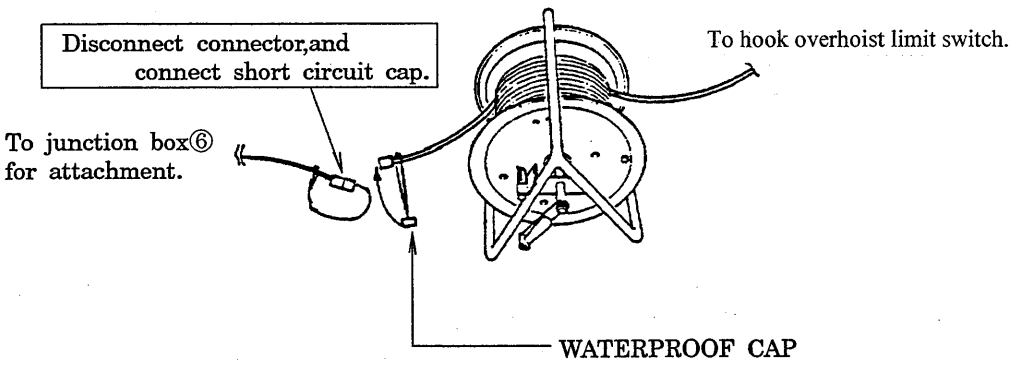
FOR OPERATING CRANE

⚠ WARNING

Do not operate crane with connecting short circuit cap, because
automatic stop and alarm do not work when the hook is overhoisted.



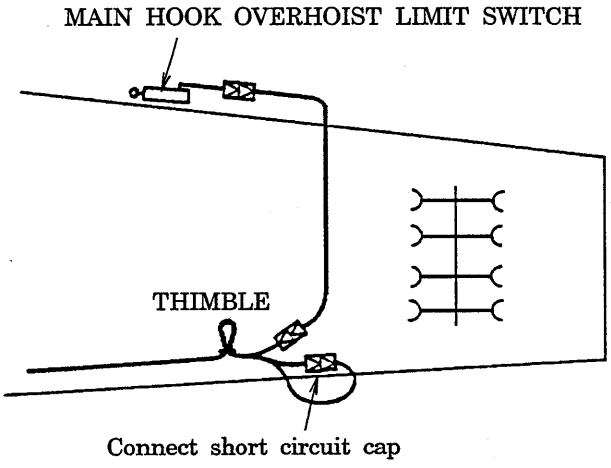
FOR TRANSPORTATION



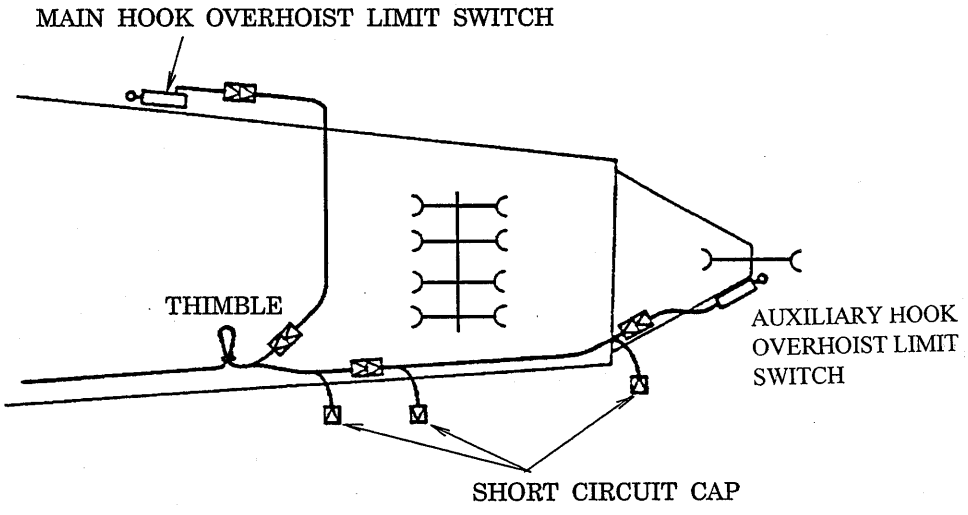
(3) CONNECTION OF CABLES AT BOOM TIP SECTION

A thimble hook for supporting the cable is provided on the boom tip section. If the cable is not hung to this hook, unreasonable force is loaded to the connector for connecting the hook limit switch. Be sure to hang the thimble to this hook.

(4) CONNECTION OF THE HOOK OVERHOIST LIMIT SWITCH SECTION

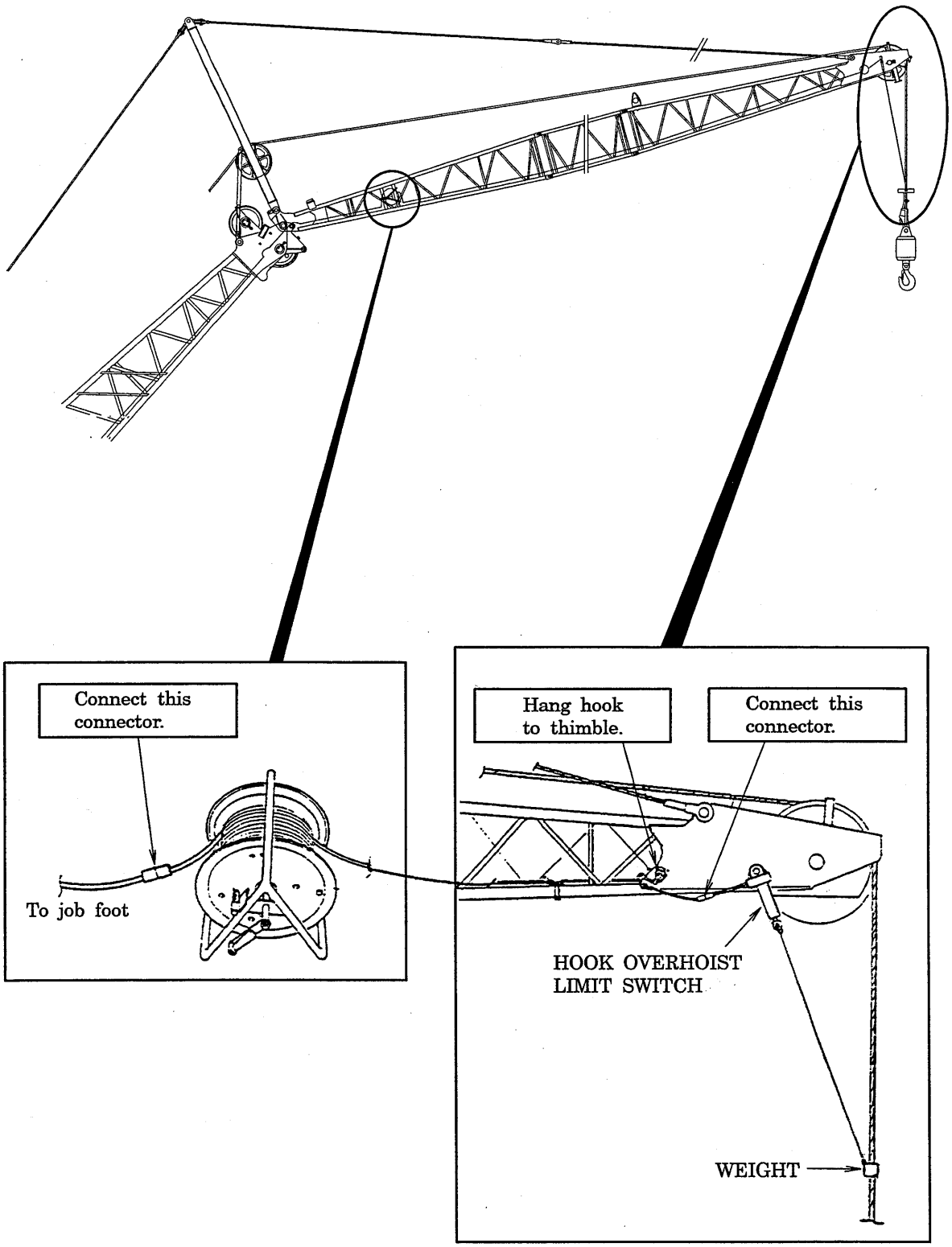


Connecting when boom only



Connecting when auxiliary sheave is attached

(5) CONNECTING THE JIB SECTION (WITH FIXED JIB)



3.4 WARNING ALARM AND AUTOMATIC STOP

3.4.1 ITEMS OF WARNING ALARM AND AUTOMATIC STOP

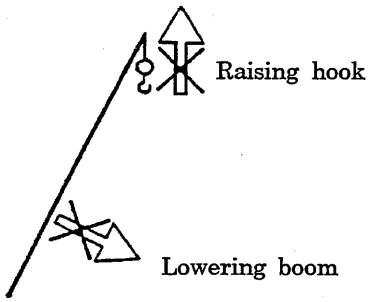
3.4.2 CONTENTS OF AUTOMATIC STOP

When the machine stops automatically due to respective dangerous condition, the machine cannot be operated in the × mark direction in the following figures. Since the direction without the × mark is safe side, the machine can be operated in this direction even without operating the release switch.

When the machine stops automatically, immediately operate the machine to the safe side.

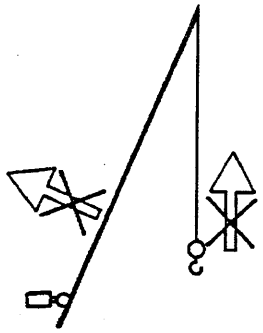
CRANE OPERATION

① HOOK ANTI-TWO-BLOCK (OVERHOIST)



② BOOM OVERHOIST

(Controlled by boom overhoist limit switch)



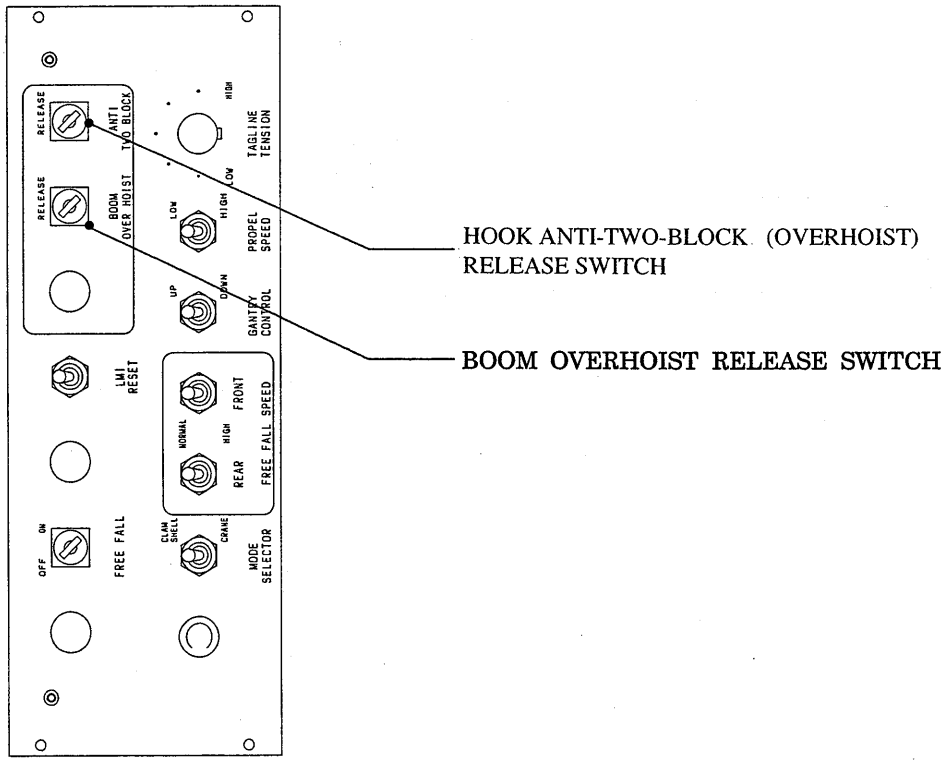
Generally, when the boom is overhoisted, the limit switch functions to stop boom hoist automatically.
If the operator releases the automatic stop at this time and raises the boom more, the limit switch for boom overhoist stops the machine automatically in this time. The automatic stop in this time cannot be released.

3.4.3 RELEASE OF AUTOMATIC STOP

(1) AUTOMATIC STOP RELEASE SWITCH

DANGER

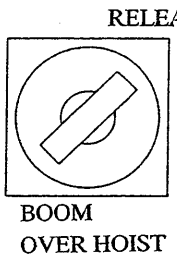
Do not operate crane with keeping the release switches fixed in the RELEASE position.



(2) OPERATION OF AUTOMATIC STOP RELEASE SWITCH

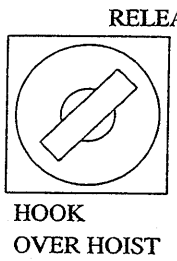
Use this switch only when releasing the automatic stop to operate the machine for emergency or maintenance work is required.

• BOOM OVERHOIST RELEASE SWITCH



This releases the automatic stop function due to boom overhoist.
By placing the key in the RELEASE position, the automatic stop is released.

• HOOK ANTI-TWO-BLOCK (OVERHOIST) RELEASE SWITCH



This switch releases the automatic stop when the hook is overhoisted.
By placing the key in the RELEASE position, the automatic stop is released.

When releasing the automatic stop function due to overhoist, turn and hold the release switch as it is. If released, the switch returns to the neutral position to allow the automatic stop function to operate.

When releasing the automatic stop function, be sure to operate the corresponding release switch.
Even by operating a release switch without relation, the function cannot be released.

⚠ WARNING

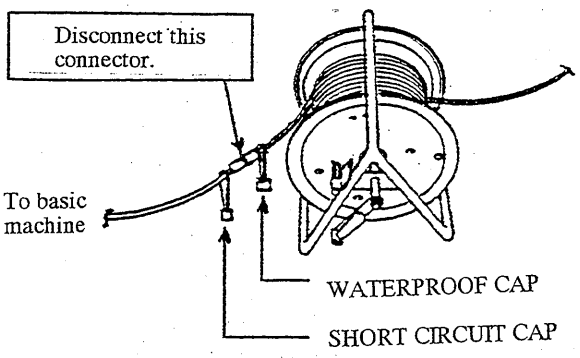
Use the release switch only under necessary circumstances such as disassembling and assembling the machine.
Failure to observe this precaution may result in serious injury or loss of life.

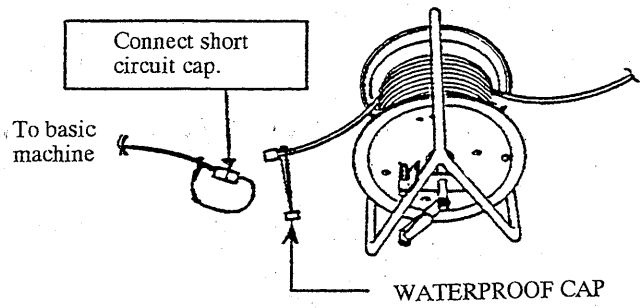
(3) RELEASE OF AUTOMATIC STOP WHEN ASSEMBLING AND DISASSEMBLING THE BOOM

① Release by Short-circuiting the Cable for the Hook Overhoist Limit Switch

When the cable for the hook overhoist limit switch is not completely connected, the automatic stop function operates. When raising or lowering the boom or when winding the winch wire rope onto the drum in assembling and disassembling work, make the following measures.

Using the short circuit cap, short-circuit the cable for the hook overhoist limit switch in the place of the cable reel for the boom base section.





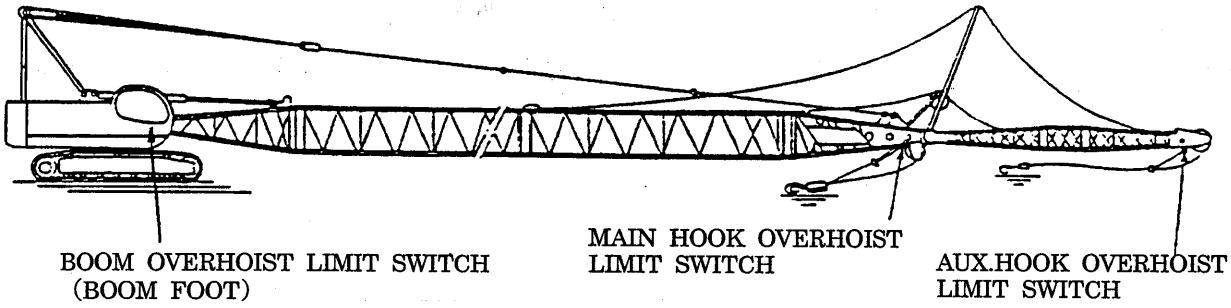
⚠ WARNING

Absolutely do not use the short circuit cap except when disassembling and assembling the basic machine.
Failure to observe this precaution may result in serious injury or loss of life.

3.5 INSPECTION

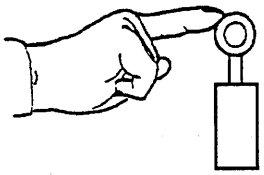
3.5.1 INSPECTION BEFORE RAISING THE BOOM AFTER ASSEMBLY OF ATTACHMENT IS COMPLETED.

After the assembly of attachment is completed, inspect the safety device relation for performance, and confirm that there is no abnormality, then raise the boom.
Besides, since sometimes the limit switch may already operates, pull the limit switch once to set to the safe condition, then inspect respectively as follows:



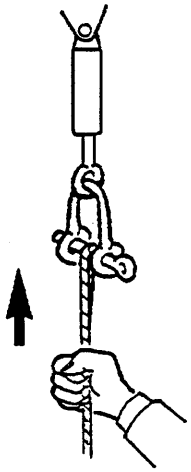
• Inspection of Boom Overhoist Limit Switch

Push the roller of the limit switch with hand, and confirm that the alarm buzzer is sounding.



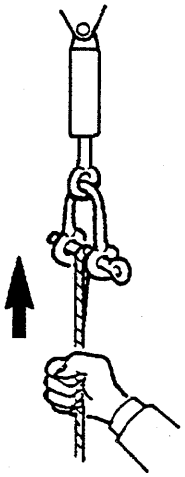
• Inspection of Main Hook Anti-two-block (Overhoist) Limit Switch

Push up the weight lifting rope of the limit switch to confirm that the alarm buzzer is sounding, and pull the rope with hand to confirm that the alarm buzzer is stopped.



• Inspection of Auxiliary Hook Anti-two-block (Overhoist) Limit Switch

Push up the weight lifting rope of the limit switch to confirm that the alarm buzzer is sounding, and pull the rope with hand to confirm that the alarm buzzer is stopped.



3.5.2 INSPECTION AFTER ERECTING THE ATTACHMENT

Operate the machine up to the respective dangerous condition, and confirm that the automatic stop/warning alarm functions. The automatic stop angle of the boom in the overhoist side is shown in the following table.

Classification	Kind of Overhoist	Classification of Stop	Automatic Stop Angle
Crane	Boom overhoist	Limit switch	84 degrees

4. UNLOADING/LOADING THE BASIC MACHINE

This section covers the basic machine unloading from and loading on a transport trailer, with the condition of the basic machine of which the counterweight has been removed and the gantry and crawlers have been set to the transport positions (retracted positions).
Confirm the following items before entering the actual work.

(1) PLACE
The ground must be level and firm, and improve the ground as required.

(2) WORKING PROCEDURE AND PREARRANGEMENT FOR SAFETY
Before working, all concerned must gather, make prearrangement for procedure and safety, and make precise role and responsibility of each person.

(3) PREOPERATION CHECKS
Perform preoperation checks of the basic machine.

(4) When transporting, install the short circuit cap of the hook overhoist cable to release the hook overhoist. Be sure to remove the short circuit cap when operating the machine.

DANGER

- Disassembly and assembly work requires cooperation among workers. It is therefore essential to nominate a supervisor and to make thorough arrangements beforehand as to signals, so as to avoid any possible misunderstandings.
- Do not stand under any part of the crane or jib. Do not handle boom or jib sections with chains, hooks or wire ropes attached directly to chords or lacings. This can cause structural damage which can result in collapse of the section under load.

Failure to observe this precaution may result in serious injury or loss of life.

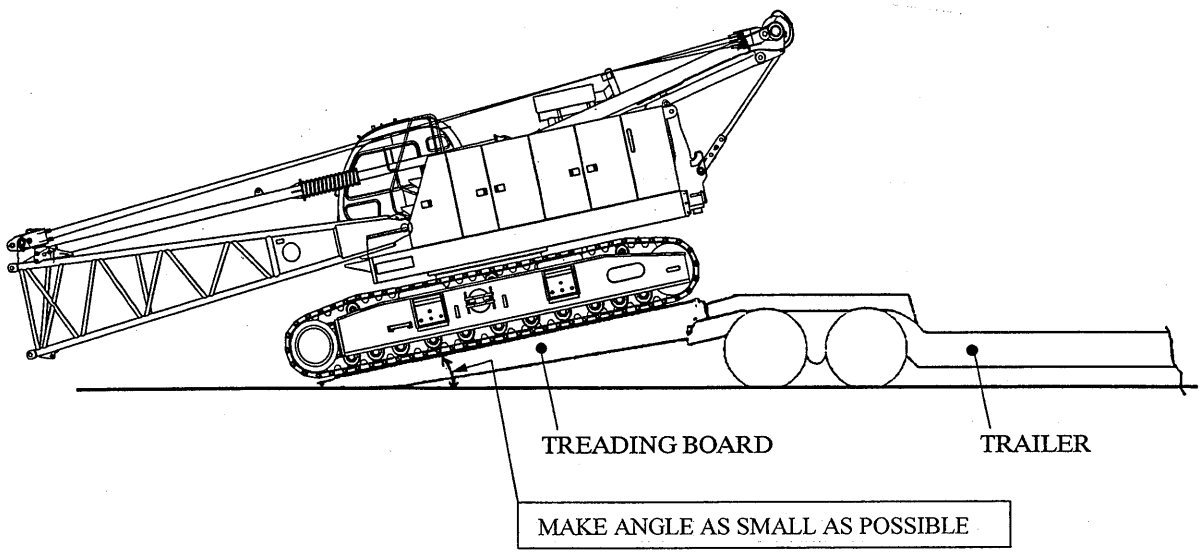
4.1 UNLOADING THE BASIC MACHINE FROM THE TRAILER

(1) After confirming the ground condition of a place where the basic machine is unloaded, stop the trailer.

(2) Using treading boards, unload the machine with the drive sprocket to the rear.

⚠ DANGER

Do not swing the machine on the trailer to avoid overturning.



4.2 SWING LOADING THE MACHINE ON A TRAILER

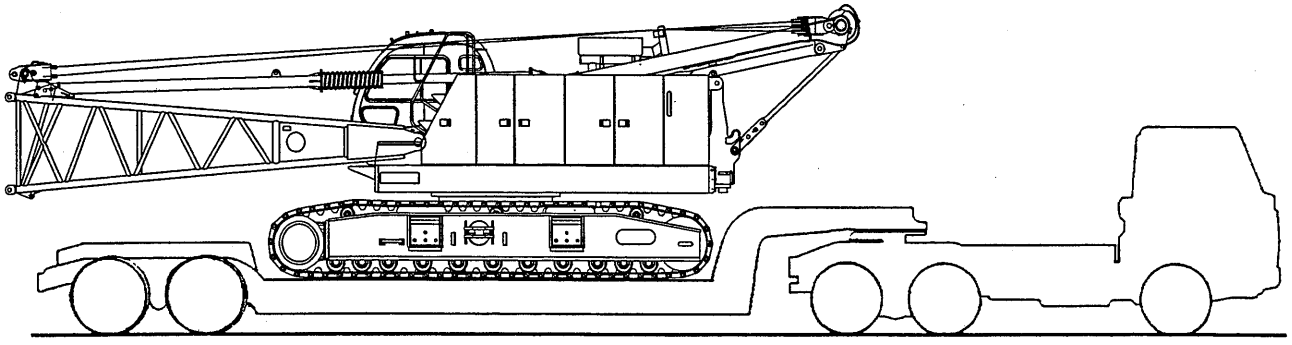
(1) Swing the upper so that the upper becomes parallel with the crawlers, insert the swing lock pin, and engage the swing brake.

(2) Using treading boards, load the machine with the sprockets to the rear on a trailer.

⚠ DANGER

Do not swing the machine on the trailer to avoid overturning.

(3) Secure the basic machine to the trailer.



5. ASSEMBLY/DISASSEMBLY OF BASIC MACHINE

This section covers extending and retracting the crawlers, erecting and lowering the gantry, and installation and removal of the counterweight.
Before starting actual work, confirm the following items.

(1) PLACE

1) The ground must be level and firm. Improve ground condition a required, and place sheet plates of iron.
2) There must be adequate room to set an assisting crane and to allow free passage of vehicles.

(2) WORKING PROCEDURE AND PREVIOUS ARRANGEMENT FOR SAFETY

Before assembling work, gather all concerned to make previous arrangement for the working procedure and safety, and make precise role and responsibility of each person.

(3) PREOPERATION CHECKS

Perform the preoperation checks for the basic machine.

When the engine starts, the warning alarm of the safety device sounds for two to three seconds.
When assembly, coat the all pins with grease.

NOTE

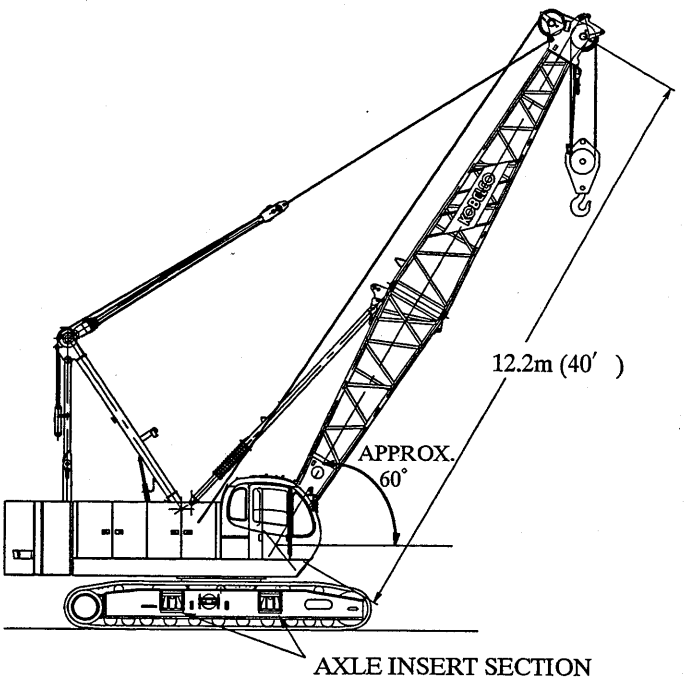
Since both safe and efficient operation are required of the operator, this section and the sections on controls and operation and Safe Operating Practices in the beginning of this manual should be studied before operating this machine.
Before actually rigging the machine, certain preparations should be made. They include the following:

1. Perform daily maintenance checks as specified in the section on Preventive Maintenance of this manual.
2. Determine the area to perform rigging operation considering that the boom must be hoisted directly in front of or behind the undercarriage.
3. Before dismantling or assembling the crane, remove any obstacles from the work area. Surround the work area with barricades in order to keep out unauthorized personnel, and allow space for vehicles carrying materials necessary for assembly to come and go freely.
4. When using an assisting crane, use a crane of sufficient lifting capacity and use suitable slings.

5.1 EXTENDING/RETRACTING THE CRAWLERS

⚠ WARNING

Be sure to confirm that people and obstacles are kept away from the area where the crawler is being extended.
Failure to observe this precaution may result in serious injury or loss of life.



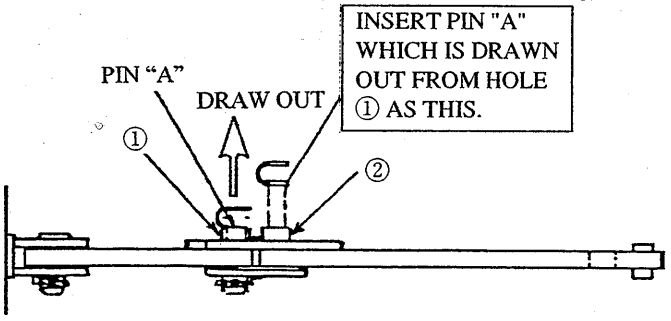
When extending and retracting the crawlers, perform the operation in the following conditions:

Without counterweight
Boom length ---- less than 40 ft (12.2 meters)
Boom angle ----- approx. 60°

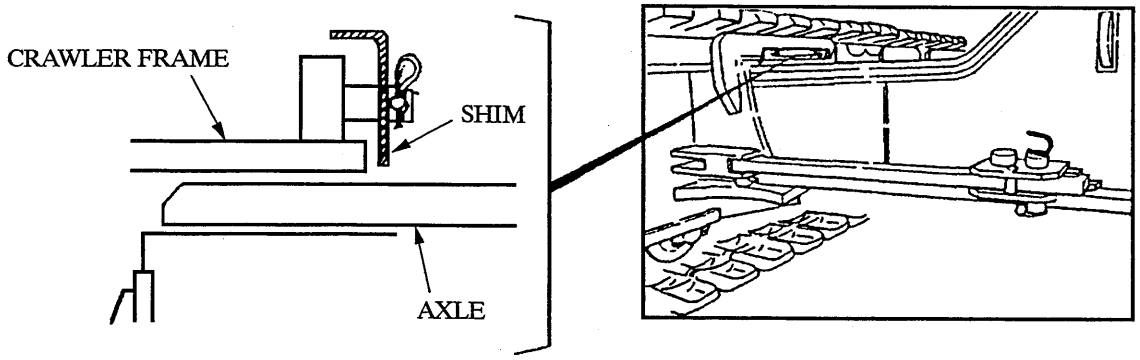
Before operating extending and retracting work, sufficiently clean the axles and extension axles, and coat the insert sections with grease.
If they are covered with mud, sometimes extending and retracting work cannot be operated normally.

5.1.1 EXTENDING THE CRAWLERS

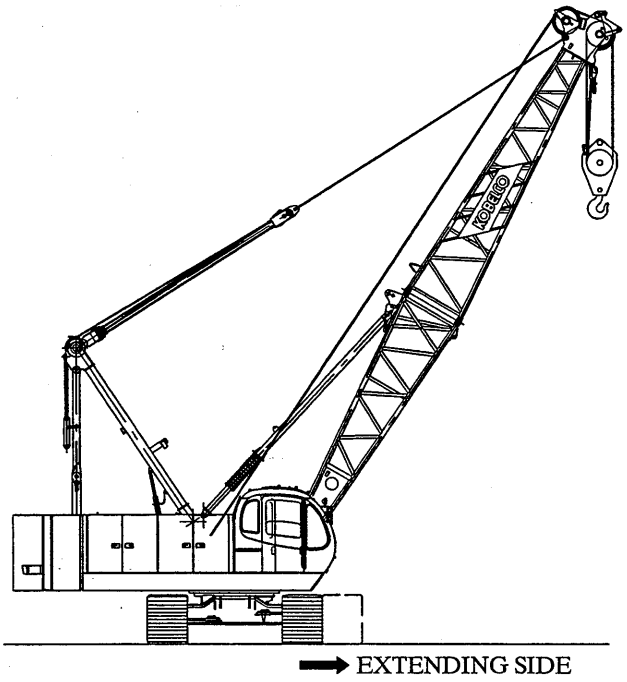
(1) Draw pins "A", which connect the crawler and the axles, out from holes ①, and insert them into link holes ②.



(2) Remove the shims for adjusting the clearance between the crawlers and axles.



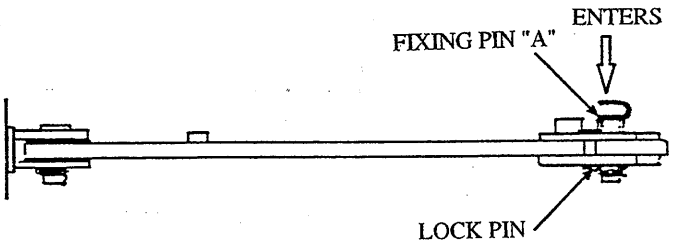
(3) Turn the upper slowly so that the upper is at right angle to the crawlers. At this time, turn the upper so that the front of the upper (operator's room) comes to the crawler side which is desired to be extended.



⚠ WARNING

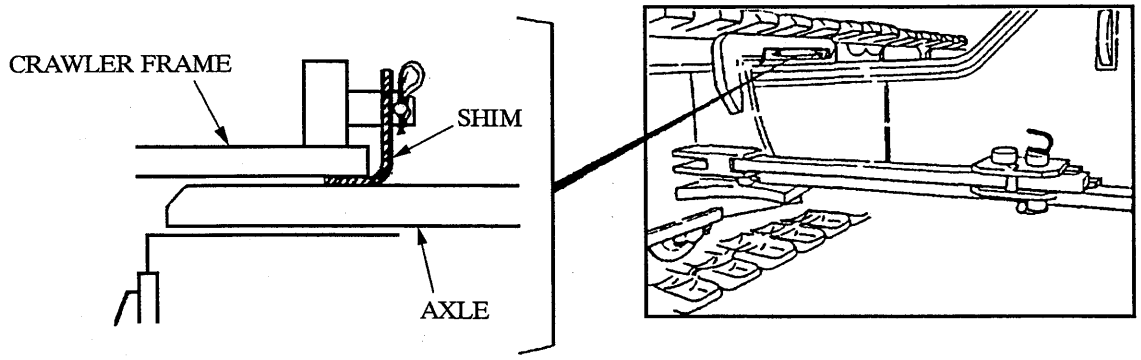
Be sure to confirm the machine stability to avoid machine from overturning.
Failure to observe this precaution may result in serious injury or loss of life.

(4) After confirming that there is no obstacle in the crawler extending side, operate the crawler extending/retracting control levers to the EXTENDING side to extend the crawler. If the crawler is not smoothly extended, while moving the crawler a little forward and backward, extend the crawler. When the crawler is extended to the extended position, fixing pins "A" enter automatically.
Insert the lock pins into fixing pins "A".



(5) Turn the upper by 180 degrees, and extend the other crawler in the same way.

(6) Turn the upper so that the clearance between the crawler and the axles becomes large, and install the clearance adjusting shims.
As the shims are stamped with numbers, install the shims so that the numbers coincide with the numbers of the frame sides.



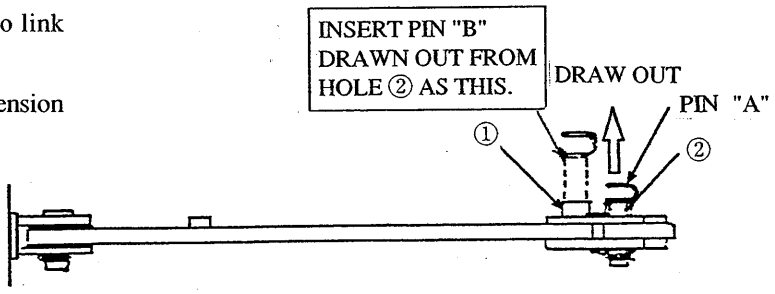
(7) Install pins "B" to the tip ends of the extension axles.

5.1.2 RETRACTING THE CRAWLER

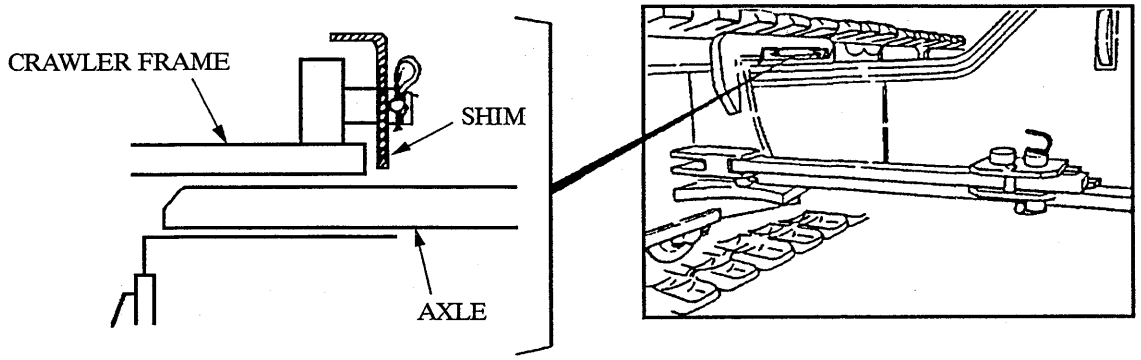
(1) Remove the counterweight

Draw out pins "A" which connect the crawlers to the axles from hole ②, and insert them into link holes ①.

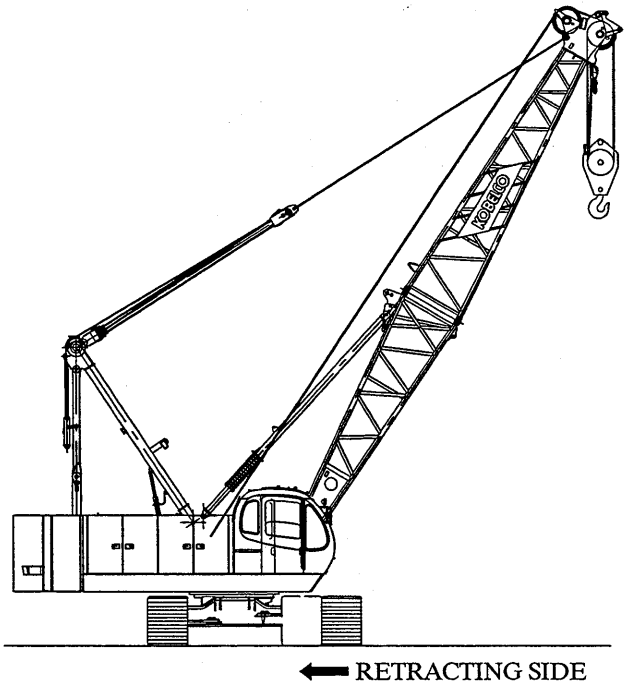
Remove pins "B" from the tip ends of the extension axles.



(2) Remove the shims for adjusting the clearance between the crawlers and axles.



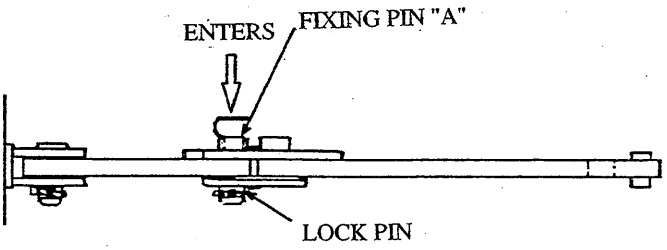
(3) Slowly turn the upper so that the upper becomes right angle to the crawlers. At this time, turn the upper so that the front of the upper (operator's room side) comes to the side of the crawler which is desired to be retracted.



⚠ WARNING

Be sure to confirm the machine stability to avoid machine from overturning.
Failure to observe this precaution may result in serious injury or loss of life.

(4) After confirming that there is no obstacle in the crawler retracting side, operate the crawler extending/retracting control lever to the RETRACT side to retract the crawlers. If the crawlers are not smoothly retracted, move the crawler in the retracting side forward and backward a little to retract it. When the crawlers are retracted to the retracting position, fixing pins "A" enter automatically.
Insert the lock pins into fixing pins "A".



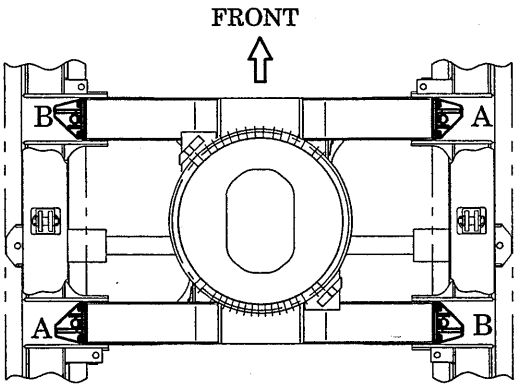
(5) Turn the upper by 180 degrees, and retract the other side crawler in the same way, too.

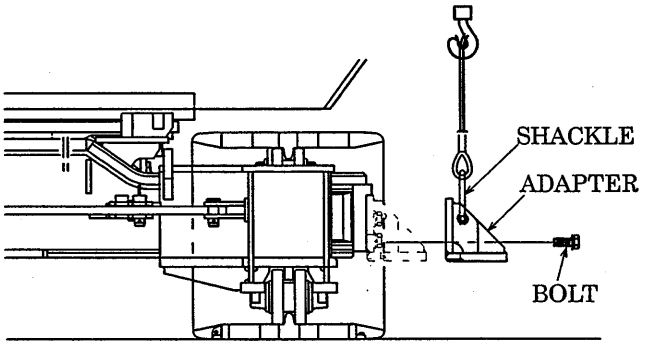
5.2 INSTALLING/REMOVING AXLE EXTENSION ADAPTERS

Fully retract the crawlers before installing or removing the axle extension adapters.
Remove the axle extension adapters (4 pos., left and right) during transportation.

5.2.1 INSTALLING AXLE EXTENSION ADAPTERS

(1) Install the attached shackle to the adapter, and lift it with the assisting crane. {Weight: approx. 126 LBS (57 kg) per piece}
(2) Fit the adapter to the axle, and fix it by tightening four bolts.
When tightening the bolt, securely tighten it to prevent loosening.
Tightening torque: 636 lbs·ft (863 N·m)





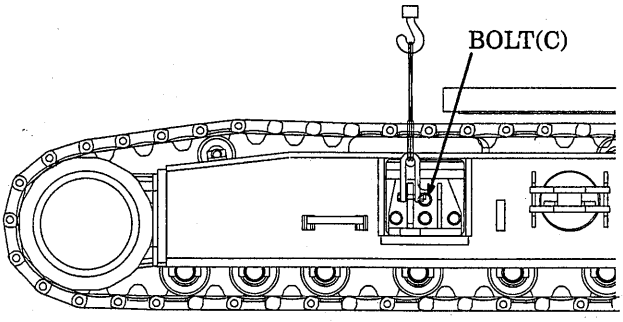
CAUTION

Check the correct installing positions of the adapters according to the types (A and B) prior to installation.

(3) Install the adapters to the remaining three positions in a similar manner.

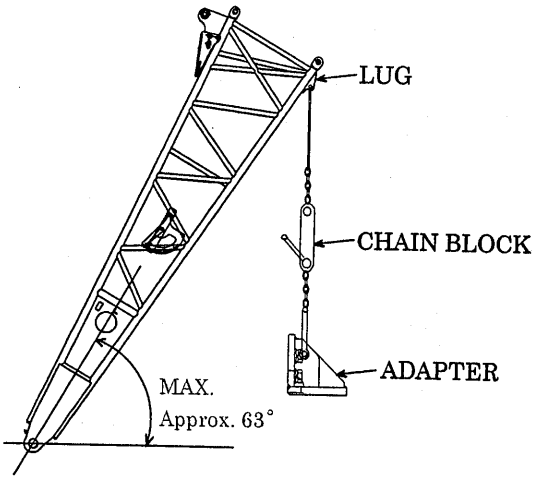
5.2.2 REMOVING AXLE EXTENSION ADAPTERS

(1) Detach the bolt (C), and install the attached shackle to the adapter.
(2) Lift the adapter with the assisting crane, and detach the bolts.
(3) Remove the remaining three adapters in a similar manner.



WARNING

If the assisting crane cannot be prepared, the axle adapters can be installed by setting the nylon sling and the chain block to the lug on the lower boom end.
In such a case, be extremely careful of the chain block operation.
Failure to observe this precaution may result in serious injury or loss of life.



5.3 ERECTING/LOWERING THE GANTRY

⚠ CAUTION

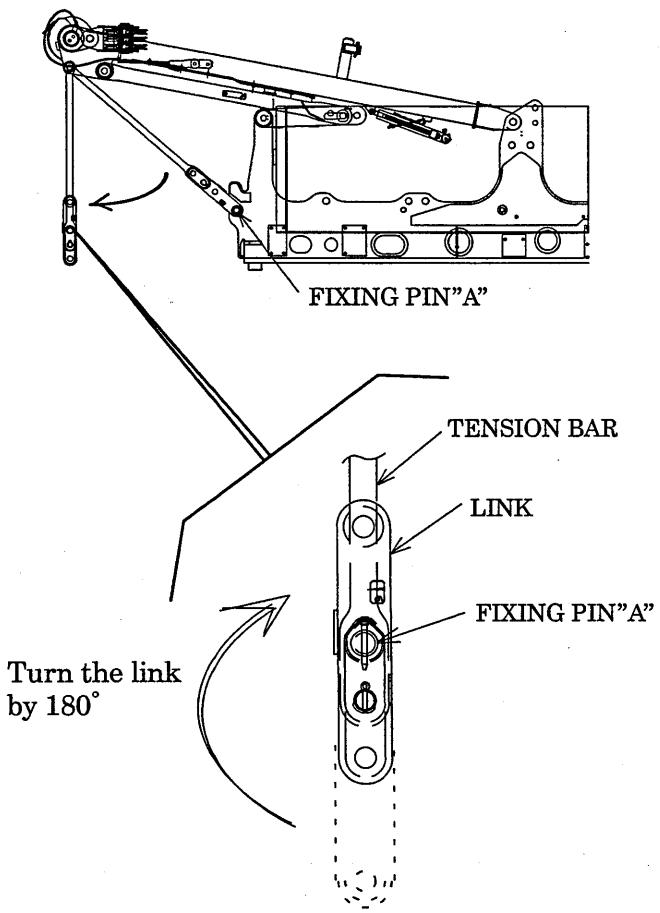
Boom should be placed on the ground and no load on boom hoist line when raising or lowering the gantry.

5.3.1 ERECTING THE GANTRY

Erect the gantry to change the machine condition from the transport posture to the working posture.

(1) Detach the pin "A", fixing the tension bar to the revolving frame, and remove the tension bar.

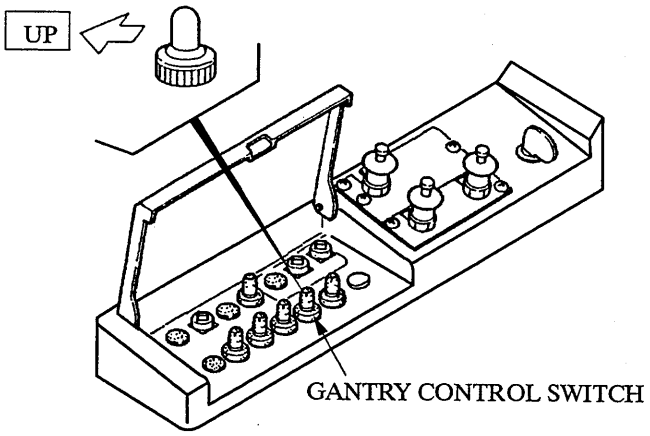
(2) Then, turn the link of the tension bar by 180°, and fix the link to the tension bar with the fixing pin "A" (link storage position).



(3) Place the gantry control switch in the UP position (outside). The gantry is pushed up with the cylinders.

⚠ CAUTION

Do not operate gantry control switch during crane operation or when boom hoist line is loaded.



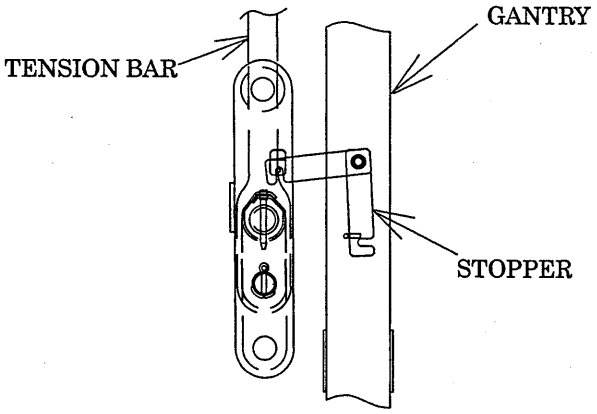
(4) When the gantry is raised to the working position, insert fixing pins "B" and secure them with the spring pins.

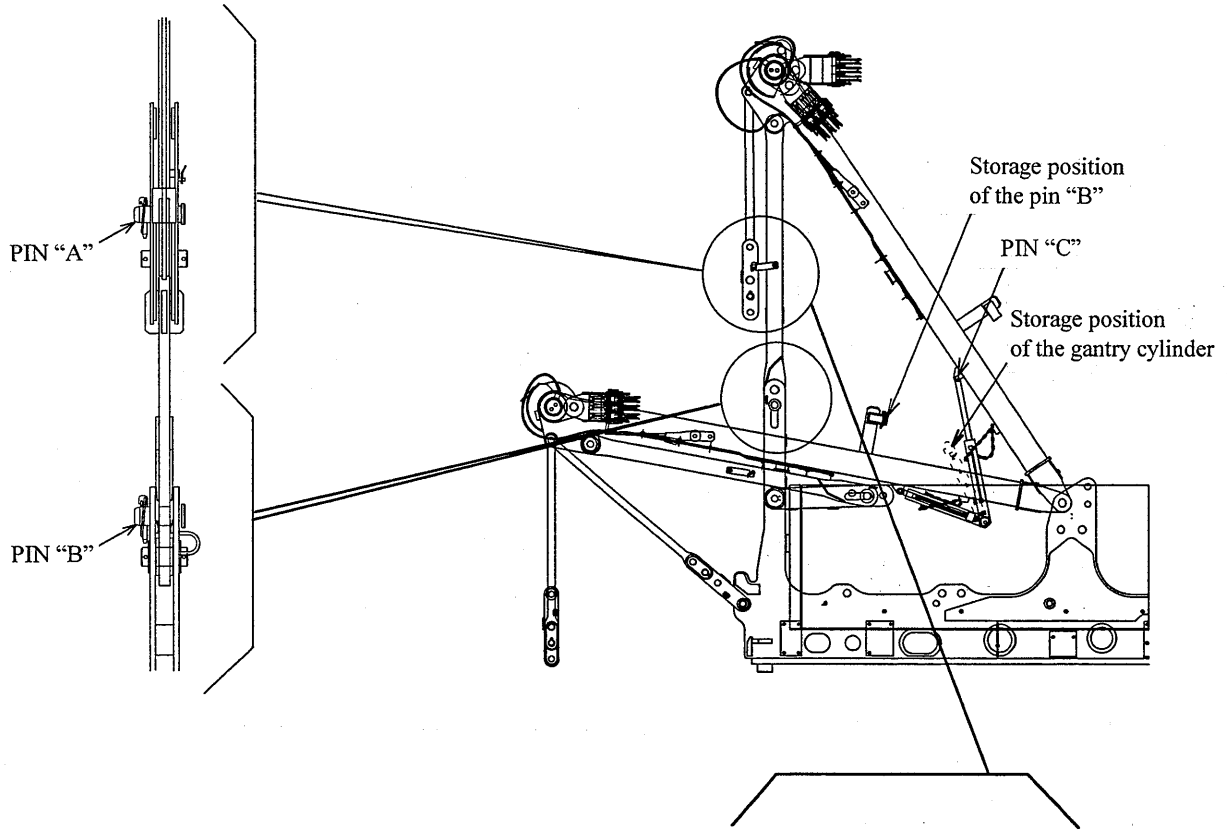
(5) Turn the link stopper attached to the gantry, fit it to the link-side pin.

(6) Detach the pin "C" and retract the gantry cylinder.

⚠ DANGER

Do not raise the gantry by using the boom hoist wire rope or the aux. crane.
The gantry may suddenly drop at the moment that the fixing pin is removed to lower the gantry.





5.3.2 LOWERING THE GANTRY

(1) Connect the gantry cylinder to the "working position", and securely support the gantry with the gantry cylinder.

(2) Store the link stopper, and remove the gantry fixing pin "B".

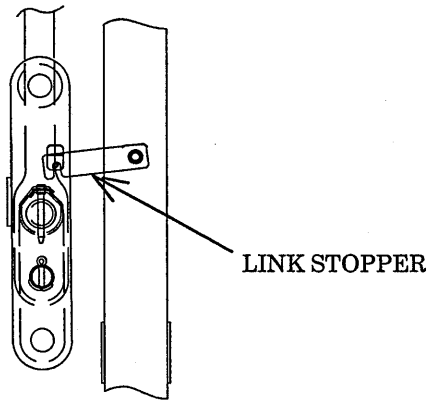
⚠ DANGER

Do not stand under the gantry when raising or lowering the gantry.
Failure to observe this precaution may result in serious injury or loss of life.

(3) Place the gantry control switch in the DOWN position (inside) to lower the gantry.

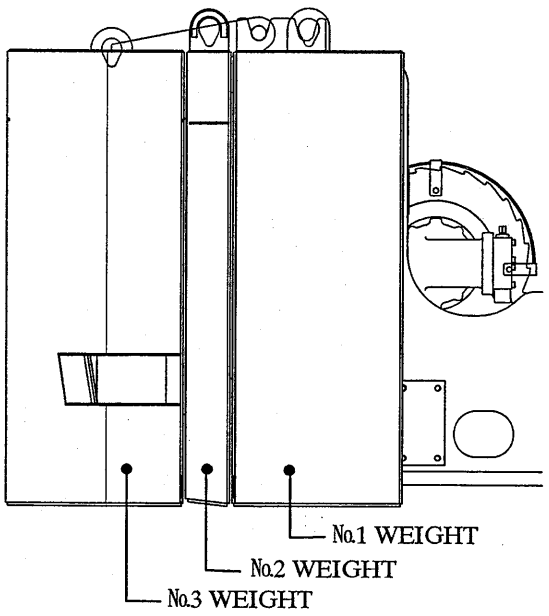
(4) Insert gantry fixing pins "B" into the storage position.

(5) Turn the link, and connect the tension bar to the revolving frame to fix the gantry.



5.4 INSTALLATION,REMOVAL OF THE COUNTERWEIGHT

The counterweight of this machine is composed of three section.
Remove the counterweight at transportation.
Never use the weight which is not specified.
The mounting bolts of the counterweight must be tightened securely enough and not to come loose.



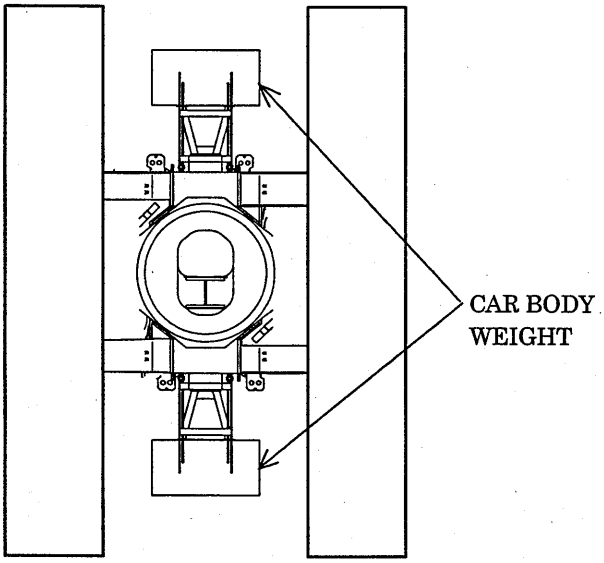
WEIGHT OF EACH SECTION

Section	Weight lbs. (kg)
No. 1 Weight	27,342 (12400)
No. 2 Weight	8,159 (3700)
No. 3 Weight	27,562 (12500)
Car body weight	4,410 (2000) x 2

5.4.1 INSTALLATION OF THE COUNTERWEIGHT

Prior to installation, check the following points of the basic machine.

① Gantry must be in the operating position.
② The basic machine is placed on the leveled and firm ground.
③ The crawlers are in the operating position.



⚠ WARNING

Make sure machine is in stability range during swing and propel (refer to chapter 9) to avoid machine turn-over.
Failure to observe this precaution may result in serious accident.

(Tool) : • One set of attached tools.
• Assisting crane (25 ton class)
• Lifting wire rope
1 inch (25 mm) dia ×26 ft (8m) 2sets

NOTE

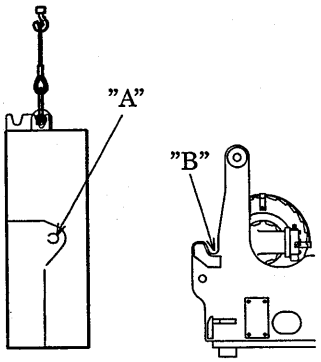
The counterweight can be installed or removed without the assisting crane by using the counter weight self removal device (optional).
For the details of operation, refer to the separate operation manual.

(1) Installation of No.1 weight.

1) Install the lifting shackle to the lifting bracket of No.1 weight and lift it with the assisting crane.

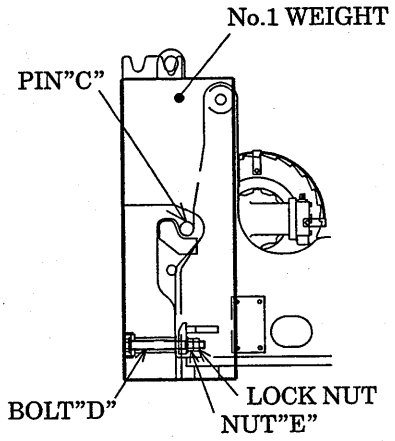
DANGER

Do not stand under lifted counterweight or between counterweight and the basic machine to avoid accident of drop or being caught. Failure to observe this precaution may result in serious injury or loss of life.



2) Place the portion "A" of No.1 weight to the portion "B" of the basic machine and install the pin "C" and the lock pin.

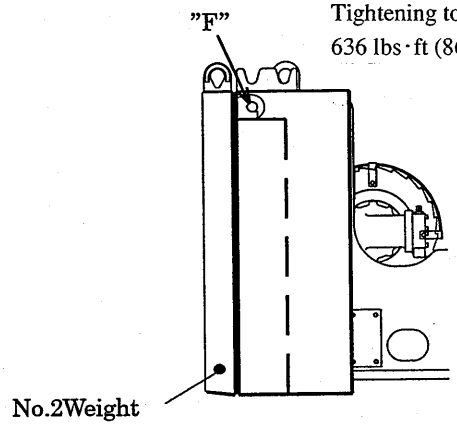
3) Pass the bolt "D" through the No.1 weight, and fix the No.1 weight to the frame with the nut "E". Then, lock it with the lock nut.
Tightening torque: 636 lbs·ft (863 N·m)



(2) Installation of No.2 weight.

1) Lift No.2 weight with the assisting crane.

2) Align the portion "F" of the No.2 weight with the portion "F" of the No.1 weight, and attach the No.2 weight to the back of the No.1 weight.



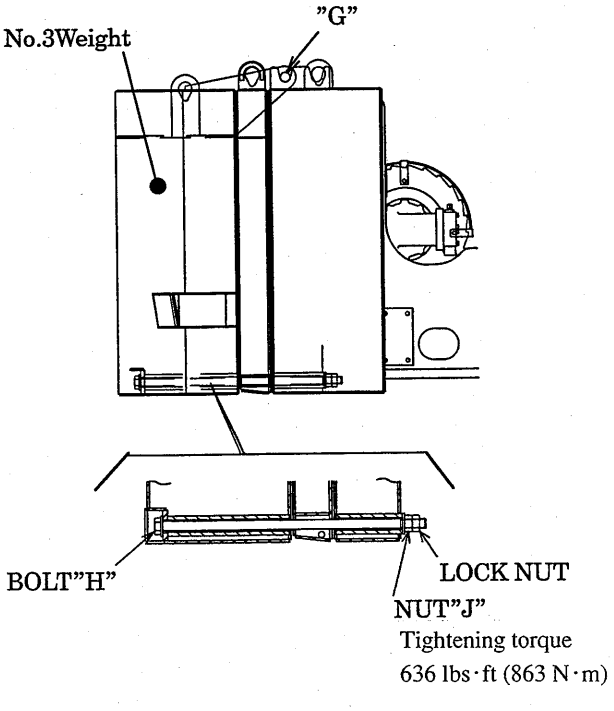
(3) Installation of No.3 weight.

1) Lift No.3 weight with the assisting crane.

2) Align the portion "G" of the No.3 weight with the portion "F" of the No.1 weight, and attach the No.3 weight to the back of the No.2 weight.

3) Pass the bolt "H" through the weights, and fix all of them with the nut "J". Then, lock it with the lock nut.
Tightening torque: 636 lbs·ft (863 N·m)

4) Make sure to use the assisting crane for lifting and insert the bolt "H" to avoid accident of drop
them.
Weight of the bolt ····· 401 lbs (18.2kg)

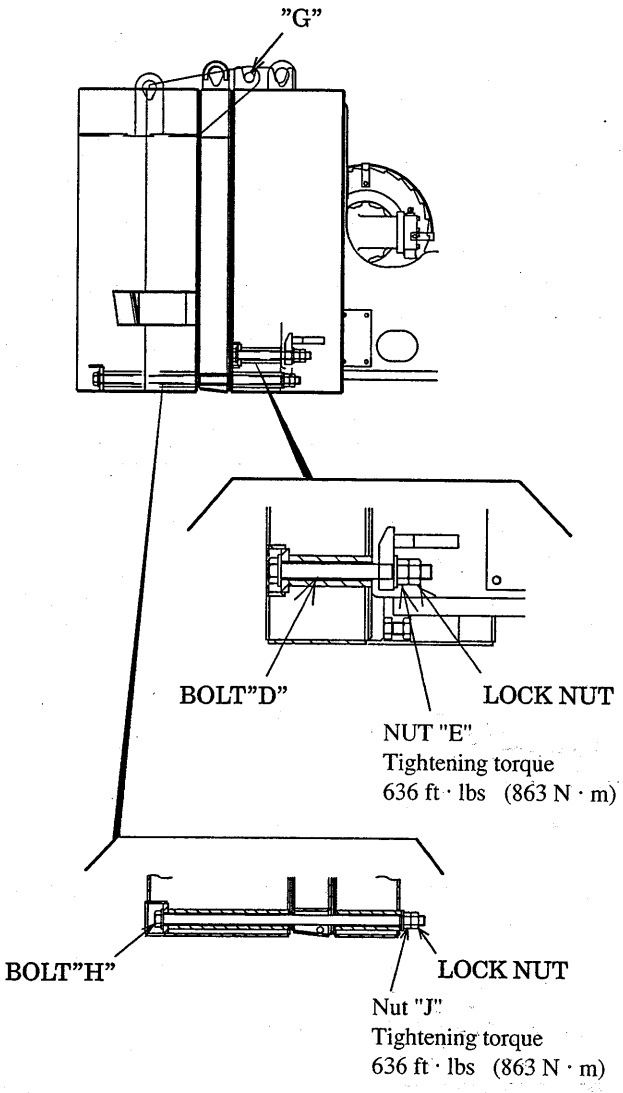


5.4.2 REMOVAL OF THE COUNTERWEIGHT

(1) Loosen the nut "J" and pull out the bolt "H".

DANGER

Do not stand under lifted counterweight or between counterweight and the basic machine to avoid accident of drop or being caught.
Failure to observe this precaution may result in serious injury or loss of life.



(2) Remove the weight No.3 and No.2 in its order one by one. Lay down the No. 2 weight. (See the note below.)

DANGER

STABILIZE REMOVED COUNTERWEIGHT

AVOID INJURE; AFTER REMOVING THIS COUNTERWEIGHT, LAY IT DOWN, SO THAT IT WILL NOT FALL OVER.

(3) Loosen the nut "E" and pull out the bolt "D".

(4) Remove the No. 1 weight.
Remove No. 1 weight after pulling out the pin "C".

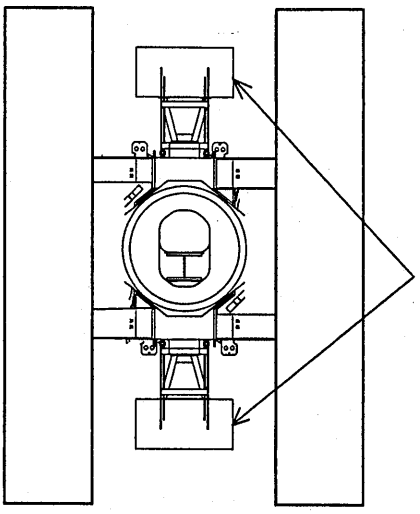
5.4.3 INSTALLING/REMOVING CAR BODY WEIGHTS

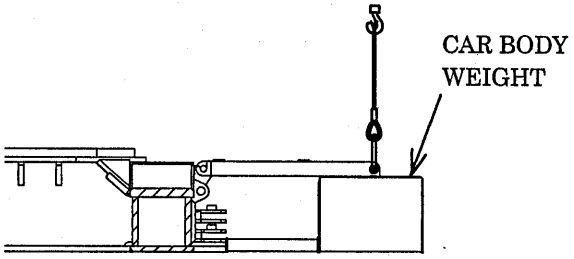
Always install the car body weights (2 pcs., front and rear) during operation.

DANGER

Do not stand under lifted counterweight or between counterweight and the basic machine to avoid accident of drop or being caught.
Failure to observe this precaution may result in serious injury or loss of life.

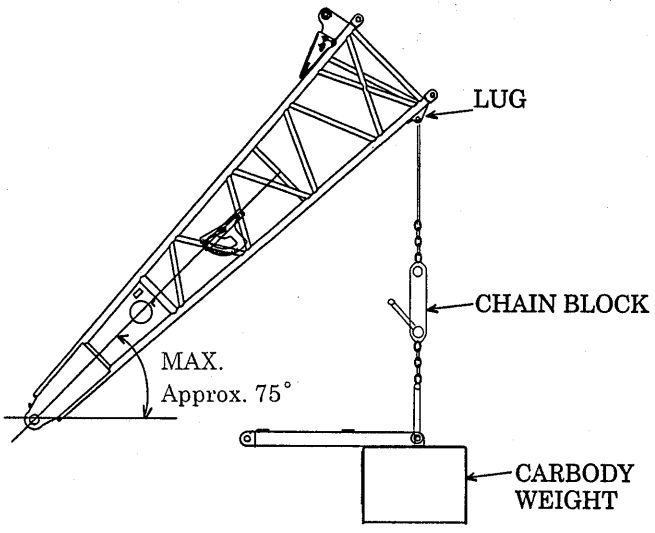
Lift the car body weights with the assisting crane, and install them by hooking them with the car body brackets.
When removing them, lift them with the assisting crane in a similar manner.





WARNING

If the assisting crane cannot be prepared, the carbody weights can be installed by setting the nylon sling and the chain block to the lug on the lower boom end.
In such a case, be extremely careful of the chain block operation.
Failure to observe this precaution may result in serious injury or loss of life.



6. ASSEMBLY/DISASSEMBLY OF CRANE ATTACHMENT

This section covers assembling, erecting, lowering and disassembling of the crane attachment and transport of the boom. Before starting the actual work, confirm the following items.

(1) PLACE

1) Paying attention to that erecting and lowering of the attachment must be operated in front or rear of the crawlers, there must be adequate room for assembling and the ground must be firm and level.
   Improve the ground as required and lay sheet plates of iron.
2) There must be also adequate room to set an assisting crane and to allow free passage of vehicles delivering necessary parts and for unloading and storing the parts until they are required.

(2) WORKING PROCEDURE AND PREARRANGEMENT FOR SAFETY.

Before assembling work, gather the all concerned to make previous arrangement for the working procedure and safety, and make precise role and responsibility of each person.

(3) PREOPERATION CHECKS

Perform the preoperation checks of the basic machine.

NOTE
When the engine starts, the warning alarm of the safety device always sounds for two to three seconds.

⚠ DANGER

Do not stand or work under, inside, or on the boom when installing or removing the connector pins at anytime.
Failure to observe this precaution may result in serious injury or loss of life.

⚠ DANGER

Do not apply slings directly to a sharp edge part to prevent the slings from cutting.
Apply the sling to the guy cable pin hole or bracket for lifting through a shackle.

⚠ WARNING

Before climbing on machine, make certain that the guard and walk ways are clean and dry, and use life belt in order to prevent falls due to slippery surface. Failure to observe this precaution may result in serious injury or loss of life.

⚠ WARNING

Do not put your hand or finger into a pin hole.

⚠ WARNING

To avoid serious injury, fix guy line to both ends of each boom when placing guy lines on the booms during boom connection.

⚠ CAUTION

Do not handle boom or jib sections with chains, hooks or wire rope attached directly to main chords or lacings. Either use soft material sling points or use fabric type slings.

6.1 ASSEMBLING THE ATTACHMENT

⚠ CAUTION

For most efficient use of this machine, boom and guy line arrangement must be correctly observed as shown in these figures.

[TOOLS]

- One set of attached tools
- Assisting crane (25 ton class)
- Lifting wire rope (fiber belt)
- Wooden blocking
- Sling cloths
- Steel bar [ϕ13/16 inch ×12 inch (ϕ20×300mm)]

6.1.1 ARRANGEMENT OF BOOM/JIB/ GUY LINE

(1) PREPARATION OF BOOM/JIB/GUY LINE AND STEEL BLOCKING PLATE

Prepare necessary parts.

① Boom and Jib

Prepare the boom and jib following to the arrangement chart.

Do not assemble the boom with boom arrangement not specified in the arrangement chart.

And also, check the each boom and jib for damage.

If damage is confirmed, repair the damage in the designated service shop.

Item	Boom Length
Length of boom to which jib can be attached.	80 ft to 190 ft (24.4 m to 57.9 m)
Length of boom to which auxiliary sheave can be attached.	40 ft to 190 ft (12.2 m to 57.9 m)

⚠ WARNING

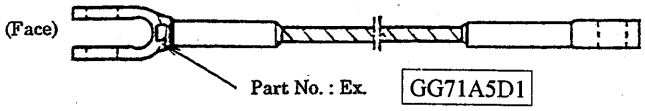
Do not use damaged boom section.
The damaged booms may collapse and cause serious injury or loss of life.

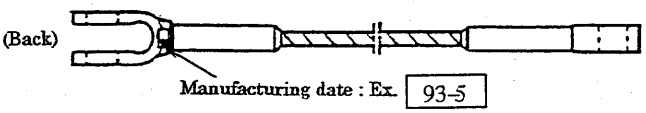
② Guy Line

Prepare the guy lines following the arrangement chart as the same as the boom/jib.

The diameter of the boom guy line is 30mm, and that of the jib guy line is 20mm.

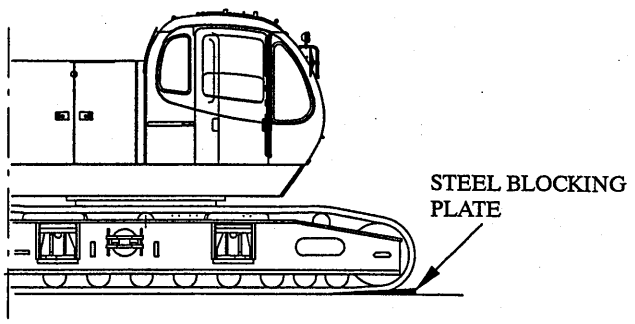
To discriminate each guy line, see the part number stamped on the connector part.

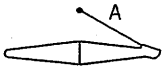
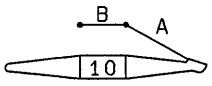
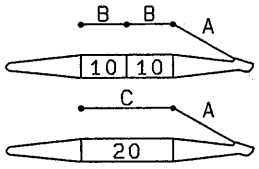
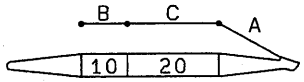
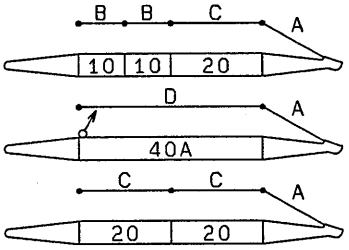
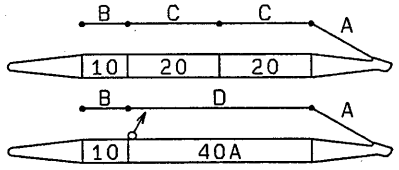
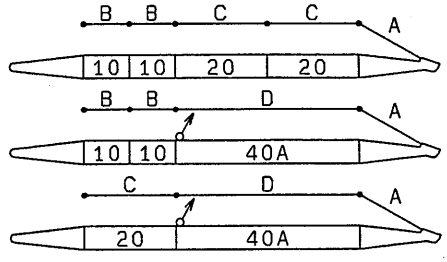




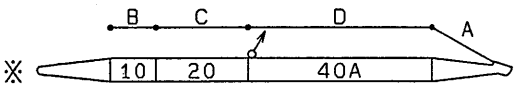
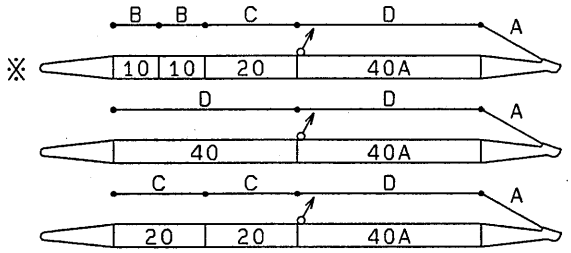
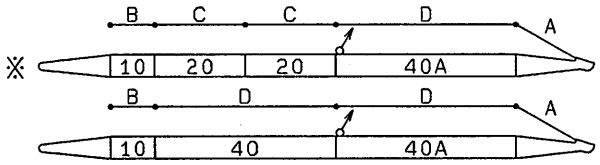
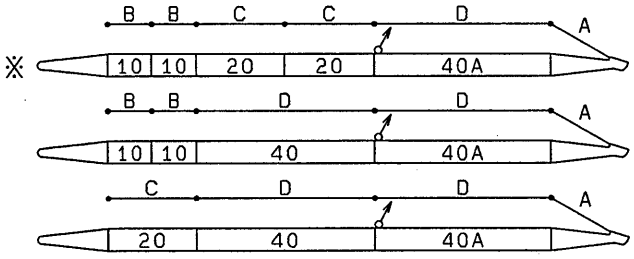
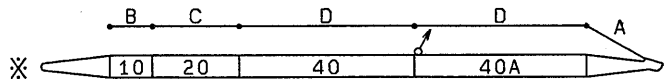
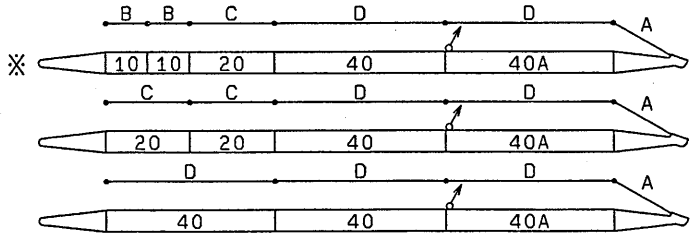
③ Steel Blocking Plate

For the combination of the boom of 190 feet (57.9 m) length and the jib of any length, place steel plates between the ends of the crawlers and the ground.

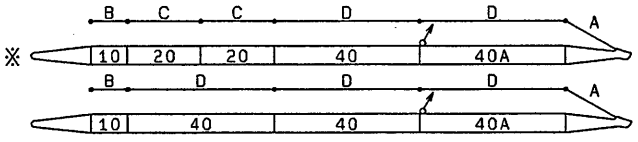
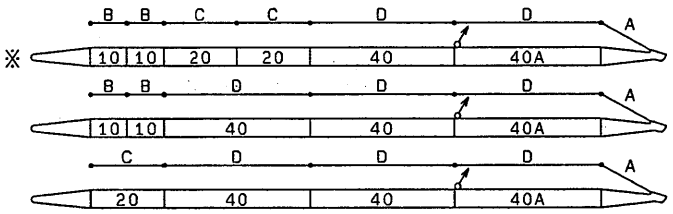
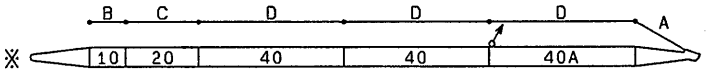
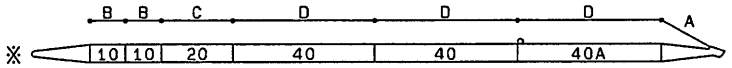


Boom Length ft(m)	Boom And Guy Line Arrangement Chart 1/3	With Aux.Sheave	With Jib	Main Hoist Reeving (No. of Line)	Aux. Hoist Reeving (No. of Line)
40 (12.2)		○	×	8	1
50 (15.2)		○	×	8	1
60 (18.3)	※ 	○	×	8	1
70 (21.3)	※ 	○	×	6	1
80 (24.4)	※ 	○	○	6	1
90 (27.4)	※ 	○	○	5	1
100 (30.5)	※ 	○	○	5	1

○ : Attachable × : Not attachable

Boom Length ft(m)	Boom And Guy Line Arrangement Chart 2/3	With Aux.Sheave	With Jib	Main Hoist Reeving (No. of Line)	Aux. Hoist Reeving (No. of Line)
110 (33.5)		○	○	4	1
120 (36.6m)		○	○	4	1
130 (39.6)		○	○	3	1
140 (42.7m)		○	○	3	1
150 (45.7)		○	○	3	1
160 (48.8)		○	○	2	1

○ : Attachable × : Not attachable

Boom Length ft(m)	Boom And Guy Line Arrangement Chart 3/3	With Aux.Sheave	With Jib	Main Hoist Reeving (No. of Line)	Aux. Hoist Reeving (No. of Line)
170 (51.8)		○	○	2	1
180 (54.9)		○	○	2	1
190 (57.9)		○	○	2	1
200 (61.0)		×	×	2	1

○ : Attachable × : Not attachable

♂ mark shows the insert boom with lugs attached and the guy line installing position when the jib is used.

※ mark shows the standard boom arrangement which make the boom arrangement of less than the each boom length possible.

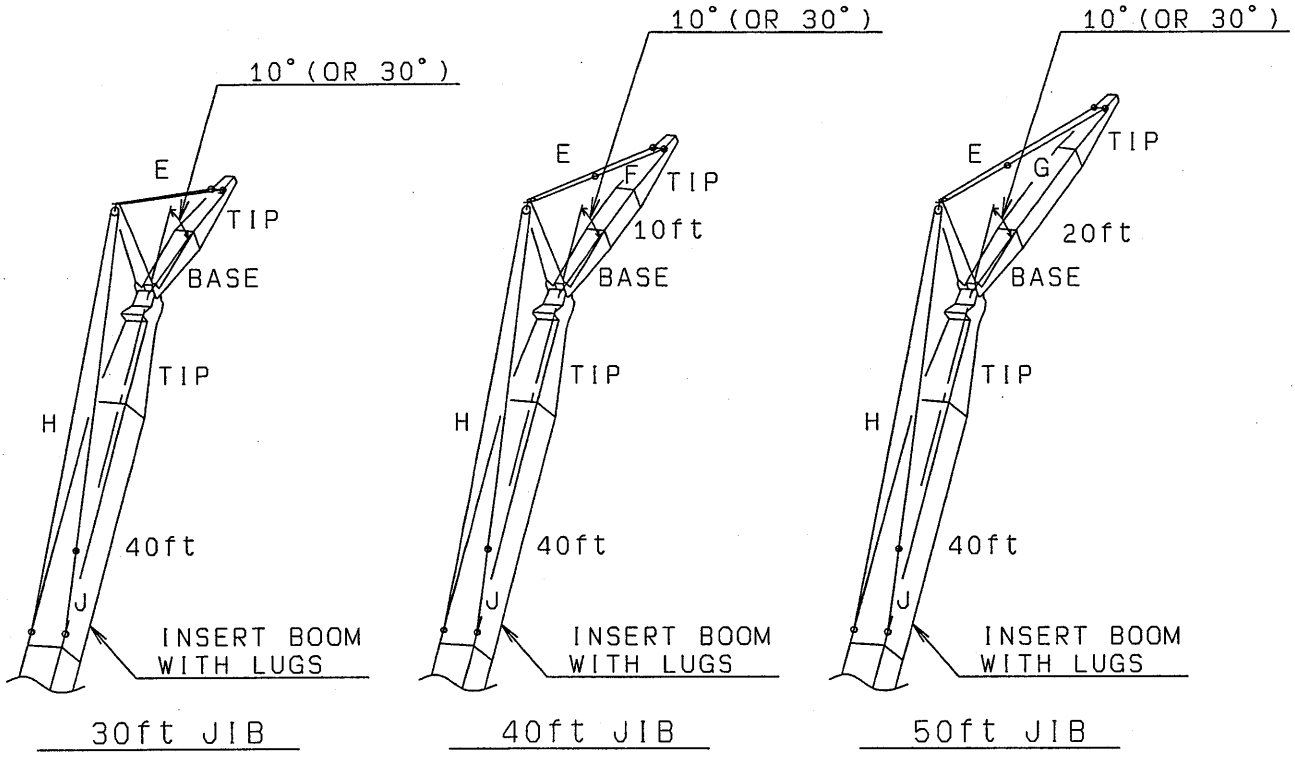
In the following case, one of 40 ft (12.2 m) insert boom with lugs attached is required.
In case that the jib is attached.

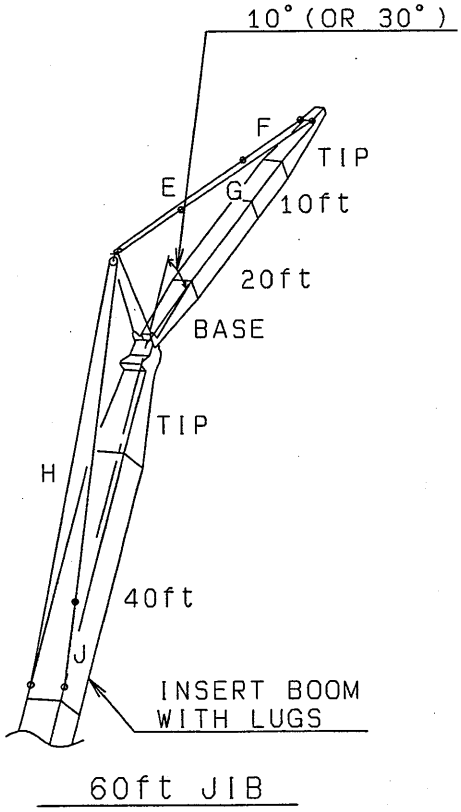
Kind of Insert Boom		
Symbol	Boom Length	Specification
10	10 ft (3.0 m)	Without lug
20	20 ft (6.1 m)	Without lug
40	40 ft (12.2 m)	Without lug
○ 40A	40 ft (12.2 m)	With lug

Boom Guy Line Chart				
Symbol	Guy Line Dimension		Part Number	Remarks [ft (m)]
	Diameter (mm)	Length ft (m)		
A	ϕ30	20.2 (6.17)	GG71A00009D1	Tip Boom
B	ϕ30	10 (3.05)	GN71A00005D1	10 (3.0) Insert Boom
C	ϕ30	20 (6.10)	GN71A00005D2	20 (6.1) Insert Boom
D	ϕ30	40 (12.19)	GN71A00005D4	40 (12.2) Insert Boom

JIB AND GUY LINE ARRANGEMENT

The length of the boom to which the jib is attached is 80 feet (24.4 m) to 190 feet (57.9 m).





Arrangement of Guy Line in Boom Side	
Boom Arrangement	(Boom Tip + 40 ft) Arrangement
10°	H
30°	H + J

J: Additional guy line when the offset angle is 30°

Arrangement of Guy Line in Jib Side			
30 ft Jib	40 ft Jib	50 ft Jib	60 ft Jib
E	E + F	E + G	E + F + G

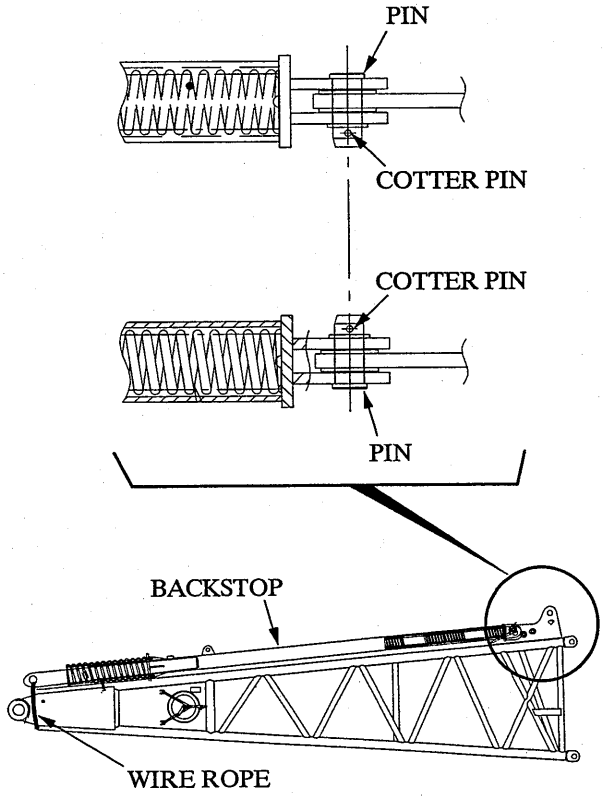
Kind of Guy Line			
Symbol	Diameter (mm)	Length {ft (m)}	Part Number
E	ø22	63.5 (19.34)	2430R317D2
F	ø22	19.3 (5.88)	2430R316D3
G	ø22	38.6 (11.75)	2430R316D2
H	ø22	123.2 (37.54)	2430R317D4
J	ø22	8.0 (2.44)	2430R316D1

6.1.2 INSTALLING THE BACKSTOPS

Connect the spring side of the backstop to the top of the base boom, and also fix the outer pipe to the base boom with a wire rope.

WARNING

Do not allow the inner stop member to slide off from the outer stop member. Failure to observe this precaution may result in serious injury or loss of life.



6.1.3 INSTALLING THE BOOM BASE

DANGER

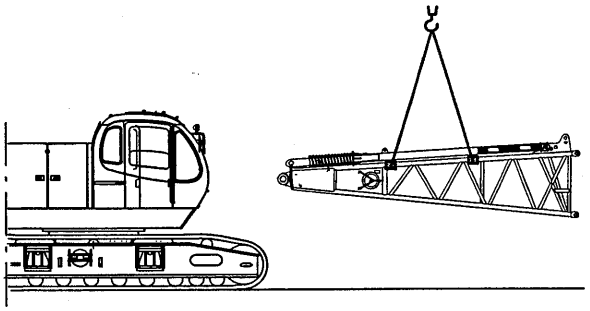
Do not stand under, inside, or on the boom when installing or removing the connector pins. Failure to observe this precaution may result in serious injury or loss of life.

Before starting work, confirm the machine condition.

1. The base machine must be placed on a firm and level ground.
2. The crawlers are extended, and the each lock pin and shim are set.

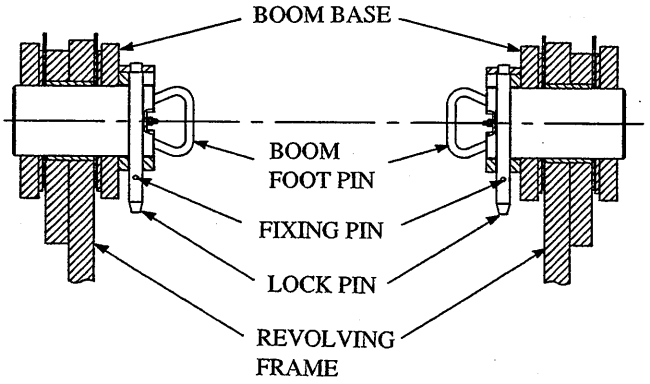
(1) Using the assisting crane, lift up the boom base, and install it to the basic machine. Lift up the boom horizontally right and left.
At this time, fix the backstop not to allow the backstop to come out.

(2) Align the both boom foot pins with the holes surely. Insert the right side pin from the inside, then insert the left side pin. (insert the lock pins from the top to the bottom, and fix with fixing pins.)



WARNING

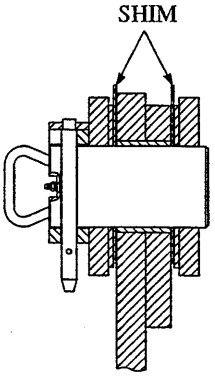
Do not insert your hand or finger to pin hole to align or check holes.
Failure to observe this precaution may result in serious injury or loss of life.



(3) Place the connector section of the boom base on blocking, remove the lifting wire rope.

(4) In order to reduce play in the boom foot section, insert the shims.
Amount of the shims shall be adjusted to a degree that the shim can be inserted lightly by hand. Do not tap in forcibly.

BOOM FOOT SECTION

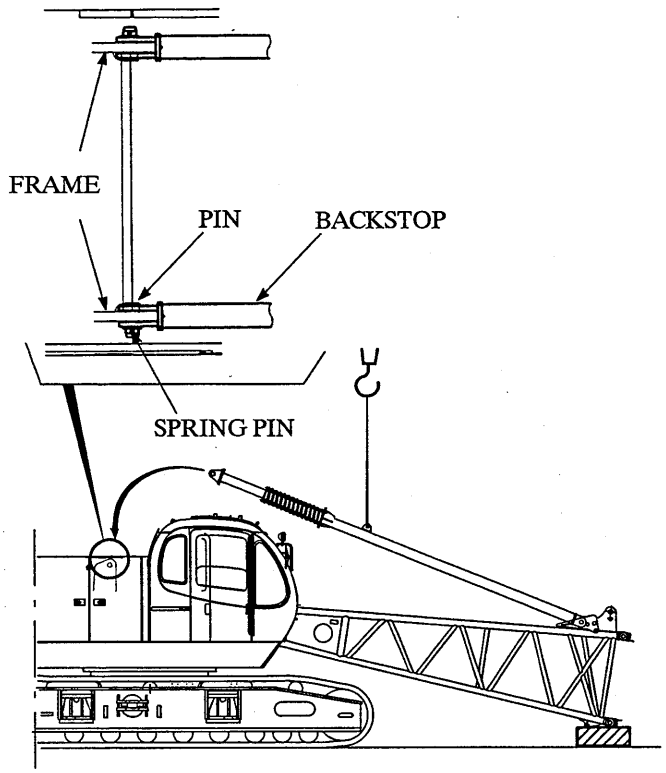


6.1.4 INSTALLING THE BACKSTOPS TO THE REVOLVING FRAME

(1) Lifting up the outer pipe of the backstop, draw out it to the basic machine side, and connect it to the revolving frame with the pin.

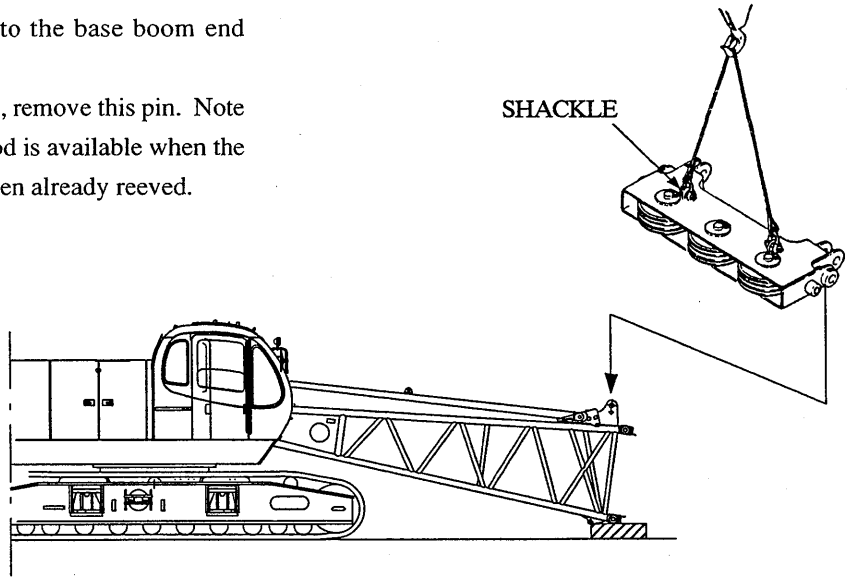
⚠ WARNING

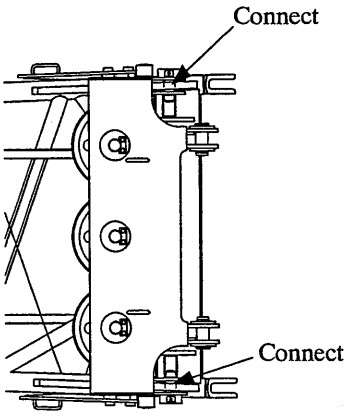
NEVER get close to the area where the backstop is removed. Failure to observe this precaution may result in serious accident.



6.1.5 INSTALLING THE UPPER SPREADER

(1) Install the upper spreader to the base boom end bracket with pins.
After connecting the guyline, remove this pin. Note that another installing method is available when the boom hoist wire rope has been already reeved.





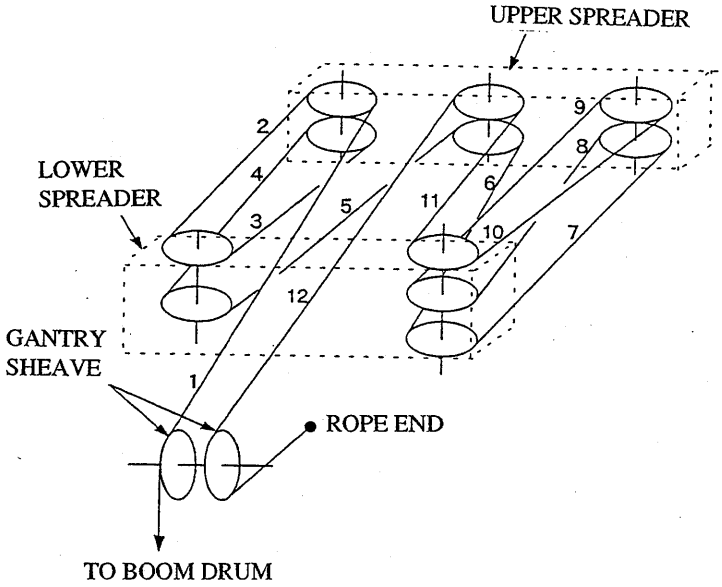
6.1.6 REEVING THE WIRE ROPE INTO THE UPPER AND LOWER SPREADER

⚠ WARNING

Do not touch a wire rope directly with bare hands. If wire protrude, you could be injured.
Working gloves are recommended.
Keep hands and clothing clear of the rotating drum and running wire rope.
Failure to observe this precaution may result in serious injury or loss of life.

(1) Before performing any work, place the upper spreader on the ground.
Operate the boom drum control lever, and unwind the wire rope from the boom drum.

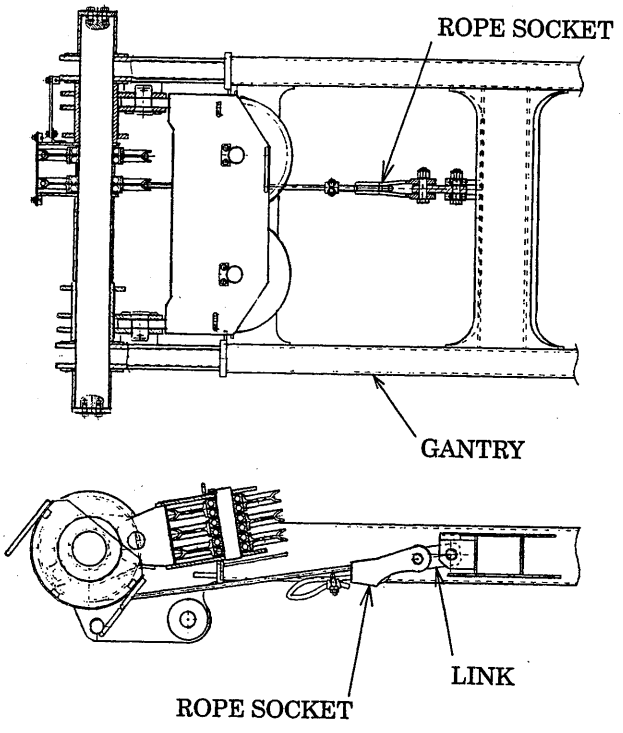
(2) Correct any distorted, tangle on the rope and coming off of the rope from the sheave, reeve the wire rope through the upper spreader and lower spreader.



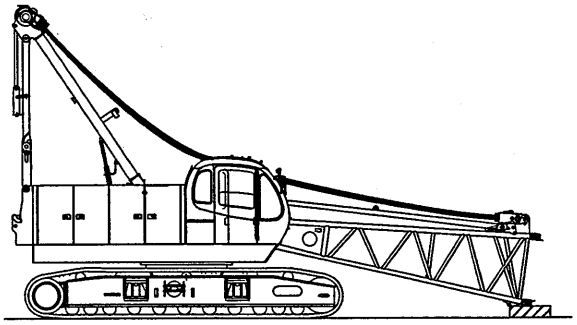
(3) Fix the wire rope end to the link at gantry with a socket, wedge, and clamp.

⚠ WARNING

To prevent personnel from being caught by the rope, be sure to post a signal person.

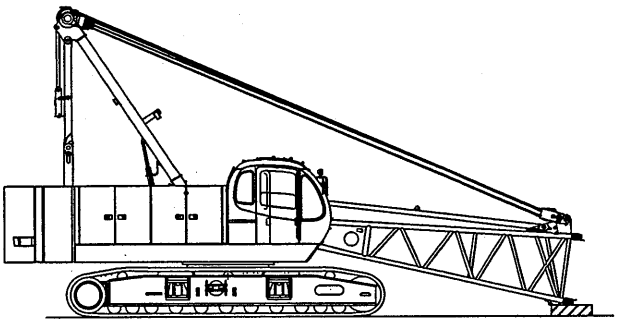


(4) Raise the gantry to the working posture (Refer to Chapter 5).



(5) Install the counterweight (Refer to Chapter 5).

(6) Slowly wind up the wire rope to take out the extra slackening. At this time, wind up the wire rope on the drum tidily to prevent the wire rope from rough spooling.



⚠ WARNING

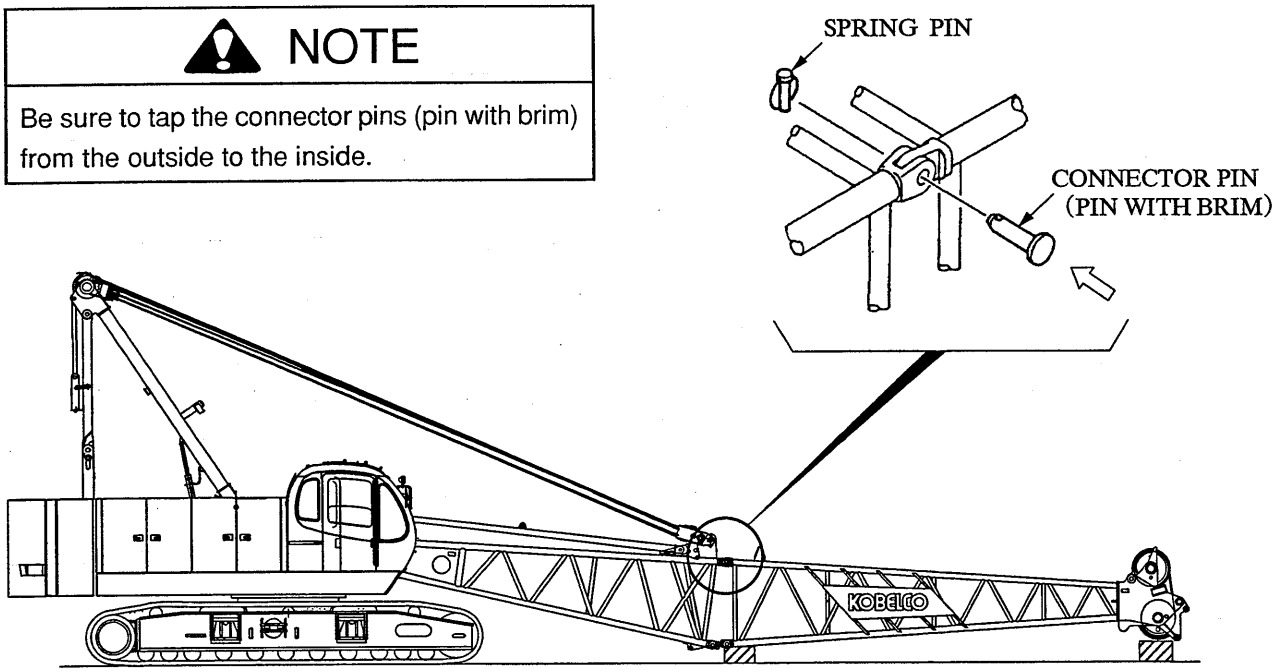
To prevent personnel from being caught by the rope, be sure to post a signal person.
Failure to observe this precaution may result in serious injury or loss of life.

6.1.7 INSTALLING THE BOOM TIP

(1) Align the top connectors of the boom tip with that of the base boom, tap the connector pins (pin with brim) in, and insert the spring pin into the side of the connector pins to fix them.

⚠ NOTE

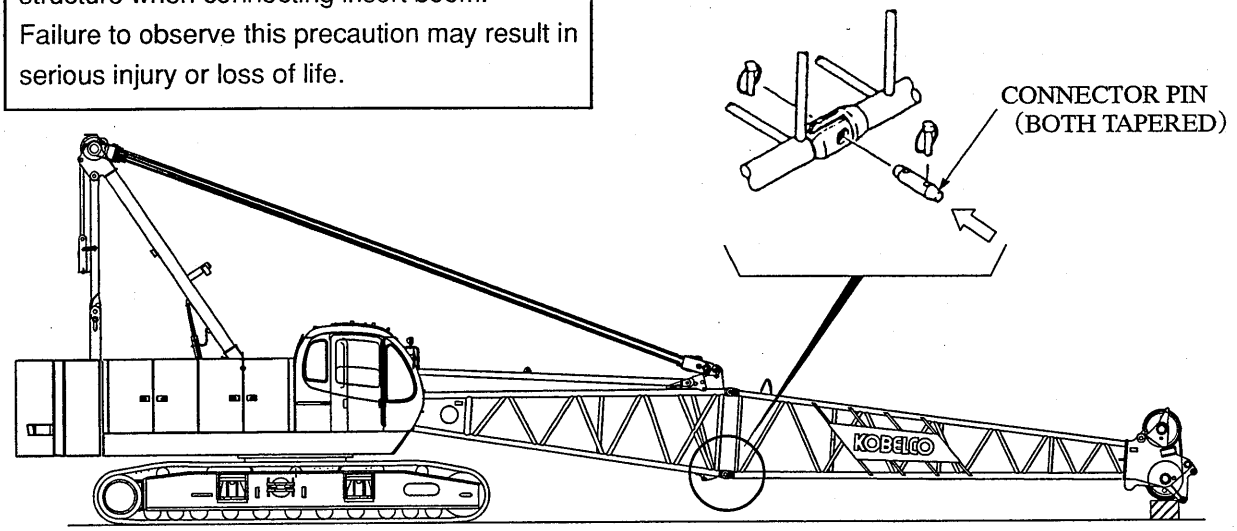
Be sure to tap the connector pins (pin with brim) from the outside to the inside.



(2) Hoist the lower boom until the lower pin holes are aligned with each other. Only then, tap the connector pins (both ends of which are tapered) in, and insert the spring pins into the both ends of the connector pin.

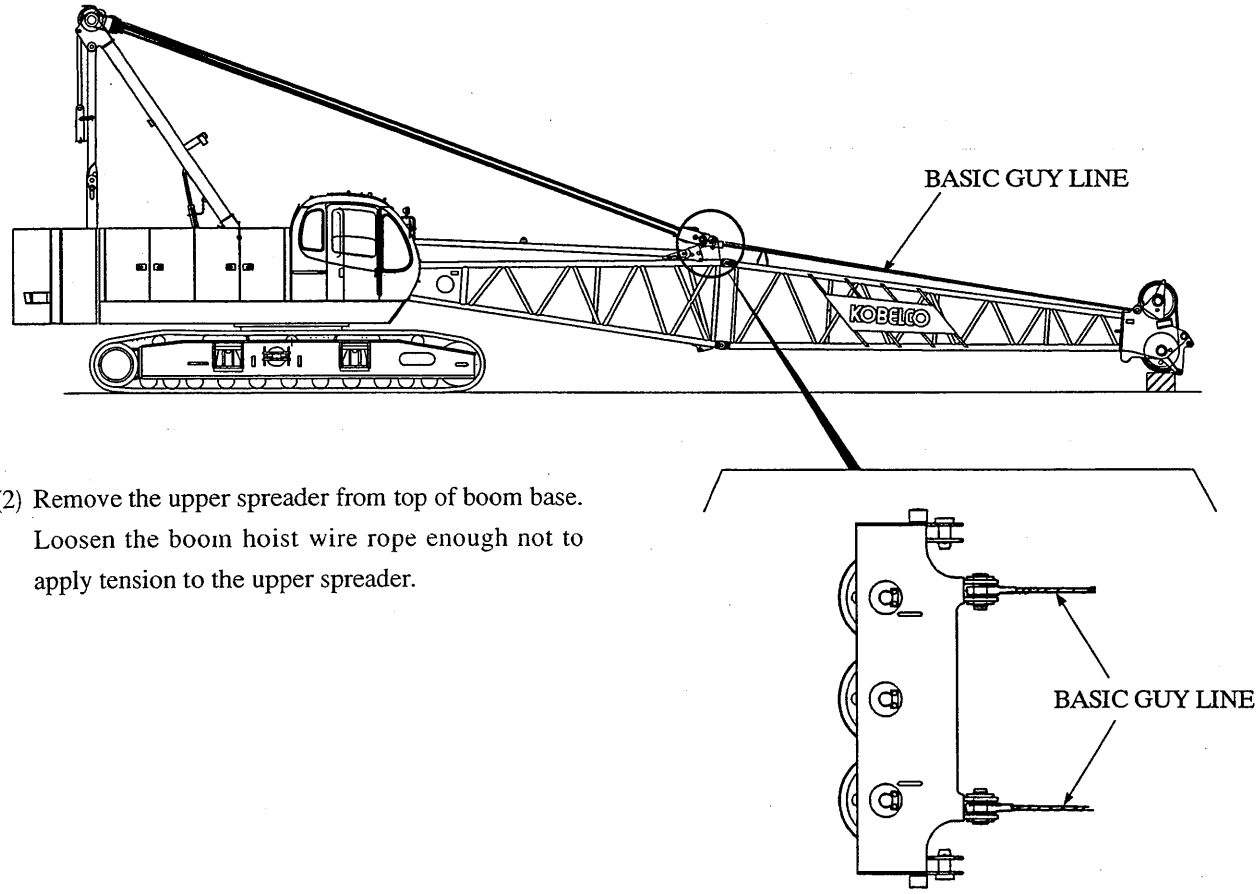
DANGER

Do not stand under, inside, or on the boom structure when connecting insert boom.
Failure to observe this precaution may result in serious injury or loss of life.



6.1.8 INSTALLATION OF THE BASIC GUY LINE

(1) Install the basic guy line to the boom tip and upper spreader.

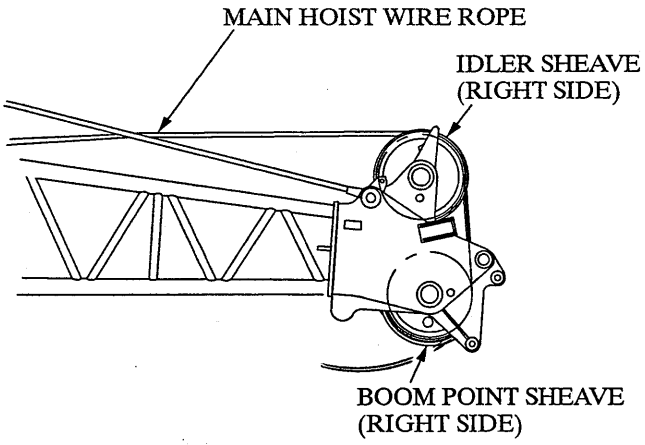


(2) Remove the upper spreader from top of boom base. Loosen the boom hoist wire rope enough not to apply tension to the upper spreader.

6.1.9 MAIN HOIST WIRE ROPE REEVING

⚠ WARNING

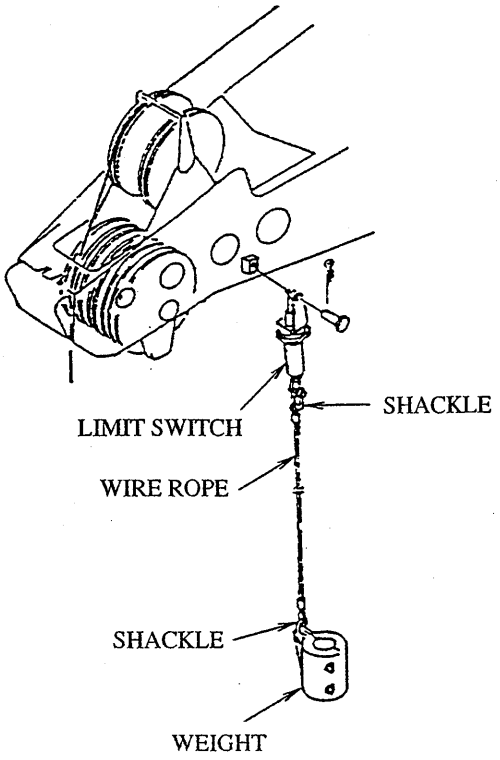
Do not touch a wire rope directly with bare hands. If wires protrude, you could be injured. Working gloves are recommended.
Failure to observe this precaution may result in serious injury or loss of life.



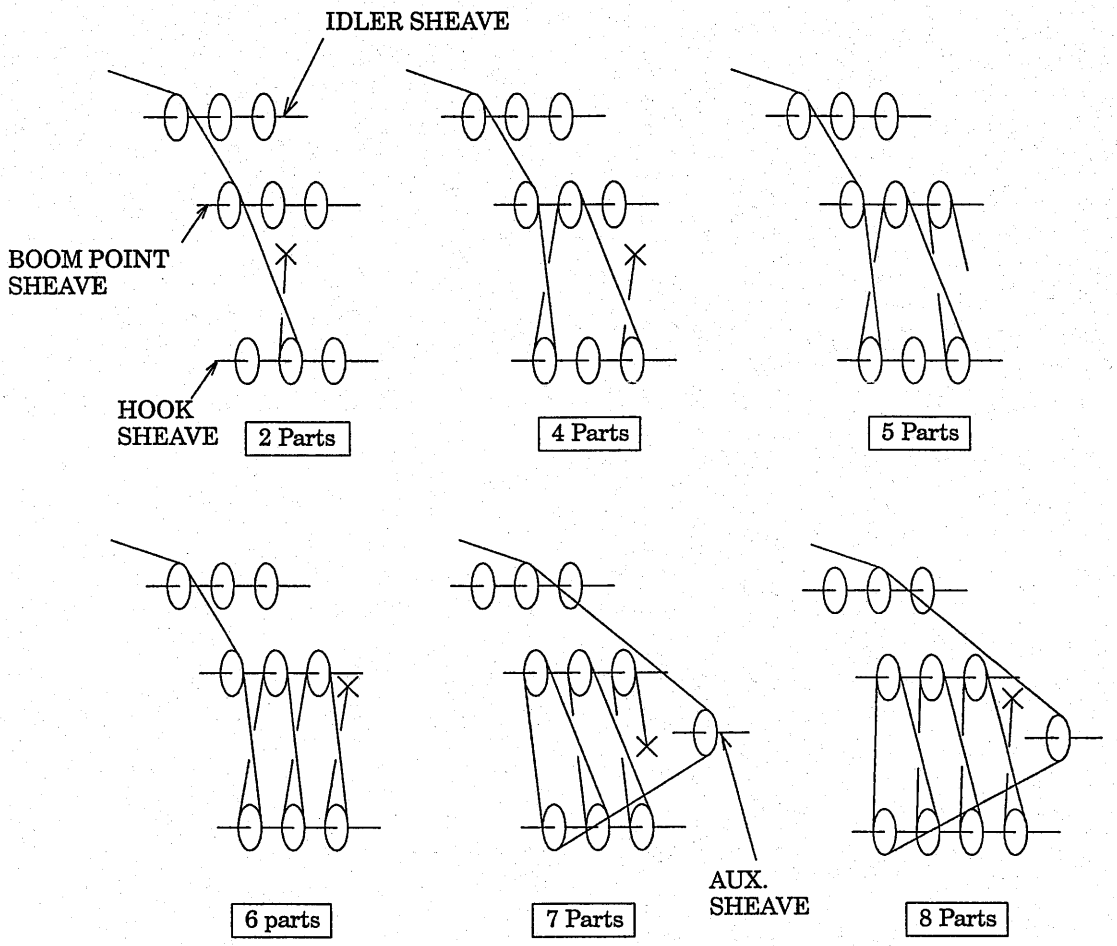
(1) Prepare the hook, overhoist limit switch, weight and socket, etc. to used near the tip end of the boom.

(2) Operating the front drum control lever to the lowering side to pay out the wire rope to the tip end of the boom, pass it through the right end the boom point.

(3) Install the overhoist limit switch and weight to the left side bracket on the tip end of the boom.
Insert the cotter pin into the shackle pin to fix it.



(4) Pass the front drum wire rope through the hook sheave(s) and boom point sheave(s) in order. Do no forget to pass the wire rope through the weight for the overhoist limit switch.
Fix the wire rope end to the boom point for even number part reeving and to the hook for odd number part reeving with the rope socket.



(This figure is a figure looking from boom tip side.)

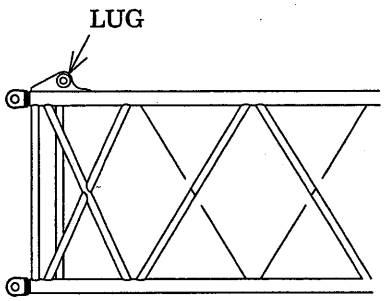
6.1.10 CONNECTING THE INSERT BOOMS

This topic covers procedure to connect the insert boom (s) from the condition, that the basic-boom has been once assembled, to assemble the long length boom.

(1) KIND OF INSERT BOOMS

Standard Insert Boom	Insert Boom with Lug
10 ft (3.0 m)	—
20 ft (6.1 m)	—
40 ft (12.2 m)	40 ft (12.2 m)

The case that the insert boom with the lugs attached is as follows:
In case of specification of boom with the jib attached.



(2) WINDING UP THE MAIN HOIST WIRE ROPE

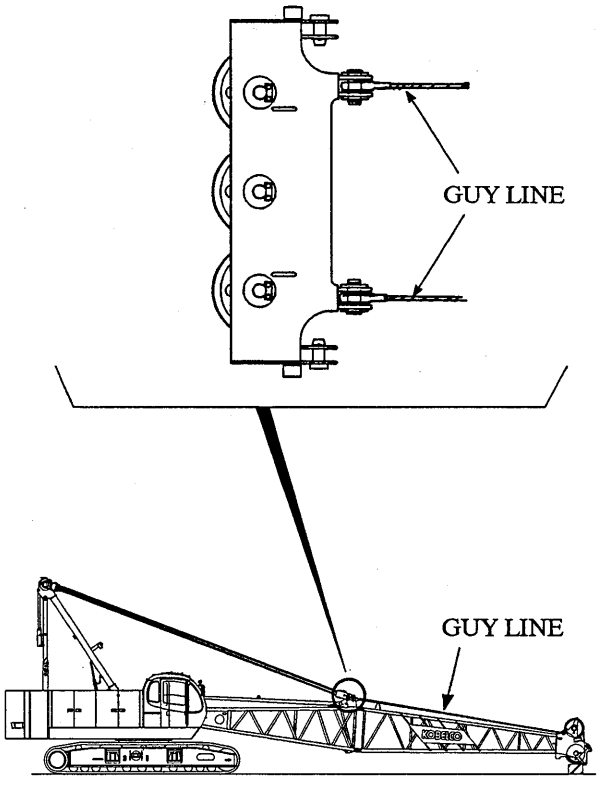
Remove the rope socket from the wire rope, and wind up the wire rope onto the drum.
Take suitable step not to allow the wire rope wound onto the drum to be loosened.

⚠ WARNING

- Do not touch a wire rope directly with bare hands. If wire protrude, you could be injured. Working gloves are recommended.
- Keep away from rope end when removing the wire rope. It may suddenly jump and cause injury.
- Keep hands and clothing clear of the rotating drum and running wire rope. Failure to observe this precaution may result in serious injury or loss of life.

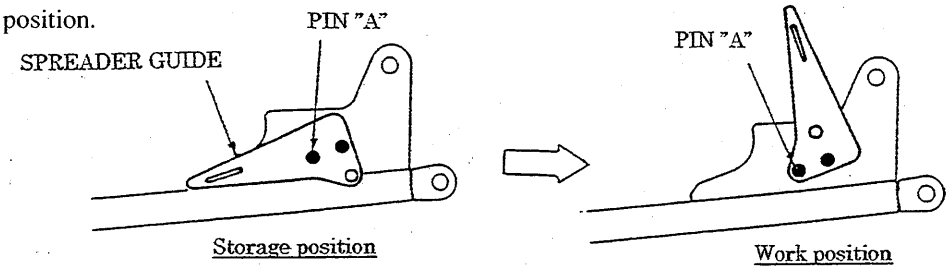
(3) REMOVING THE BOOM TIP SECTION

1) Lowering the boom onto blocking, install the upper spreader onto the top of the boom base with the use of spreader guide.
How to use spreader guide is shown in the next page.

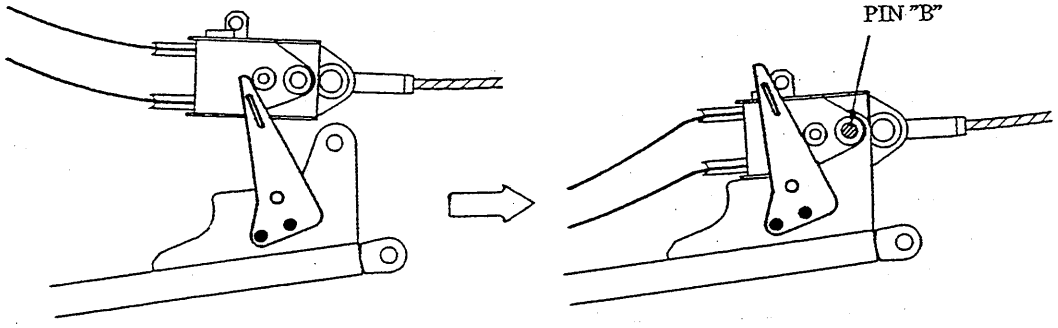


HOW TO USE SPREADER GUIDE

① Draw out pin "A", change the spreader guide from the storage position to the work position.
Place the pin "A" in the work position.



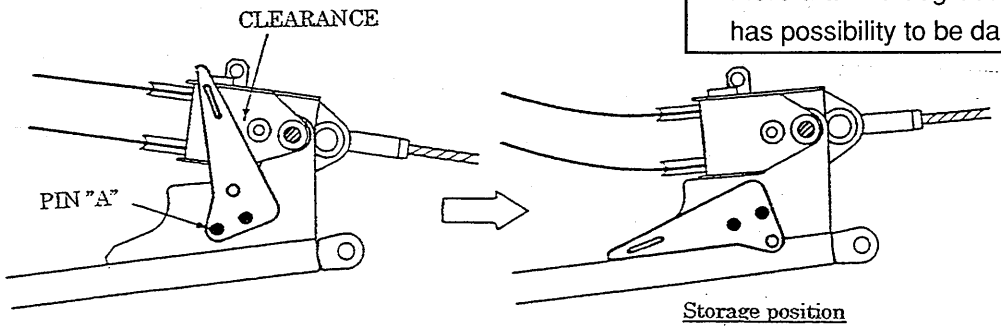
② Lower the boom. After the tip end of the boom has been grounded, slowly loosen the boom hoist wire rope more. The spreader is lowered along the spreader guide. When the hole of the spreader is aligned with the pin hole of the bracket on the boom base section, insert pin "B" to connect the spreader to the bracket.



③ When storing the spreader guide, slowly stretch the boom hoist wire rope. When clearance is generated between the spreader and the spreader guide, draw out pin "A", and return the spreader guide to the storage position.
Since the clearance is not be generated with boom base section only, perform before disassembling the boom.

⚠ CAUTION

- When the gantry is in the lowered condition, be sure to set the guide in the storage position. If the guide is left in the work position, the guide could be damaged by boom hoisting.
- When the gantry is lowered and the upper spreader is connected to the boom base section, set the guide in the storage position. At this time, do not raise the boom to more than 20 degrees. If the boom is raised to more than 20 degrees, the winch wire rope has possibility to be damaged.



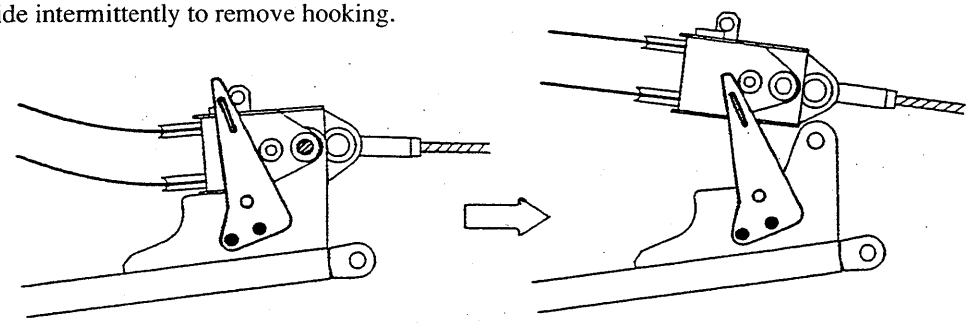
⚠ WARNING

Be sure to hold the guide end with hands. Only then, remove the pin, and stow the spreader guide. Failure to observe this precaution may result in serious injury or loss of life.

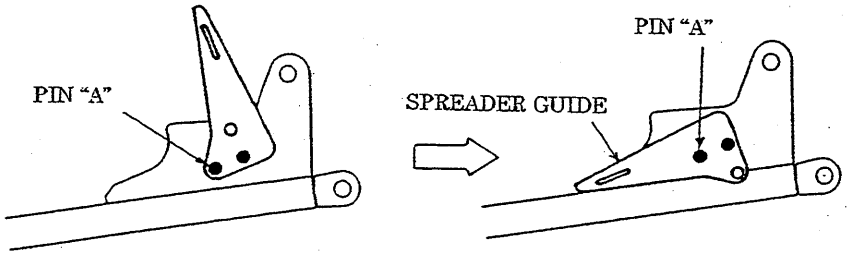
④ After change of the boom connection or assembly has been finished, draw out pin "B", and wind up the boom hoist wire rope so that the spreader slides up on the guide.

Relating to the reeving way of the boom hoist wire rope, the spreader slides up while rocking from side to side.

If the spreader is raised up at a stretch, the spreader has possibility to be caught on the guide and to bend the guide. If it is caught, loosen the wire rope once, then move the boom drum control lever to the RAISE side intermittently to remove hooking.



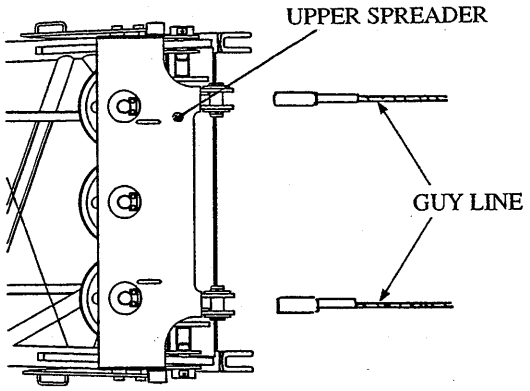
⑤ Return the spreader guide to the storage position.



Work position　　Storage position

⑥ When setting the spreader guide to the work position, after the boom connection is finished, stretch the boom hoist wire rope, and set the spreader guide to the work position.

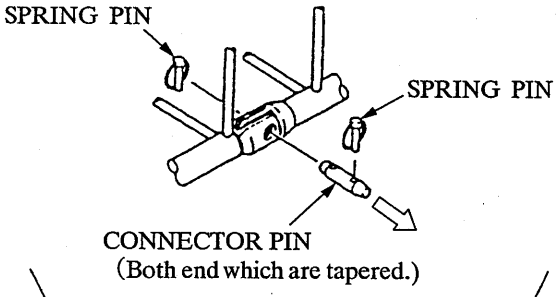
2) Remove the basic guy lines from the upper spreader.

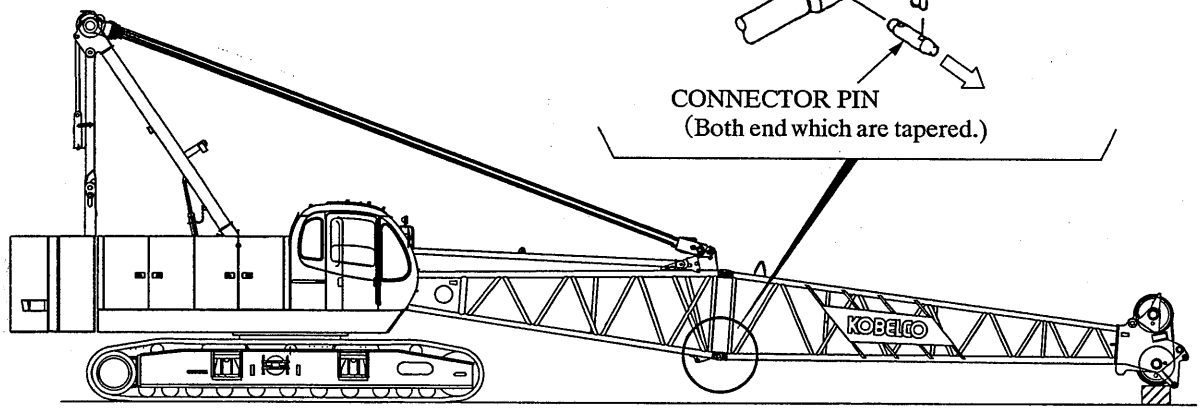


3) Operate the boom hoist control lever to stretch the boom hoist wire rope to remove load from the bottom connector section, then draw out the bottom connector pins (Both ends of which are tapered).

⚠ DANGER

Do not set stand or work under, inside or on the boom structure when removing the connector pins.
Failure to observe this precaution may result in serious injury or loss of life.

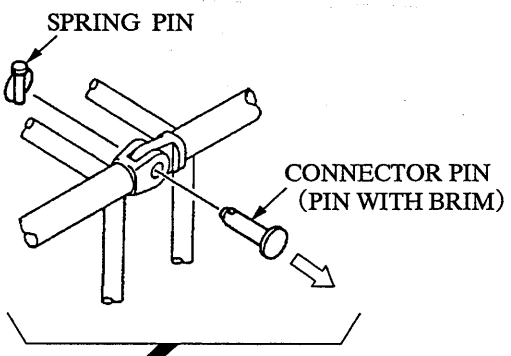


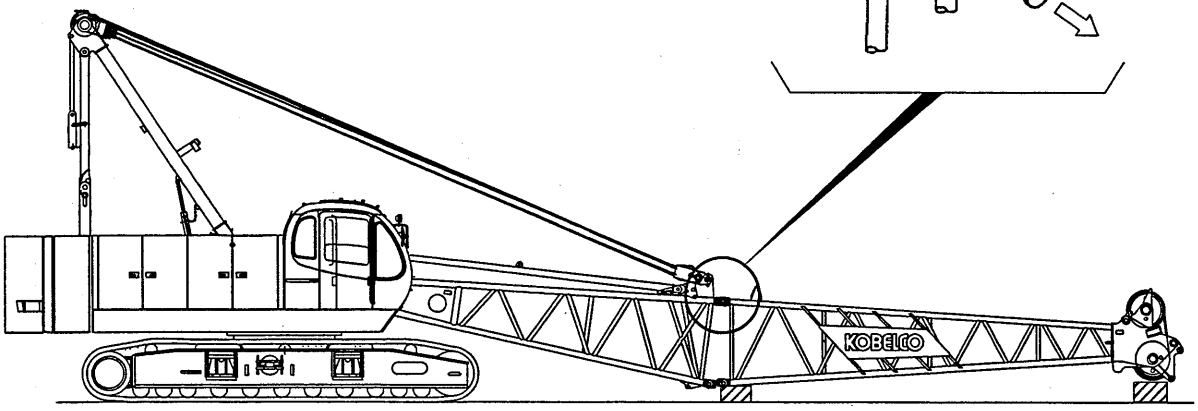


4) Place blocking under the boom tip section, lower the boom base section, then draw out the top connector pins (Pin with brim).

⚠ DANGER

Do not set stand or work under, inside or on the boom structure when removing the connector pins.
Failure to observe this precaution may result in serious injury or loss of life.

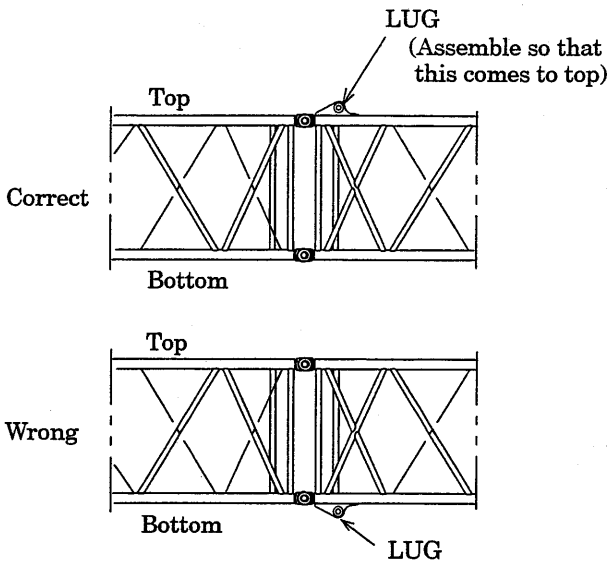




(4) CONNECTING THE INSERT BOOM

For the notes on the cantilever support, refer to p.6-25.

1) Referring to the boom and guy line arrangement chart, lift the required insert boom(s), being careful not to mistake the top for the bottom, and bring it near the boom base section.

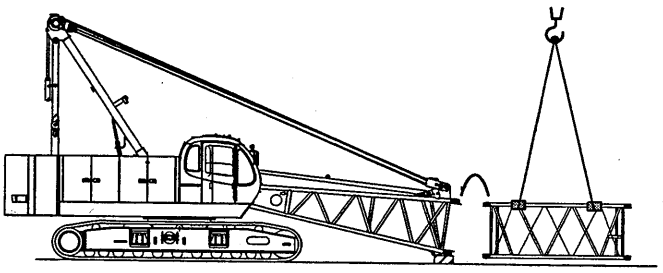


DANGER

- Do not stand under the boom or inside the boom structure when removing the connector pins.
- Do not climb, stand, or walk on boom.
- Use a ladder or similar device to reach only necessary areas.

Failure to observe this precaution may result in serious injury or loss of life.

2) Align the top connector pin holes, insert the connector pin with the lock pinholes facing up and down. Insert the spring pins to fix the connector pins.



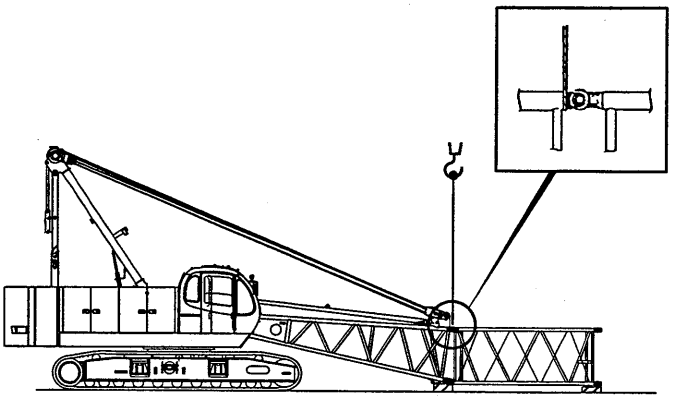
NOTE

Be sure to tap the connector pins from the outside to the inside.

WARNING

Do not insert your hand or finger into pin hole. Failure to observe this precaution may result in serious injury or loss of life.

3) Lifting up the connecting section of the base boom and the insert boom, align the bottom connector pin holes, and insert the connector pins (both ends of which are tapered) into these holes.
Insert the spring pins into the connector pins to fix them.

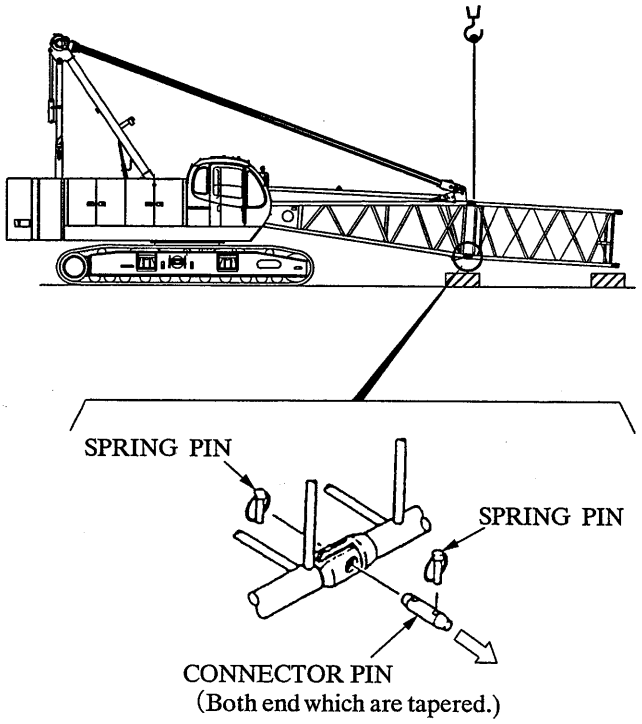


DANGER

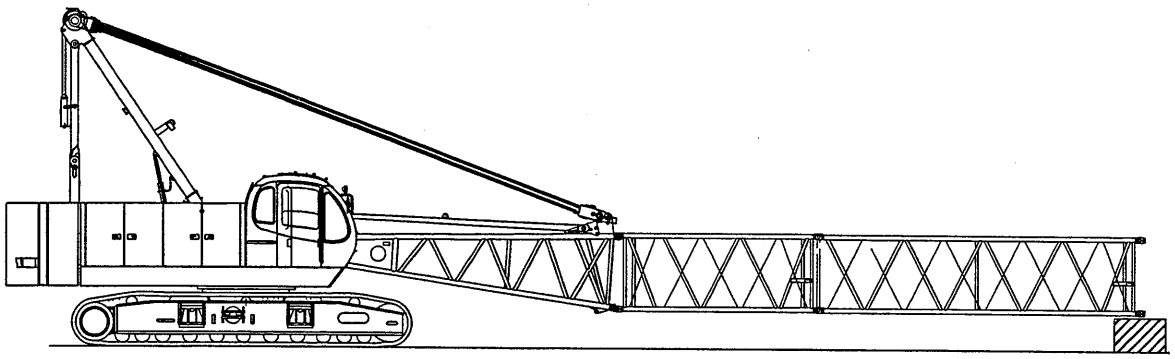
Do not stand under, inside or on the boom structure when connecting insert boom.
Failure to observe this precaution may result in serious injury or loss of life.

WARNING

Do not climb, stand, or walk on the boom.
Use a ladder or similar device to reach necessary area.
Failure to observe this precaution may result in serious injury or loss of life.

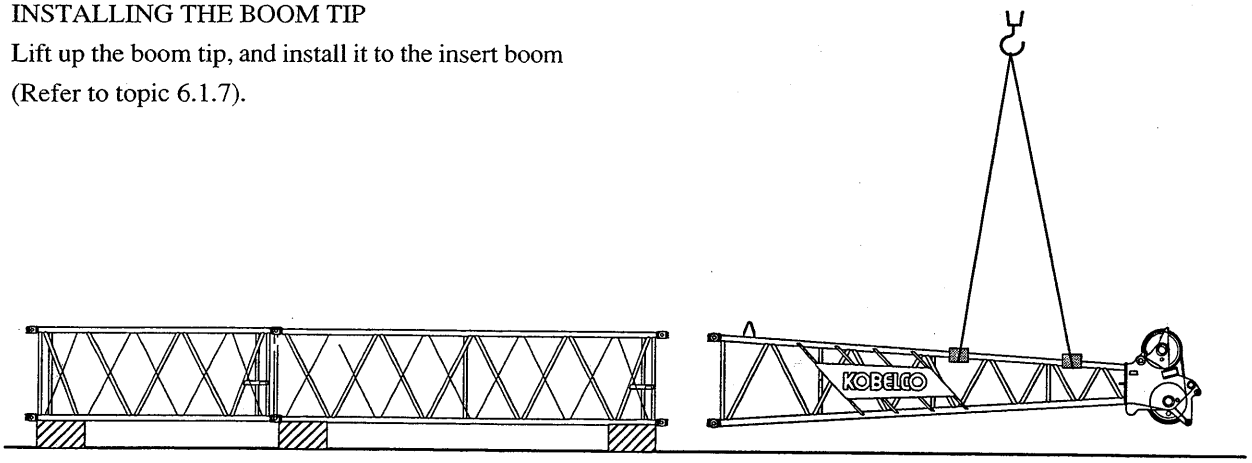


4) Referring to the boom and guy line arrangement chart, connect the insert booms in order in the same way.



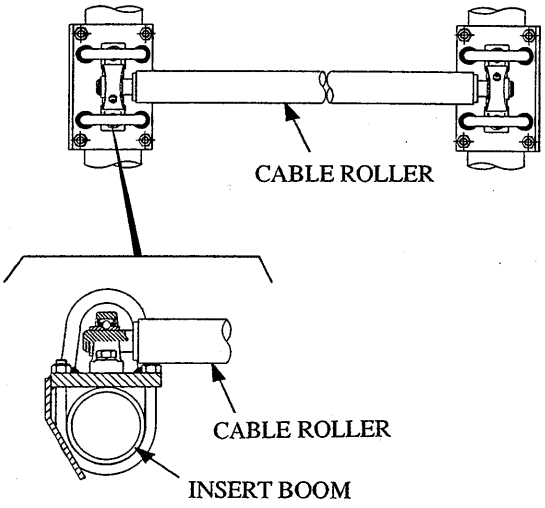
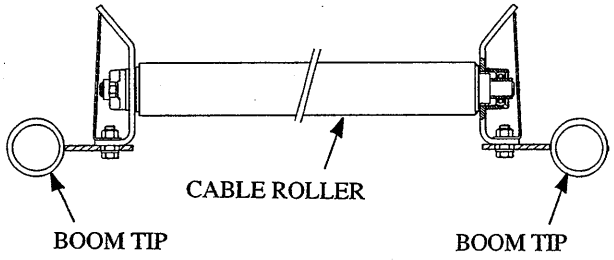
(5) INSTALLING THE BOOM TIP

Lift up the boom tip, and install it to the insert boom (Refer to topic 6.1.7).



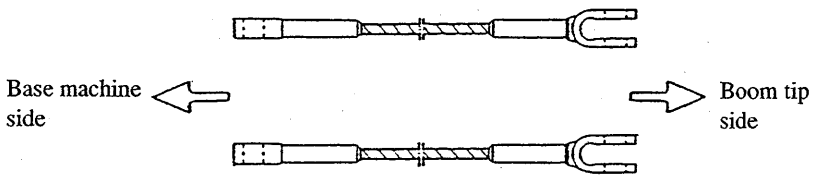
6.1.11 INSTALLING THE CABLE ROLLERS

Install the cable rollers. (Spanner : 17mm)

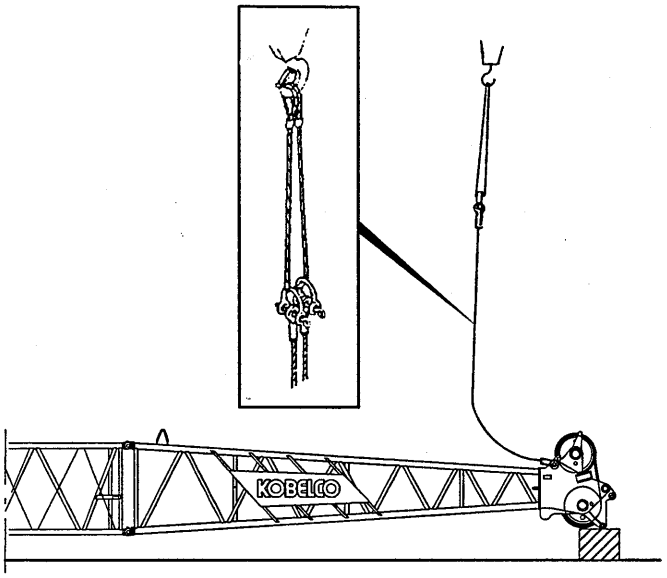
FOR INSERT BOOM	FOR BOOM TIP
	

6.1.12 CONNECTING THE BOOM GUY LINES

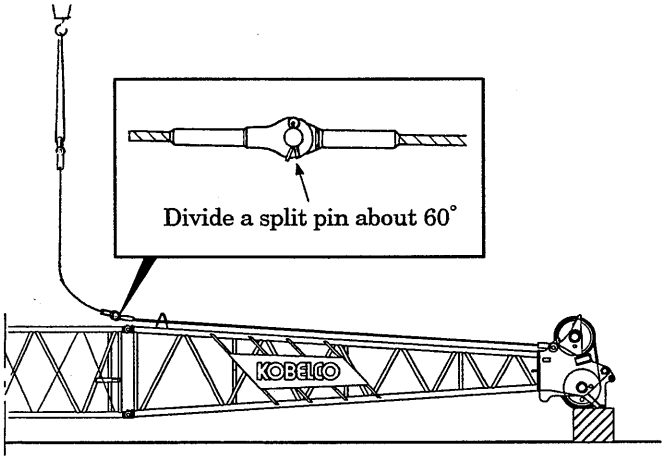
(1) Prepare the required boom guy lines as shown in the boom and guy line arrangement chart.

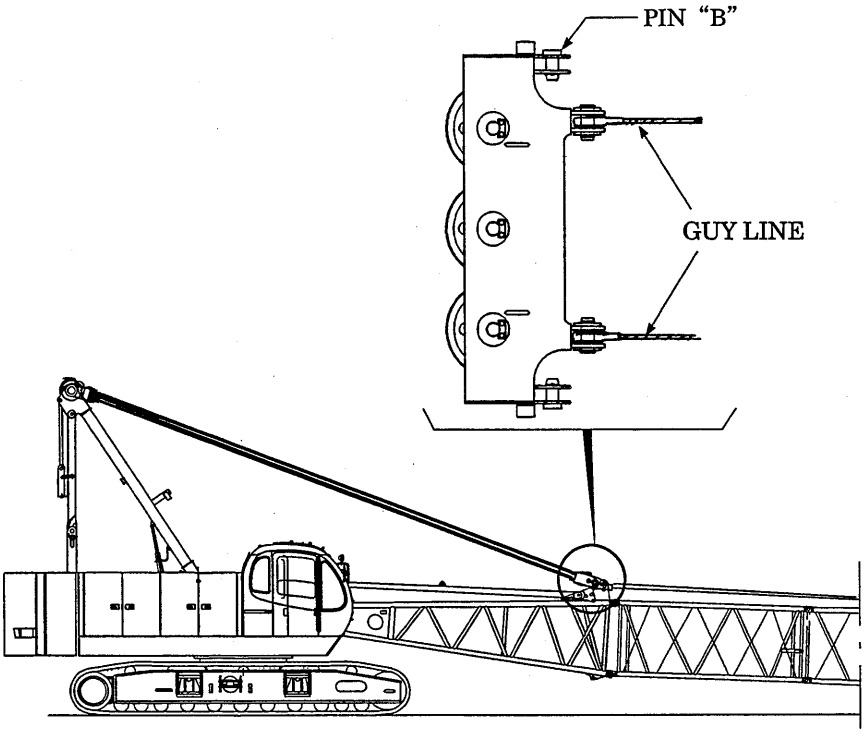


(2) Connect the prepared guy lines from the boom tip side to the basic machine side one by one.
When connecting from boom tip side one by one, do not make the guy lines slacken.
If the guy lines slacken much, then guy lines may not reach to the upper spreader.



(3) Connect the guy line to the upper spreader.

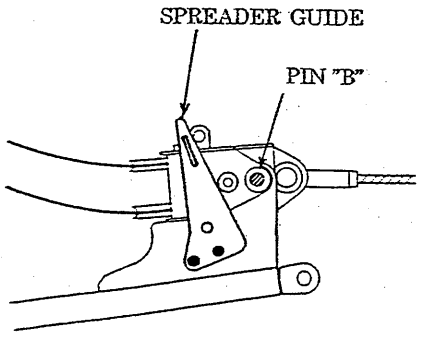




(4) Loosen the boom hoist wire rope enough.

(5) Use the spreader guide to remove the pin "B.

(6) Wind up the boom hoist rope to the boom hoist drum paying attention not making rough winding.



⚠ WARNING

Place an signal man to avoid accident of being caught.
Failure to observe this precaution may result in serious injury or loss of life.

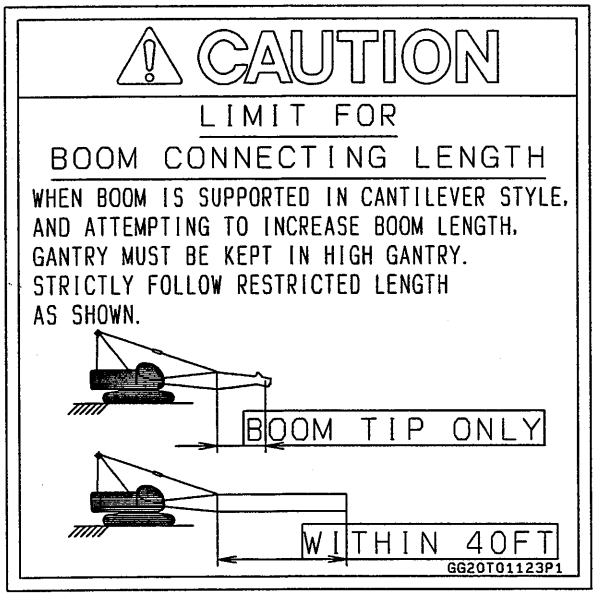
6.1.13 CAUTION FOR CANTILEVER

(1) SUPPORT WITH BASE BOOM

⚠ CAUTION

- Be sure the confirm that gantry is set in high gantry condition.
- Do not exceed the length of cantilever mentioned below.
- Operate crane at the slowest speed as possible.

The boom length which can be supported with cantilever is shown as below.



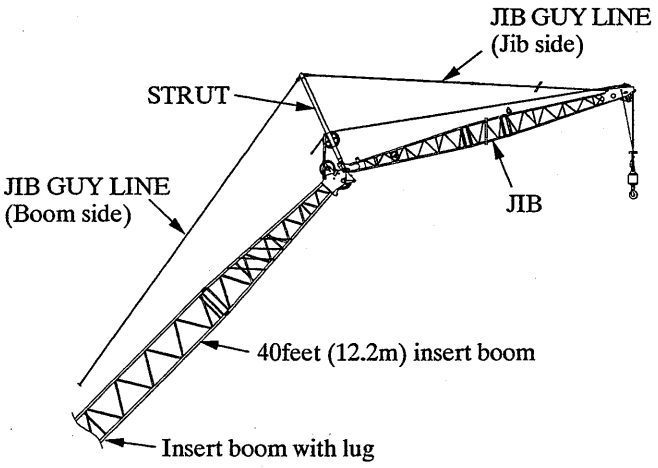
6.1.14 ASSEMBLING THE JIB

For arrangement of the jib and guy line, see page 6-8.

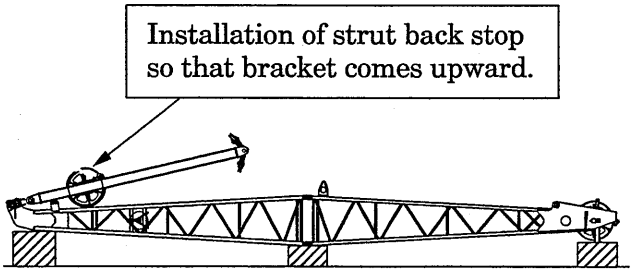
The boom length to which the jib can be attached is 80 feet (24.4 m) to 190 ft (57.9 m).

DANGER

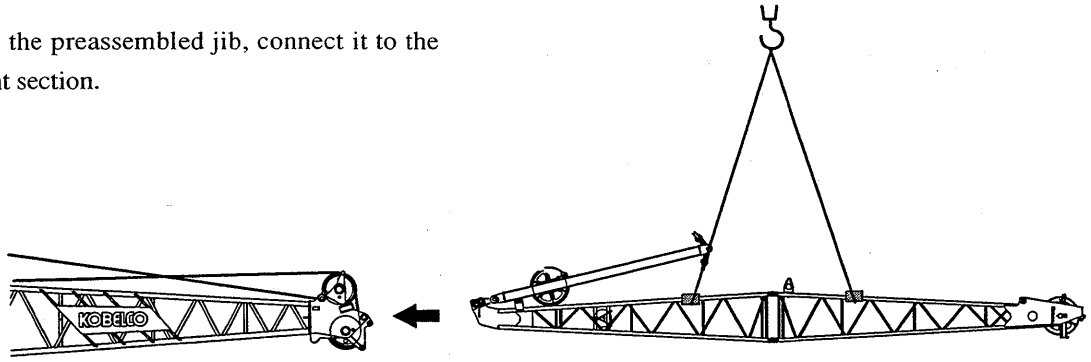
Do not stand or work under, inside or on the jib structure when assembling jib.
Failure to observe this precaution may result in serious injury or loss of life.



(1) Assemble the jib and strut at the elongation of the tip end of the tip boom.
The jib connecting pins are all pins with brim.

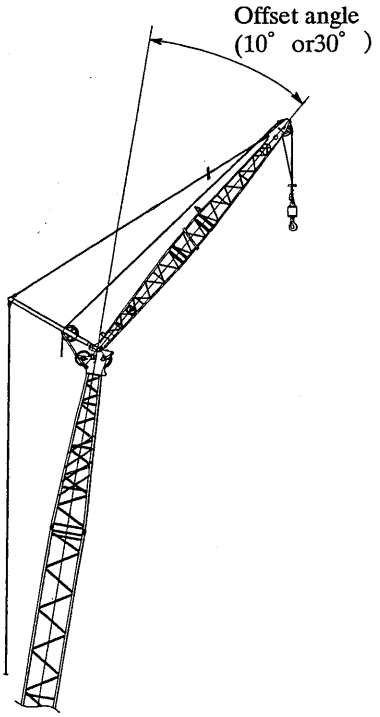


(2) Lifting up the preassembled jib, connect it to the boom point section.

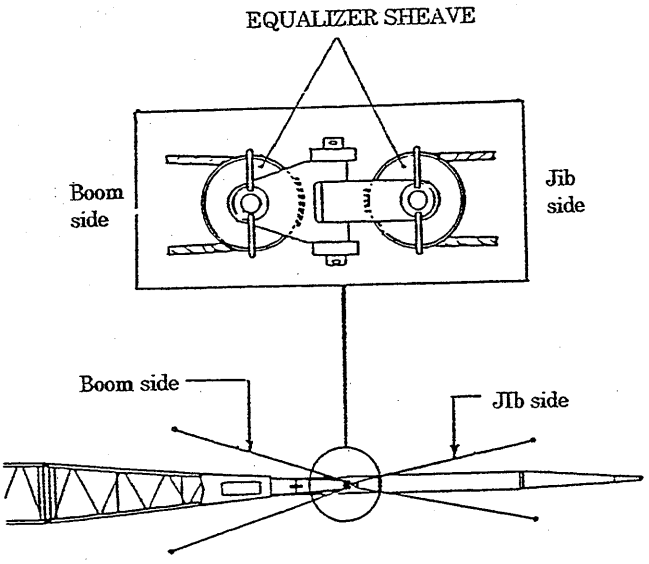


(3) Prepare the jib guy lines (the jib side and boom side).

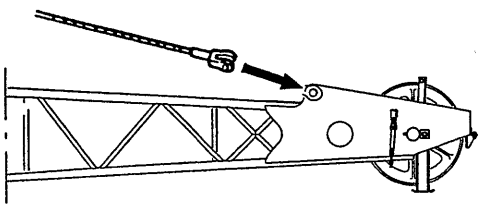
- The length of the jib guy line of the jib side varies according to the jib length.
- The length of the jib guy line of the boom side varies according to the jib offset angle (10°or 30°), and the length of the 40 feet (12.2 m) insert boom connected to the boom tip.



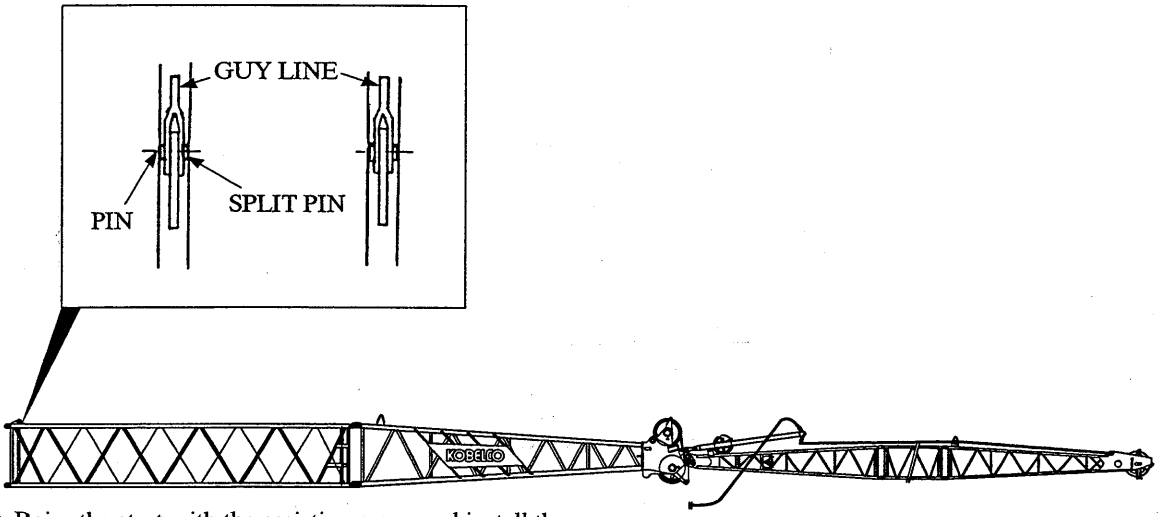
(4) Temporarily remove the equalizer sheave of the jib strut, and thread the jib guy line through the sheave. Only then, reinstall the sheave. (Keep the strut down.)



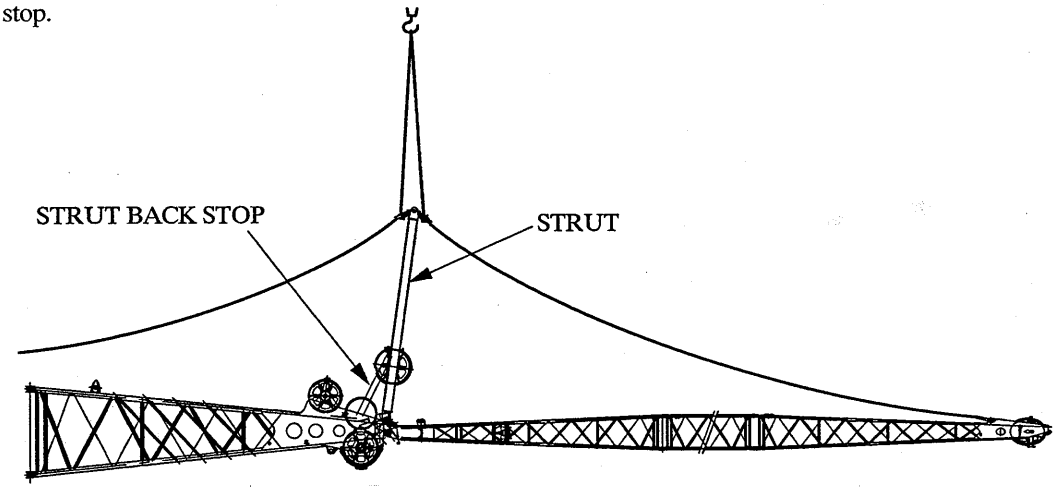
(5) Connect both end of the jib guy line to the top end of the jib.



(6) Install the jib guy line link to the insert boom with lug, referring to the "Boom and Guy Line Arrangement Chart".



(7) Raise the strut with the assisting crane and install the strut back stop.

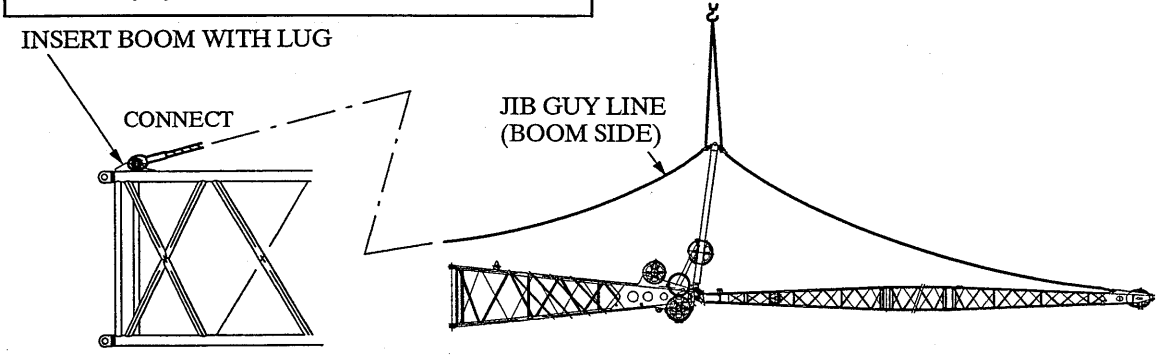


(8) With the jib strut held, connect the both ends of the boom side jib guy line to the lug on the 40 ft (12.2 m) insert boom.

(9) Remove the sling wire rope from the jib strut.

WARNING

After the assembly has been completed, be sure to confirm that all connecting pins and lock pins are correctly installed.
Failure to observe this precaution may result in serious injury or loss of life.



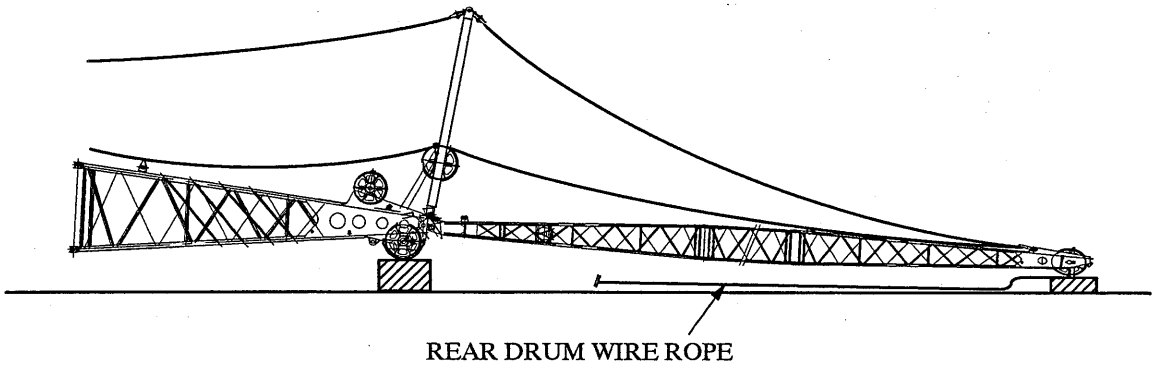
6.1.15 REEVING OF REAR DRUM WIRE ROPE

⚠ WARNING

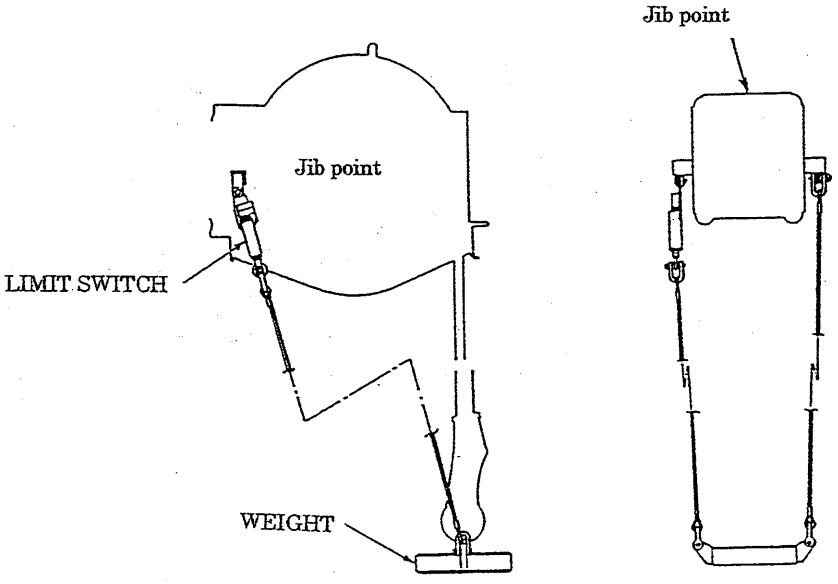
Do not touch a wire rope directly with bare hands. If wire protrude, you could be injured.
Working gloves are recommended.
Keep hands and clothing clear of the rotating drum and running wire rope.
Failure to observe this precaution may result in serious injury or loss of life.

(1) Place the hook block near the tip end of the jib.

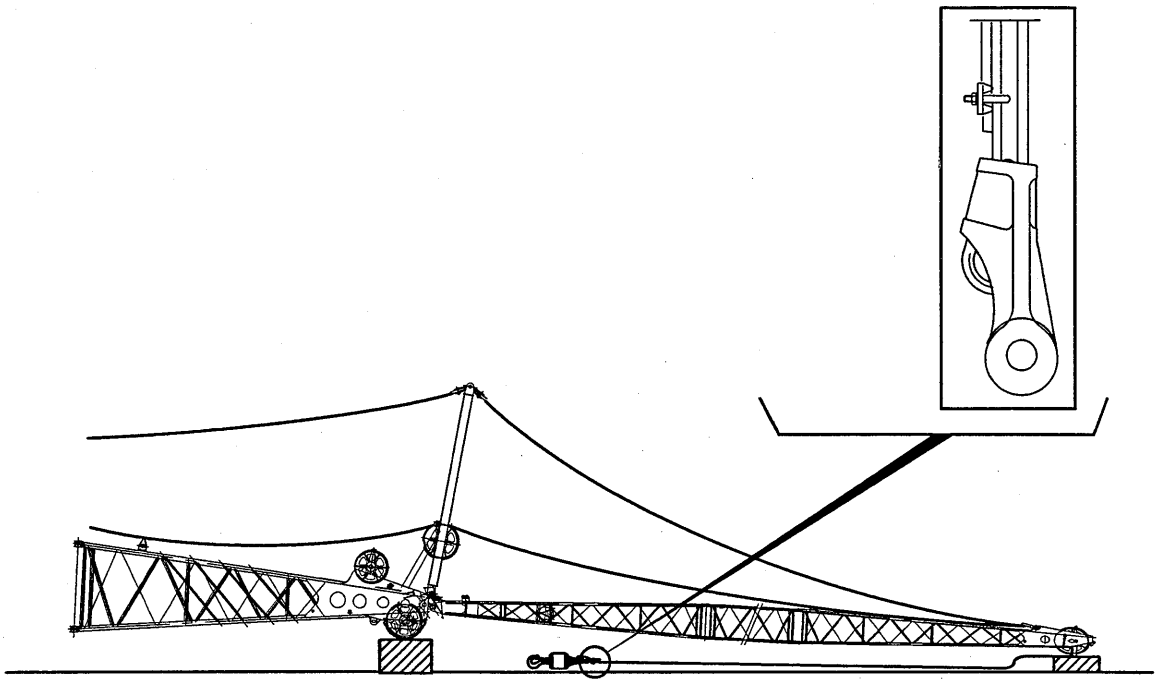
(2) Push the rear drum control lever to the lowering side to pay out the rear drum wire rope to the tip end of the jib, and pass it through the jib point sheave.



(3) Install the limit switch and weight to the jib point section.



(4) Pass the wire rope end through the weight for the limit switch, and secure the end to the hook block with the rope socket.

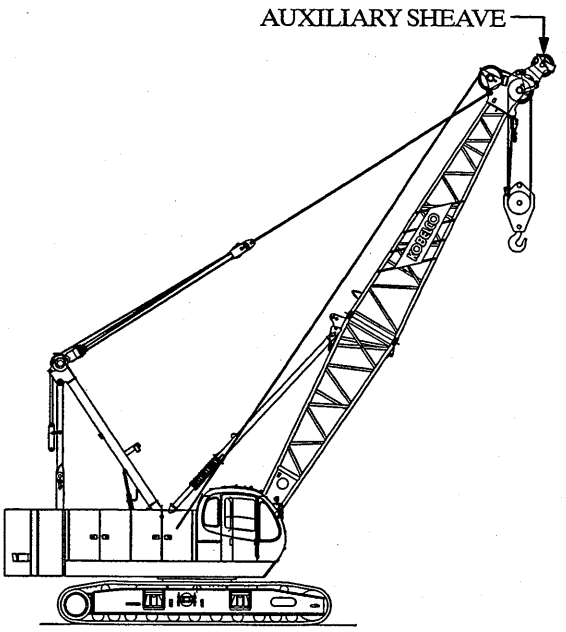


(5) Referring to Section 3 Safety Device, connect the wiring for the auxiliary hoist hook anti-two-block (overhoist) limit switch (see p.3-9).

⚠ WARNING

After the assembly has been completed, be sure to confirm that all connecting pins and lock pins are correctly installed.
Failure to observe this precaution may result in serious injury or loss of life.

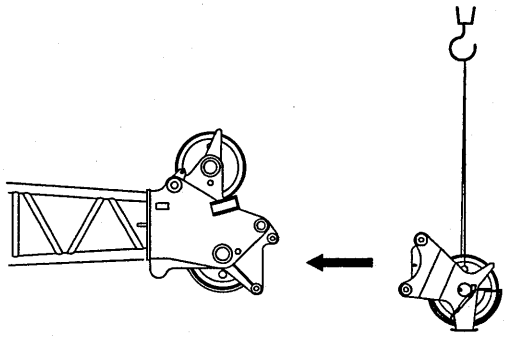
6.1.16 INSTALLING THE AUXILIARY SHEAVE

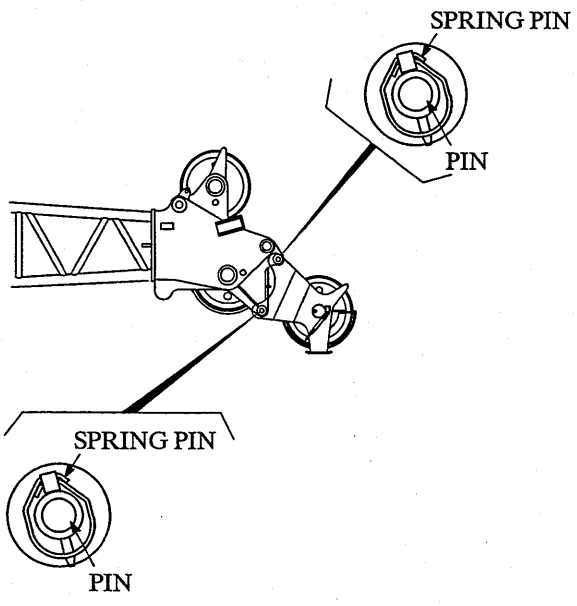


The boom length to which the auxiliary sheave can be installed is 40 feet (12.2 m) to 190 feet (57.9 m).

Weight: 420 lbs (190 kg)

(1) Install the auxiliary sheave installation position at the boom top, and fix it with the pin.





6.1.17 REEVING THE REAR DRUM WIRE ROPE TO THE AUXILIARY SHEAVE

⚠ WARNING

Do not touch a wire rope directly with bare hands. If wire protrude, you could be injured.
Working gloves are recommended.
Keep hands and clothing clear of the rotating drum and running wire rope.
Failure to observe this precaution may result in serious injury or loss of life.

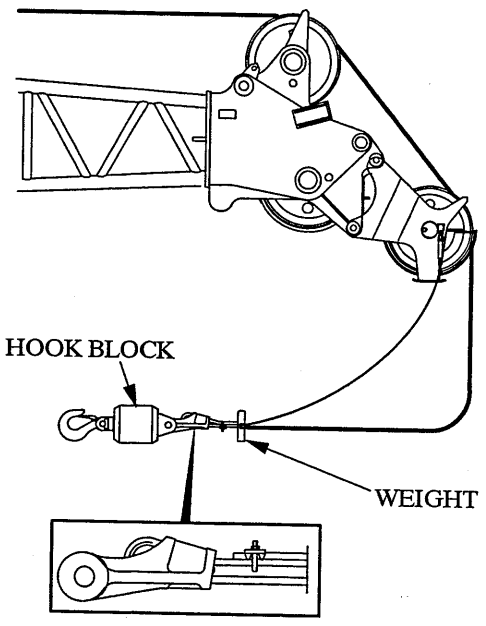
(1) Place the hook block near the tip of the auxiliary sheave.

(2) Control the rear drum control lever to the lowering position to pay out the wire rope upto the tip end of the boom, and pass the wire rope through the idler sheave and auxiliary sheave in this order.

(3) Install the limit switch and weight to the auxiliary sheave.

(4) Pass the wire rope end through the weight for the limit switch, and fix the end to the ball hook with the use of the rope socket.

(5) Connect the wiring of the auxiliary hook anti-two-block (overhoist) limit switch, referring to Section 3 Safety Device (see p.3-9).

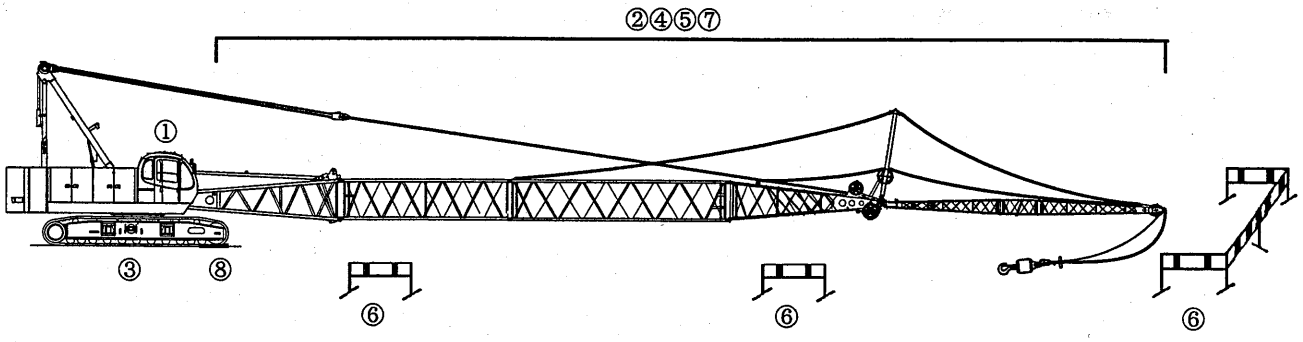


6.2 ERECTING THE ATTACHMENT

6.2.1 CONFIRMATION BEFORE ERECTING THE ATTACHMENT

Check the following items, and confirm that there is no abnormality, then erect the attachment.

① Preoperation check,
② Lubrication to the each part of the attachment,
③ The crawlers extended to the working position,
④ The wire ropes correctly reeved,
⑤ Tools,etc. not left on the attachment.
⑥ The offlimiting step to the surrounding area of the attachment was taken,
⑦ The wirings for the boom, main and auxiliary hook overhoist limit switches correctly connected,
⑧ For the combination of the boom of 190 feet (57.9 m) length and the jib of any length, place floor plates between the ends of the crawlers and the ground.



6.2.2 ERECTING THE ATTACHMENT

⚠ WARNING

Before operating the boom ensure the area above and beneath the boom is clear of all obstructions and personnel.
Failure to observe this precaution may result in serious injury or loss of life.

(1) CAUTIONS WHEN ERECTING

① Erecting of the attachment must be performed in the front and rear direction of the crawlers.

② Place the hook block until boom angle reaches approximately 20 degrees.

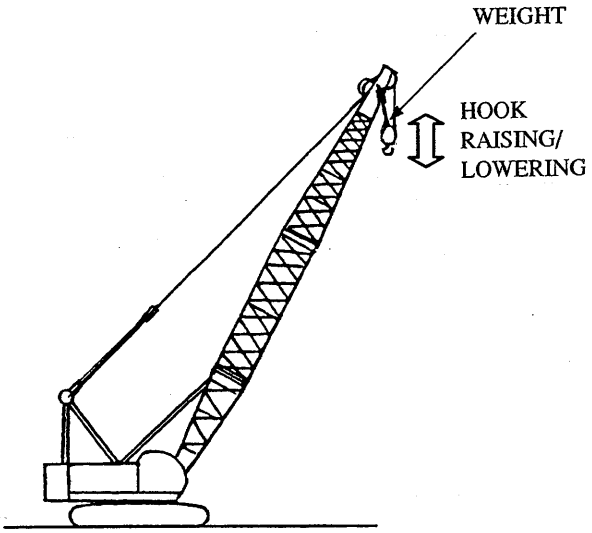
③ Operation must be performed at a low speed. Sudden start and stop must be avoided.

④ Prevent catching and kink, etc. of the wire rope in the tip of the boom and jib.

(2) Release the drum lock in the side where the hook is attached.

(3) Operate the boom hoist control lever toward the RAISING side to raise the boom slowly.

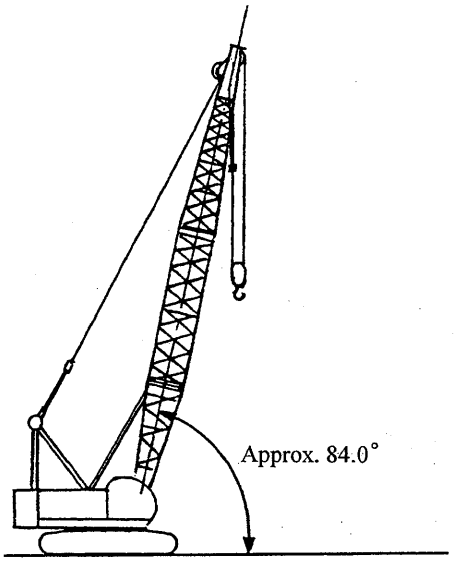
(4) Paying close attention to catching and kink of the hoist wire rope, raise the hook.



(5) Before starting actual work, confirm the following items.

① When the hook is raised to strike against the weight for preventing overhoist, raising motion must be stopped.

② When the boom is raised to approximately 84.0 degrees of boom angle, boom raising must be stopped.



6.3 LOWERING THE ATTACHMENT

When lowering the attachment, observe the following items.

① Lowering of the attachment must be performed in the front and rear direction of the crawlers.

② When the boom angle is less than approximately 30 degrees, place the hook on the ground.

③ Operation must be operated at a low speed. Sudden start and stop must be avoided.

④ Prevent the wire rope from catching and kink in the tip end of the boom and jib.

⑤ For the combination of the boom of 190 feet (57.9 m) length and the jib of 60 feet (18.3 m) length, place floor plates between the ends of the crawlers and the ground.

⚠ WARNING

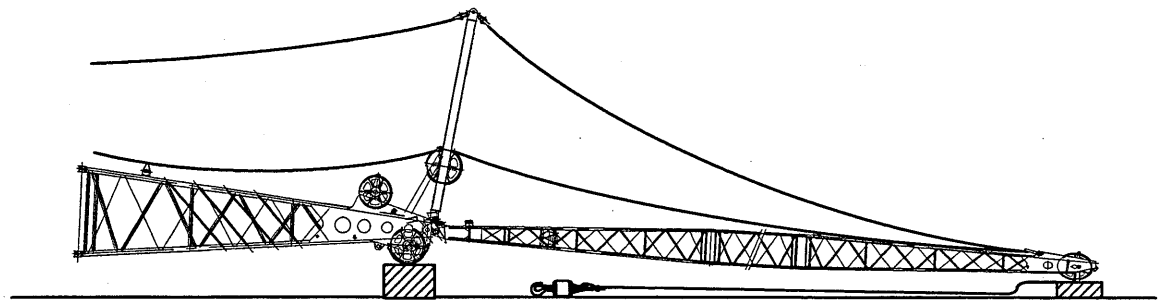
Before operating the boom ensure the area above and beneath the boom is clear of all obstructions and personnel.
Failure to observe this precaution may result in serious injury or loss of life.

6.3.1 LOWERING THE ATTACHMENT

(1) Lower the boom at a low speed.

(2) Lower the hook onto the ground.

(3) By lowering the boom more, the hook overhoist limit switch operates, and the boom lowering is automatically stopped. Operate the hook overhoist release switch to the RELEASE side, and lower the boom onto the ground.



6.4 DISASSEMBLING THE ATTACHMENT

6.4.1 TREATMENT OF OVERHOIST LIMIT SWITCH WIRING

(1) Disconnect the overhoist limit switch wiring in the boom tip end, and wind it up onto the cable reel.

(2) Disconnect the wiring between the cable reel and the basic machine side, and install the short circuit cap to the basic machine side wiring.

(3) If the jib is attached, wind up the jib side wiring onto the cable reel in the same way.

6.4.2 WINDING UP THE FRONT DRUM/REAR DRUM WIRE ROPES

(1) Confirm that the hook is set in the stabilized condition.
(2) Remove the rope socket and clamp from the wire rope end.
(3) Slowly operate the front drum or rear hoist drum control lever to wind up the hoist wire rope onto the appropriate drum, being careful for being caught to the sheave.

⚠ WARNING

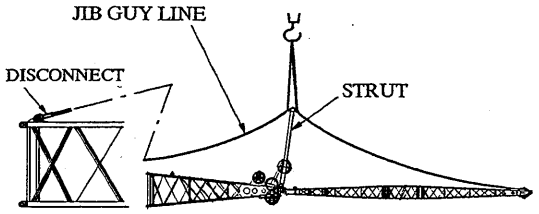
Do not touch a wire rope directly with bare hands. If wire protrude, you could be injured.
Working gloves are recommended.
Keep hands and clothing clear of the rotating drum and running wire rope.
Failure to observe this precaution may result in serious injury or loss of life.

6.4.3 DISASSEMBLING THE JIB

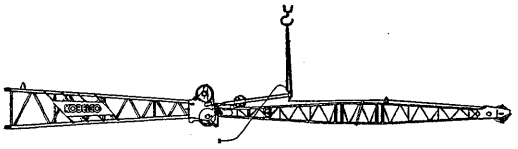
⚠ WARNING

Do not stand or work under, inside or on the jib structure when assembling jib.
Failure to observe this precaution may result in serious injury or loss of life.

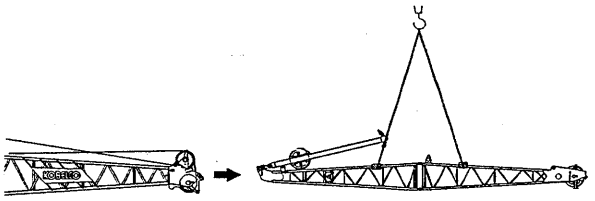
(1) While holding the jib strut with the assisting crane, disconnect the jib guy line from the insert boom.



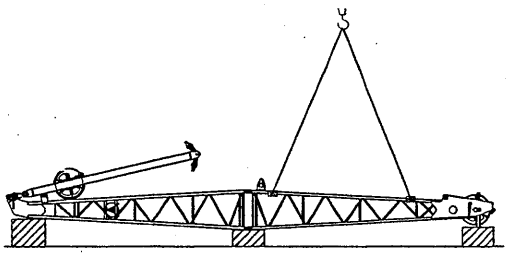
(2) Remove the backstop from the strut, and lay down the strut to the jib side.



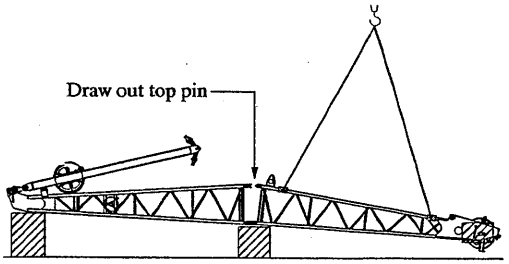
(3) Take off the jib side jib guy line from the jib tip end.
(4) Take off the jib side and boom side guy lines from the strut.

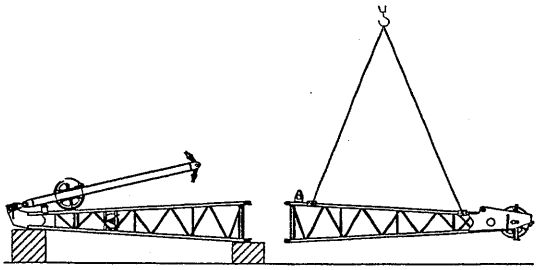


(5) With the jib held with the assisting crane, detach the jib from the boom.
Place the jib on blocking.



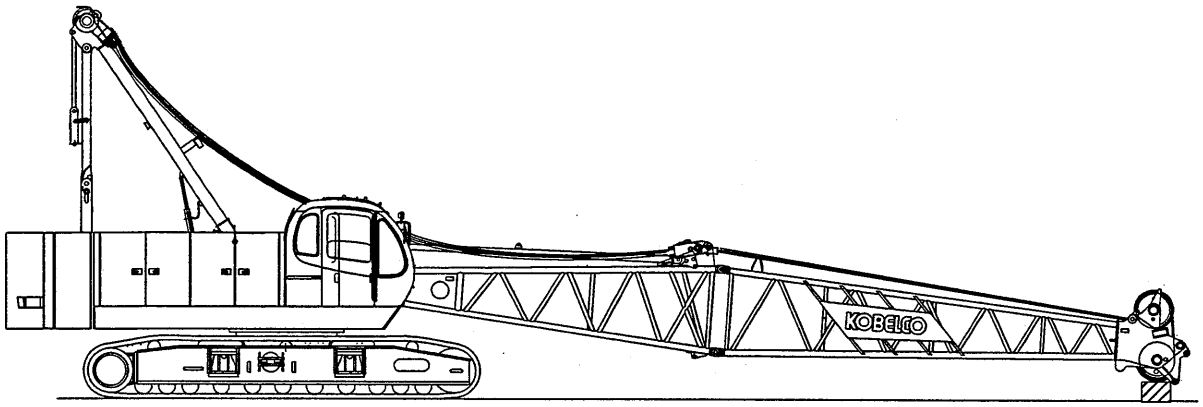
(6) Disassemble the jib.
Draw out the top connecting pins first, then draw out the bottom connecting pins.
To prevent the jib from jumping up when the jib connecting section is disconnected, support the jib with blocking, etc..





6.4.4 REMOVING THE BOOM GUY LINE

(1) Set the spreader guide to the "working position", and slowly slacken the boom hoist wire rope (Refer to P. 6-18).

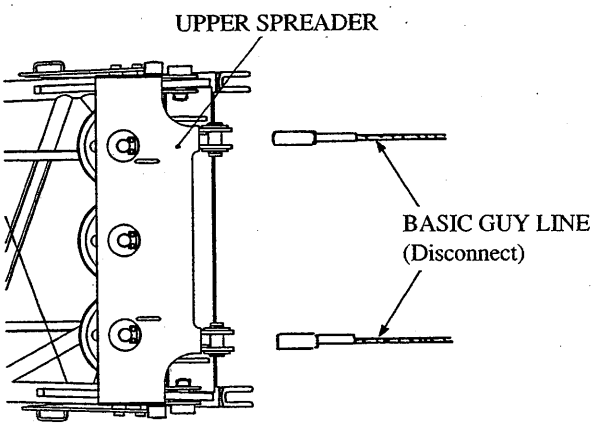


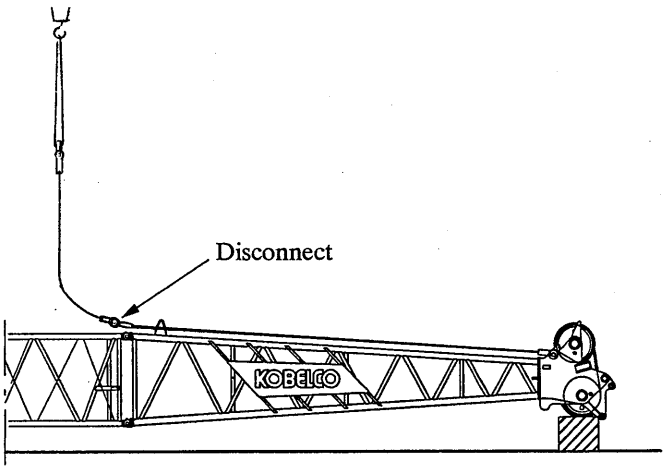
(2) Use the spreader guide, and install the upper spreader on the lower boom with the pin.

(3) Disconnect the guy lines from the upper spreader.

(4) Disconnect the connector sections of the guy lines in order.

(5) Using the assisting crane, lower the guy lines onto the ground. At this time, be careful not to injure the boom.





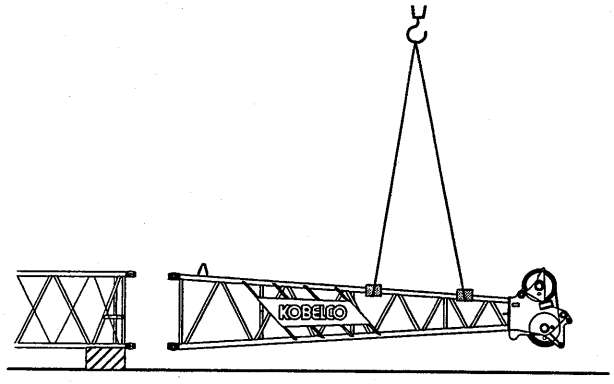
6.4.5 DISASSEMBLING THE BOOM

DANGER

Do not stand under, inside or on the boom structure when disassembling boom.
Failure to observe this precaution may result in serious injury or loss of life.

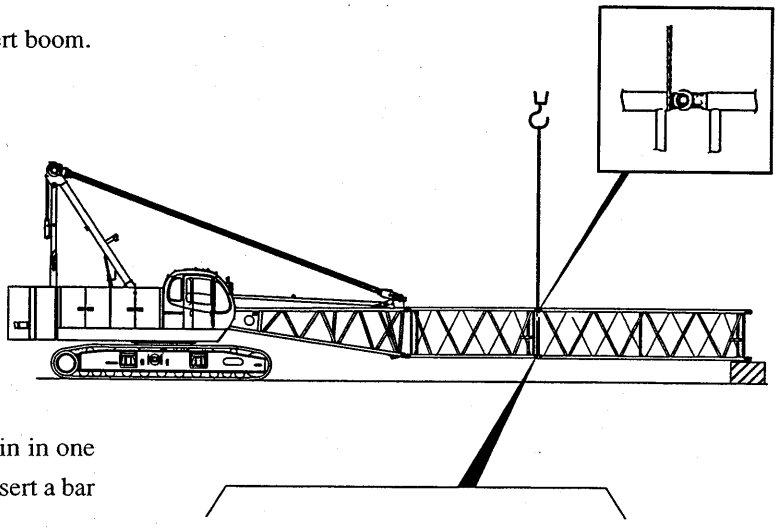
(1) Disconnect the tip boom.

1) While holding the tip boom with the assisting crane, draw out the top side connector pins. Then, draw out the bottom side connector pins, and disconnect the tip boom.



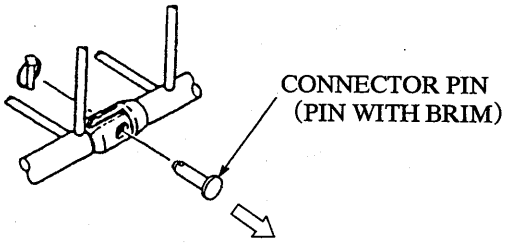
(2) Disconnect the insert boom.

1) Hold the connecting section of the insert boom.



2) Draw out the bottom side connector pin in one side only. After drawing out the pin, insert a bar to prevent the pin hole from moving.

3) Draw out the other bottom side connector pin.



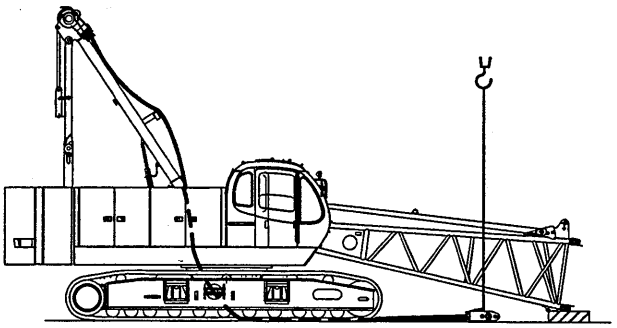
4) Remove the moving preventive bar, and lower the boom onto the ground with the use of the assisting crane.

5) Draw out the top side connector pins, and disconnect the insert boom.

6.4.6 REMOVING THE BASE BOOM

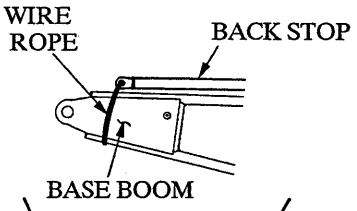
⚠ DANGER

Do not stand under, inside or on the boom structure when disassembling boom.
Failure to observe this precaution may result in serious injury or loss of life.



(1) Hold the upper spreader with the assisting crane. Then, take off the upper spreader from the lower boom, and place it on the ground to the left of the basic machine.

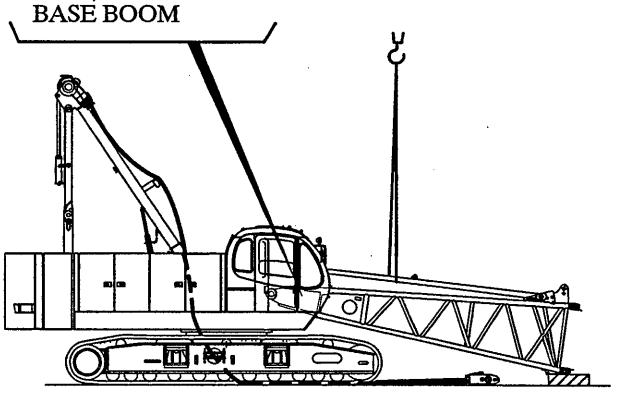
(2) While holding the backstop with the assisting crane, take off the outer pipe from the revolving frame, retract it, and fix it to the bracket of base boom (both left and right).



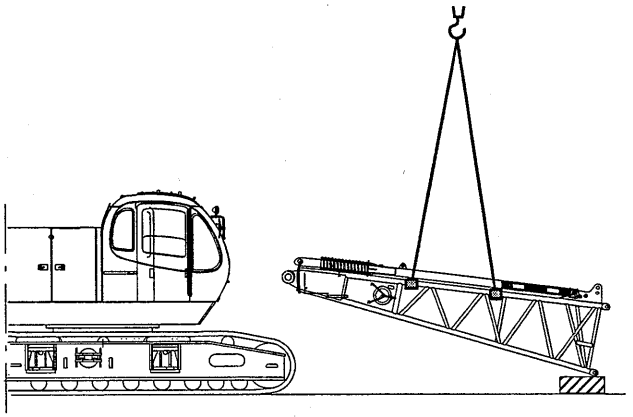
(3) While holding the foot side of the base boom with the assisting crane, draw out the boom foot pin in the cab side (right side) first, then draw out the left side boom foot pin.

⚠ CAUTION

Be careful that the lower boom can move suddenly, once the boom foot pin is removed.



(4) Move the basic machine backward a little, and lower the base boom onto the ground.



6.4.7 REMOVAL OF THE COUNTERWEIGHT

Remove the counterweight as per section 5.4.

DANGER

Do not stand on or under the lifted counterweight or between weight and the basic machine to avoid accident of being caught.
Failure to observe this precaution may result in serious injury or loss of life.

6.4.8 LOWERING THE GANTRY

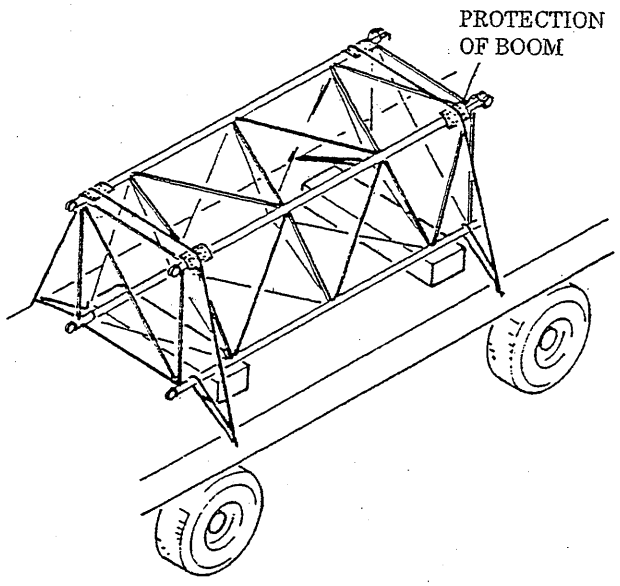
Lower the gantry as per section 5.3.

WARNING

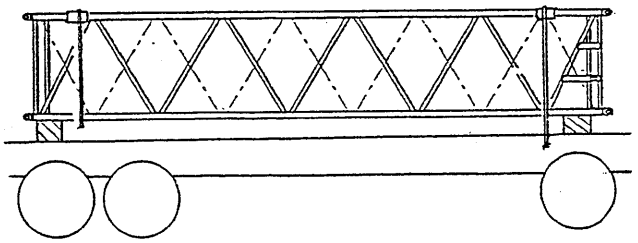
Do not stand under the gantry to avoid accident of being caught due to sudden drop of the gantry.
Failure to observe this precaution may result in serious injury or loss of life.

6.5 CAUTION WHEN TRANSPORTING BOOM

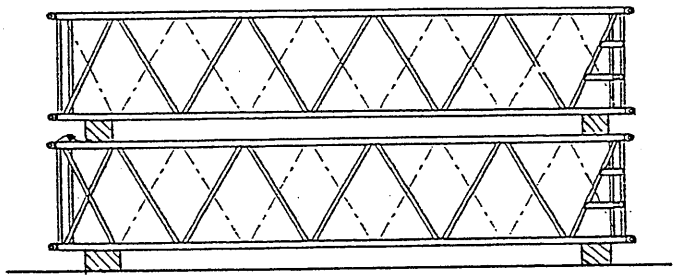
(1) In order to prevent the boom from damage, do not hook the fixing ropes directly to the main chord members and lacing members. Be sure to use sling cloths.



(2) Place blocking under the both ends of the boom.



(3) When placing a boom upon another boom, place blocking just above the under blocking.
Place the insert boom with lugs attached on the bottom. If it is placed on the top, the transporting height becomes high.



7. WIRE ROPE

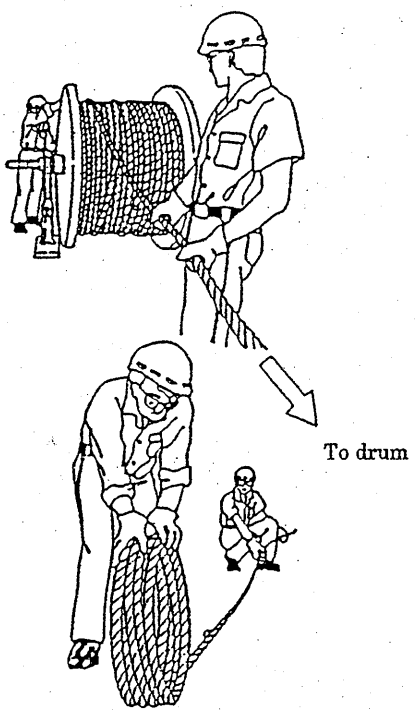
7.1 HANDLING OF WIRE ROPE

⚠ WARNING

Do not touch a wire rope directly with bare hands. If wires protrude, you could be injured. Working gloves are recommended.
Failure to observe this precaution may result in serious injury or loss of life.

7.1.1 UNREELING METHOD OF WIRE ROPE

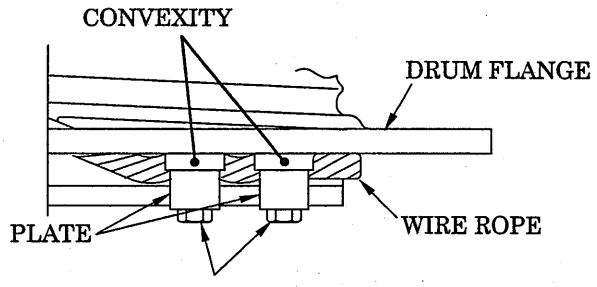
When unreeling the wire rope, take sufficient care to prevent it from kinking.
It is convenient to use a jig as shown in the right figure.
If the method mentioned above is unavailable, being careful not to soil the wire rope, roll over to extend it straightly.



Unreeling method of wire rope

7.1.2 WINDING WIRE ROPE ONTO THE DRUM

(1) Pass the wire rope end through from the inside of the drum flange, and fix it with the plate so that the wire rope does not stick out from the flange circumference.
When tightening the bolts with the specified tightening torque, adjust the clearance between the plate and flange convexity is uniform.

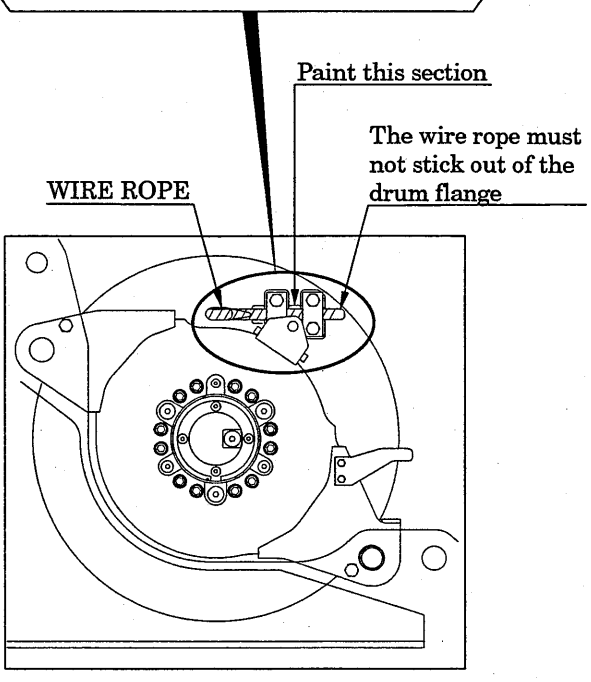


Tightning Torque: 275ft·lbs(373N·m)

⚠ WARNING

If the wire rope end is not securely fixed, it may be unfixed, causing the accidental drop of the lifted load. Be sure to securely fix the wire rope end.

When unwinding the wire rope, remember that at least three lines of the wire rope must be on the drum.



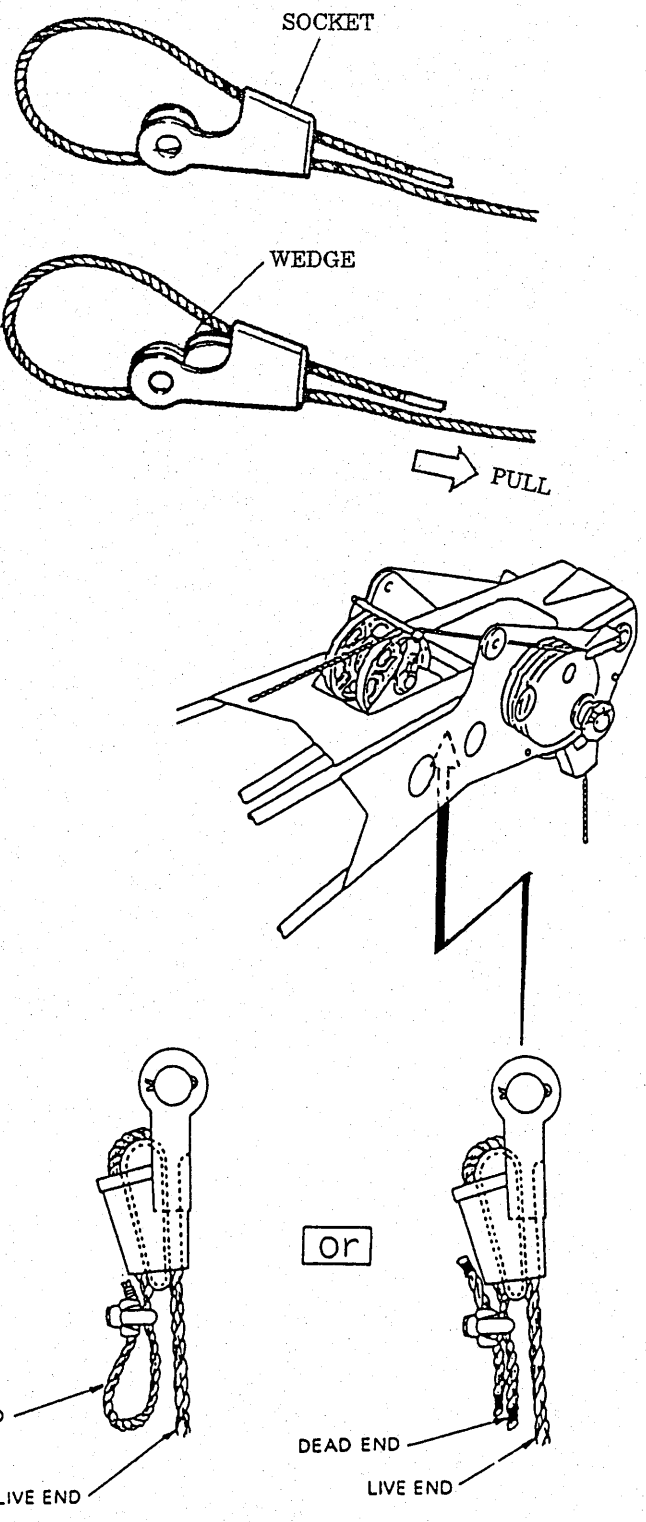
⚠ WARNING

If the number of the line of the wire rope on the drum is smaller than three, the wire rope may be unfixed, causing the accidental drop of the lifted load.
DO NOT unwind the wire rope further if three lines of the wire rope on the drum.

(2) Lightly tap the rope to line up, and slowly wind it onto the drum.
While pulling the rope, tightly wind the rope onto the drum.

7.1.3 INSTALLING THE ROPE SOCKET

(1) Thread the wire rope through the socket and bring it around in an easy to handle loop. The live end of the rope must be in a straight line through the socket.
(2) Insert the wedge in the rope loop and pull the wedge and rope loop tight enough to hold the wedge in position while handling.
(3) After the socket is pinned to the boom or hook block, apply gradually increasing loads to the wire rope until the wedge is in its final position.
(4) Secure the wire rope with the rope clamp.
The rope clamp must be correctly installed not to mistake the direction.



7.1.4 SPECIFICATION OF WIRE ROPE

(1) Crane

Use	Specification	Diameter [inch (mm)]	Length [feet (m)]	Breaking Strength [lbs (kg)]
Front Drum	IWRC 6×Fi (25) C/O	1 (25.4)	771 (235)	103,415 (46900)
Rear Drum	IWRC 6×Fi (25) C/O	1 (25.4)	525 (160)	103,415 (46900)
Boom Hoist Drum	IWRC 6×WS (36) C/O	5/8 (15.8)	492 (150)	47,209 (21400)

7.1.5 WIRE ROPE LENGTH

1. Main

Unit: ft (m)

Parts of Line / Boom Length	1 Part	2 Part	4 Part	5 Part	6 Part	7 Part	8 Part
40 (12.2)	92 (28)	131 (40)	213 (65)	256 (78)	295 (90)	338 (103)	377 (115)
50 (15.2)	112 (34)	161 (49)	262 (80)	315 (96)	364 (111)	417 (127)	466 (142)
60 (18.3)	131 (40)	190 (58)	312 (95)	374 (114)	433 (132)	495 (151)	554 (169)
70 (21.3)	151 (46)	220 (67)	361 (110)	433 (132)	502 (153)		
80 (24.4)	171 (52)	249 (76)	410 (125)	492 (150)	571 (174)		
90 (27.4)	190 (58)	279 (85)	459 (140)	551 (168)			
100 (30.5)	210 (64)	312 (95)	512 (156)	610 (186)			
110 (33.5)	230 (70)	341 (104)	561 (171)				
120 (36.6)	249 (76)	371 (113)	610 (186)				
130 (39.6)	269 (82)	400 (122)	659 (201)				
140 (42.7)	289 (88)	430 (131)	709 (216)				
150 (45.7)	308 (94)	459 (140)	758 (231)				
160 (48.8)	328 (100)	489 (149)					
170 (51.8)	348 (106)	518 (158)					
180 (54.9)	367 (112)	548 (167)					
190 (57.9)	387 (118)	577 (176)					
200 (61.0)	407 (124)	607 (185)					

2. Auxiliary

Unit: ft (m)

Jib / Boom Length	Jib Length			
	30 (9.1)	40 (12.2)	50 (15.2)	60 (18.3)
80 (24.4)	236 (72)	256 (78)	272 (83)	292 (89)
90 (27.4)	256 (78)	276 (84)	295 (90)	312 (95)
100 (30.5)	276 (84)	295 (90)	315 (96)	331 (101)
110 (33.5)	295 (90)	315 (96)	335 (102)	354 (108)
120 (36.6)	315 (96)	335 (102)	354 (108)	374 (114)
130 (39.6)	335 (102)	354 (108)	374 (114)	394 (120)
140 (42.7)	354 (108)	374 (114)	394 (120)	413 (126)
150 (45.7)	374 (114)	394 (120)	413 (126)	433 (132)
160 (48.8)	394 (120)	413 (126)	433 (132)	453 (138)
170 (51.8)	413 (126)	433 (132)	453 (138)	472 (144)
180 (54.9)	433 (132)	453 (138)	472 (144)	492 (150)
190 (57.9)	453 (138)	472 (144)	492 (150)	512 (156)

Note : This table shows the necessary rope length when the hook is lowered to the boom foot height.
If underground work is required, the corresponding length is required.

NOTE

Too long a rope may cause rough spooling on the drum.

8. MAINTENANCE

In order to use this machine always safely in the best condition, preventive maintenance is required.

⚠ WARNING

When checking the machine, lower the boom down on to the ground, stop the engine and engage all locks. Also remove the keys or battery cables to prevent other personnel from starting the crane while maintenance personnel are at work. Failure to observe this precaution may result in serious injury or loss of life.

1. PRECAUTIONS WHEN PERFORMING CHECK AND MAINTENANCE

- Carry out check and maintenance with a suitable working clothes on.
- Be sure to set the machine on a firm and level ground, and post a notice board showing "Under Check and Inspection".
- Check and maintenance in a place of higher than two meters are elevation work. Be sure to use a working scaffold and safety band.
- When moving to perform check and maintenance, determine the fixed signals, and move the machine following the signals.
- When performing check and maintenance of hydraulic equipments, be careful to prevent dust and dirt from entering.

2. CHECK AND CHECK TABLE

- The following check table is based on the average operating condition. Consider the check schedule according to the working condition and weather condition.
- The check table covers all items, but if operators and maintenance personnel judge that additional items are necessary, add them to the check items.
- Whenever a question arises regarding check and maintenance, consult the local presentative.

⚠ WARNING

Repair or adjust the machine immediately when necessity of repair or adjustment is observed during check and inspection.

3. MAINTENANCE

- Maintenance

  When replacement of parts and readjustment are required by check, immediately replace or adjust.
  If repair is necessary, consult the service shop designated by our company.

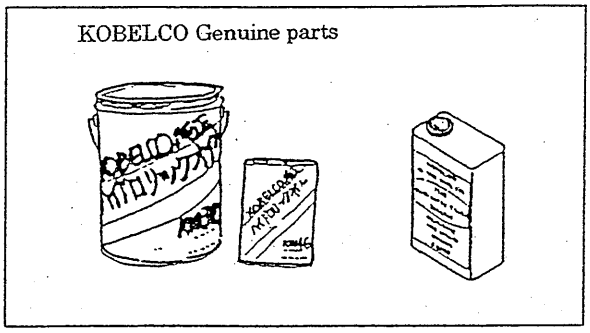
- Parts

  Use the KOBELCO genuine parts for replacement parts and lubricant to be used in order to keep performance of the machine.
  The parts of consumption such as elements, etc. must be replaced somewhat early in order to prevent deterioration of performance due to delay of replacement.
  For doubtful point regarding check and maintenance, consult the service shop designated by our company.

4. PRECAUTIONS FOR CHECK AND MAINTENANCE

- Use genuine parts of our company.

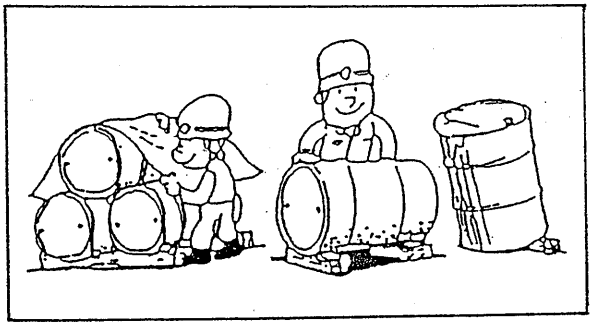
  Be sure to use KOBELCO genuine parts for replacement parts and lubricant to be used.



- Use clean oil and grease.

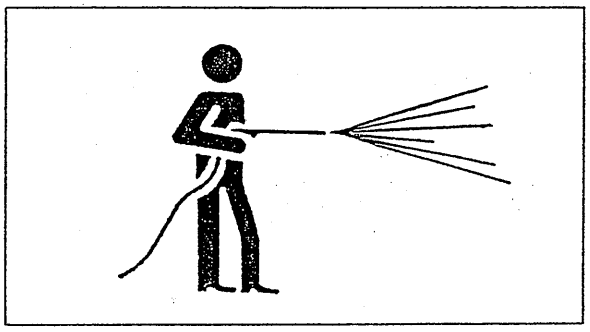
  Keep the containers for oil and grease in a clean inside of a house to prevent dust and water from entering.

  Be sure to use clean oil and grease which do not contain water.



- Clean carrier.

  Cleanly wash the carrier to make finding of oil leak, crack, loosening and other wrong condition easy. Especially, clean grease fittings, breathers and oil level gauge parts (window for check of oil), and avoid entering of dust.

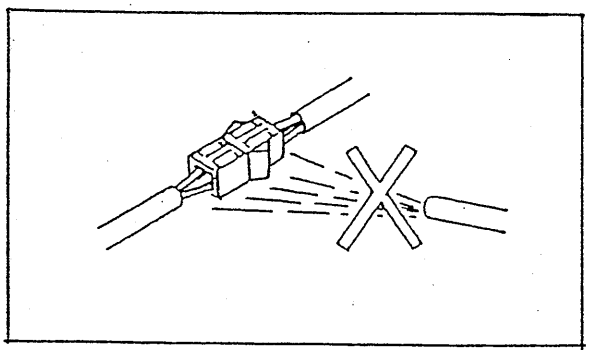


- Disposal of spilled oil

  Leaving oil spilled when refilling or replacing fuel, hydraulic oil, various lubricants, or replacing the filter, may lead to a fire accident. Thoroughly wipe it away.

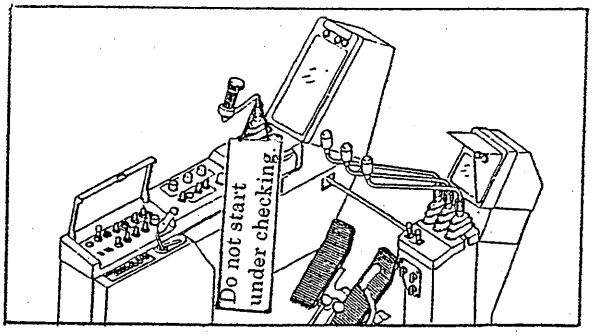
- Caution when washing the machines.

  Do not pour steam directly to electric parts and connectors.



- Place a warning plate under checking.

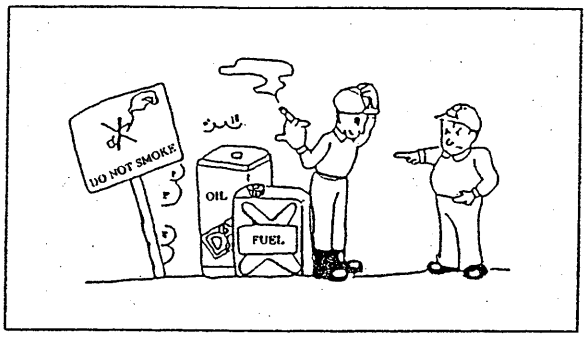
  When performing check and maintenance, be sure to indicate warning plate "Under checking. Do not Start." to the key switch.



- The lighting of fires prohibited!

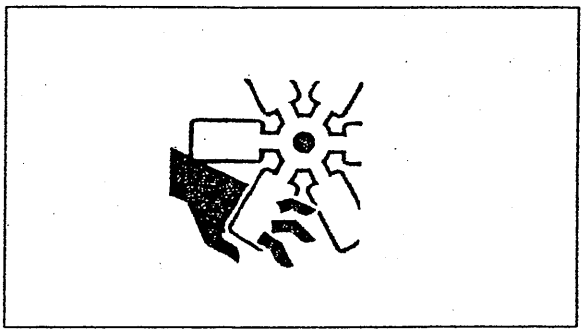
  Wastes with oil adhered and combustibles should be stored in a safe place without fire.

  Confirm the storage position and using method of fire extinguisher for emergency.



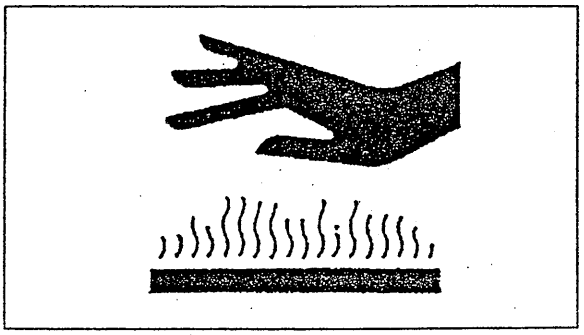
- Pay attention to rotating parts!

  When checking fan belt tension or water pump, it may become entangled in moving machinery. Stop the engine, then work.



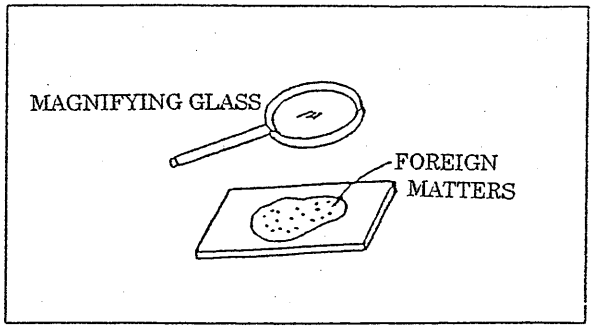
- Pay attention to temperature of water and oil.

  Since draining oil, draining water and replacing filter just after the engine stops is dangerous, wait until the temperature lowers, then perform these works. However, when oil is cold, warm the oil properly (approximately 20°C to 50°C), on the contrary, then drain the oil.



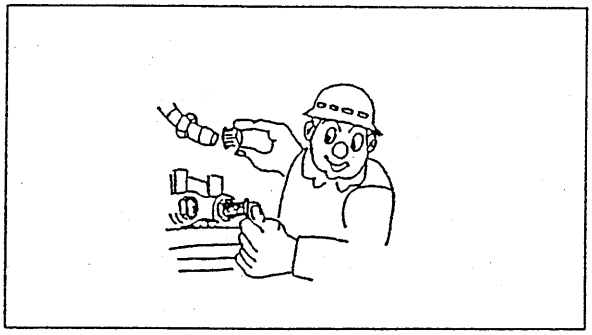
- Check drained oil and old filter.

  When replacing oil or when replacing a filter, check the old oil or old filter for much metallic powder and foreign matters.



- Be careful for entering of dust.

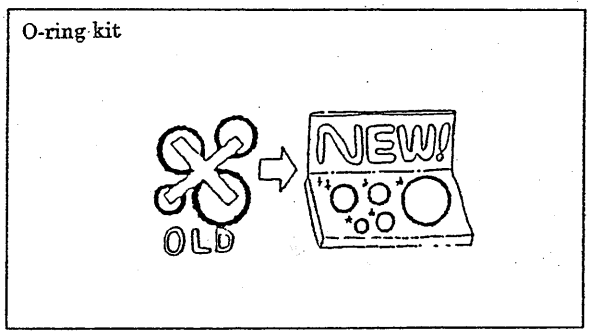
  Put the blind plug and cap to the oil holes of the removed hydraulic hoses and hydraulic equipments to prevent foreign matters from entering.



- Clean mounting Surfaces.

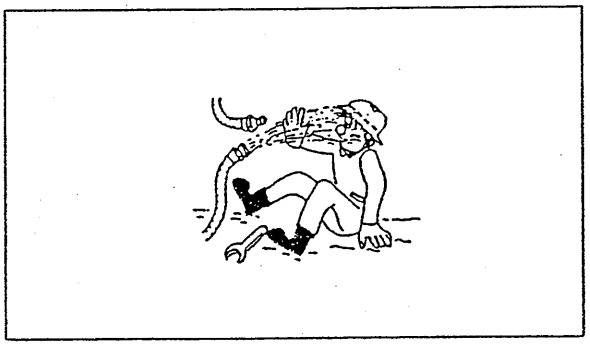
  When sealing sections of O-rings and gaskets were removed, clean the mounting surfaces, then replace with new ones.

  When assembling, apply a thin coat of oil to the seals.



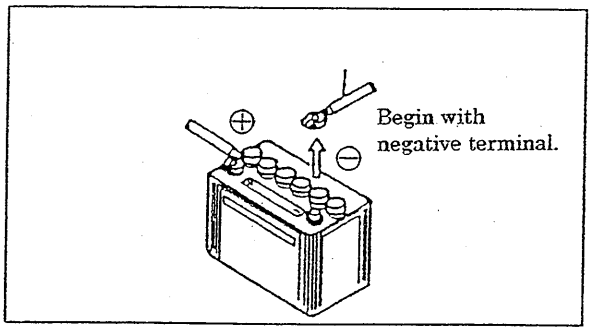
- Pay attention to internal pressure.

  When removing hydraulic system, air system, fuel system or pipings and connectors of cooling system and other related parts which have internal pressure, bleed internal pressure beforehand.



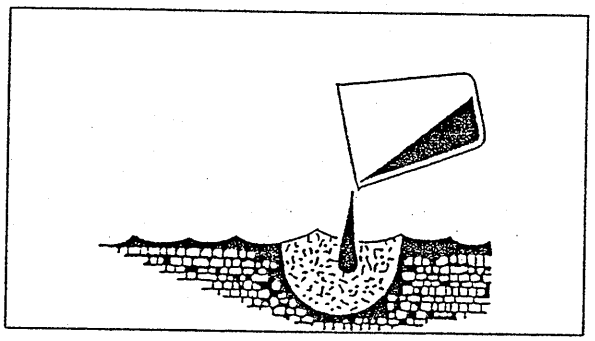
- Precaution when welding.

  - Turn off power supply (turn the key switch off).
  - Disconnect the cable of [-] side of the battery.
  - Do not apply voltage more than 200 volts continuously.
  - Provide earth (ground) within 1 meter from the welding section.
  - Do not allow a seal and bearing to enter between the welding section and earth section.
  - When welding near the load safety device and controller, remove them to prevent damage.



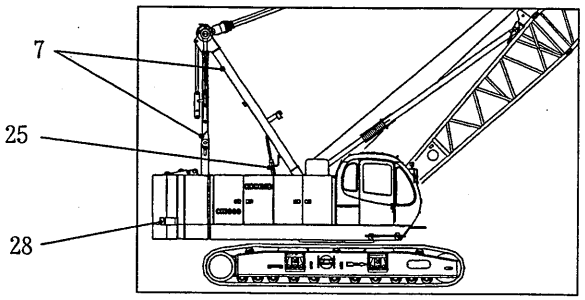
- Treatment of discarded oil.

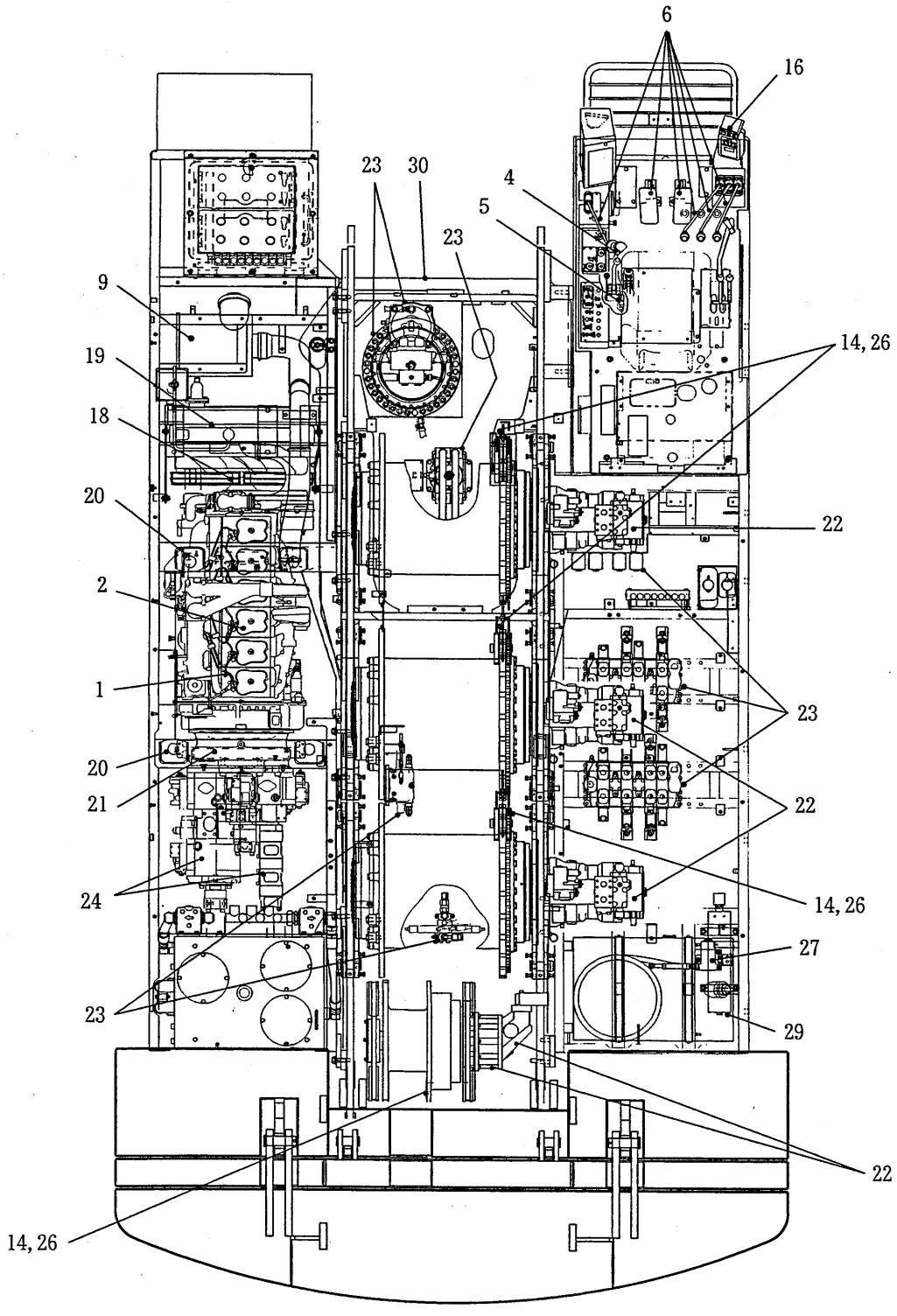
  Be sure to drain discarded oil into a container such as oil can, and treat it as industrial discharges.



8.1 CHECKS

8.1.1 CHECKS OF THE UPPER





Check Interval	Item No.	Identification	Check Item	Check Method	Reference page
Daily or every 5 hours	1	Fuel and hydraulic system hose	Damage	Visual check	8-8
	2	Engine	Starting, leak, unusual noise	Starting, check by hearing	8-8
	3	Hose, piping, connector	Oil leak	Visual check	8-8
	4	Swing brake	Effectiveness	Operation	8-8
	5	Swing lock	Performance	Operation	8-8
	6	Control lever, brake pedal	Play, deformation	Operation, visual check	8-9
	7	Gantry	Deformation, crack	Visual check	8-9
	8	Horn, head light, wiper	Performance	Operation, visual check	8-9
	9	Air cleaner	Clogging (indicator)	Visual check	8-9
	10	Pin, link, cotter pin	Damage, falling off	Visual check	8-10
	11	Bolt, nut	Looseness, falling off	Visual check	8-10
	12	Hook overhoist preventive device	Performance	Operation	8-10
	13	Boom overhoist preventive device	Performance	Operation	8-10
	14	Drum lock	Performance	Operation	8-10
	15	Window glass, step, handle, guard	Damage, crack, falling off	Visual check	8-10
	16	Drum brake free fall indicator lamp	Filament is gone	Operation, visual check	8-11
	17	Drum brake disk	Wear	Visual check	8-11
Monthly or every 100 hours	18	Fan belt	Looseness, damage	Push with finger, visual check	8-12
	19	Radiator, oil cooler	Oil leak, damage	Visual check	8-12
	20	Engine mounting bolt, rubber mount	Looseness, damage	Visual check, test hammer	8-12
	21	Power divider	Oil leak, unusual noise	Visual check, check by hearing	8-13
	22	Hydraulic motor, reduction unit	Oil leak, unusual noise	Visual check, check by hearing	8-13
	23	Valve, etc.	Oil leak	Visual check	8-14
	24	Hydraulic pump	Oil leak, unusual noise	Visual check, check by hearing	8-14
	25	Gantry cylinder	Oil leak, damage	Visual check	8-14
	26	Drum lock	Wear, damage	Visual check	8-14
	27	Fuel supply pump, hose	Performance, damage	Operation, visual check	8-14
	28	Swing alarm lamp	Alarm sound Filament is gone	Operation, visual check	8-15
Semi-annually or every 600 hours	29	Accumulator	Oil leak, damage	Visual check	8-15
	30	Frame	Damage, crack	Visual check	8-15

※ The item numbers in the above table correspond to the numbers in the following description.

※ The item numbers, 3, 10, 11, 12, 13, and 15 are not indicated in the drawing.

CHECK OF UPPER DAILY OR EVERY 5 HOURS

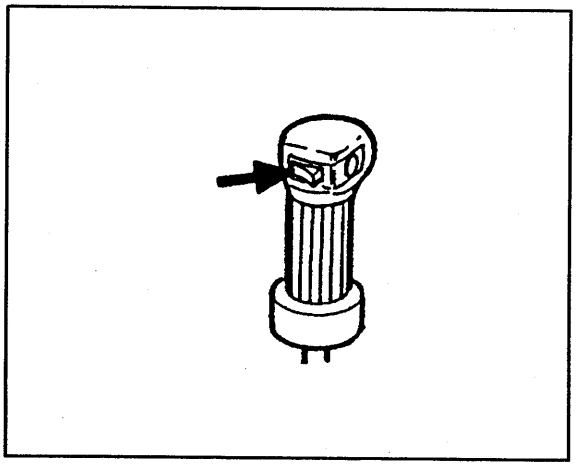
1. FUEL SYSTEM HOSE
   Check the fuel system hose for damage and for fuel leak.

⚠ CAUTION
Wipe up fuel, if fuel leak is observed.

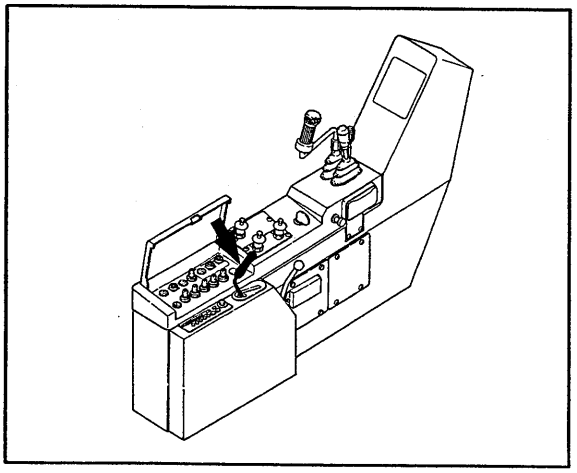
2. ENGINE
   Start the engine, check for starting condition and for unusual noise.

3. HOSE, PIPING AND CONNECTOR, ETC.
   Check the hose, piping and connector, etc. for oil leak and for damage.

4. SWING BRAKE
   Confirm that the swing brake is surely effective.
   (With the swing brake switch placed in the ON position, operate the swing control lever to confirm that the swing brake is surely effective. When the swing brake is engaged, swinging is impossible.)

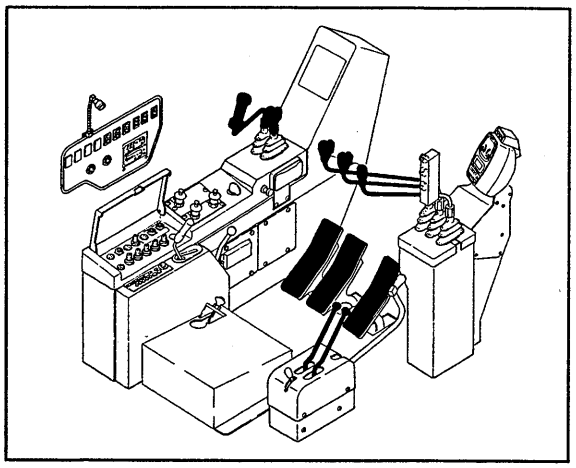


5. SWING LOCK
   Confirm that the swing lock pin is inserted smoothly. Check the lock pin and rod for deformation.



6. CONTROL LEVER AND BRAKE PEDAL

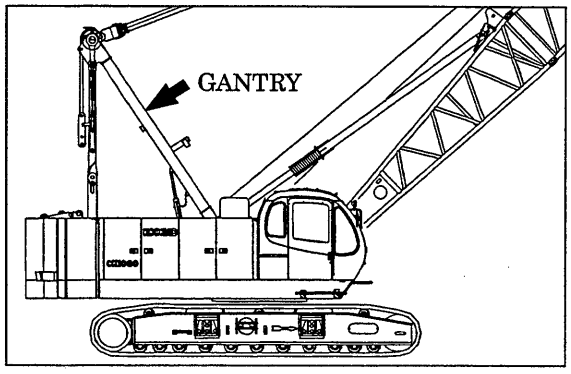
Check the control lever and brake pedal for unusual play and for damage.



7. GANTRY

Check the gantry for damage.

> **⚠ CAUTION**
>
> Due to the high strength steels used in booms and jibs, special repair procedures are required. Consult your local authorized KOBELCO distributor for instructions.



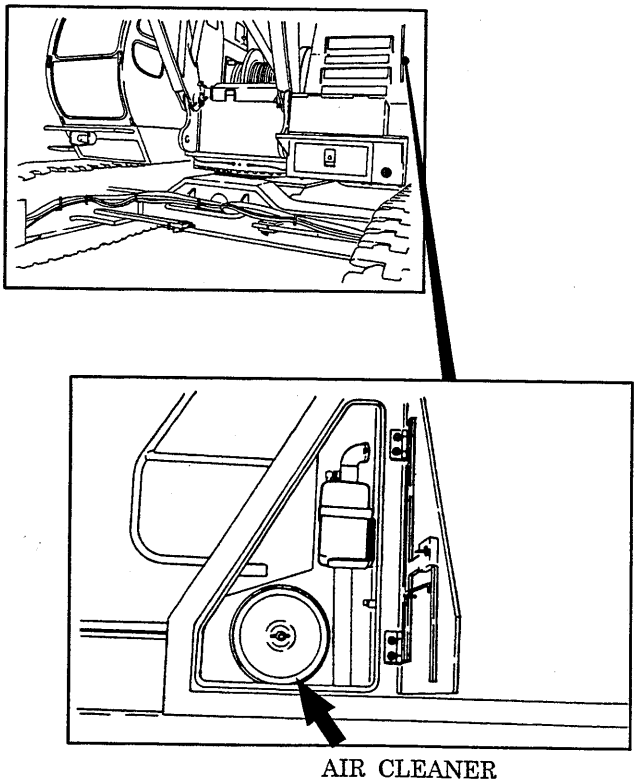
8. HORN, HEAD LIGHT AND WIPER

Confirm that the horn, head light and wiper operate normally by switch operate.

9. AIR CLEANER

Confirm, if the air cleaner is clogged, with the indicator.

When the air cleaner is clogged, the indicator changes to red color (Refer to p. 8-53).



10. PIN, LINK AND COTTER PIN

Check the pin, link and cotter pin for damage and for falling off.

11. BOLT AND NUT

Check the bolt and nut for looseness and for falling off.

12. HOOK OVERHOIST PREVENTIVE DEVICE

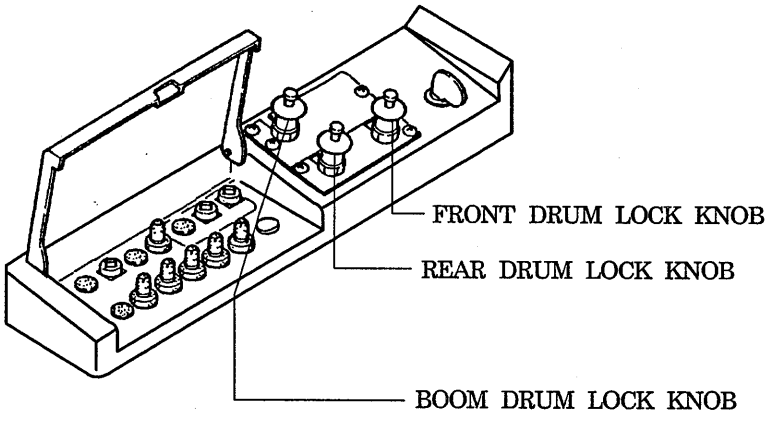
Confirm that the hook overhoist preventive device operates normally. (Refer to chapter 3 SAFETY DEVICE)

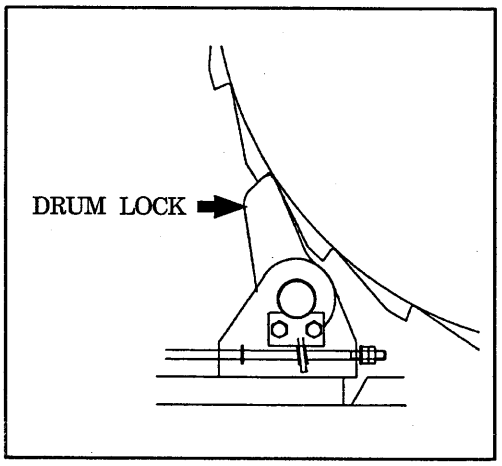
13. BOOM OVERHOIST PREVENTIVE DEVICE

Confirm that the boom overhoist limit switch operates normally. (Refer to chapter 3 SAFETY DEVICE)

14. DRUM LOCK

Confirm that the drum lock functions normally.





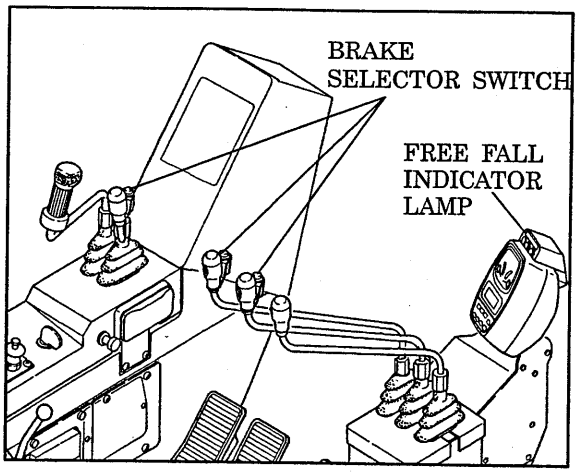
15. WINDOW GLASS, STEP, HANDLE AND GUARD

Always clean the window glass, step, handle and guard, etc.

Especially remove contamination by grease and oil.

16. FREE FALL INDICATOR LAMP

Make sure that the free fall indicator lamp lights up when a drum brake selector switch is shifted to free fall position after the engine starts.



⚠ WARNING

Place the hook block on the ground when checking the free fall function.

17. FRONT · REAR DRUM BRAKE DISK

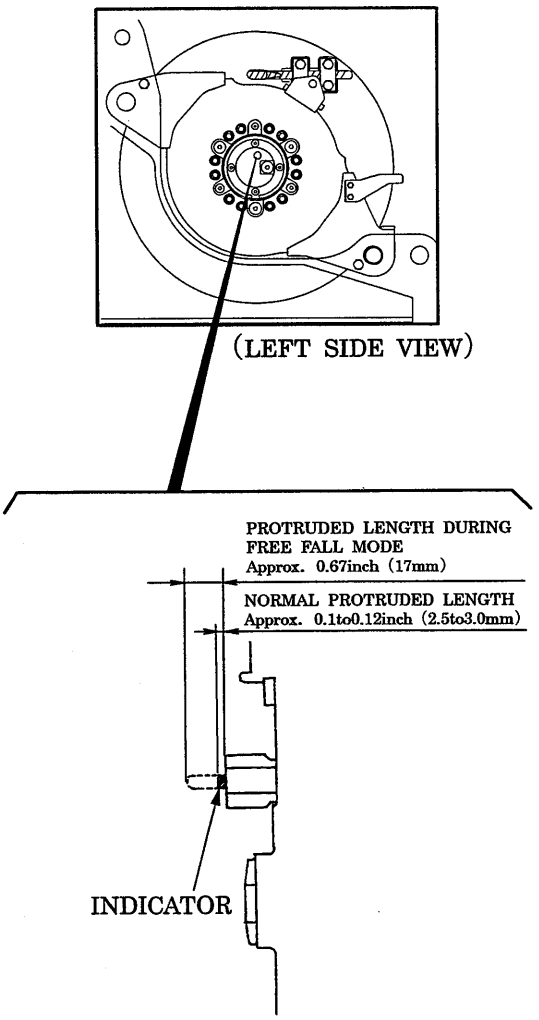
Check the wear of the brake disk with the indicator.

If the FREE FALL mode is selected, the indicator is protruded by approx. 0.67 inch (17 mm).

Then, stop the engine, and push in the indicator. If the indicator is protruded from the end face by approx. 0.1 to 0.12 inch (2.5 to 3 mm), the brake disk is normal.

If the protruded length of the indicator is 0 mm or shorter, winching may be impossible. In such a case, replace the brake disk.

In that case, contact your nearest KOBELCO service shop.



⚠ DANGER

Be sure to lower the hook block onto the ground to prevent it from dropping abruptly.

CHECK OF UPPER MONTHLY OR EVERY 100 HOURS

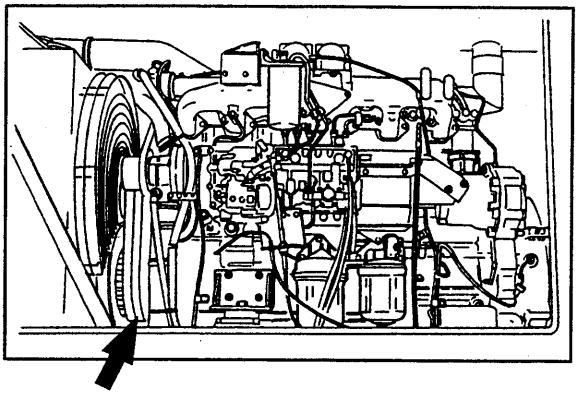
18. FAN BELT

Check the fan belt for tension.

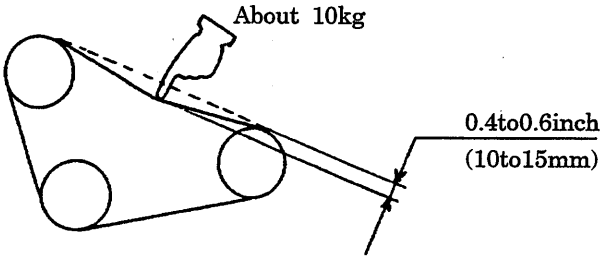
Firmly push a midway of the fan belt with a finger. Deflection of 0.4 to 0.6 inch (10 to 15 mm) is normal.

⚠ WARNING

Shut of engine before inspection of fan belt. Failure to observe this precaution may result in serious injury or loss of life.



FAN BELT

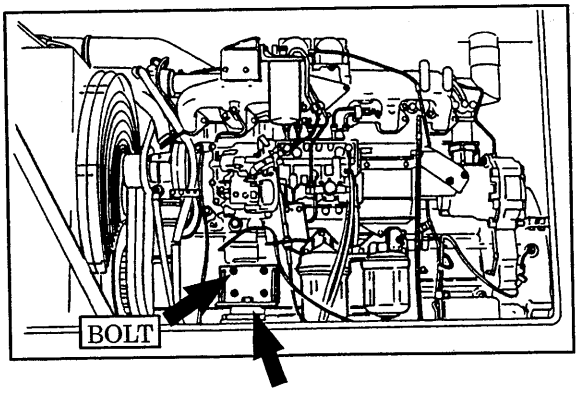


19. RADIATOR AND OIL COOLER

Clean the radiator core. And, check the radiator and oil cooler for abnormality and deformation.

20. ENGINE MOUNTING BOLT AND RUBBER MOUNT

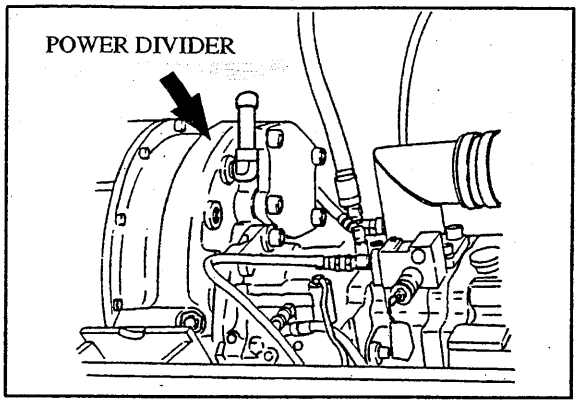
Check the engine mounting bolt for looseness, and the rubber mount for damage.



RUBBER MOUNT

21. POWER DIVIDER

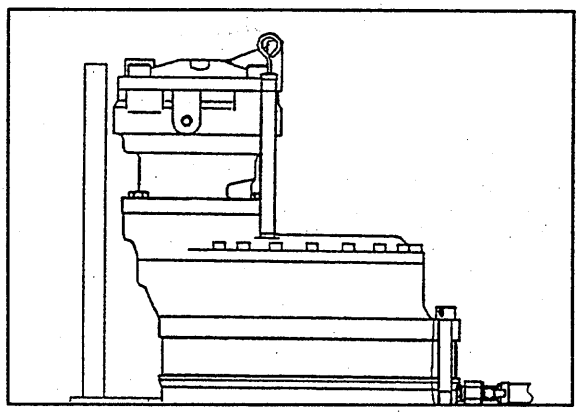
Check the power divider for oil leak and unusual noise.



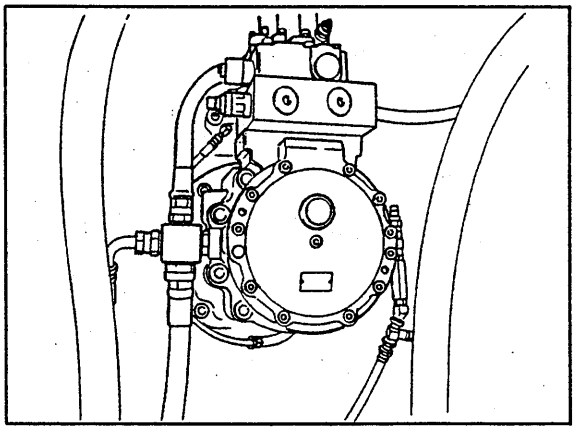
22. HYDRAULIC MOTOR AND REDUCTION UNIT

- Swing motor and reduction unit.
- Front and rear drum motors and reduction units.
- Boom hoist drum motor and reduction unit.

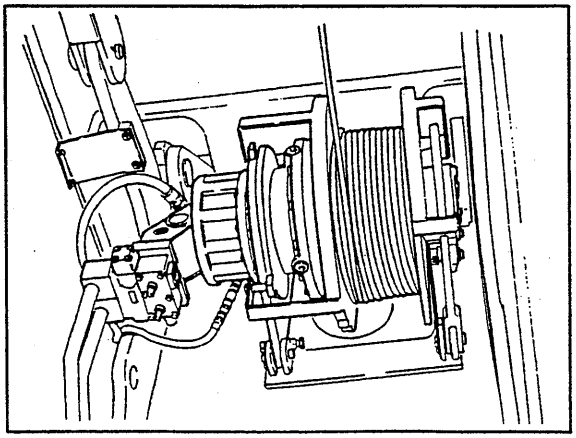
Check these for oil leak and unusual noise.



SWING MOTOR
and REDUCTION UNIT



FRONT AND REAR DRUM MOTORS
and REDUCTION UNITS



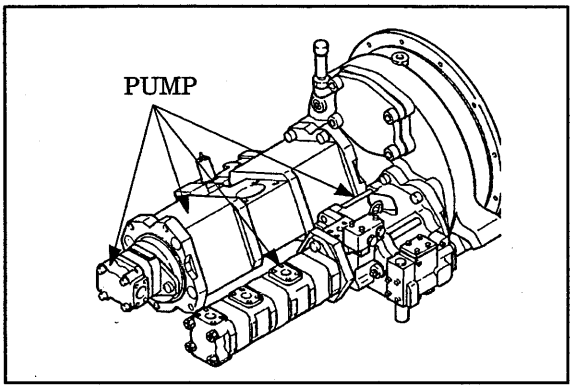
BOOM HOIST DRUM MOTOR
and REDUCTION UNIT

23. VALVE

Check each valve for oil leak.

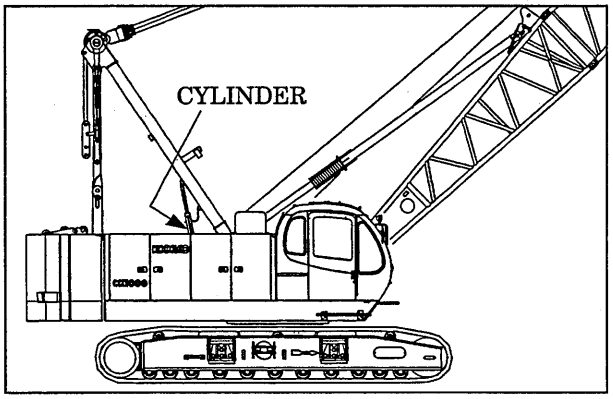
24. HYDRAULIC PUMP

Check the hydraulic pump for oil leak and for unusual noise.



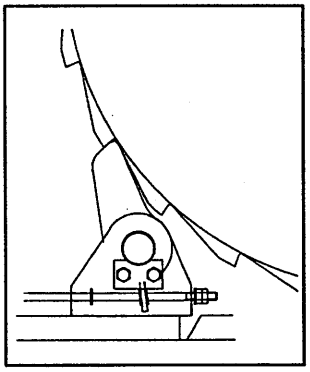
25. GANTRY CONTROL CYLINDER

Check the gantry control cylinder for oil leak and damage.

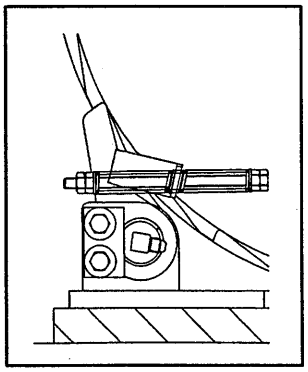


26. DRUM LOCK

Check the drum lock and drum ratchet for wear and damage.



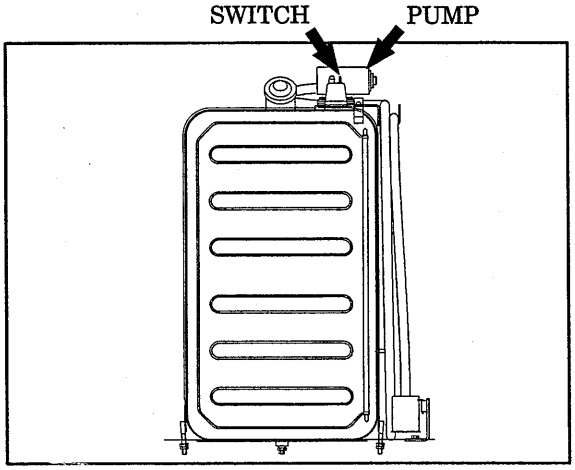
FRONT & REAR DRUM LOCK



BOOM DRUM LOCK

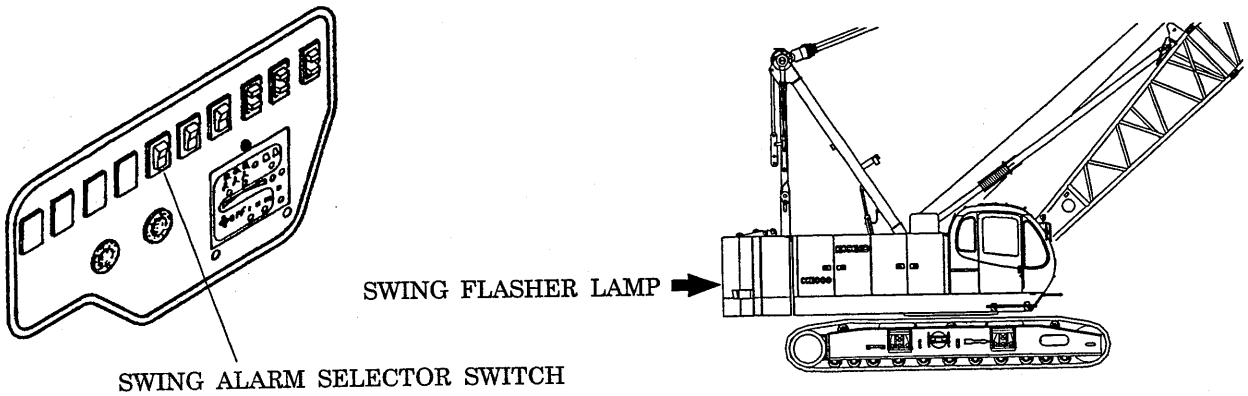
27. FUEL SUPPLY PUMP AND HOSE (OPTION)

Check the fuel supply pump for normal operation, and check the supply hose for damage.



28. SWIING ALARM

Make sure that the swing alarm and swing flasher function properly with operating machine swing.



CHECK OF UPPER SEMI-ANNUALLY OR EVERY 600 HOURS

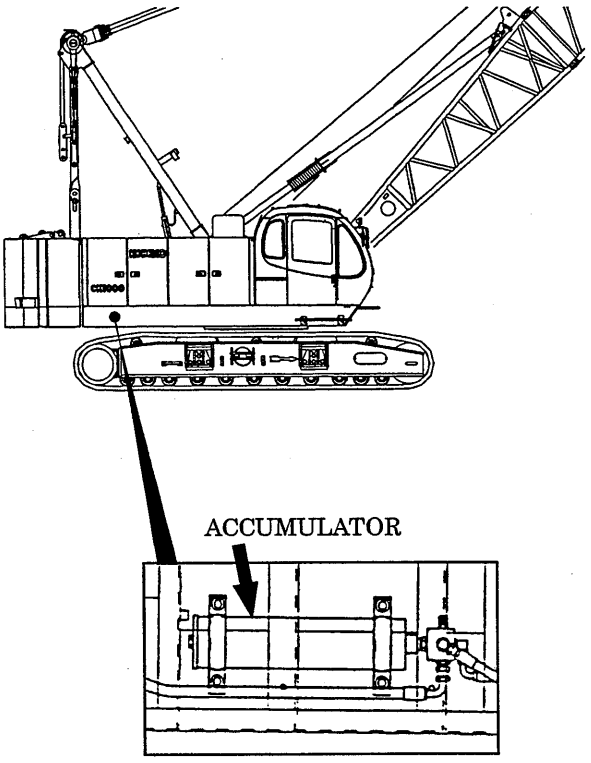
29. ACCUMULATOR

Check the accumulator for oil leak.

⚠ WARNING

The accumulator is charged with Nitrogen gas under pressure of 45 to 50 kg/cm².

1. Do not handle the accumulator roughly.
2. Do not store or handle the accumulator near the heat of fire.
3. Do not weld or machine the accumulator.
4. Do not remove valve cap except when charging or discharging gas.
5. Do not step on or place heavy material on the accumulator installed on the machine.
6. Check the accumulator for gas pressure every two years.
7. Ask our authorized KOBELCO distributor to charge the gas.
8. Do not disassemble the accumulator.

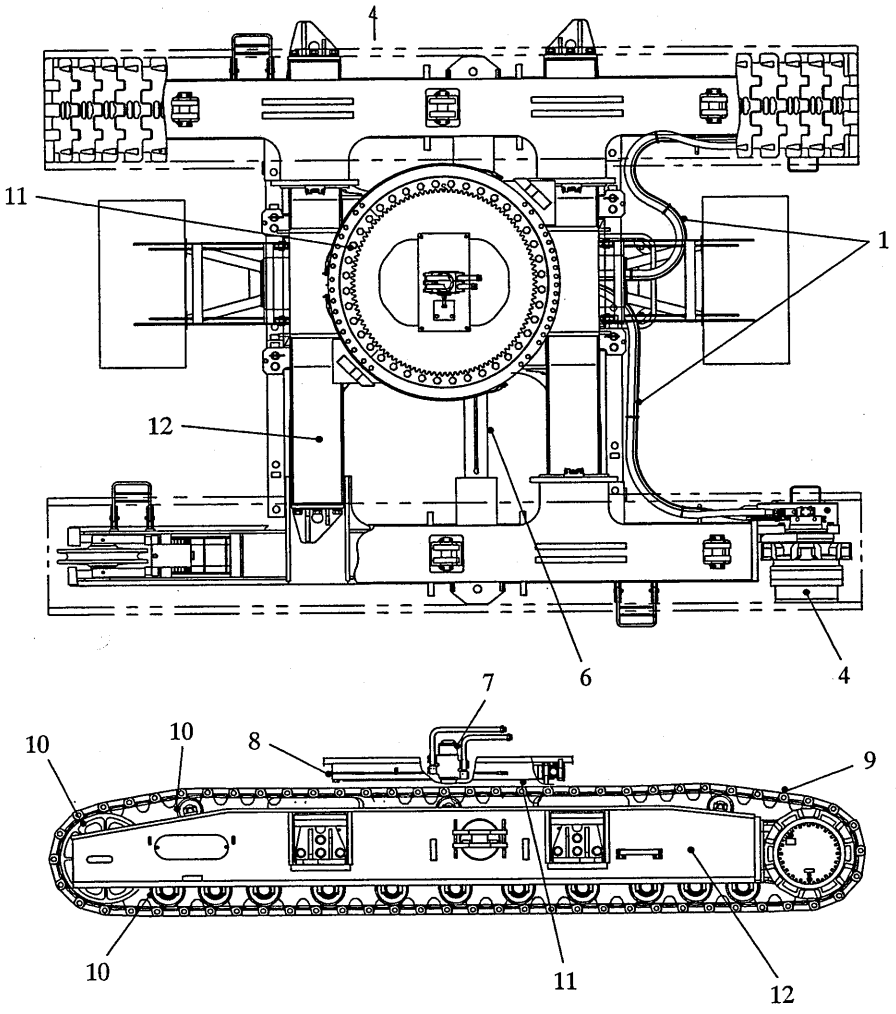


The accumulator is charged with Nitrogen gas under pressure of 3434～3728kPa (35～38 kg/cm²).

30. FRAME

Check the frame for crack and deformation.

8.1.2 CHECK OF LOWER



Check Interval	Item No.	Identification	Check Item	Check Method	Reference page
Daily or every 5 hours	1	Hose, piping, connector	Oil leak, damage	Visual check	8-18
	2	Pin, link, cotter pin	Damage, falling off	Visual check	8-18
	3	Bolt, nut	Looseness, falling off	Visual check	8-18
Monthly or every 100 hours	4	Hydraulic motor, reduction unit	Oil leak, unusual noise	Visual check	8-19
	5	Valve, etc.	Oil leak	Visual check	8-19
	6	Crawler extend/retract cylinder	Oil leak, damage	Visual check	8-19
	7	Swivel joint	Oil leak	Visual check	8-19
	8	Slewing ring bearing	Unusual noise	Check by hearing	8-20
	9	Crawler shoe	Extension, damage, wear	Visual check	8-20
Quarterly or every 250 hours	10	Drive sprocket, crawler idler, upper and lower rollers	Oil leak, damage	Visual check	8-21
	11	Slewing ring bearing mounting bolt	Looseness, falling off	Visual check	8-21
Semi-annually or every 600 hours	12	Frame	Damage, crack	Visual check	8-22

※ The item number in the above table correspond to numbers in the following description.

※ The item numbers, 2, and 3 are not indicated in the drawing.

CHECK OF LOWER DAILY OR EVERY 5 HOURS

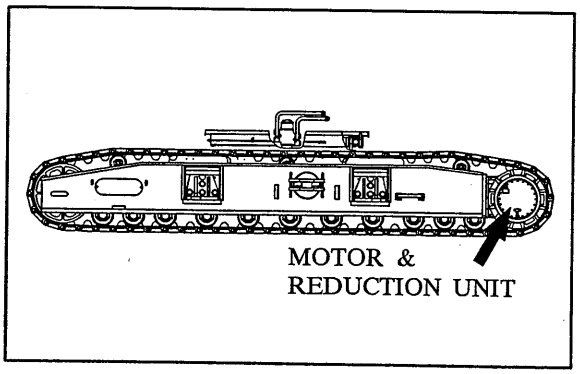
1. HOSE, PIPING AND CONNECTOR
   Check the hose, piping and connector, etc. for oil leak and damage.

2. PIN, LINK AND COTTER PIN
   Check the pin, link and cotter pin for damage, and for falling off.

3. BOLT AND NUT
   Check the bolt and nut for looseness and for falling off.

4. HYDRAULIC MOTOR AND REDUCTION UNIT

Check the propel motor and reduction unit for oil leak and unusual noise.

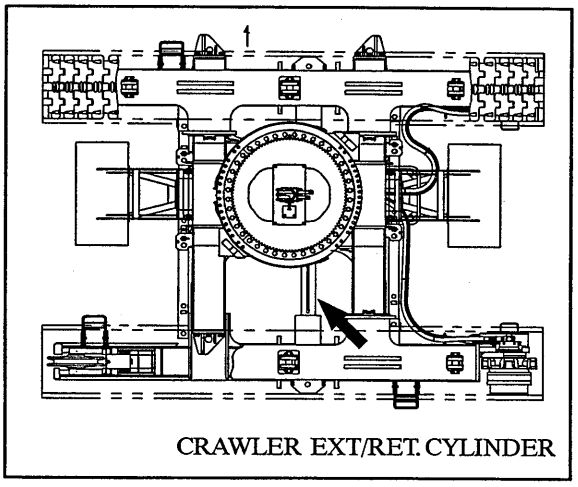


5. VALVE

Check the valve, etc. for oil leak.

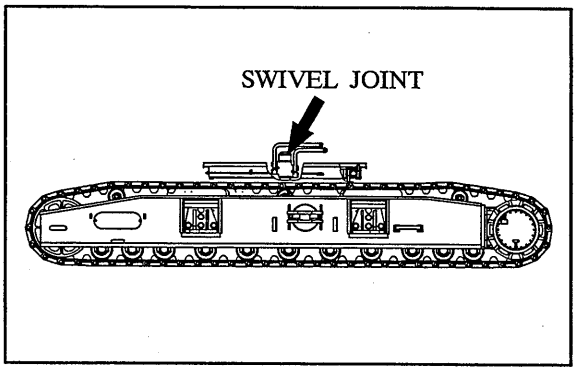
6. CRAWLER EXTEND/RETRACT CYLINDER

Check the crawler extend/retract cylinder for oil leak and damage.



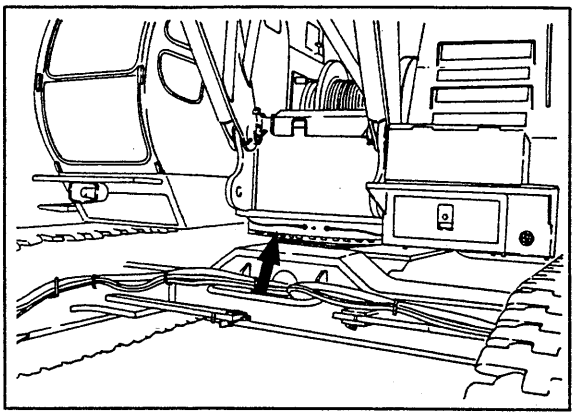
7. SWIVEL JOINT

Check the swivel joint for oil leak.



8. SLEWING RING BEARING

Check the slewing ring bearing for unusual noise.

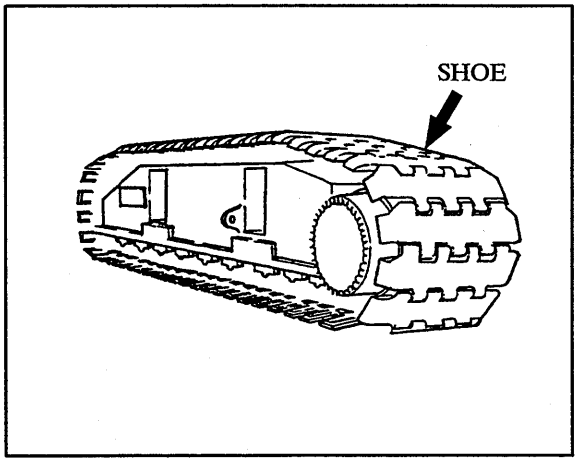


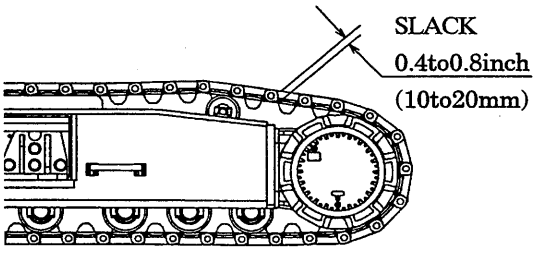
9. CRAWLER SHOE

Check the crawler shoes for looseness and for damage and wear.

If the crawler shoes are too tight, the shoes wear quickly and a connection part of shoes could break. On the other hand, if the shoes are too loose, the shoes may ride off the drive sprocket and idler wheel during propelling.

The slackening of 0.4 to 0.8 inch (10 to 20 mm) is normal condition after propelling the machine forward about the crawler length so that the slackening of the crawler shoes appear on the upper side of the crawler.

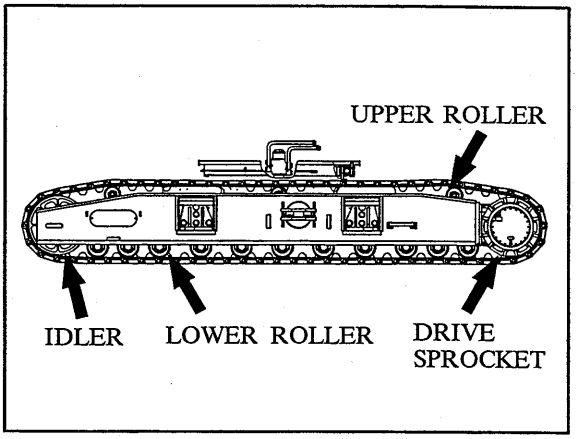




CHECK OF LOWER QUARTERLY OR EVERY 250 HOURS

10. DRIVE SPROCKET, CRAWLER IDLER AND UPPER/LOWER ROLLER

Check the drive sprocket, crawler idler and upper/ lower rollers for oil leak and damage.



11. SLEWING RING BEARING MOUNTING BOLT

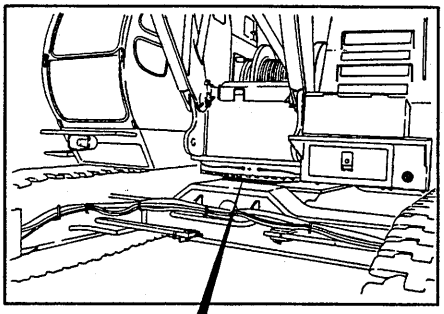
Check the slewing ring bearing mounting bolt for looseness and falling off.

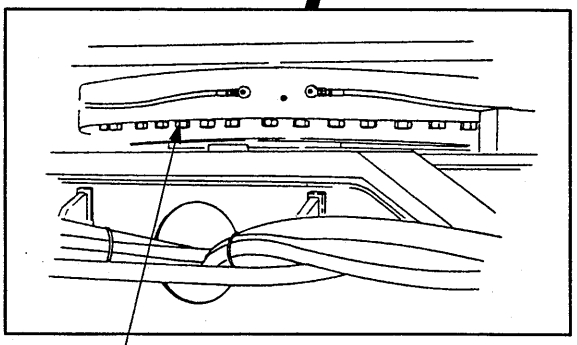
If the bolt is loose, remove and check the bolt. If the bolt is damaged, replace it with new one. If the removed bolt is not damaged, clean and coat it with Loctite #242 or equivalent, then securely tighten it.

Tightening torque :

Outer Bolt = 1431 ft·lbs (1.94 KN·m)

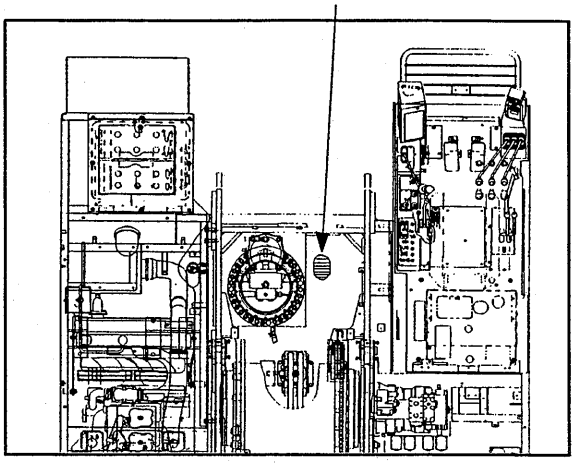
Inner Bolt = 2060 ft·lbs (2.79 KN·m)





BOLT (OUTER)

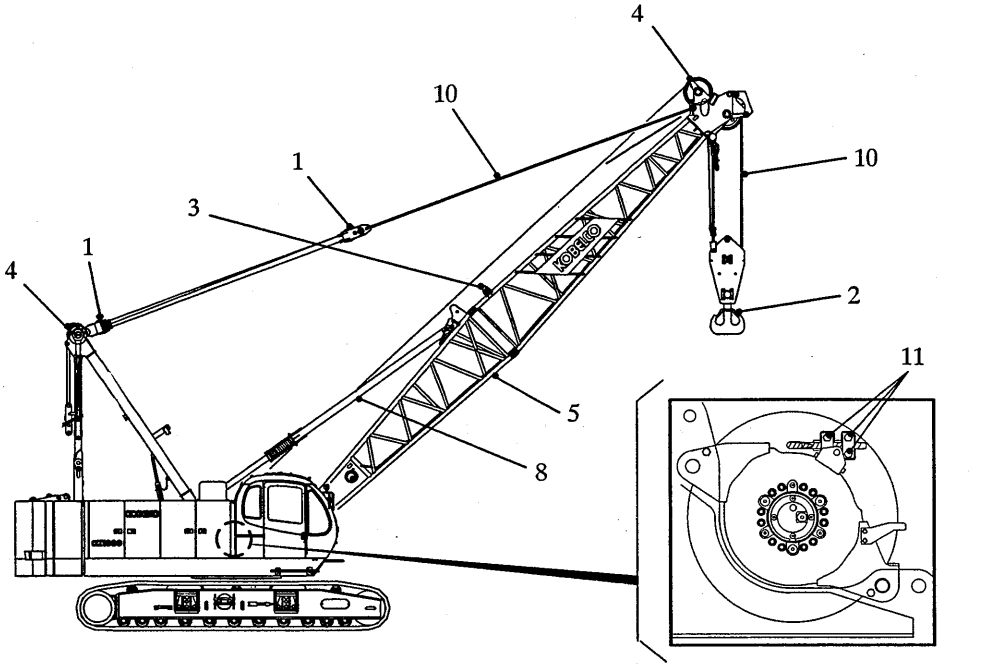
Remove this cover and check the inner bolt.



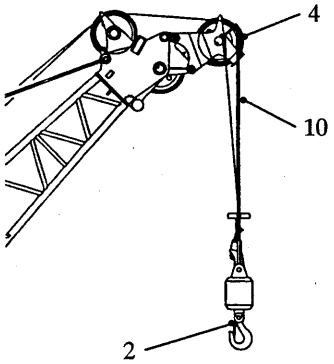
12. FRAME

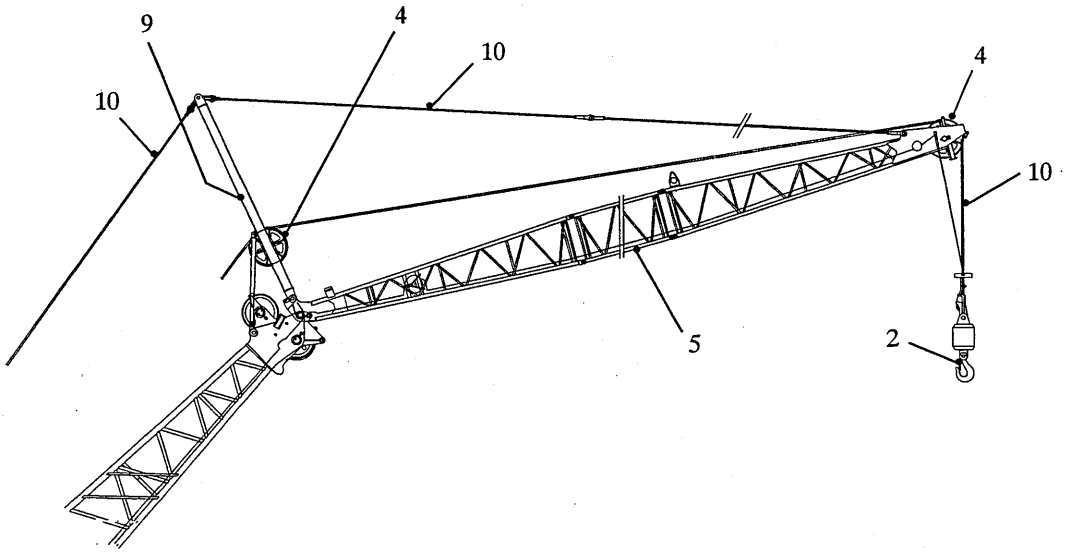
Check the carbody and crawler frame for crack and damage.

8.1.3 CHECK OF ATTACHMENT



(LEFT SIDE DRUM FLANGE)





Check Interval	Item No.	Identification	Check Item	Check Method	Reference page
Daily or every 5 hours	1	Upper spreader, lower spreader	Deformation, crack	Visual check	8-25
	2	Hook, wire lock	Damage, looseness	Visual check	8-25
	3	Cable roller	Damage, deformation, wear	Visual check	8-25
	4	Sheave	Damage, deformation, wear	Visual check	8-25
	5	Boom, jib	Damage, deformation	Visual check	8-26
	6	Pin, link, cotter pin	Damage, falling off	Visual check	8-26
	7	Bolt, nut	Looseness, falling off	Visual check	8-26
	8	Backstop	Damage, deformation	Visual check	8-27
	9	Strut	Damage, deformation	Visual check	8-27
	10	Wire rope, guy line	Damage, deformation, wear	Visual check	8-27
	11	Hoist wire rope clamp bolt	Looseness, falling off	Visual check	8-27

※ The item number in the above table correspond to numbers in the following description.

※ The item numbers, 2, and 3 are not indicated in the drawing.

CHECK OF ATTACHMENT DAILY OR EVERY 5 HOURS

1. UPPER SPREADER AND LOWER SPREADER
   Check the sheave and frame of the upper and lower spreaders for damage.

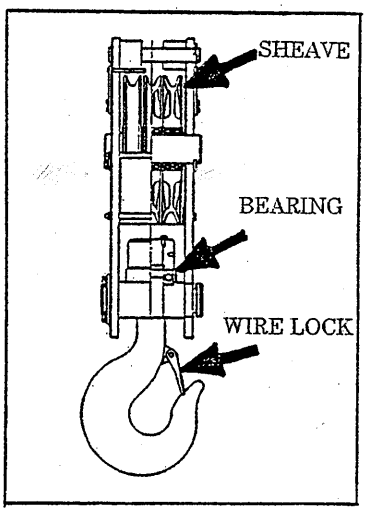
⚠ WARNING

Do not touch a wire rope directly with bare hands. If wires protrude, you could be injured. Working gloves are recommended.
Failure to observe this precaution may result in serious injury or loss of life.

⚠ WARNING

Before climbing on machine make certain that the guard and walk ways are clean and dry, and use life belt in order to prevent falls due to slippery surface. Failure to observe this precaution may result in serious injury or loss of life.

2. HOOK AND WIRE LOCK
   Check the sheave, bearing and wire lock of the hook block for damage, and check the bolt and nut for falling off.



3. CABLE ROLLER
   - Cable roller for insert boom
   - Cable roller for upper boom

   Check these parts for damage, deformation and wear.

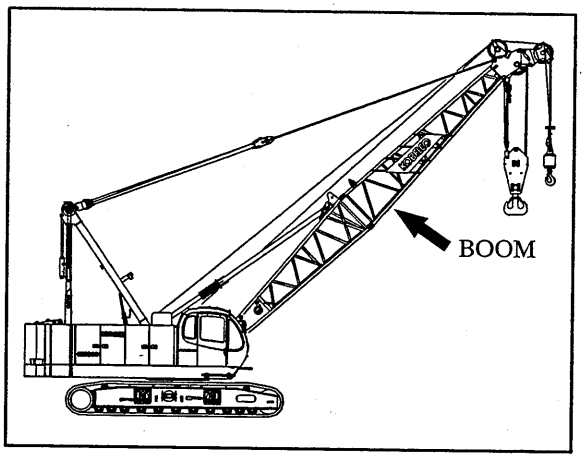
4. SHEAVE
   - Boom point sheave
   - Idler sheave
   - Auxiliary sheave
   - Jib point sheave
   - Strut sheave

   Check these sheaves for damage, deformation and wear.

5. BOOM AND JIB

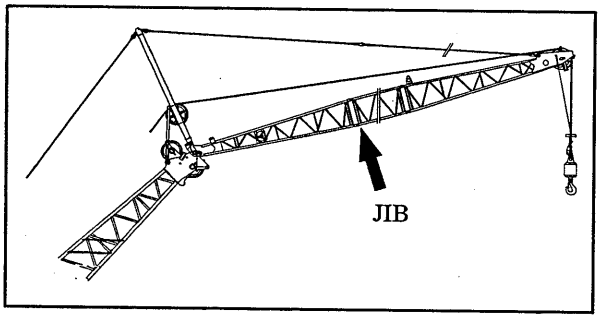
Check the boom and jib for damage and deformation. Do not use the damaged and/or deformed boom and jib.

Be sure to replace the damaged boom and jib with new ones, or repair.



CAUTION

Due to the high strength steels used in boom and jibs, special repair procedures are required. Consult your local authorized KOBELCO distributor for instruction.



6. PIN, LINK AND COTTER PIN

Check the pin, link and cotter pin for damage and falling off.

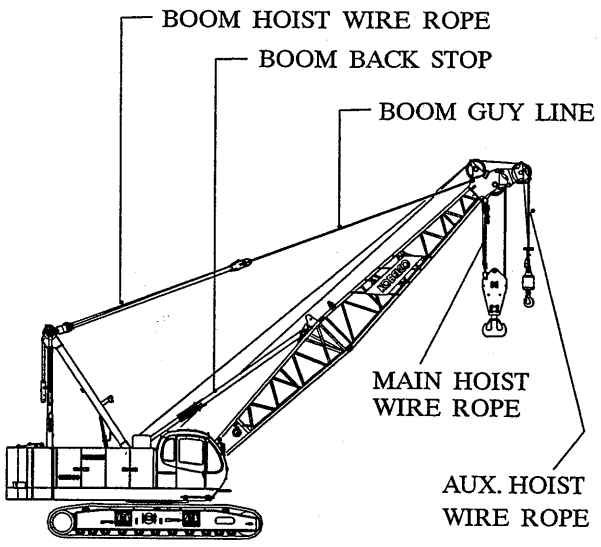
7. BOLT AND NUT

Check the bolt and nut for looseness and for falling off.

8. BACKSTOP

- Boom backstop
- Jib backstop

Check these backstops for damage and deformation.



⚠ CAUTION

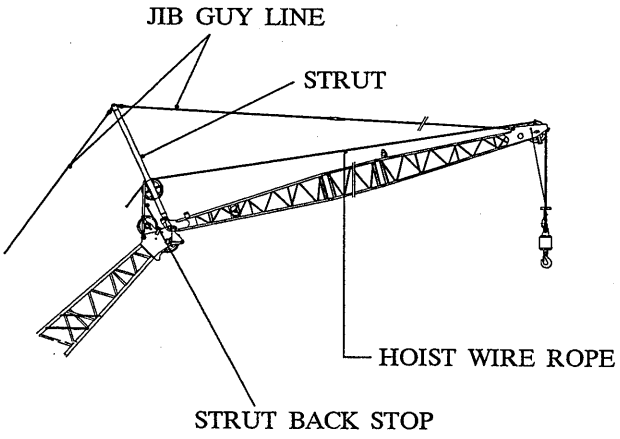
Special procedures required for repair. Consult your local authorized KOBELCO distributor for instruction.

9. STRUT

Check the jib strut for damaged and deformation.

⚠ CAUTION

Special procedures required for repair. Consult your local authorized KOBELCO distributor for instruction.



10. WIRE ROPE AND GUYLINE

Check the wire rope and guy line for damage and deformation. Do not use the wire rope and guy line of which wires are broken or which are kinked.

See the following page.

REPLACEMENT STANDARDS FOR WIRE ROPE

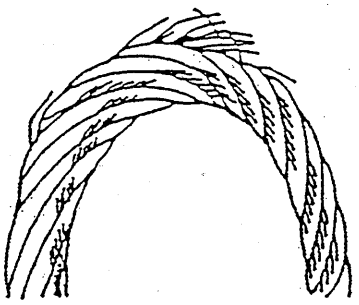
(1) CHECK AND REPLACEMENT STANDARDS OF WIRE ROPE

If the wire rope is broken during operation, it might cause a serious accident. Therefore, check the rope periodically. Never use those wire ropes that are subject to wire-cut, abrasion, corrosion and other defects. Such wire rope as given in Items 1 to 4 below must be immediately replaced with a new rope. And wire rope subject to damage mentioned in Items 5 onwards should be replaced with new one as soon as possible according to the degree of damage.

Kind of Wire rope
• HOIST WIRE ROPE • GUY LINE • TAGLINE ROPE (OPTION)

① 10% or more steel wires are broken excepting filler wires in one lay of wires. Inspection of internal breakage of wires is difficult. To check breakage of wires in the valley section of wire ropes, bend the rope sharply. Broken element wires, if any, will be exposed.

If breakage of wires in the valley section is found, it is considered that internal breakage of wires may also have developed, and that in other words, fatigue of the whole rope may have developed. Replace the rope at once.



Band rope sharply to expose breakage

② Reductions from nominal diameter of more then;

(a) 1/64 in. (0.4mm) for diameters up to and including 5/16 in. (8.0mm);

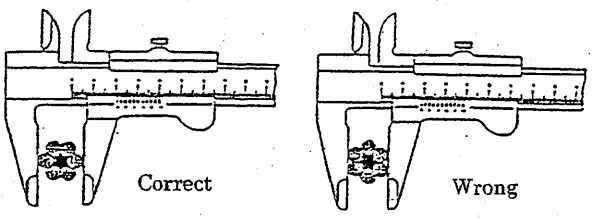
(b) 1/32 in. (0.8mm) for diameters 3/8 in. (9.5mm), to and including 1/2 in. (13.0mm);

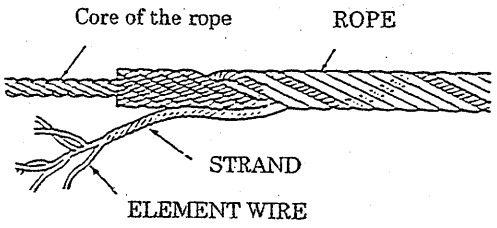
(c) 3/64 in. (1.2mm) for diameters 9/16 in. (14.5mm), to and including 3/4 in. (19.0mm);

(d) 1/16 in. (1.6mm) for diameters 7/8 in. (22.0mm), to and including 1-1/8 in. (29.0mm);

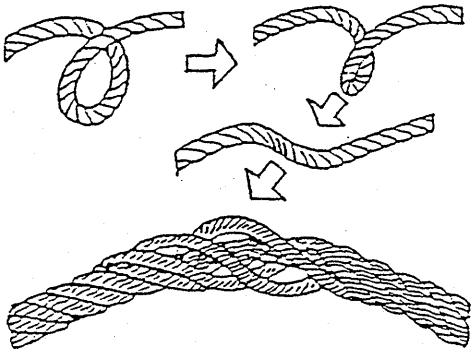
(e) 3/32 in. (2.4mm) for diameter 1-1/4 in. (32.0mm), to and including 1-1/2 in. (38.0mm)

Method of measuring rope diameter





③ Kink is observed in the wire rope.



④ Excessive deformation or corrosion is observed on the wire rope.

⑤ Excessive elongation is observed due to overloading or derailment from sheaves.

⑥ A short circuit has been formed electrically.

⑦ Those wire ropes that are subject to fire or spark by electric current or by gas welding as well as subject to high temperature.

(2) REPLACEMENT STANDARD FOR GUYLINE

Since damage and corrosion are caused by fatigue from the inside in the boom guy line, replacement time cannot be judged from the appearance.

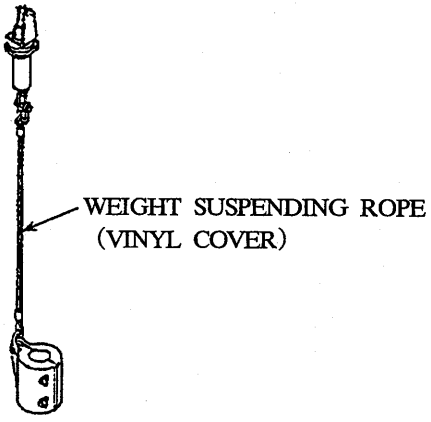
If the guy line is broken by progressing of internal damage and/or corrosion, there is possibility to cause an serious accident. Be sure to replace the guy line periodically.

Replacement time according to the content of work is shown in the table.

Contents of Work	Replacement Interval
Lifting magnet or clamshell work only	2 years
Both crane and clamshell work, or frequent crane work such as landing work	4 years
Normal crane work	6 years

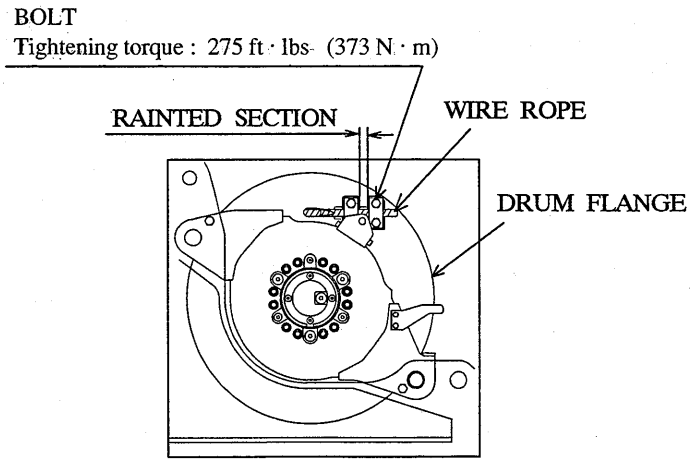
(3) REPLACEMENT STANDARD OF WEIGHT SUSPENDING ROPE FOR OVERWIND LIMIT SWITCH AND HOOK FIXING ROPE

If the vinyl cover of the wire rope is broken or the rope itself has conditions as mentioned in step 1, replace the rope at once.



11. HOIST WIRE ROPE CLAMP BOLT

Ensure that the bolts fixing the hoist wire rope to the drum flange are securely tightened, and the painted section of the wire rope is correctly positioned.



8.2 OIL/GREASE SUPPLY AND WATER SERVICE

To ensure proper operation of this machine, all points requiring lubrication must be serviced with the correct lubricant (oil, grease and water) at the proper interval.

Standard oil (Water) Supply Capacity Table (not including Greasing Point)

	Points of Lubrication	Kind	Symbol	Capacity (ltr.)
Upper	Engine	Engine oil SAE #30	MO	29 (Oil pan=25, filter=4)
	Radiator	Water (soft water)	—	34 (Engine=22, radiator=12)
	Fuel tank	Light oil JIS #2		400
	Hydraulic oil tank	Hydraulic oil #32	HO	450
	Power divider	Gear oil #90	GO	2.8
	Front/rear drum reduction unit	Gear oil #80W-90	GO	22/each
	Boom hoist drum reduction unit	Gear oil #80W-90	GO	3
	Swing reduction unit	Gear oil #90	GO	16.5
Lower	Propel reduction unit	Gear oil #90	GO	26/each
	Idler wheel	Gear oil #140	GO	0.25/each
	Lower roller	Gear oil #140	GO	0.13/each
	Upper roller	Gear oil #140	GO	0.06/each

Note 1: The radiator is supplied with coolant combined with Long Life Coolant (antifreeze) of 30% to 50% concentration by volume.

Note 2: When using the machine in extreme cold and extreme heat places, see page 8-56 and 8-57.

KOBELCO Genuine Lubricant Chart

Kind	Symbol	Specification	Part Number
Hydraulic oil	HO	KW46 (for general use)	20 ltr. can→2421R157D5 200 ltr. can→2421R157D6
		KW32S (for cold region)	20 ltr. can→2421R157D3 200 ltr. can→2421R157D4
Extreme pressure grease	EPG		2121Z183
High temperature grease	HPG		2421Z183D2
Molybdenum disulphide grease	GL		2421Z183D3
Gear oil	GO	#90	20 ltr. can→KSPSP90020 200 ltr. can→KSPSP90200
Engine oil	M	#30	20 ltr. can→2421Z353D1 200 ltr. can→2421Z353D2
		#10W	20 ltr. can→2421Z354D1 200 ltr. can→2521Z354D2
Antifreeze	—	Long life coolant	18 ltr. can→KSPLLC95-18 20 ltr. can→KSPLLC95-20
		Permanent	18 ltr. can→KSPPT95-18 20 ltr. can→KSPPT95-20

LUBRICATION CHART

Lubricant	Symbol	Recommended Lubricant (Initial Factory Fill)
Hydraulic Oil	HO	Hydraulic oil with anti-wear, anti-oxidant an anti-harmful foaming 55℃~5℃: ISO VG68 / 40℃~5℃: ISO VG46 / 30℃~−25℃: ISO VG32 / 15℃~−30℃: ISO VG22
Gear Oil	GO	Extreme pressure gear oil #90 Grade GL-4 by API classification
Grease	EPG	Extreme pressure Multipurpose grease NLGI No.2 Lithium base grease EP type
	GL	NLGI No.1 Lithium base with Mo52 grease
Engine Oil	MO	Above 40℃: SAE40 / 40℃~−5℃: SAE30 / 10℃~−30℃: SAE10W-30

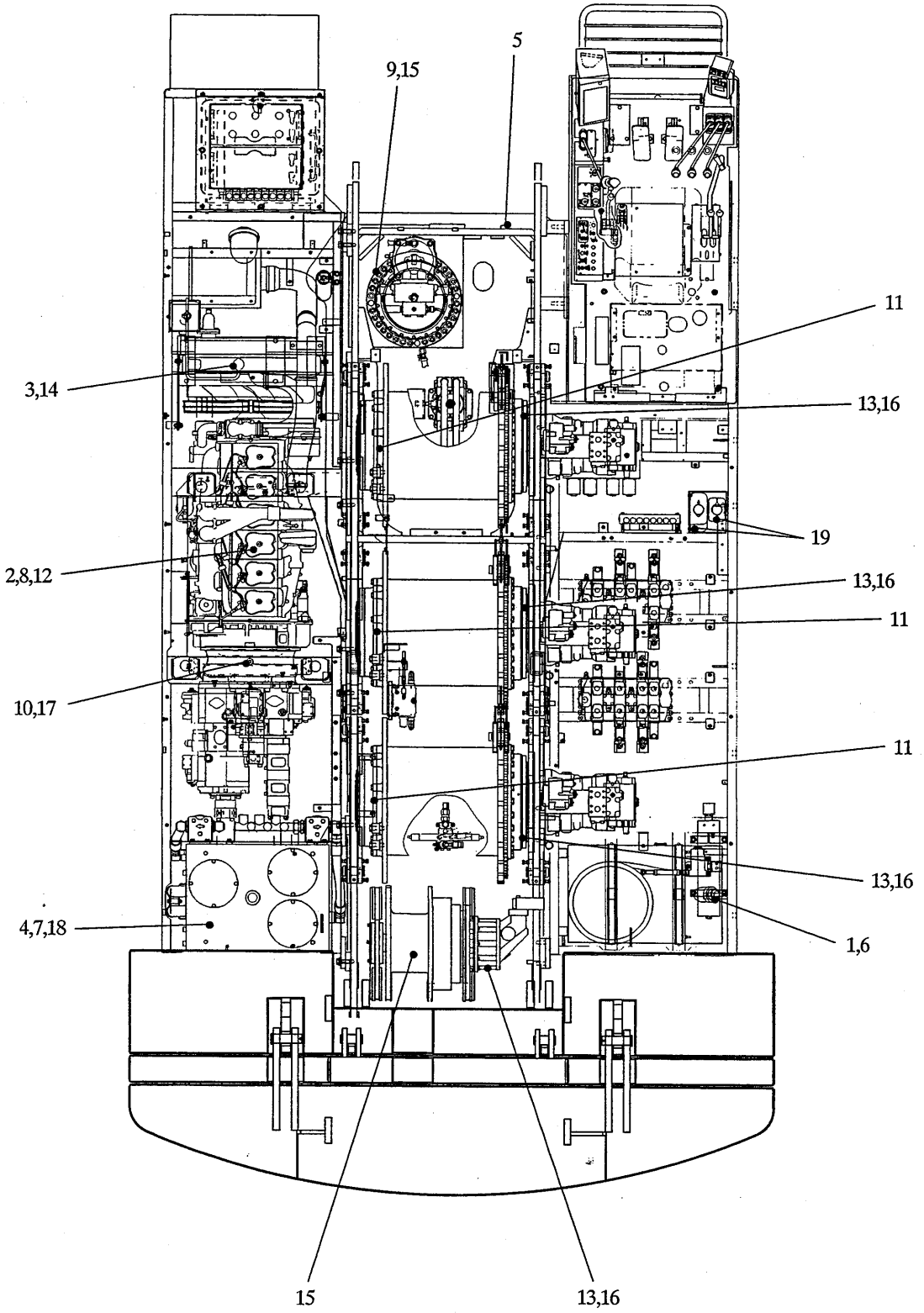
RECOMMENDED HYDRAULIC OIL

	VG22 KW32S	VG32 KW32	VG46 KW46	VG68 KW68
ESSO	–	NUTO H32	NUTO H46	NUTO H68
MOBIL	DTE 13	DTE 24	DTE 25	DTE 26
CALTEX	–	RANDO HD32	RANDO HD46	RANDO HD68
SHELL	–	TELLUS 32	TELLUS 46	TELLUS 68
GULF	–	HARMONY 32AW	HARMONY 46AW	HARMONY 68AW

⚠ CAUTION

- Do not mix different brands of oil. The same brand of oil should be used.
- Do not mix the original factory supplied oil with recommended hydraulic oil.

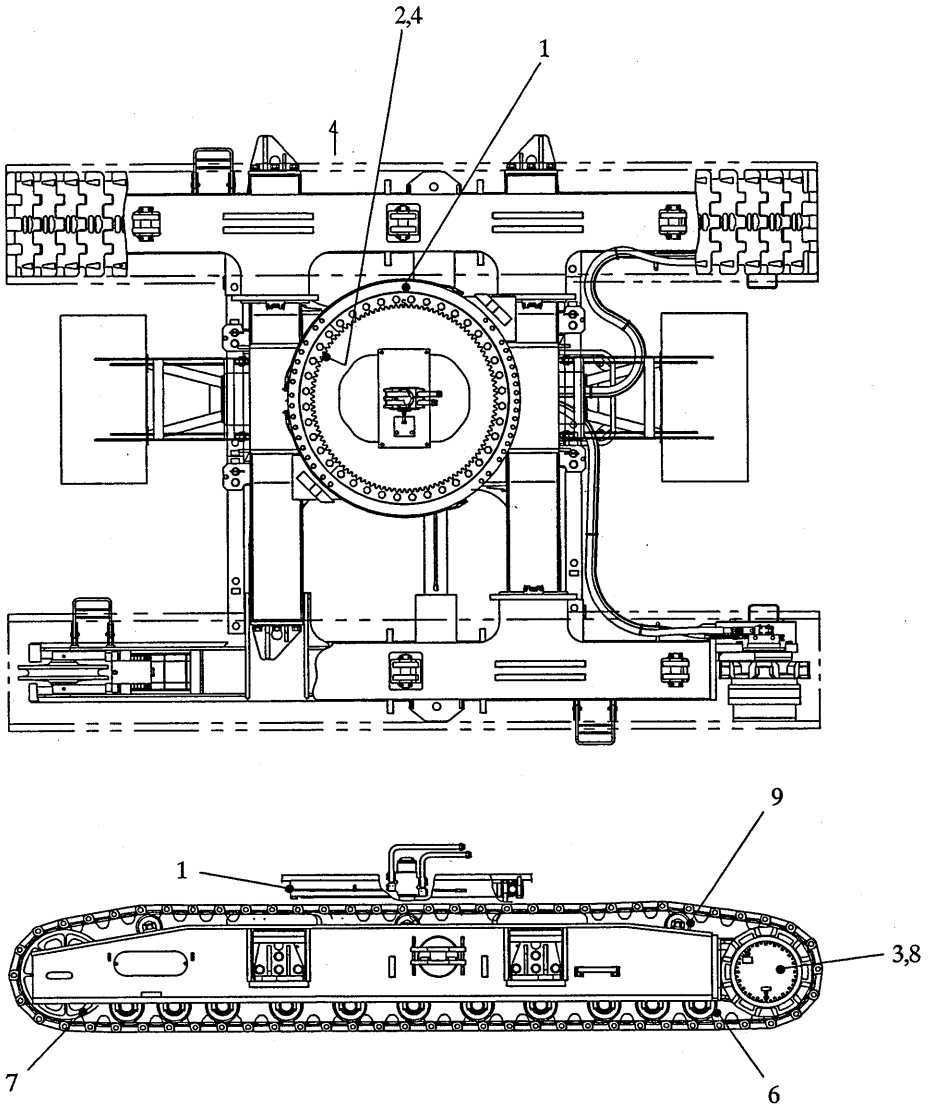
8.2.1 UPPER LUBRICATION (INCL. WATER SUPPLY)



Upper Lubrication Table

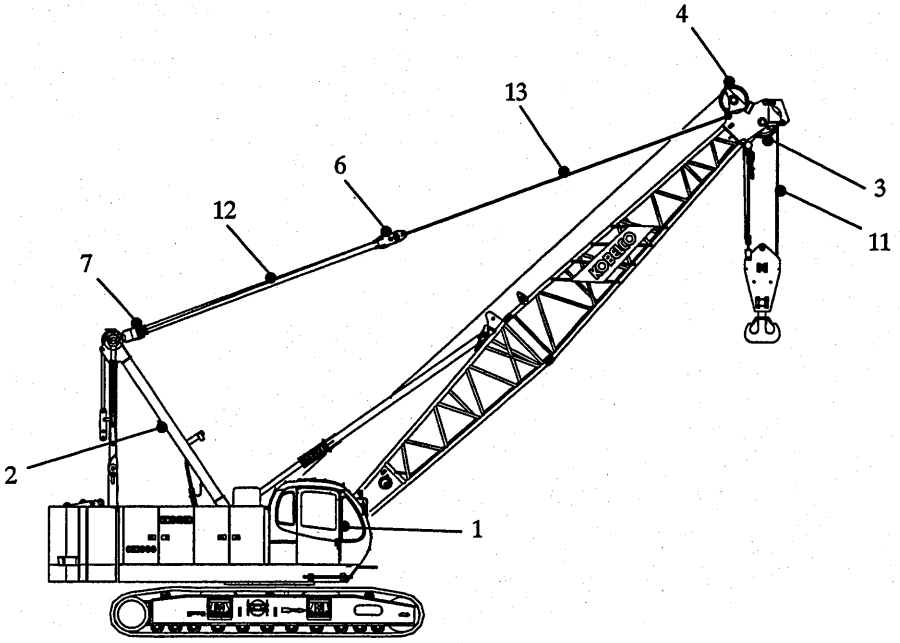
Check and Lubrication Interval	Item No.	Check and Lubrication Place	Required Service	Kind of Lubricant	Reference Page
Daily or every 5 hours	1	Fuel tank	Supply fuel	Light oil	8-41
	2	Engine	Check oil level	MO	8-40
	3	Radiator	Check coolant level	Soft water	8-42
	4	Hydraulic oil tank	Check oil level	HO	8-44
Weekly or every 25 hours	5	Drum lock (Front, rear, boom drums)	Grease	EPG	8-38
	6	Fuel tank	Drain		8-41
	7	Hydraulic oil tank	Drain		8-44
First time only (50 hours)	8	Engine	Replace oil	MO	8-40
Monthly or every 100 hours	9	Swing reduction unit	Check oil level	GO	8-46
	10	Power divider	Check oil level	GO	8-48
Quarterly or every 250 hours	11	Drumshaft bearing	Grease	EPG	8-39
	12	Engine	Replace oil	MO	8-40
	13	Winch reduction unit (Front, rear, boom)	Check oil level	GO	8-47
Annually or every 1000 hours	14	Radiator	Replace coolant		8-41
	15	Swing reduction unit	Replace oil	GO	8-46
	16	Winch reduction unit (Front, rear, boom)	Replace oil	GO	8-47
	17	Power divider	Replace oil	GO	8-48
Every 2 years or 2000 hours	18	Hydraulic oil tank	Replace oil	HO	8-44
	19	Washer tank	Supply liquid	Washer liquid	

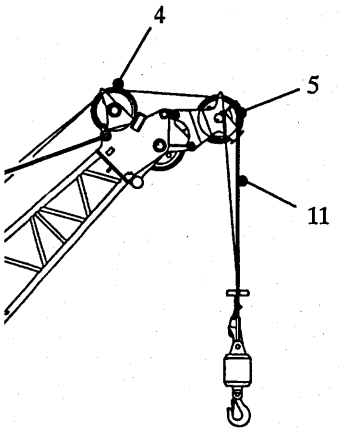
8.2.2 LOWER LUBRICATION

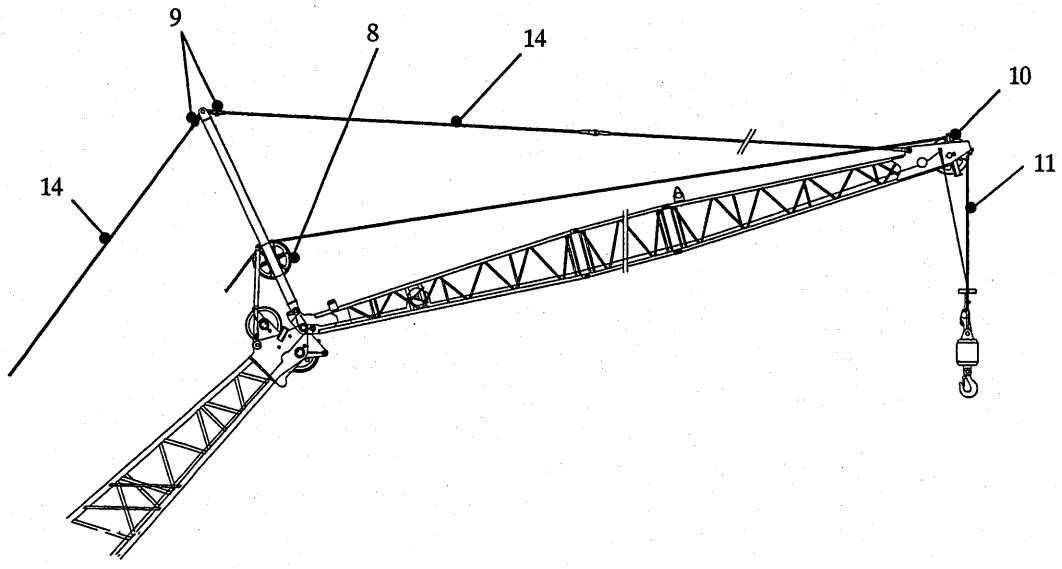


Check and Lubrication Interval	Item No.	Check and Lubrication Place	Required Service	Kind of Lubricant	Reference Page
Weekly or every 25 hours	1	Slewing ring bearing	Grease	EPG	8-39
	2	Slewing ring gear (When operating clamshell or lifting magnet)	Grease	GL	8-39
Quarterly or every 250 hours	3	Propel reduction unit	Check oil level	GO	8-48
	4	Slewing ring gear	Grease	GL	8-39
Annually or every 1000 hours	6	Lower roller	Change oil	GO	8-49
	7	Idler wheel	Change oil	GO	8-49
	8	Propel reduction unit	Change oil	GO	8-48
	9	Upper roller	Change oil	GO	8-49

8.2.3 ATTACHMENT LUBRICATION







Lubrication Interval	Item No.	Lubrication Place	Required Service	Kind of Lubricant	Reference Page
Daily or every 5 hours	1	Boom foot pin	Grease	EPG	8-37
	2	Gantry link	Grease	EPG	8-37
See Note 1.	3	Boom point sheave	Grease	EPG	
	4	Idler sheave	Grease	EPG	
	5	Auxiliary sheave	Grease	EPG	
	6	Upper spreader sheave	Grease	EPG	
	7	Lower spreader sheave	Grease	EPG	
	8	Strut sheave	Grease	EPG	
	9	Strut equalizer sheave	Grease	EPG	
	10	Jib point sheave	Grease	EPG	
See Note 2.	11	Front and rear drum wire rope	Lubricate	WO	
	12	Boom hoist wire rope	Lubricate	WO	
	13	Boom guy line	Lubricate	WO	
	14	Jib guy line	Lubricate	WO	

Note 1 : Although item No.3 to 10 are grease sealing type, they can be also relubricated.

Note 2 : Lubricate wire ropes, according to the operating conditions.

To lubricate wire ropes, use a brush or spray.

8.2.4 GREASE

	Greasing Place	Kind of Lubricant	Greasing Time (Hourmeter:Hrs)				
			5	25	100	250	600
1	Boom foot pin	EPG	○				
2	Gantry link	EPG	○				
3	Drum lock (front, rear, boom drums)	EPG		○			
4	Drumshaft bearing	EPG				○	
5	Slewing ring bearing	EPG		○			
6	Slewing ring gear	GL		※○		○	

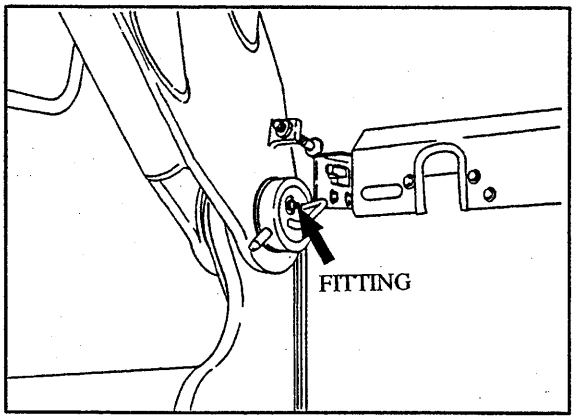
※mark shows the time for clamshell and lifting magnet operation.

Before greasing, clean the grease fitting. Wipe off the extra grease which is crowded out.

WARNING

Shut off engine before lubrication.
Failure to observe this precaution may result in serious injury or loss of life.

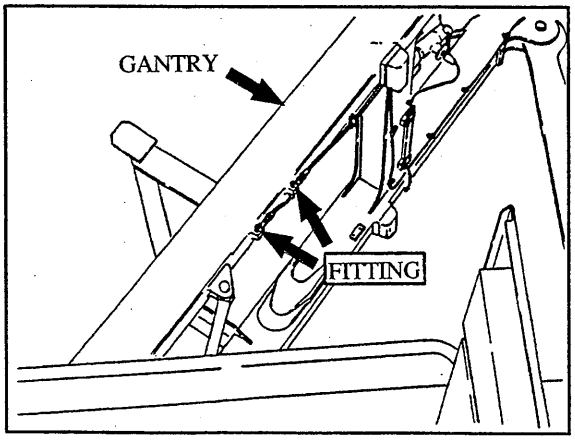
1. BOOM FOOT PIN
   Grease through the grease fitting on the foot pin (left and right) .



2. GANTRY LINK
   Grease through the grease fitting provided on the front member.

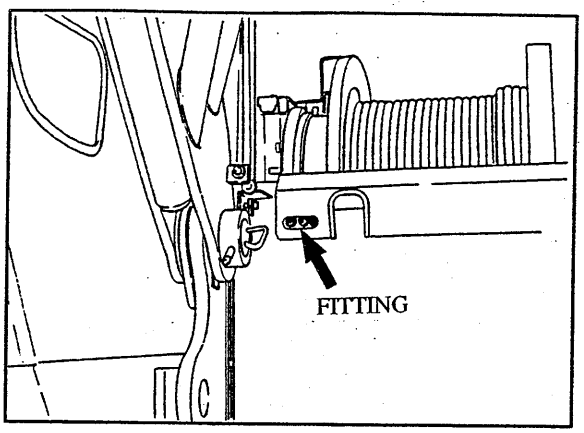
WARNING

Before climbing on machine make certain that the guard and walk ways are clean and dry, and use life belt in order to prevent falls due to slippery surface. Failure to observe this precaution may result in serious injury or loss of life.



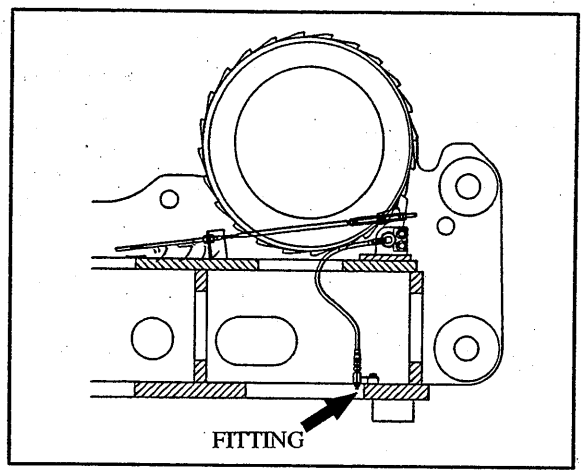
3. DRUM LOCK

To grease the front and rear drum locks, grease through the grease fittings provided in the front of the revolving frame (two places).



FRONT, REAR AND THIRD DRUM LOCK

To grease the boom hoist drum lock, grease the grease fitting provided on the revolving frame.

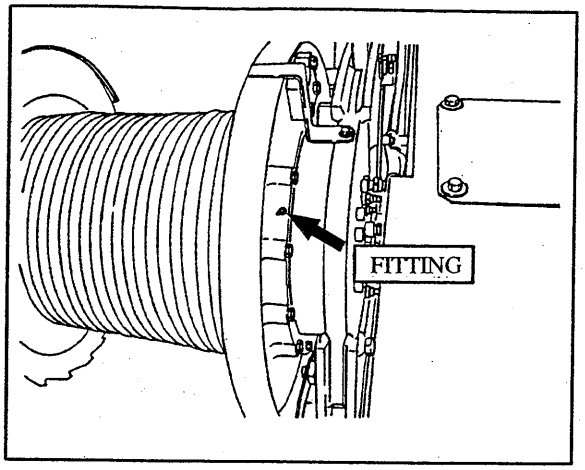


BOOM DRUM LOCK

4. DRUMSHAFT BEARING

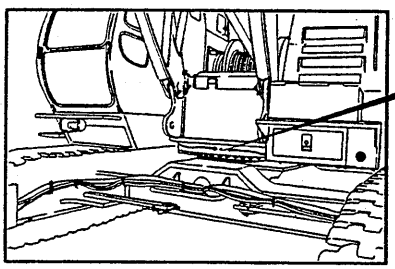
Grease through the grease fittings provided on the side stand and drumshaft bearing retainer.

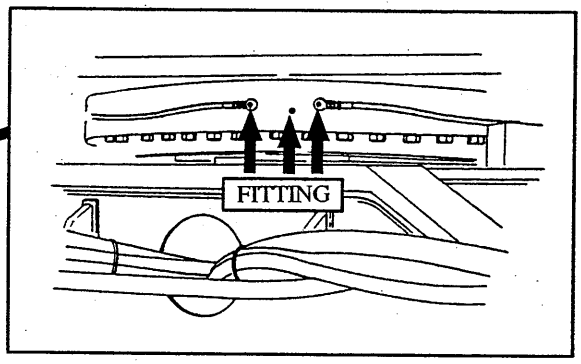
When greasing, any of the three grease fittings may come first. Start from the fitting at one position easy to grease. You do not need to grease all three fittings.



5. SLEWING RING BEARING

Grease through the grease fitting provided on the slewing ring bearing.



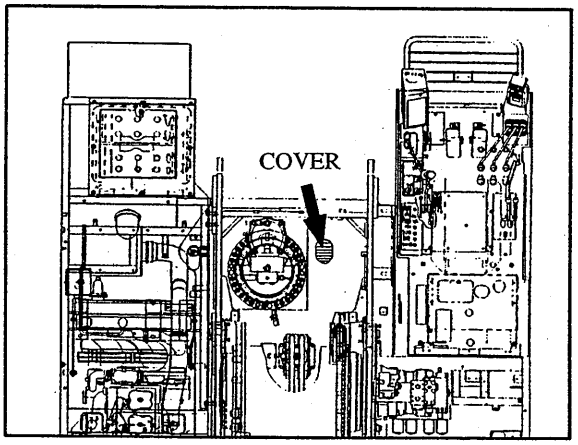


6. SLEWING RING GEAR

Removing the swing motor cover, turn the upper little by little, and grease so that grease goes around the entire ring gear.

⚠ WARNING

To avoid injury, do not apply grease to slewing ring gear directly by hand.



8.2.5 ENGINE OIL

Item No.	Checking Item	Check and Change Interval (hourmeter:hour)					Remarks
		5	100	250	500	1000	
1	Oil level check of engine oil	○					
	Change of engine oil			○			7.7 gal (29 ℓ)

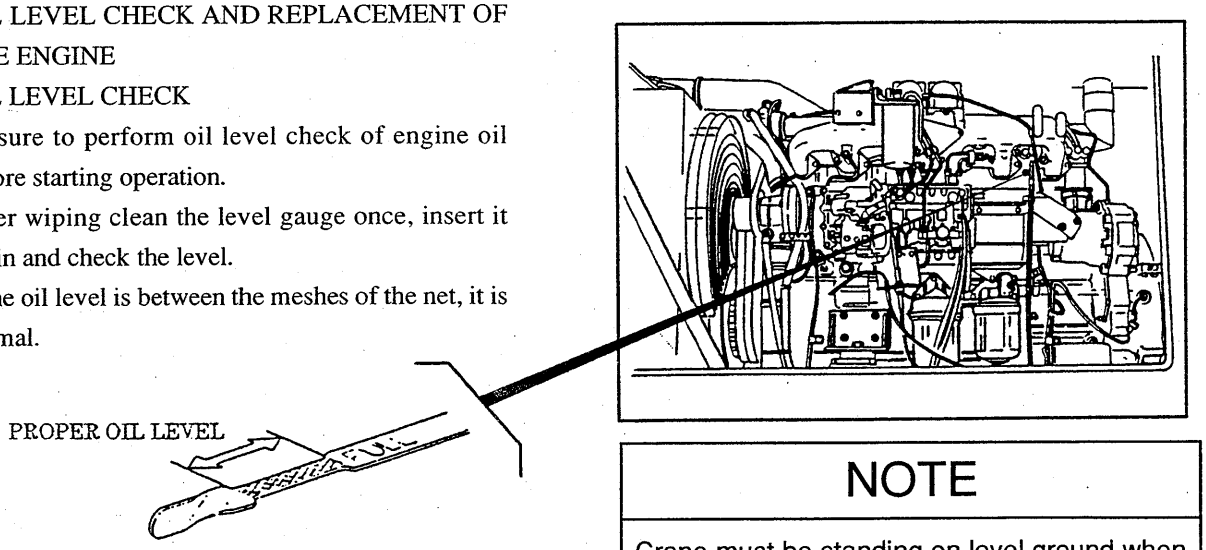
1. OIL LEVEL CHECK AND REPLACEMENT OF THE ENGINE

(1) OIL LEVEL CHECK

Be sure to perform oil level check of engine oil before starting operation.

After wiping clean the level gauge once, insert it again and check the level.

If the oil level is between the meshes of the net, it is normal.



NOTE

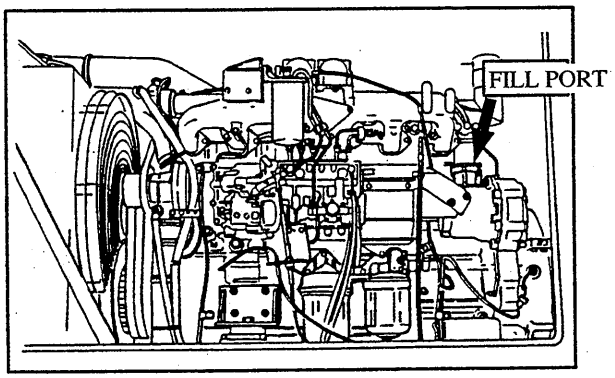
Crane must be standing on level ground when oil level is checked or reading may be inaccurate.

(2) OIL CHANGE

⚠ WARNING

While the engine oil is hot, absolutely do not open the drain cock to avoid burns caused by hot oil.

Failure to observe this precaution may result in serious injury or loss of life.



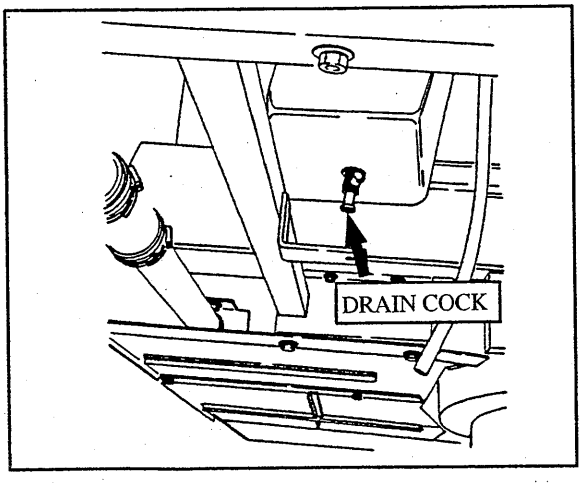
① Prepare a container of approx. 7.9 gal (30 ℓ) capacity.

② Loosen the drain plug, and allow the oil to drain into the prepared container.

③ Tighten the drain plug.

④ After confirming that metal particles does not exist, refill fresh oil through the fill port.

When replacing the engine oil, replace the oil filter together at the same time.



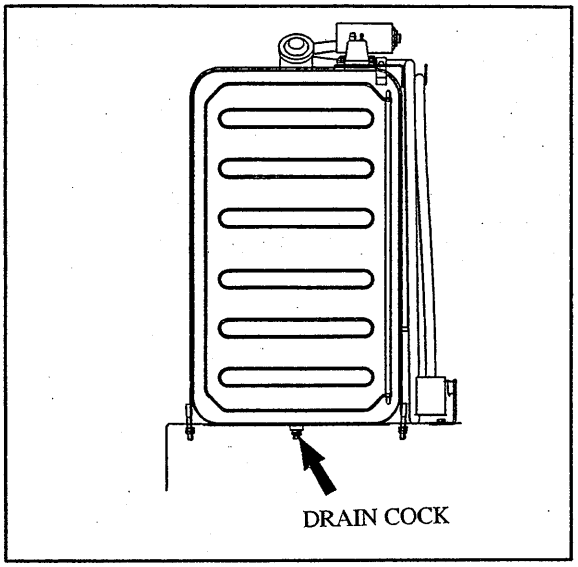
8.2.6 FUEL

Item No.	Checking Item	Check and Change Interval (hourmeter:Hr)						Remarks
		5	25	250	500	1000	2000	
1	Drain of fuel tank		○					
2	Adding fuel	※						105.6 gal (400ℓ)

※As required

1. DRAIN OF FUEL TANK

   Loosen the drain plug, and drain water and sediment from the tank.

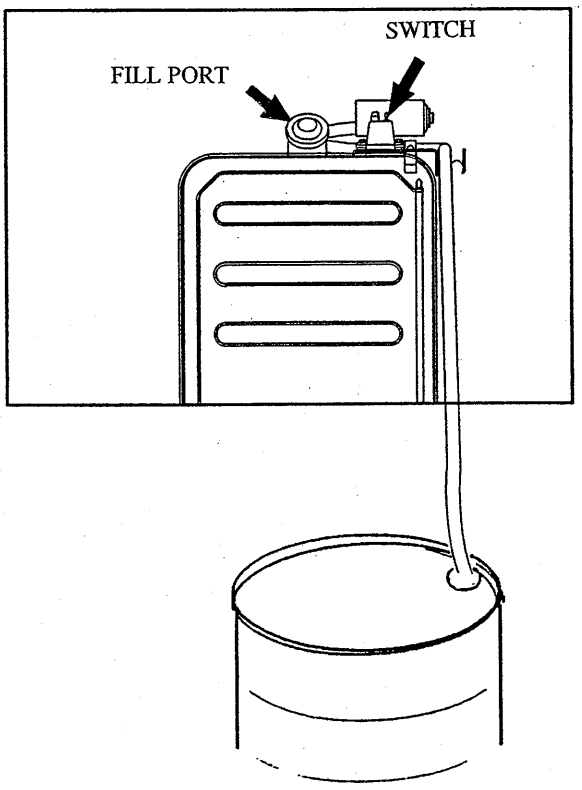


2. ADDING FUEL

   After daily work is finished, fill the fuel tank as full as possible in order to minimize condensation.

⚠ WARNING

- Do not bring any spark or flame close to the fuel.
- Never smoke cigarettes while refueling. This could ignite the fuel and cause property damage, injury to personnel, or loss of life.



⚠ CAUTION

Never run the fuel pump empty.

The fuel pump is optional.

Refuel from the fill port if the fuel pump is not provided.

8.2.7 COOLANT

Item No.	Checking Item	Check and Change Interval (hourmeter:Hr)						Remarks
		5	25	250	500	1000	2000	
1	Check of coolant level	○						
2	Change of coolant					○		9 gal (34ℓ)

※Changing interval of coolant is for the case that Long Life coolant is combined. In other case, replace coolant semi-annually.

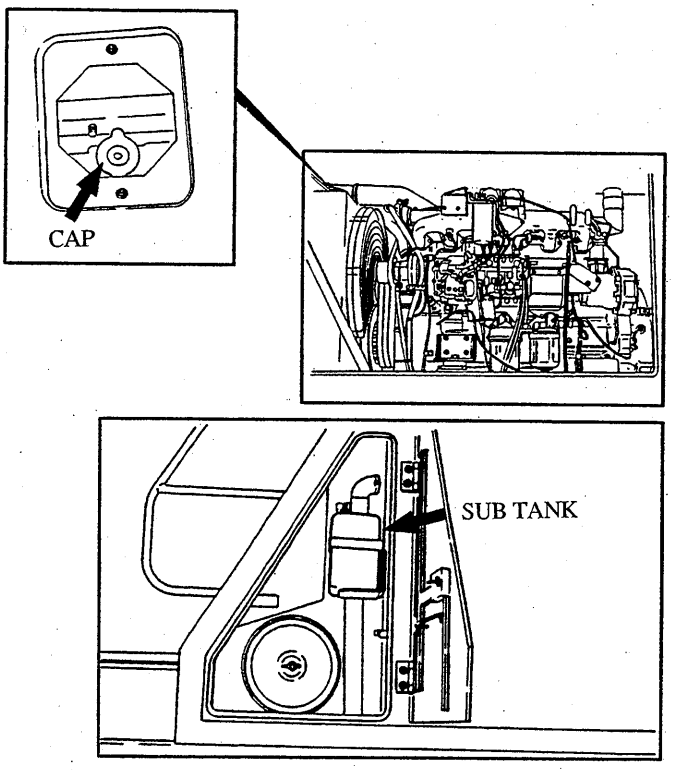
1. CHECK OF COOLANT LEVEL

⚠ WARNING

Do not remove the radiator cap when the engine is hot. Use a heavy cloth or gloves to protect yourself while loosening the cap slowly. Wait until any sound or fluid flow stops before removing cap. Engine coolant is hot and under pressure when the engine is at operating temperature.
Failure to observe this precaution may result in serious injury or loss of life.

Removing the radiator cap, confirm coolant level, and also confirm the coolant level of the sub-tank.

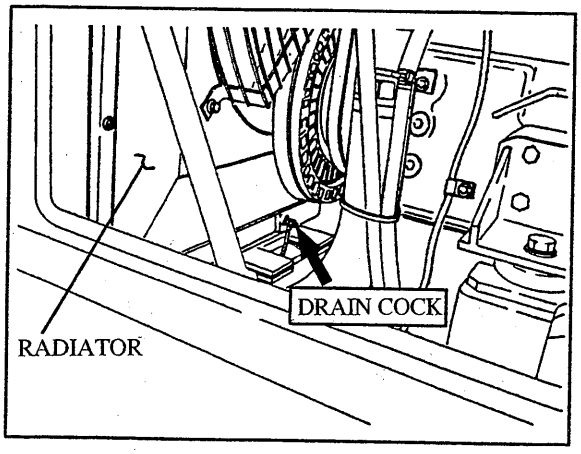
- When coolant is insufficient, fill the radiator upto the foot of the water supply port and also fill the sub-tank up to the FULL mark position with soft water (running water) by removing the cap.



2. CHANGE OF COOLANT

WARNING

Do not drain the coolant when it is hot. The hot water may spout out which could result in personal injury. After the water has cooled, drain the water.
Failure to observe this precaution may result in serious injury or loss of life.



① Loosen the drain cock in the bottom of the radiator and the plug of the water jacket, drain the coolant.

② Combine soft water (city water) and Long life coolant, and fill the radiator upto the foot of the water supply port.
In order to prevent air from entering, slowly pour water. After water pouring, confirm that the water level does not lower, then tighten the radiator cap.

③ Start and run the engine for about 1 minute. Stop the engine, and check water level. If insufficient, add water.

8.2.8 HYDRAULIC OIL

Item No.	Check Item	Check and Change Interval (hourmeter:Hr)						Remarks
		5	25	250	500	1000	2000	
1	Check of hydraulic oil level	○						
2	Drain of hydraulic oil tank		○					
3	Change of hydraulic oil						○	119 gal (450ℓ)

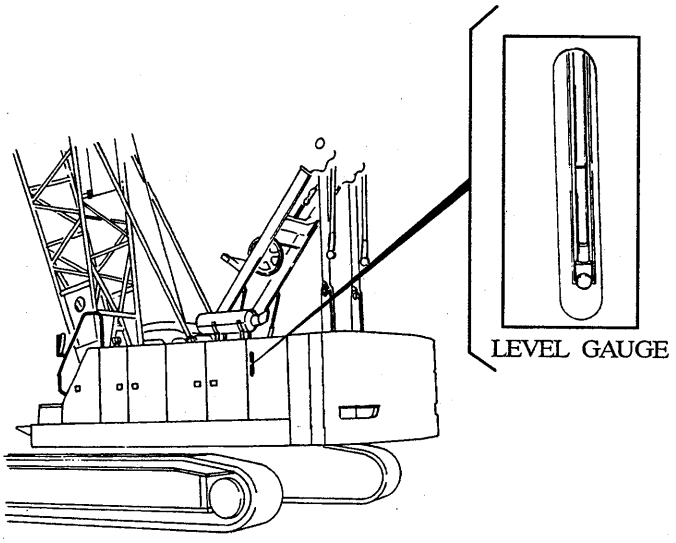
1. CHECK OF HYDRAULIC OIL LEVEL

   If the hydraulic oil level is in the center of the level gauge with the following conditions and the engine running, the oil level is normal.

   [Oil temperature :68°F (20°C)]

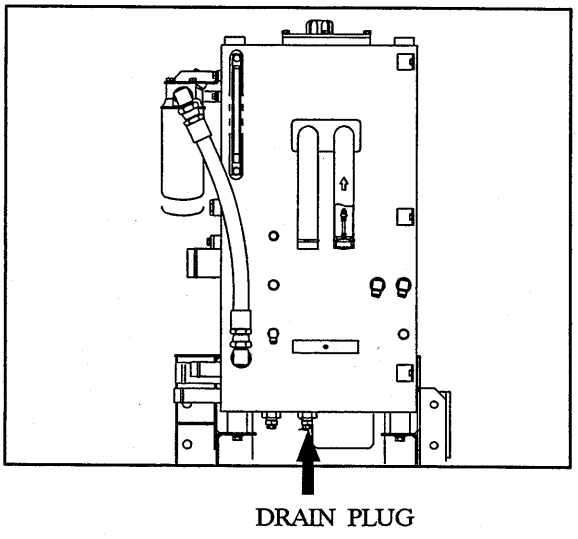
   Gantry cylinder ---------- Extended

   Crawler ext/retr cylinder ------ Extended



2. DRAIN OF HYDRAULIC OIL TANK

   Before starting operation, loosen the drain plug to drain water and sediment from the tank.



3. CHANGE OF HYDRAULIC OIL

⚠ WARNING

Do not drain the oil when it is hot. The hot oil may spout out which could result in personal injury. After the oil has cooled, drain the oil. Failure to observe this precaution may result in serious injury or loss of life.

⚠ CAUTION

Extra care must be taken to insure that all the hydraulic tank is completely filled with oil before the engine is restarted. Failure to properly prime the hydraulic pumps could result in a catastrophic failure of the pumps.

It is standard to replace hydraulic oil every 2000 hours of the hourmeter, but if the oil is remarkably contaminated or deteriorated, replace the oil regardless of operating hours.

① Prepare a container of approx. 119 gal (450 ℓ)

② Remove the cap of the filler port and filter cover

③ Loosen the drain plug and drain the hydraulic oil into the prepared container.

④ Replace the drain plug, fill the tank with the specified hydraulic oil through the filler port up to the specified level.

⑤ Reinstall the filter cover and oil supply cap.

⑥ Start and run the engine for about 1 minute, then extend the crawler extend/retract cylinders, Check the oil level again.

When changing hydraulic oil, change the filter also of the same time.

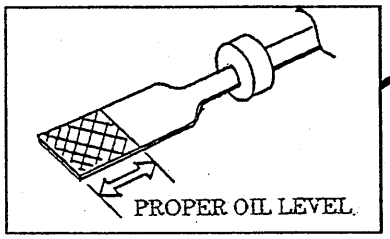
8.2.9 GEAR OIL

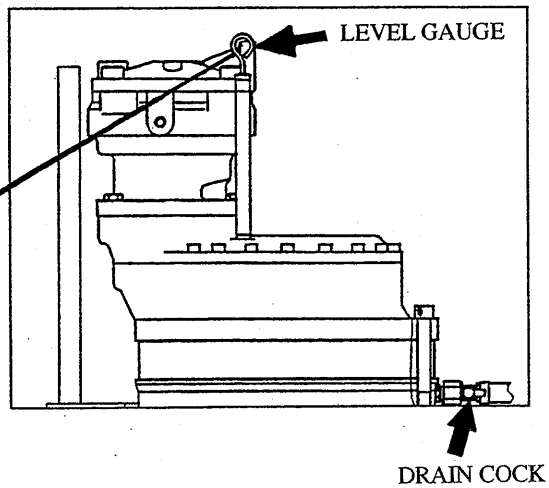
Item No.	Check Item	Check Interval (hourmeter:Hr)						Remarks
		5	100	250	500	1000	2000	
1	Oil level check of swing reduction unit		○					
	Oil change of swing reduction unit					○		Oil quantity:4.4 gal (16.5ℓ)
2	Oil level check of front and rear drum reduction unit			○				
	Oil change of front and rear drum reduction unit					○		Oil quantity:5.8 gal (22 ℓ)
3	Oil level check of boom hoist drum reduction unit			○				
	Oil change of boom hoist drum reduction unit					○		Oil quantity:0.8 gal (3ℓ)
4	Oil level check of power devider		○					
	Oil change of power divider					○		Oil quantity:0.7 gal (2.8 ℓ)
5	Oil level check of propel reduction unit			○				
	Oil change of propel reduction unit					○		Oil quantity:6.9 gal (26 ℓ)
6	Oil change of lower roller					○		Oil quantity:0.03 gal (130 cc)
7	Oil change of upper roller					○		Oil quantity:0.02 gal (60 cc)
8	Oil change of idler wheel					○		Oil quantity:0.08 gal (300 cc)

1. OIL LEVEL CHECK AND OIL CHANGE OF SWING REDUCTION UNIT

(1) OIL LEVEL CHECK

If the oil level is in the net meshes of the level gauge, it is normal.





(2) OIL CHANGE

⚠ WARNING

Do not drain the oil when it is hot. The hot oil may spout out which could result in personal injury. After the oil has cooled, drain the oil. Failure to observe this precaution may result in serious injury or loss of life.

With the level gauge drawn out, remove the drain cock, drain the oil into a prepared container.

2. OIL LEVEL CHECK AND OIL CHANGE OF FRONT AND REAR DRUM REDUCTION UNITS

(1) OIL LEVEL CHECK

If the oil level in the front and rear drum reduction unit is upto the red color mark of the level gauge, it is normal.

If the oil level in third drum reduction unit is up to the bottom face of the level plug, it is normal.

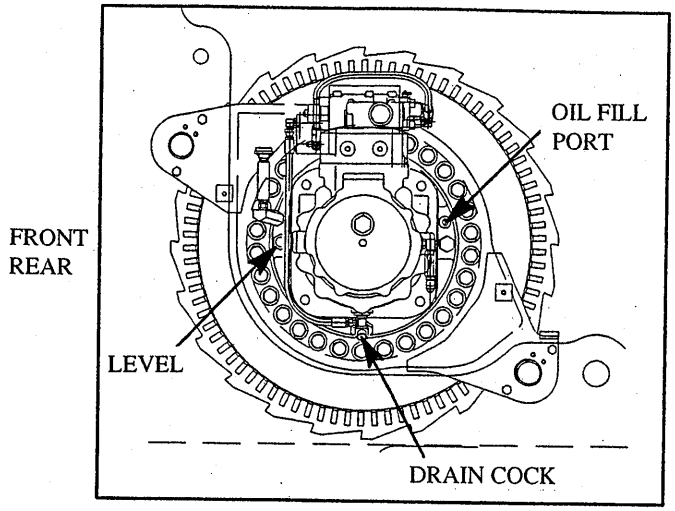
(2) OIL CHANGE

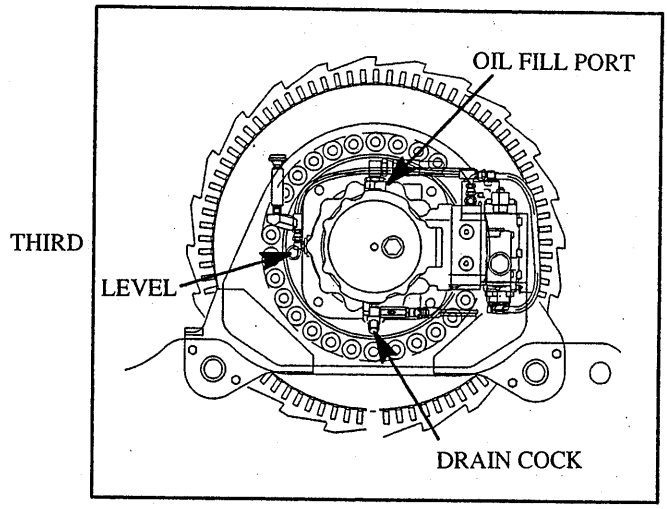
⚠ WARNING

Do not drain the oil when it is hot. The hot oil may spout out which could result in personal injury. After the oil has cooled, drain the oil. Failure to observe this precaution may result in serious injury or loss of life.

Prepare a container of approx. 6.6 gal (25 ℓ) capacity. With the oil fill plug removed, turn the lever of the drain cock to drain the oil into the prepared container.

Return the lever of the drain cock to the original position, and supply the specified oil through the oil fill port until the oil level reaches the specified oil level.





3. OIL LEVEL CHECK AND OIL CHANGE OF BOOM HOIST DRUM REDUCTION UNIT

(1) OIL LEVEL CHECK

If the oil level is located of the level plug, it is normal.

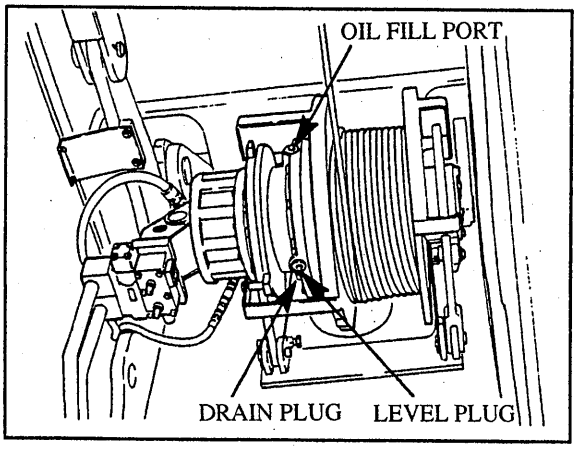
(2) OIL CHANGE

⚠ WARNING

Do not drain the oil when it is hot. The hot oil may spout out which could result in personal injury. After the oil has cooled, drain the oil. Failure to observe this precaution may result in serious injury or loss of life.

Prepare a container of approx. 2.6 gal (10 ℓ) of capacity.

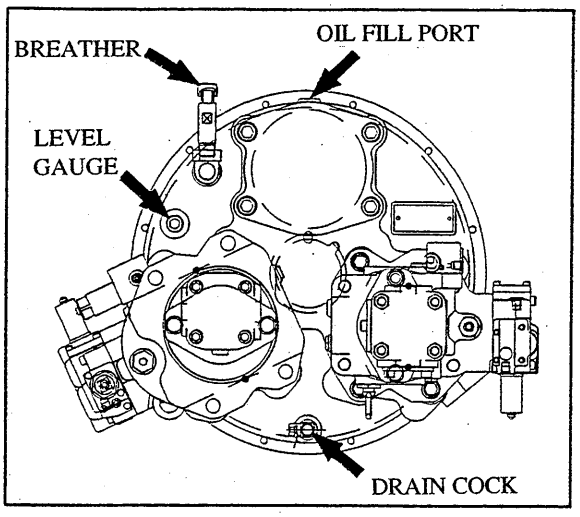
With the level plug removed, removed the drain plug to drain the oil into the container. Return the drain plug to the original position, and supply the specified oil through the oil fill port until the oil level reaches the specified level.



4. OIL LEVEL CHECK AND OIL CHANGE OF POWER DIVIDER

(1) OIL LEVEL CHECK

If the oil level is upto the red color mark of the level gauge, it is normal.



(2) OIL CHANGE

⚠ WARNING

Do not drain the oil when it is hot. The hot oil may spout out which could result in personal injury. After the oil has cooled, drain the oil. Failure to observe this precaution may result in serious injury or loss of life.

Prepare a container of approx. 1.3 gal (5 ℓ) of capacity.

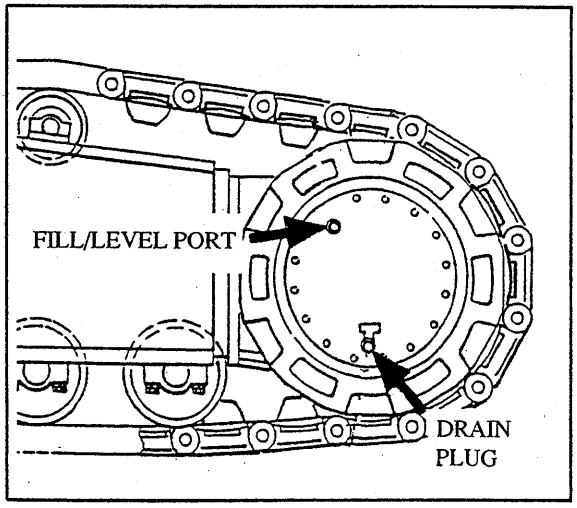
With the cap of the oil supply port removed, turn the lever of the drain cock to drain the oil into the container.

Return the lever of the drain cock to the original position, pour the specified oil through the oil supply port until the oil level reaches the specified level.

5. OIL LEVEL CHECK AND OIL CHANGE OF PROPEL REDUCTION UNIT

(1) OIL LEVEL CHECK

With the drain plug positioned at the right bottom, remove the level plug. If the oil level is up to the bottom of the level plug opening, it is normal.



(2) OIL CHANGE

⚠ WARNING

Do not drain the oil when it is hot. The hot oil may spout out which could result in personal injury. After the oil has cooled, drain the oil. Failure to observe this precaution may result in serious injury or loss of life.

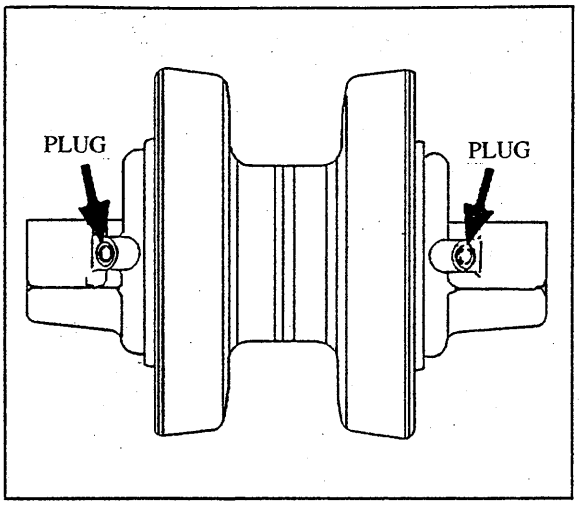
Prepare a container of approx. 7.9 gal (30 ℓ) of capacity.

With the level plug removed, remove the drain plug to drain the oil into the container.

Reinstall the drain plug, pour the specified oil through the fill/level port until the oil reaches the specified level.

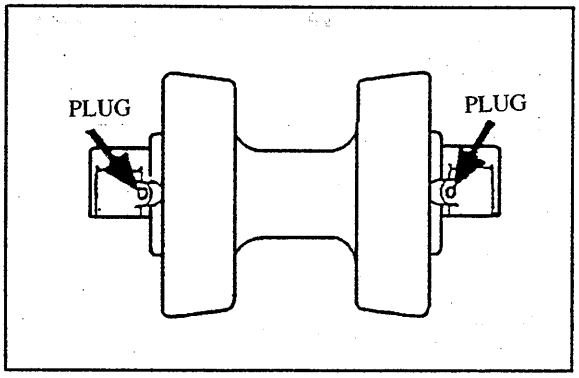
6. OIL CHANGE OF LOWER ROLLER

Remove the both end plugs to drain the oil. Supply the specified oil of specified amount. To change oil, consult the local KOBELCO distributor.



7. OIL CHANGE OF UPPER ROLLER

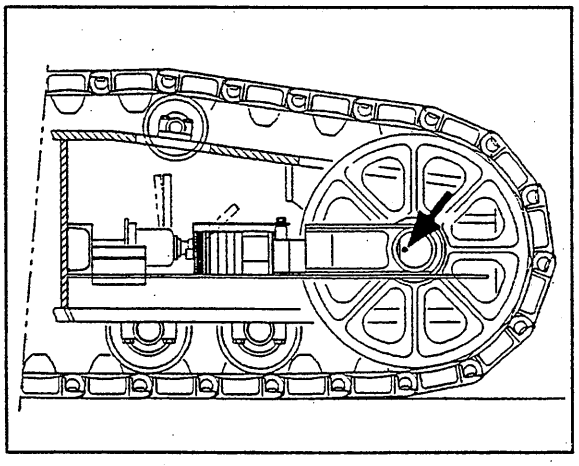
Remove the both end plugs to drain the oil. Supply the specified oil of specified amount. To change oil, consult the local KOBELCO distributor.



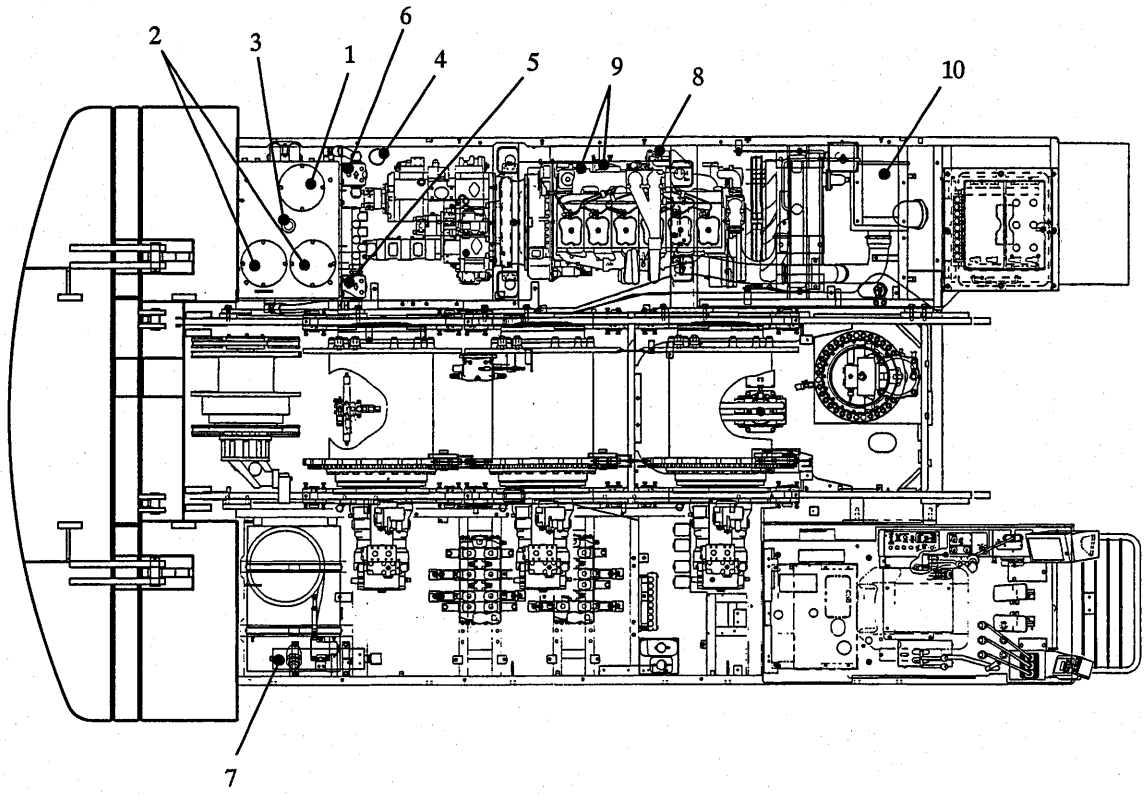
8. OIL CHANGE OF IDLER WHEEL

Remove the plug of the sliding block to drain the oil.

Supply the specified oil of specified amount. To change oil, consult the local KOBELCO distributor.



8.3 CLEANING/WASHING/CHANGE OF FILTER ELEMENT AND STRAINER



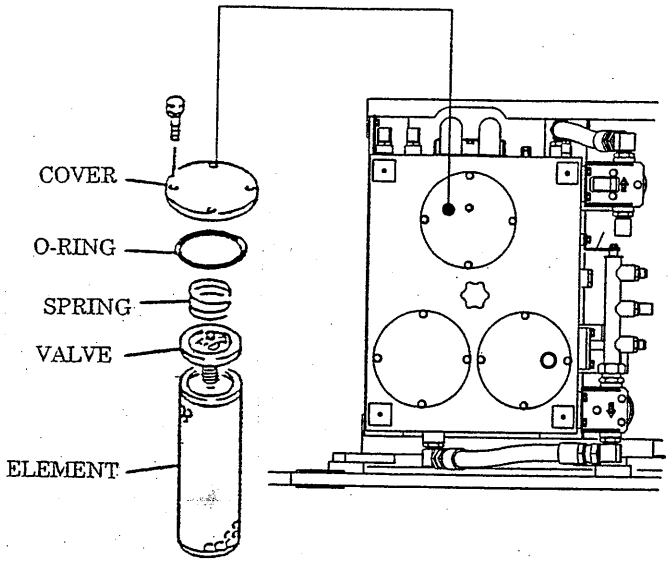
Item No.	Service Item		Cleaning/Washing/Changing Interval (hourmeter:Hr)						PART No.	Quantity
			5	100	250	500	1000	2000		
1	Hydraulic oil tank	Change of return filter			○				2446R275 (element) ZD11G22000 (O-ring)	1
2		Change of suction filter						○	GB50V00004S001 (element) ZD11G22000 (O-ring)	2
3		Washing of oil fill port strainer						○		1
4	Washing or change of line filter						○		2446R183S2 (filter) 45Z91D84 (O-ring)	2
5	Change of drain filter (cartridge)		○		○				2446U254S3	1
6	Change of line filter for brake cooling line		○		○				2446U254S3	1
7	Washing of fuel tank fill port strainer				○					1
8	Change of fuel filter					○			ME056670 (Mitsubishi PART)	1
9	Change of engine oil element				○				Kit ME121789 (Mitsubishi PART)	1
10	Cleaning and change of air element						Change ○		GB11P00001S002	1

1. CHANGE OF HYDRAULIC OIL TANK RETURN FILTER

WARNING

Do not change hydraulic oil filter when hydraulic oil is hot.
After the oil has cooled and the pressure has been released, change the filter.
Failure to observe this precaution may result in serious injury or loss of life.

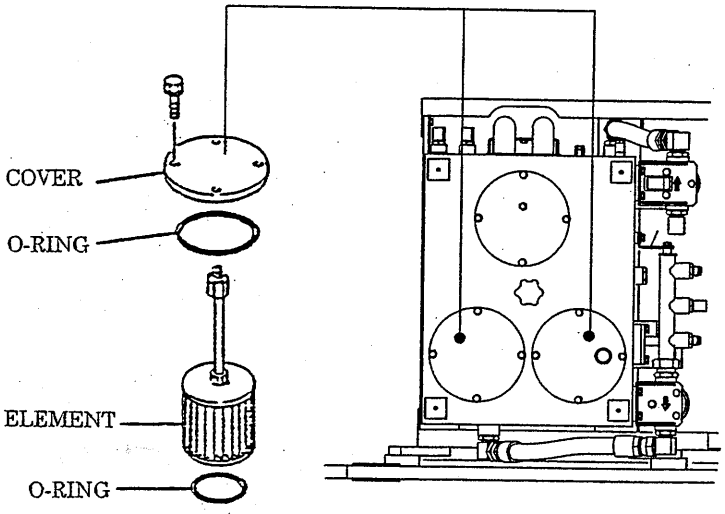
Removing the filter cover, replace the element and O-ring with new ones.



2. CHANGE OF HYDRAULIC OIL SUCTION FILTER

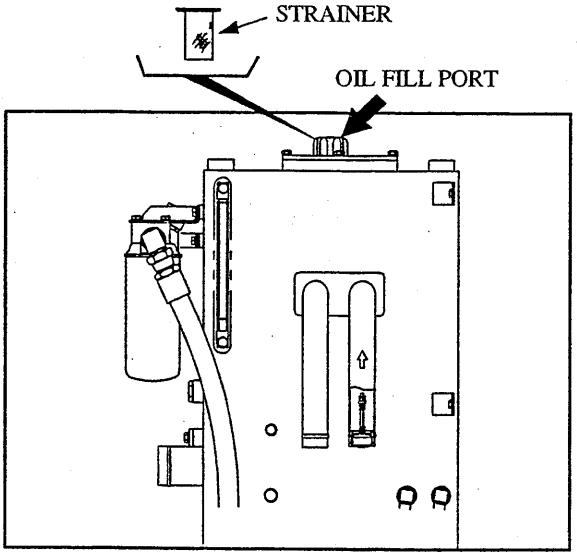
Removing the filter cover, replace the element and O-ring.

Perform this change when changing the hydraulic oil.



3. WASHING OF FILL PORT STRAINER

Removing the air breather cap, take out the fill port strainer, and sufficiently wash it with washing liquid.



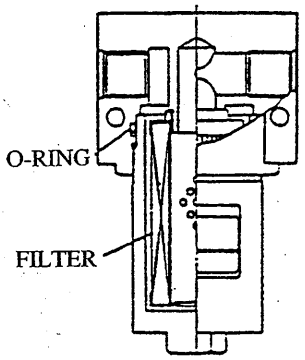
4. WASHING OF LINE FILTER

WARNING

After stopping engine, wait for five minutes to release pressure.

Removing the case, take out the filter, and sufficiently wash it.

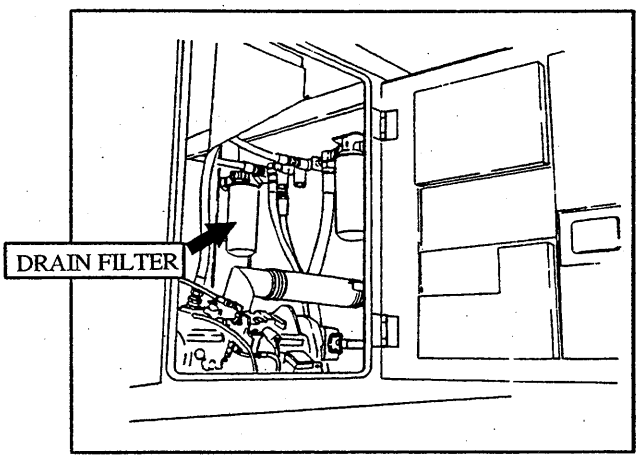
Replace the O-ring with a new one.



5. CHANGE OF DRAIN FILTER (CARTRIDGE)

Loosen the plug of the filter cover to remove the remaining pressure in the tank.

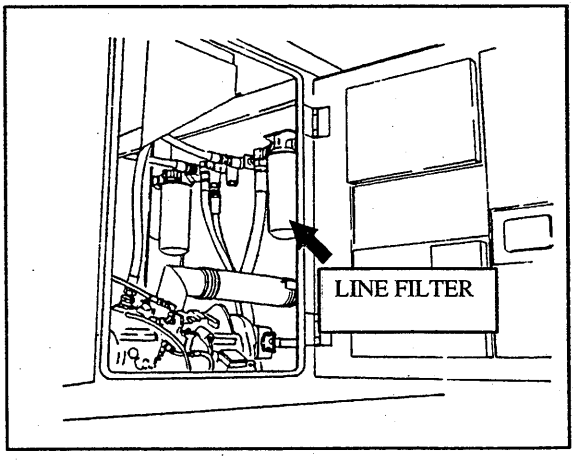
Prepare a oil receptacle under the filter, and replace the cartridge with a new one.



6. CHANGE OF LINE FILTER FOR BRAKE COOLING LINE (CARTRIDGE)

Loosen the plug of the filter cover to remove the remaining pressure in the tank.

Prepare a oil receptacle under the filter, and replace the cartridge with a new one.

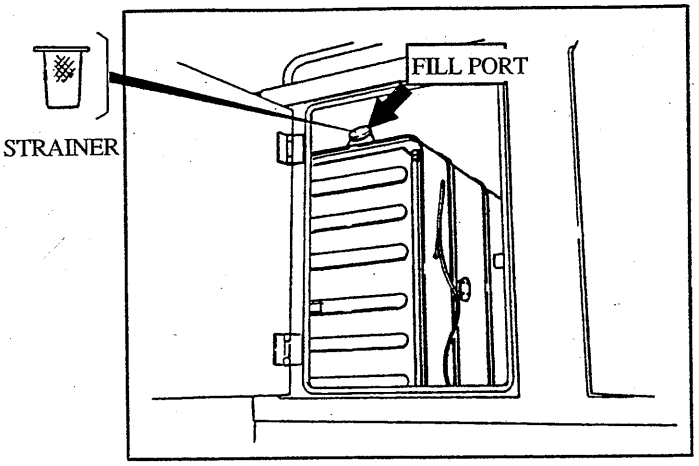


7. WASHING OF FUEL TANK FILL PORT STRAINER

Removing the cap, take out the strainer and sufficiently wash it with washing liquid.

WARNING

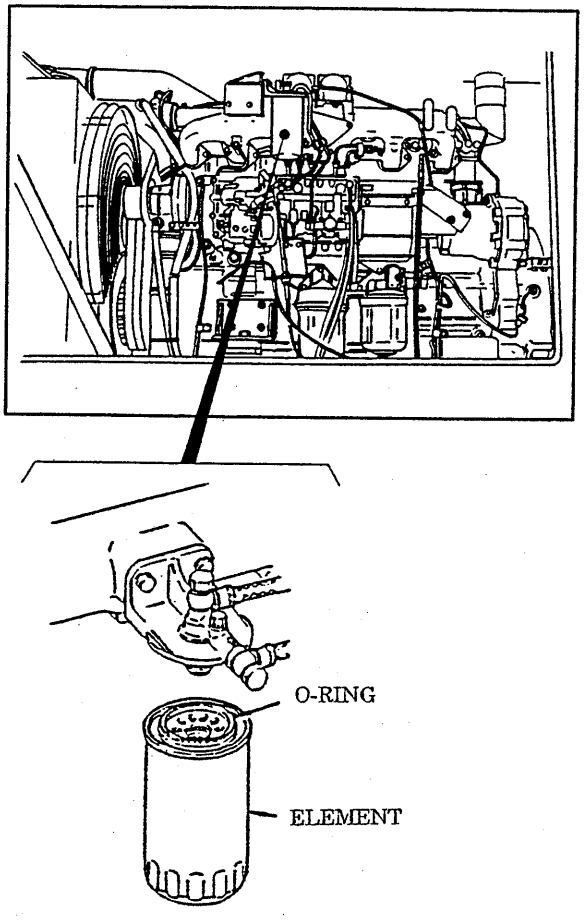
Do not bring any spark or flame close to the fuel.



8. CHANGE OF FUEL FILTER

Place a suitable container to receive fuel under the filter, being careful not to allow fuel to spill, and remove the case. Then replace the filter and O-ring with new ones.

After replacing the filter, be sure to bleed air, and wipe off spilt fuel.



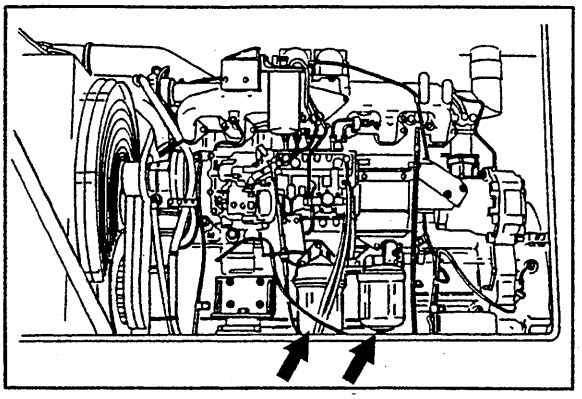
WARNING

- Do not bring any spark of flame close to the fuel.
- Never smoke cigarettes while changing fuel filter, this could ignite the fuel and cause property damage, injury to personnel or loss of life.

9. CHANGE OF ENGINE OIL ELEMENT

(1) Place a suitable container to receive oil under the filter, and loosen the drain plug on the bottom side of the filter case to drain the oil in the case.

(2) Remove the filter case, and replace the element with a new one.


OIL ELEMENT

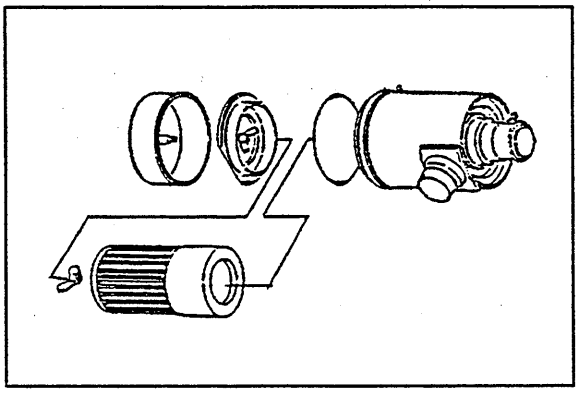
WARNING

Do not change engine oil element when oil is hot. Hot oil may spout out.
After the oil has cooled, change the filter.
The hot oil may cause severe burns.
Failure to observe this precaution may result in serious injury or loss of life.

10. CLEANING AND CHANGE OF AIR ELEMENT

Remove the air element, and blow air from the inside to remove dust.

If it is remarkably dirty and the element is deformed, replace the element with a new one early.



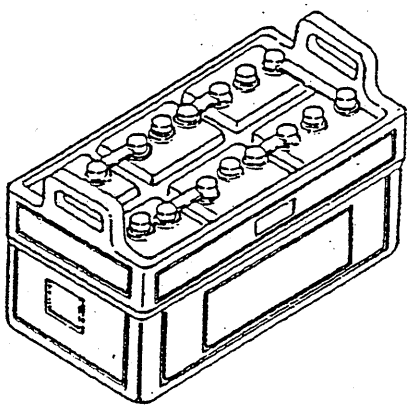
8.4 CHECK OF BATTERY

Item No.	Check Item	Check Interval (hourmeter:Hr)						Remarks
		5	100	250	500	1000	2000	
1	Check of battery electrolyte level.		○					
2	Check of charge condition.							As required

1. CHECK OF BATTERY ELECTROLITE LEVEL

   If the battery electrolyte level is upto 10mm above the plates, it is normal.

   If insufficient, add distilled water.



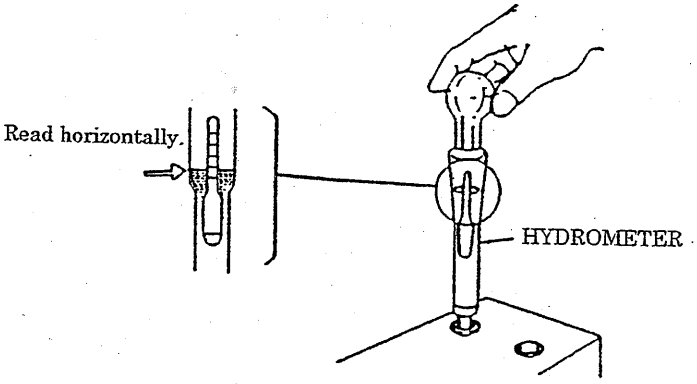
WARNING

- Do not bring a flame or spark close to the batteries.
- Never smoke cigarettes while checking electrolyte level. This could cause the battery electrolyte to ignite, and could cause property damage, injury to personnel or loss of life.

WARNING

- Since the battery electrolyte is dilute sulfuric acid, avoid battery acid contact with the skin, eyes, or clothing. If accidentally contacted, immediately flush the area with water and consult a doctor immediately.
- Wear eye glasses to protect eyes when working with electrolyte.

Failure to observe this precaution may result in serious injury or loss of life.



WARNING

- Wear eye grasses to protect eyes when working with electrolyte.
- Do not short across the battery terminals.

Failure to observe this precaution may result in serious injury or loss of life.

2. CHECK OF CHARGE CONDITION

   The charge condition is judged by measuring the specific gravity of the battery electrolyte.

   The normal specific gravity is 1.25 to 1.27 at 68°F (20℃) of electrolyte temperature. If the specific gravity is lower than 1.25, charge the battery.

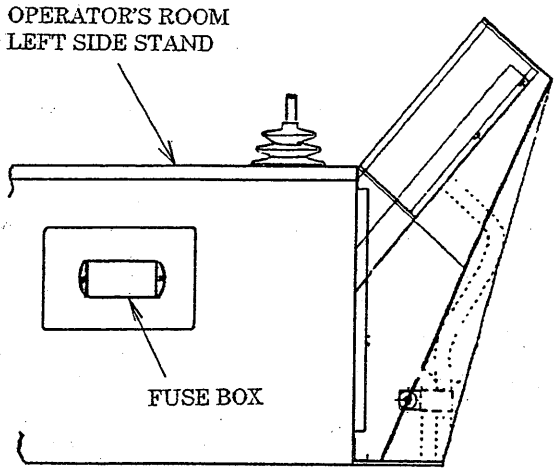
   If the battery is not used for a long time, remove the battery from the machine, and store it in a cold and dark place.

CAUTION

If the battery will not be used for an extended period of time, remove the battery, clean it thoroughly and store it in a cool, dry location where the temperature will not fall below 32°F (0℃.)

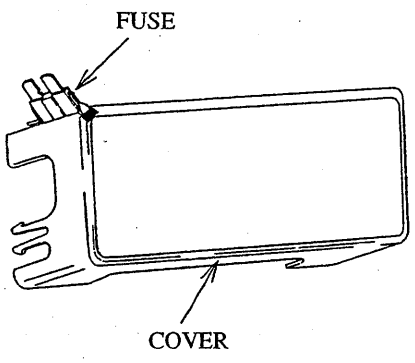
If the battery cannot be removed and stored, then disconnect the terminals to avoid draining the battery.

8.5 ARRANGEMENT AND USE OF FUSE



REMOVAL OF FUSE

Fit the fuse to the corner of the fuse box cover, and pull it out.



Classification of Fuse Use				
Fuse No.	Capacity	Kind	Line No.	Use
F1	20A	Automotive Blade	1 — 11	Main power supply, headlight
F2	5A		1 — 12	Back-up
F3	5A		54 — 13	Engine start
F4	5A		2 — 14	Neutral free
F5	10A		2	Spare
F6	10A		2 — 16	Solenoid valve
F7	5A		3 — 17	Not available in this model
F8	5A		3 — 18	Anti-two-block (Overhoist)
F9	20A		2 — 19	Wiper
F10	20A		2 — 20	Air conditioner
F11	10A		52 — 21	One-way
F12	20A		2 — 22	Total controller
F13	5A		2	Spare
F14	10A		2 — 24	Swing flasher
F15	10A		2 — 25	Cigaret lighter, fuel pump
F16	10A		2 — 26	Monitor
F17	20A		2 — 27	Governor control circuit
F18	20A		2	Spare
F19	10A		2	Spare
F20	10A		2	Spare

8.6 OPERATION UNDER UNUSUAL CONDITIONS

(1) OPERATION IN COLD REGION

<table>
<tr><th>Item</th><th>Treatment</th><th>Caution</th></tr>
<tr><td>Engine Oil</td><td>Use engine oil suitable to the atmospheric temperature.
(See the engine manual.)
Class CD in API service classification.
<table><tr><td>Atmospheric temperature when engine starting.</td><td>104°F to 50°F (40°C to 10°C)</td><td>50°F to −22°F (10°C to −30°C)</td></tr><tr><td>Viscosity of oil</td><td>SAE 30</td><td>SAE10W-30</td></tr></table></td><td>When replenishing or adding oil, do not mix different brand and quality oil, but use the same brand and quality oil.</td></tr>
<tr><td>Fuel</td><td>Use fuel suitable to the atmospheric temperature.
<table><tr><th>Atmospheric temperature</th><th>Kind</th></tr><tr><td>Higher than 23°F (−5°C)</td><td>JIS #2 light oil</td></tr><tr><td>23°F + 5°F (−5°C to −15°C)</td><td>JIS #3 light oil</td></tr><tr><td>Lower than 5°F (−15°C)</td><td>JIS Special #3 light oil</td></tr></table>Before starting work, drain water, and after the work is finished, fill the tank as full as possible.</td><td></td></tr>
<tr><td>Coolant</td><td>Combine antifreeze (Long Life Coolant) according to the atmospheric temperature.
(Capacity of coolant: 9.0 gal (34ℓ))
<table><tr><th>Atmospheric temperature</th><th>Volume of cooling water</th><th>Volume of antifreeze</th></tr><tr><td>−4℃</td><td>8.2 gal (31ℓ)</td><td>0.8 gal (3ℓ)(10%)</td></tr><tr><td>−7℃</td><td>7.7 gal (29ℓ)</td><td>1.3 gal (5ℓ)(15%)</td></tr><tr><td>−13℃</td><td>6.6 gal (25ℓ)</td><td>2.4 gal (9ℓ)(25%)</td></tr><tr><td>−17℃</td><td>6.3 gal (24ℓ)</td><td>2.7 gal (10ℓ)(30%)</td></tr><tr><td>−21℃</td><td>5.8 gal (22ℓ)</td><td>3.2 gal (12ℓ)(35%)</td></tr><tr><td>−25℃</td><td>5.3 gal (20ℓ)</td><td>3.7 gal (14ℓ)(40%)</td></tr><tr><td>−31℃</td><td>5.0 gal (19ℓ)</td><td>4.0 gal (15ℓ)(45%)</td></tr><tr><td>−40℃</td><td>4.5 gal (17ℓ)</td><td>4.5 gal (17ℓ)(50%)</td></tr></table></td><td>Sometimes, combination rate may be different depending upon brands.</td></tr>
<tr><td>Battery</td><td>Sufficiently charge the battery. (Maintain the specific gravity more than 1.22.)
The electro-lyte in a fully charged battery will resist freezing at lower temperature better than a battery that in not fully charged.</td><td>After distilled water has been added, start and run the engine to mix with the electrolyte.</td></tr>
</table>

(2) EXTREME HEAT

<table>
<tr><th>Item</th><th>Treatment</th><th>Caution</th></tr>
<tr><td>Engine Oil</td><td>Use engine oil suitable to atmospheric temperature.
(See the engine manual.)
Class CD in API service classification.
<table><tr><td>Atmospheric temperature when starting engine</td><td>Higher than 40℃</td><td>40℃ to 10℃</td></tr><tr><td>Viscosity of oil</td><td>SAE40</td><td>SAE30</td></tr></table></td><td>Don not mix a different brand and quality of oil, but use the same brand and quality oil.</td></tr>
<tr><td>Coolant</td><td>• Do not use antifreeze (Long Life Coolant) , but mix anticorrosive to fresh water and pour it.
• Wash the inside of the radiator, too with washing liquid.</td><td></td></tr>
<tr><td>Battery</td><td>Always maintain the electrolyte level 10mm above the plates.</td><td></td></tr>
</table>

(3) DUSTY PLACE

Item	Treatment	Caution
Air cleaner	Perform washing and change of the element early.	
Radiator, oil coler	Early clean the core not to allow dust to clog the core.	
Filter, element	Early replace with new ones.	
Engine oil	Early change oil.	
Slewing ring gear	Early lubricate.	
Wire rope	Early clean and lubricate.	

(4) OPERATION IN SEASIDE

Item	Treatment	Caution
Lubrication	Thoroughly and carefully lubricate each point Lubricate connector sections not equipped with grease fittings.	
Basic machine	Sufficiently wash the basic machine, radiator and oil cooler to wash salt off.	

8.7 MACHINE STORAGE

(1) SHORT TERM STORAGE (Period of 30 Days or Less)

- Clean the entire machine, sufficiently dry it, then carefully lubricate.
- Cover the machine to prevent dust.

(2) LONG TERM STORAGE (Longer than One month and less than 1 Year)

- Clean the entire machine, sufficiently dry it, then carefully lubricate.
- Sufficiently grease the slewing ring gear.
- Replace the reduction unit gear oil and hydraulic oil with fresh oil.
- Replace all filters and so on with new ones.
- Remove the batteries and store them in a cold and dark place.
- Apply thin coat of oil to places which are apt to rust.
- Completely drain coolant, and post a sign "No Water".
- Cover the entire machine to prevent dust.

8.8 TIGHTENING TORQUE VALUES

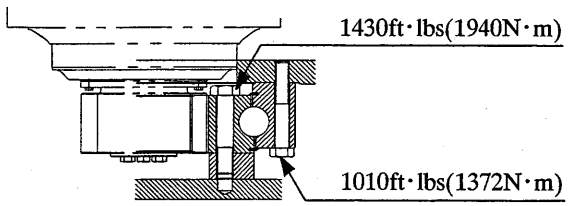
(1) Unless otherwise specified, torque all metric screws and bolts on this machine to the values shown in the table below.

	Metric Course Screw Thread			
	4T		7T	
	Tightening Torque ft·lbs (N·m)		Tightening Torque ft·lbs (N·m)	
Nominal	Dry	Lubricated	Dry	Lubricated
M6	3.8±0.4 (5.1±0.5)	3.2±0.3 (4.3±0.4)	8.2±0.8 (11.1±1.1)	6.9±0.7 (9.3±0.9)
M8	9.0±0.9 (12.3±1.2)	7.7±0.8 (10.4±1.0)	20.2±2.0 (27.4±2.7)	16.6±1.7 (22.5±2.3)
M10	18.1±1.8 (24.5±2.5)	15.2±1.5 (20.6±2.1)	39.0±3.9 (52.9±5.3)	33.2±3.3 (45.1±4.5)
M12	30.3±3.0 (41.2±4.1)	26.7±2.7 (36.3±3.6)	66.4±6.6 (90.2±9.0)	56.3±5.6 (76.4±7.6)
M14	48.4±4.8 (65.7±6.6)	41.2±4.1 (55.9±5.6)	105±10.5 (143±14)	88.8±8.9 (121±12)
M16	73.6±7.4 (100±10)	62.1±6.2 (84.3±8.4)	159±16 (216±22)	134±13 (181±18)
M18	101±10 (137±14)	85.9±8.6 (117±12)	224±22 (304±30)	188±19 (255±26)
M20	142±14 (193±19)	119±12 (162±16)	310±31 (421±42)	260±26 (353±35)
M22	188±19 (255±26)	159±16 (216±22)	412±41 (559±56)	347±35 (470±47)
M24	245±25 (333±33)	195±20 (265±27)	527±53 (715±72)	425±43 (578±58)
M27	354±35 (480±48)	289±29 (392±39)	773±77 (1048±105)	643±64 (853±85)
M30	484±48 (657±66)	404±40 (549±55)	1047±105 (1421±142)	881±88 (1195±120)
M33	650±65 (882±88)	542±54 (735±74)	1408±141 (1911±190)	1184±118 (1607±161)
M36	838±84 (1137±114)	700±70 (951±95)	1805±180 (2450±245)	1509±151 (2048±205)

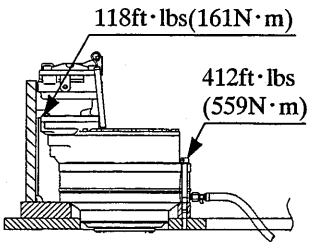
	Metric Fine Screw Thread			
	4T		7T	
	Tightening Torque ft·lbs (N·m)		Tightening Torque ft·lbs (N·m)	
Nominal	Dry	Lubricated	Dry	Lubricated
M8	9.5±0.9 (12.9±1.3)	8.0±0.8 (10.9±1.1)	20.9±2.1 (28.4±2.8)	17.3±1.7 (23.5±2.4)
M10	18.8±1.9 (25.5±2.6)	15.9±1.6 (21.6±2.2)	40.4±4.0 (54.9±5.5)	34.7±3.5 (47.0±4.7)
M12	33.2±3.3 (45.1±4.5)	28.2±2.8 (38.2±3.8)	71.5±7.2 (97.0±9.7)	59.9±6.0 (81.3±8.1)
M16	77.3±7.7 (105±11)	65.0±6.5 (88.2±8.8)	166±17 (225±23)	141±14 (191±19)
M20	152±15 (206±21)	129±13 (174±17)	332±33 (451±45)	274±27 (372±37)
M24	260±26 (353±35)	217±22 (294±29)	563±56 (764±76)	469±47 (637±64)
M30	520±52 (706±71)	433±43 (588±59)	1141±114 (1548±155)	946±95 (1284±128)
M36	866±87 (1176±118)	722±72 (980±98)	1892±189 (2568±257)	1574±157 (2136±214)

(2) The torque values required for the specified screws and bolts on this machine are shown in the table below. The allowance of the torque values shown in the table is ±(plus and minus)10%.

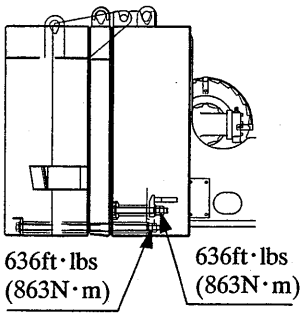
SWING BEARING



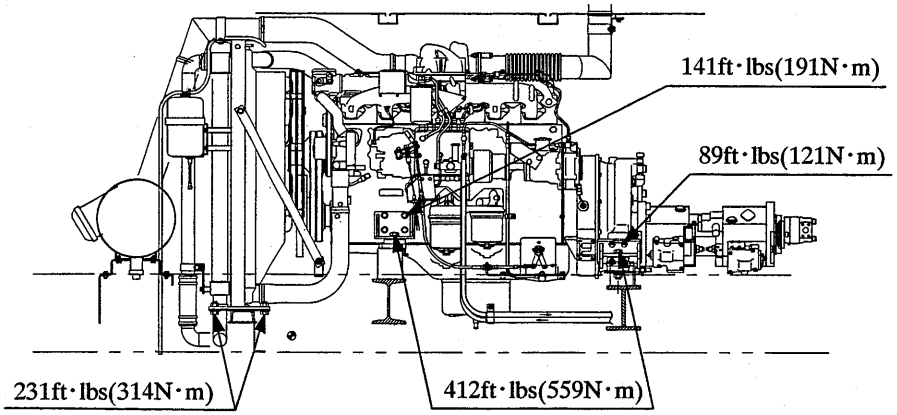
SWING MOTOR ASSY



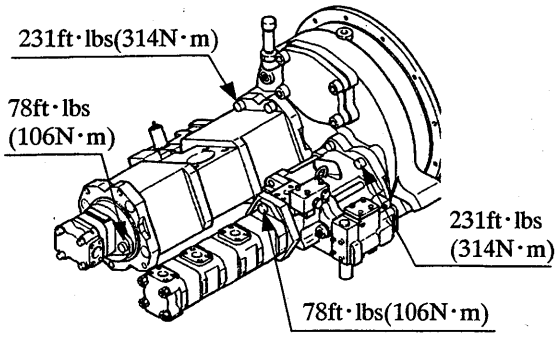
COUNTER WEIGHT



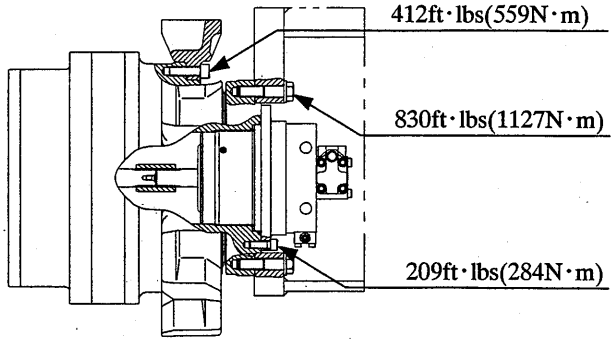
ENGINE



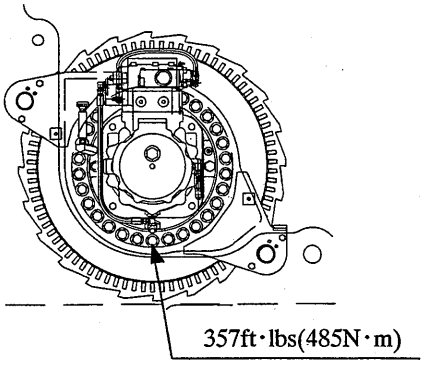
PUMP ASSY



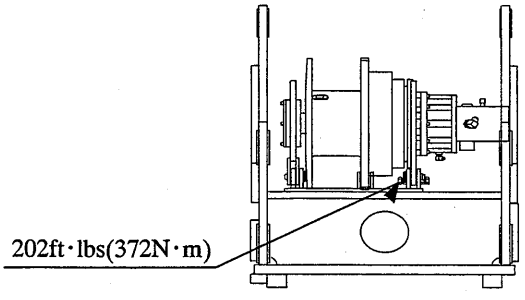
PROPEL MOTOR ASSY



FRONT · REAR DRUM MOTOR



BOOM DRUM ASSY



Temporarily and uniformly attach the bolts to the stand, and tighten them with the specified tightening torque.

Apply Loctite #242 or equivalence to the bolts and nuts.

For maintenance, contact our KOBELCO servivce shop.

8.9 SECURITY PARTS TO BE REPLACED PERIODICALLY

Abnormality of parts related to brakes and clutches has possibility to cause unexpected serious accidents. Therefore, "Security Parts to be Replaced periodically" are set for these critical parts as shown in the following table, and interval of replacement is standardized. Be sure to replace the security parts shown in the table every (within) 2 years.

No	Security Parts to be Replaced Periodically	Replacement Interval	Remarks
1	Winch brake hose	2 years	
2	Winch clutch line hose	2 years	
3	Swing brake hose	2 years	
4	Pressure line hose (accumlator to control line)	2 years	
5	Pressure line hose (pump to line filter)	2 years	

Since damage and corrosion of boom guy line are caused by fatigue from the inside in the boom guy line, replacement time cannot be judged from the appearance. If the guy line is broken by progressing internal damage and/or corrosion, there is possibility to cause serious accidents. Be sure to replace the guy line periodically.
Replacement time according to the content of work is shown in the following table.

Contents of Operation	Replacement Interval
Exclusive operation to lifting magnet or clamshell	2 years
Both crane and clamshell operation, or frequent crane operation such as landing work	4 years
Normal crane operation	6 years

Use the guyline of 36 mm dia. for the lifting magnet or clamshell operations.

8.10 ADJUSTMENT

8.10.1 ADJUSTMENT OF FRONT AND REAR DRUM LOCKS

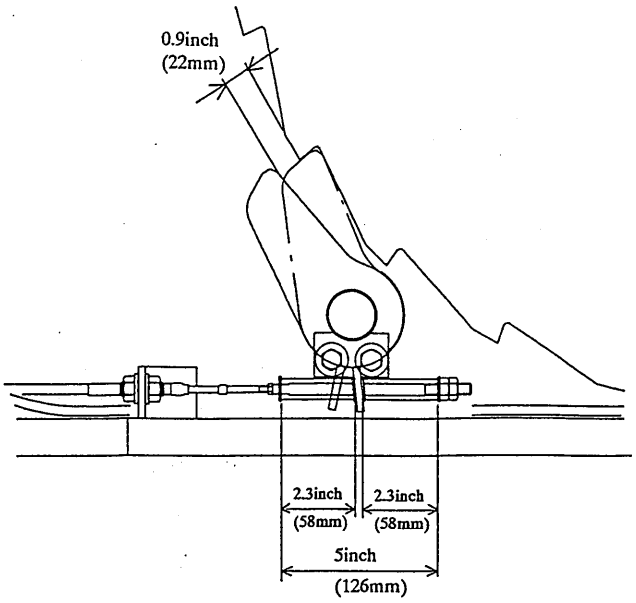
⚠ WARNING

Do not adjust the drum locks until the boom, hook block, and load have been lowered to the ground.
Failure to observe this precaution may result in serious injury or loss of life.

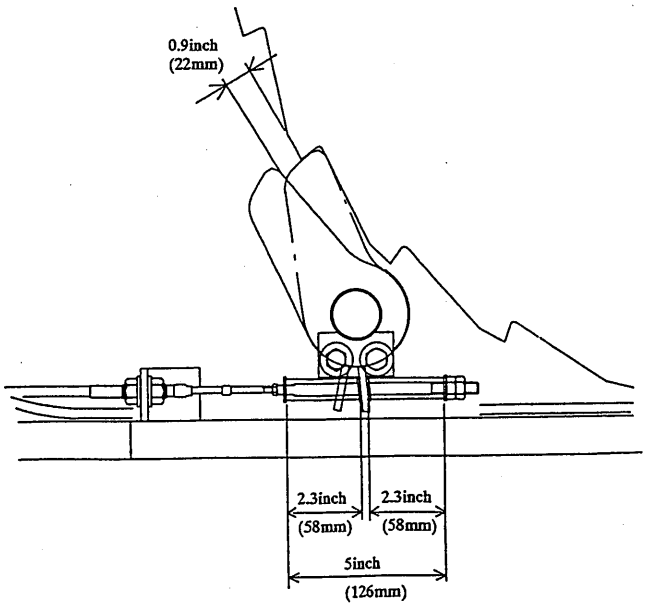
① Pull the drum lock knob in the LOCK position and check to see that the pawl is engaged in the bottom of the drum ratchet.
If the pawl is not engaged in the bottom of the ratchet, adjust the spring length to allow the pawl to be engaged in the bottom.

② With the condition of step ①, adjust the respective dimension as shown in the figure.

③ Push the drum lock knob in the RELEASE position and check to see that the pawl is clear of the ratchet by at least 0.9 inch (22 mm).
Operate the knob to the LOCK position and to the RELEASE position and confirm that the pawl moves smoothly.



FRONT · REAR DRUM LOCK

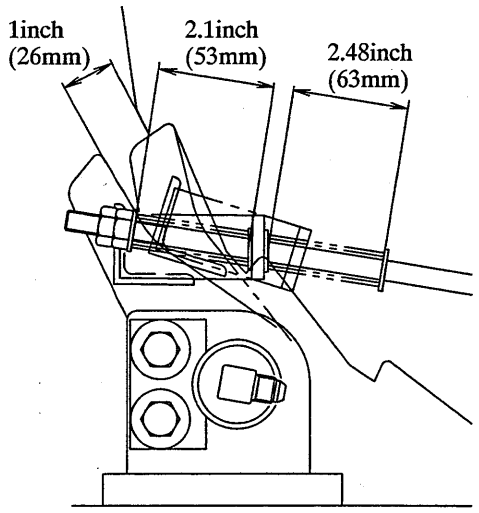


THIRD DRUM LOCK

8.10.2 ADJUSTMENT OF BOOM DRUM LOCK

WARNING

Do not adjust the boom hoist drum lock until the boom has been lowered to the ground.
Failure to observe this precaution may result in serious injury or loss of life.



① Pull the drum lock knob in the LOCK position and check to see that the pawl is engaged in the bottom of the drum ratchet with the drum lock condition.
If the pawl is not engaged in the bottom of the ratchet, adjust the spring dimension to allow the pawl to be engaged in the bottom.

② With the condition of step ①, adjust the respective dimension as shown in the figure.

③ Push the drum lock knob in the RELEASE position and check to see that the pawl is clear of the ratchet by at least 1 inch (26 mm).
Operate the knob to the LOCK position and to the RELEASE position and confirm that the pawl moves smoothly.

WARNING

Keep hands and clothing clear of the rotating drum.
Failure to observe this precaution may result in serious injury or loss of life.

8.10.3 ADJUSTMENT OF CRAWLER SHOES

If the crawler shoes are too tight, the shoes wear quickly and a connection between two shoes could break. On the other hand, if the shoes are too loose, the shoes may ride off the drive sprocket and idler wheel during the travel operation. To prevent these occurrence from happening, it is required to adjust shoe tension.

To adjust shoe tension, proceed as follows:

(1) Move the machine forward about the crawler length so that the slackening of the crawler shoes appear on the upper side of the crawler.

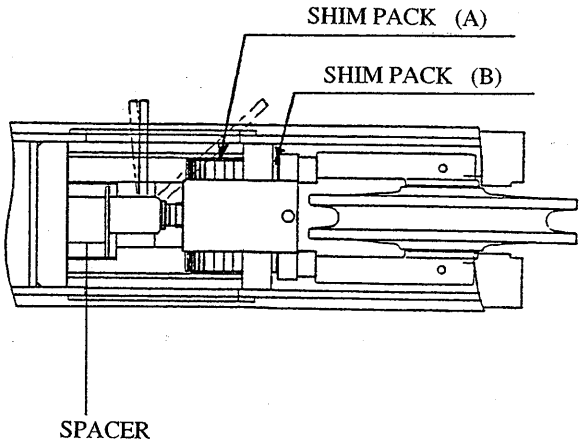
(2) Remove all the shims from shim pack (A).

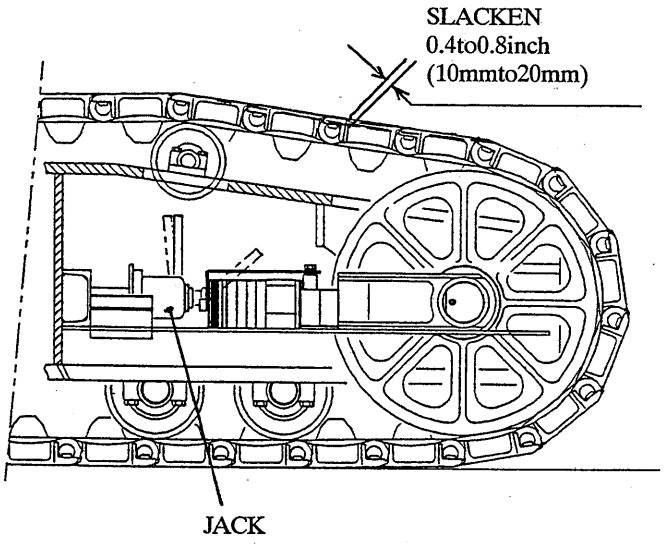
(3) Set the hydraulic jack in the position between the bracket and block of the side frame.
Operate the jack to push the idler wheel, and remove the slackening of the shoes.

(4) Insert the shims removed from pack (A) in step (2) into the vacant room of pack (B).
Insert the remaining shims into pack (A).

(5) Remove the hydraulic jack. Store spare shims in the shim pack (A).

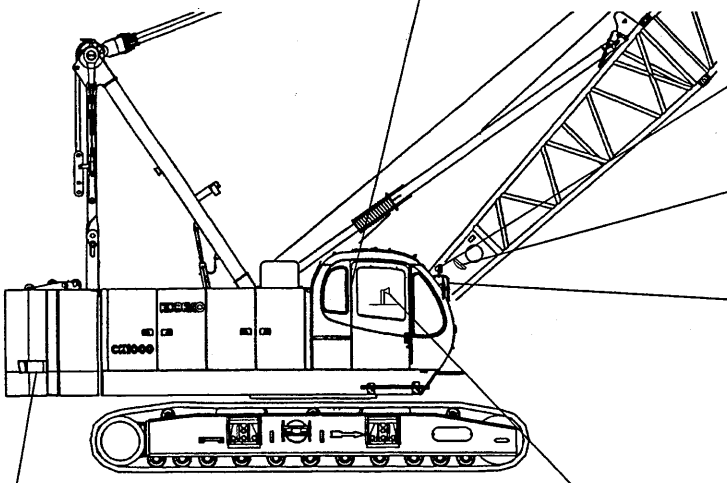
NOTE
Equalize the tension in right and left crawler tracks.





8.11 CONSUMABLE PARTS LIST

1. OIL/GREASE
   For the recommended oil and grease, refer to the "KOBELCO Genuine Lubricant Chart" in the page 8-30, and be sure to use KOBELCO genuine parts.
   For the battery electrolyte and the window washer liquid, use commercial items.
2. FILTER ELEMENT
   For the recommended filter element, refer to the chart in the page 8-50.
3. FUSE
   For the recommended fuse, refer to the chart in the page 8-55.
4. WIRE ROPE
   For the recommended wire rope, refer to the section of the "SPECIFICATION OF WIRE ROPE" in the chapter 7.
5. LIGHT AND MIRROR



ROOM LIGHT
2456R315

HEAD LIGHT
EZ80S00003D3

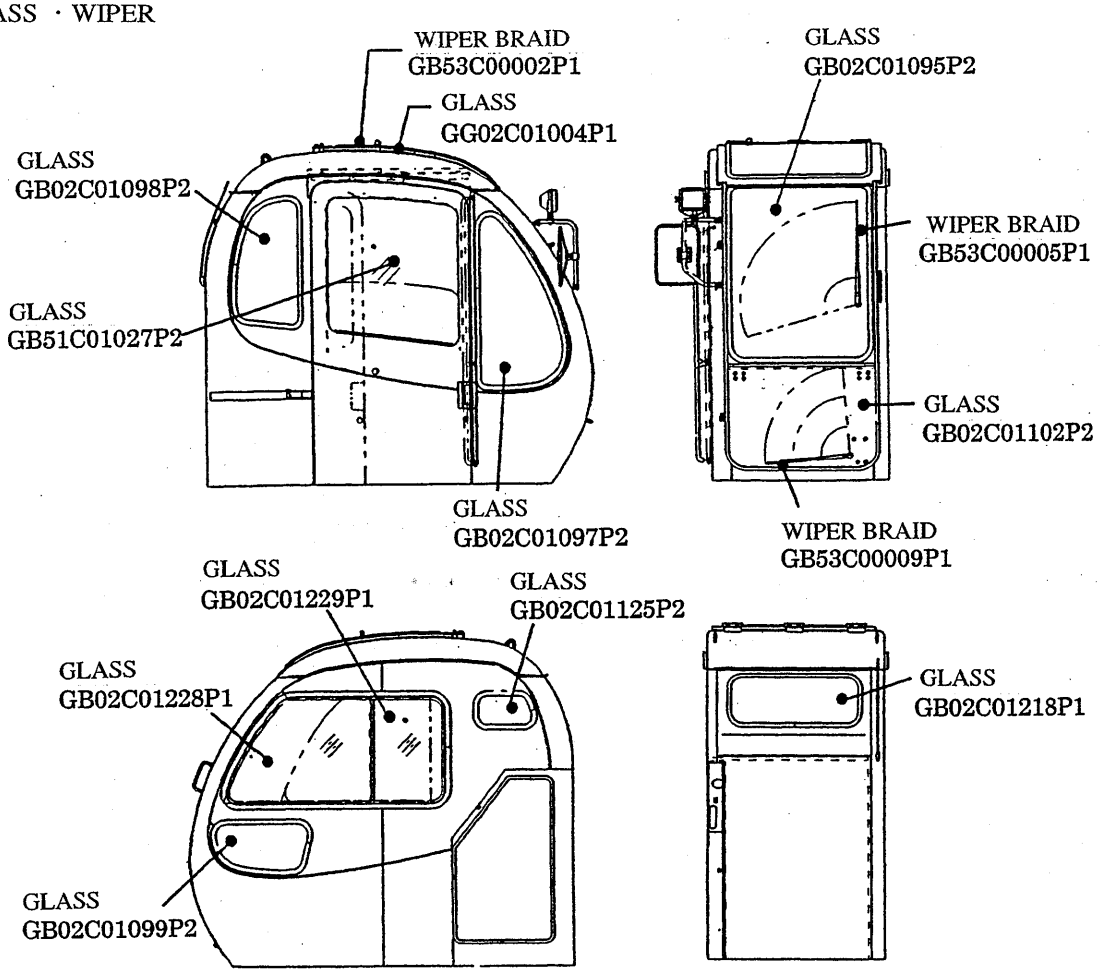
MIRROR	
Mirror assy	24100N6067F1
Mirror	2456R325

MIRROR
EZ52C00002P1

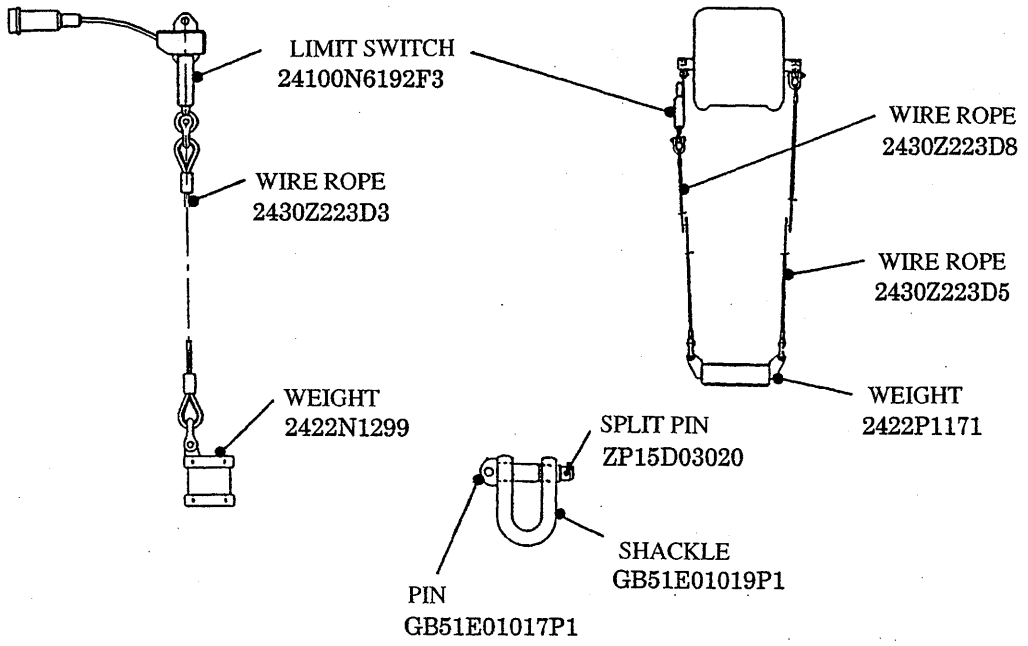
PANEL LIGHT
GB80S00011P1

SWING FLASHER · TAIL LIGHT		
Right	Assy	FP80S00002F1
	Bulb	2456U145S15
	Lens	GB80S00001S002 (Red)
	Lens	GB80S00001S001 (Trensparent)
Left	Assy	FP80S00001F1
	Bulb	2456U145S15
	Lens	GB80S00002S002 (Red)
	Lens	GB80S00002S001 (Trensparen)

6. GLASS · WIPER



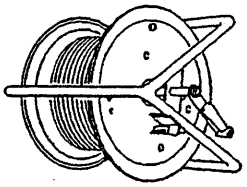
7. HOOK OVER HOIST LIMIT SWITCH



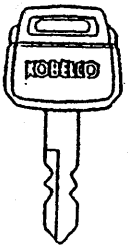
8. CABLE REEL FOR SAFETY DEVICE

Cable reel

Crane	24100R437F1
Jib	24100R438F1



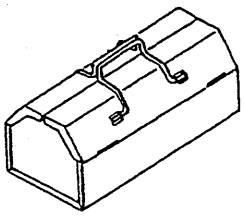
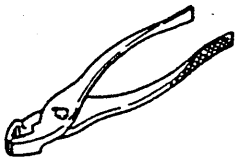
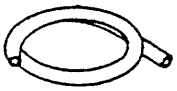
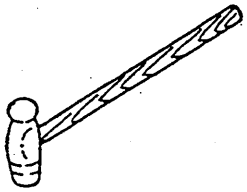
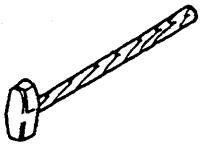
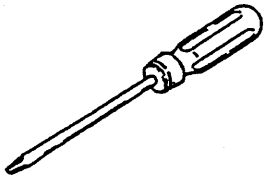
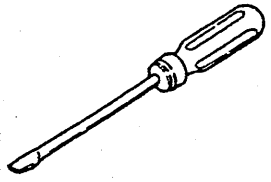
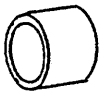
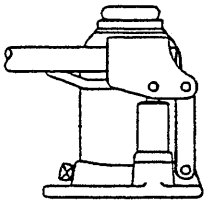
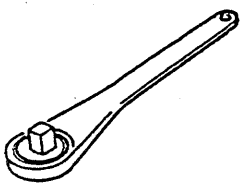
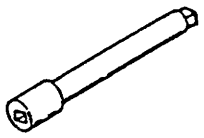
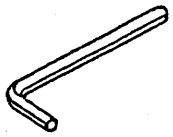
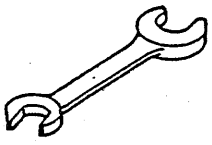
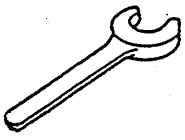
9. KEY

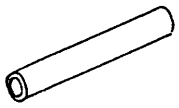
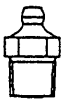
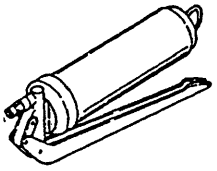
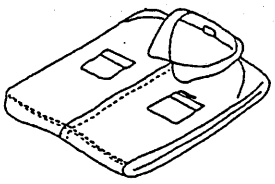
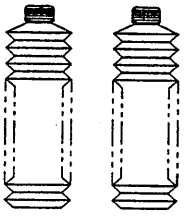
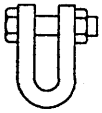


ENGINE
DOOR
GUARD

EZ51S00016S002 (K250)

10. TOOL

TOOL BOX  2427U239	PLIERS  2421R393	MONKEY WRENCH  ZT12D20000 (24mm) ZT12D37500 (44mm)	VINYLE HOSE  2420Z718D200
HAMMER  2421R397	HAMMER  21Z72D4	DRIVER  GB01T01008D1	DRIVER  2421R395D2 (5.5mm) GB01T01006D1 (10mm)
ADAPTER (When adjustment of shoes)  GB54D01005P1	JACK (For adjustment of shoes)  2421Z228D16	RATCHET HANDLE  2420R527 (□ 12.7) ZT31B19500 (□ 19)	EXTENSION BAR  2420Z623D4 (□ 12.7) ZT31D19400 (□ 19)
HEXAGON WRENCH  ZT22A05000 (5mm) ZT22A06000 (6mm) ZT22A08000 (8mm) ZT22A10000 (10mm) ZT22A12000 (12mm) ZT22A14000 (14mm) ZT22A17000 (17mm)	WRENCH  ZT12B10013 (10 × 13) ZT12B13017 (13 × 17) ZT12B17019 (17 × 19) ZT12B19022 (19 × 22) ZT12B22024 (22 × 24) ZT12B24027 (24 × 27) ZT12B27030 (27 × 30) ZT12B32036 (32 × 36)	WRENCH  ZT12A30000 (30mm) ZT12A36000 (36mm) ZT12A41000 (41mm) ZT12A46000 (46mm) ZT12A50000 (50mm) ZT12A55000 (55mm)	SOCKET  2408R587D8 (10mm) 2408R587D9 (13mm) 2408R587D1 (17mm) 2408R587D2 (19mm) 2408R587D3 (22mm) 2408R587D4 (24mm) ZT32A30000 (30mm) ZT32A55000 (55mm)

PIPE (For wrench)  2420T3100	GREASE NIPPLE  ZG91S02000 (PT1/8) ZG91S04000 (PT1/4) 44Z1D10 (NPT1/8)	OILER  2421Z238	FILTER WRENCH  2421R170
HOSE (For grease pump)  44Z186	GREASE PUMP  2421R107	WORKING CLOTHES  EZ01T01018P1	GREASE  2421R114D11
GEAR OIL (For swing gear)  21Z16D5	SHACKLE  2420Z604D6 (For 5.4t) 2420Z604D11 (For 10.0t) GG62C01002P1 (For 2.0t)		

9. REFERENCE MATERIALS

9.1 SPECIFICATION

9.1.1 PERFORMANCE

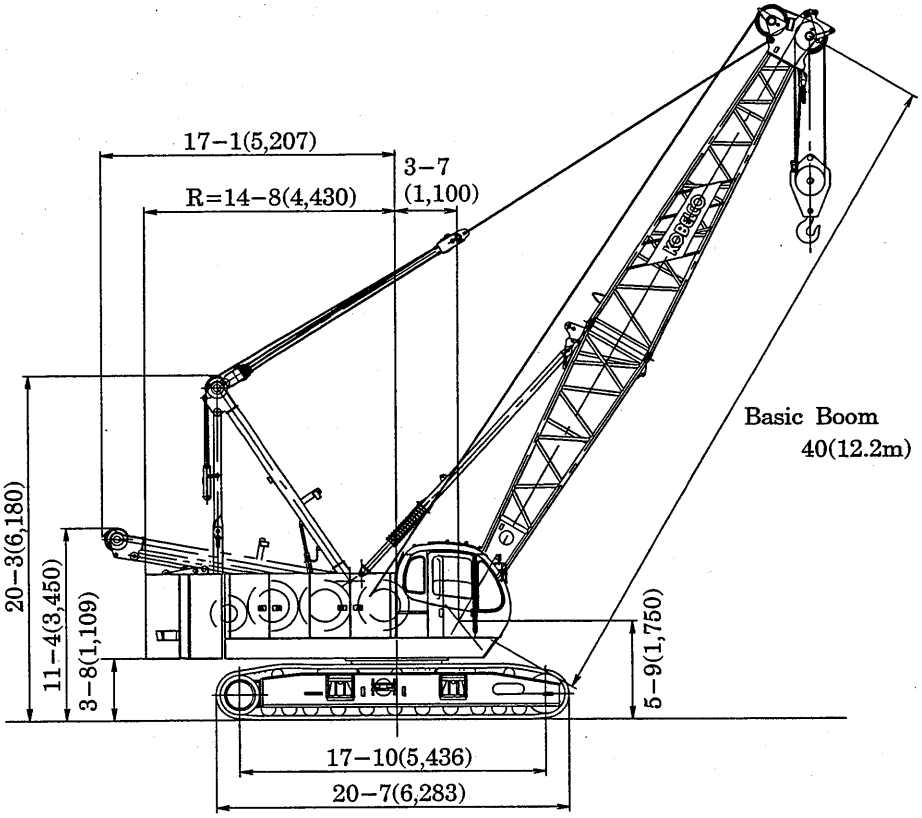
Type	Full hydraulic type
Max. lifting capacity	200,000LBS×11FT (90.7t×3.35m)
Max. boom length	200FT (61.0m)
Basic boom length	40FT (12.2m)
Working weight (with basic boom and 100t hook)	Approx. 172,000LBS (78.2t)
Average ground pressure (with wide shoe)	81kPa(0.84kg/cm^2)
Greadability (tan θ)	40%
Engine	Mitsubishi 6D24-TEG Diesel engine 198kw/2000min^{-1} (263PS/2000rpm)
Main lifting / lowering rope speed	※ 328 to 10 ft/min (100 to 3m/min)
Auxiliary lifting / lowering rope speed	※ 328 to 10 ft/min (100 to 3m/min)
Boom raising rope speed	※ 213 to 7 ft/min (65 to 2m/min)
Boom lowering rope speed	※ 213 to 7 ft/min (65 to 2m/min)
Swing speed	※ (3.5min^{-1} (3.5rpm)
Propel speed	※ 1.1/0.7mph (1.7/1.1km/h)

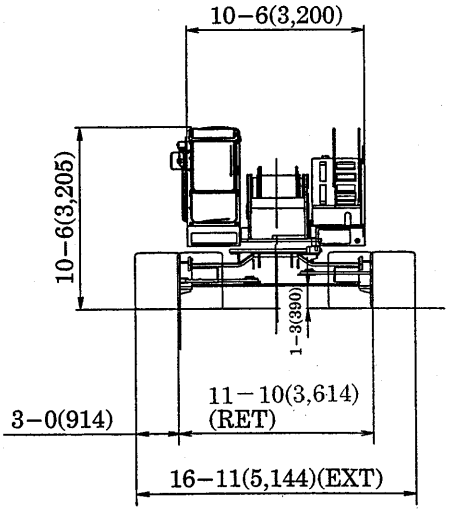
1. Above speeds based on single part of line and at first layer of rope drum.
2. The speed marked with ※ varies depending on the load.

9.1.2 OUTSIDE DIMENSIONS

Unit: ft-in (mm)

Overall width of cab	10-6 (3,200)
Height to top of gantry	11-4 (3,450)
Radious of rear endz (counterweight)	14-8 (4,430)
Center of rotation to boom foot pin	3-7 (1,100)
Height from ground to boom foot pin	5-9 (1,750)
Height to top of gantry (raised)	20-3 (6,180)
Counterweight ground clearance	3-8 (1,109)
Overall length of crawlers	20-7 (6,283)
Distance between centers of tumblers	17-10 (5,436)
Overall width of crawlers (Extend/Retract)	16-11/11-6 (5,144/3,500)
Width of crawler shoe	3-0 (914)
Ground clearance of carbody	1-3 (390)



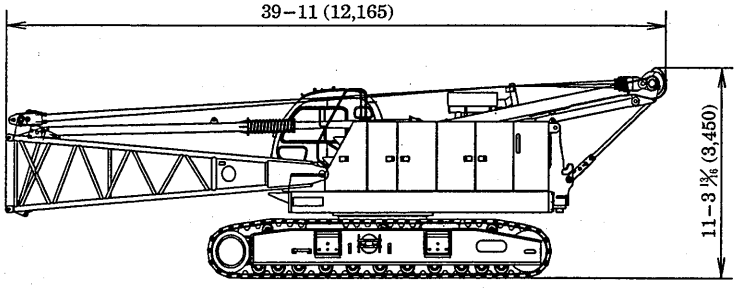
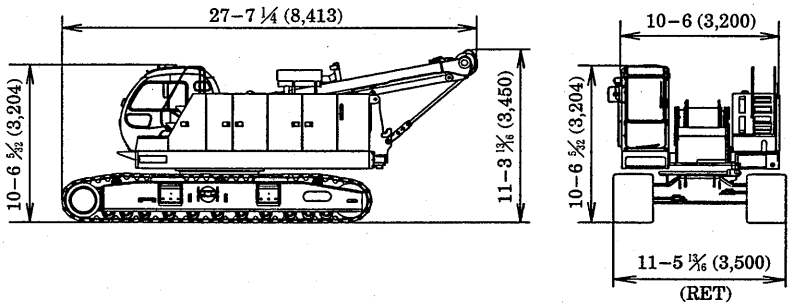
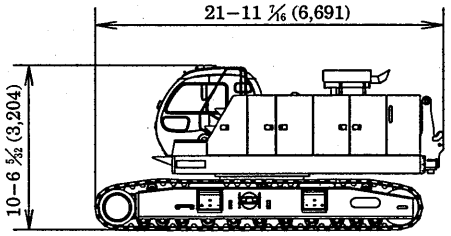
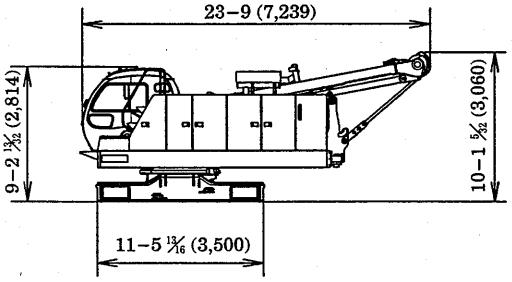
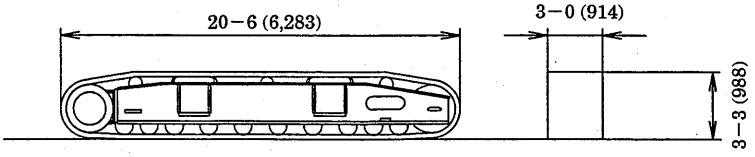


Unit: ft-inch (mm)

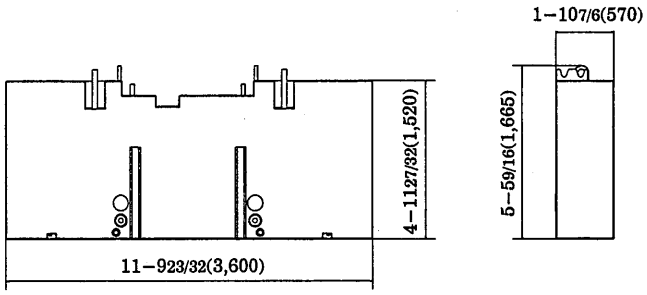
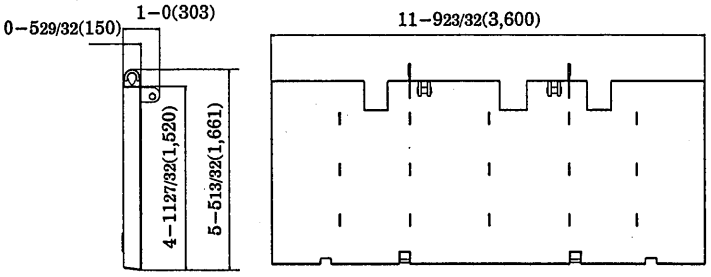
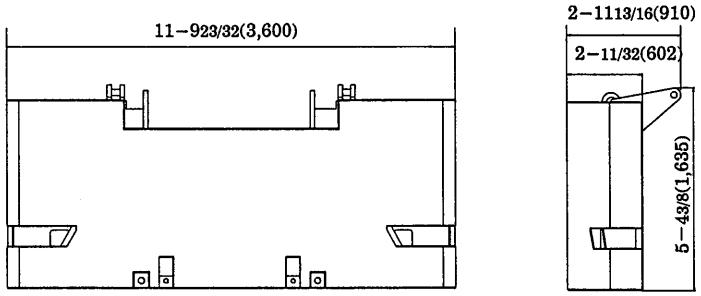
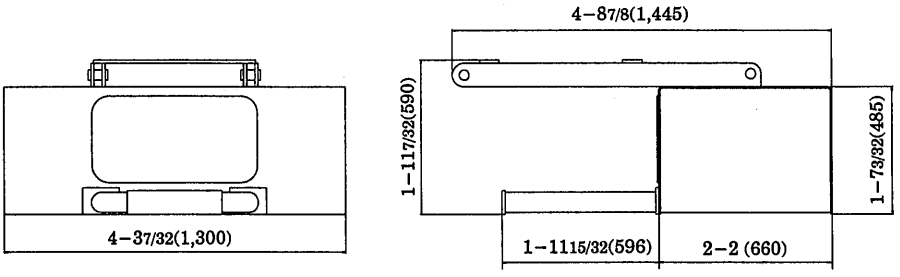
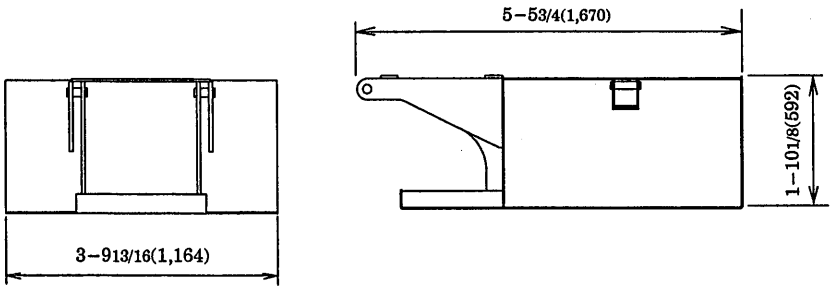
9.2 DIMENSIONS AND WEIGHT OF EACH PARTS

For your reference, the chart below shows the dimensions and weight of each parts.

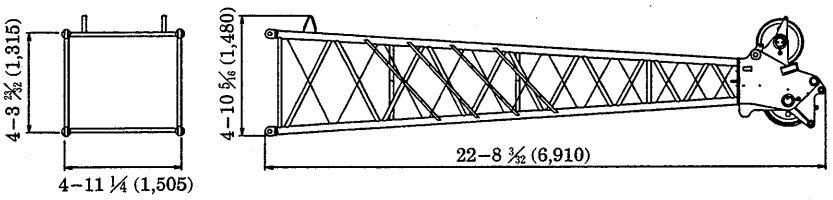
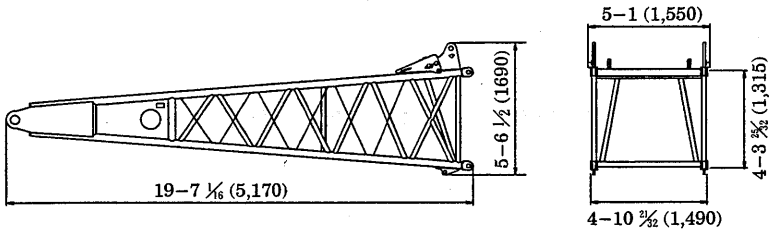
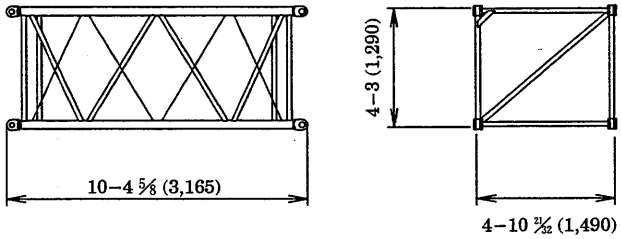
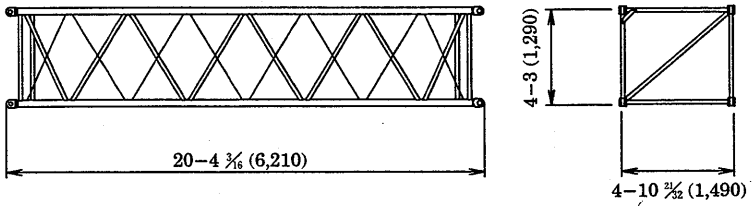
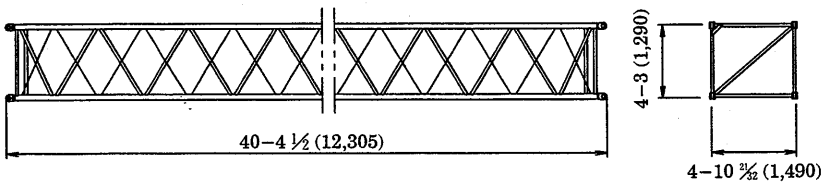
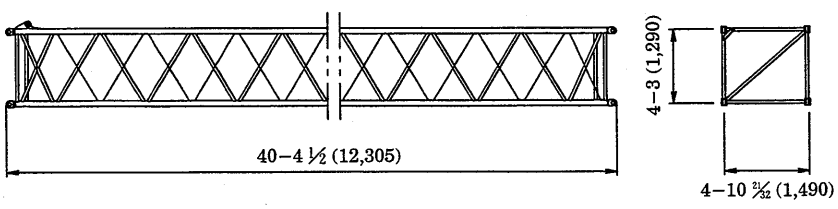
9.2.1 BASE MACHINE

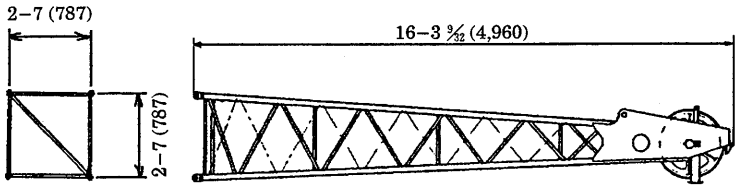
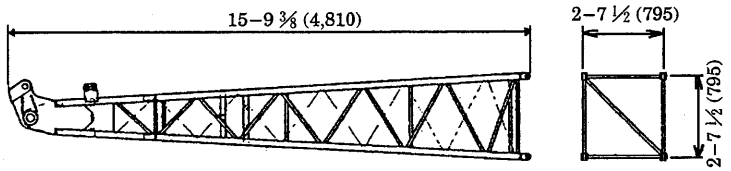
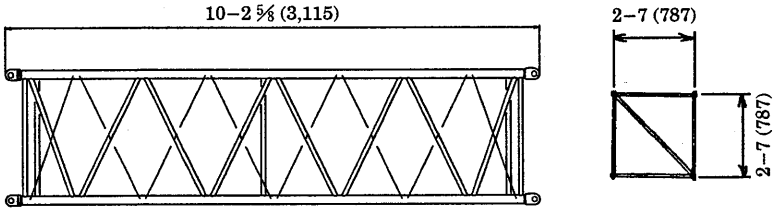
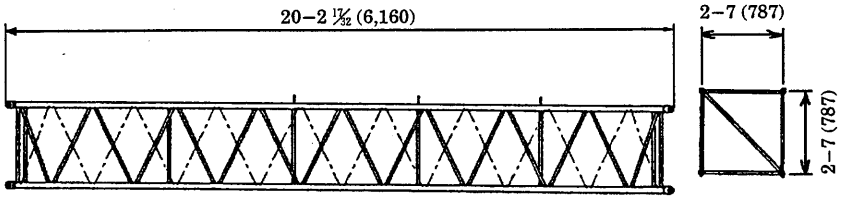
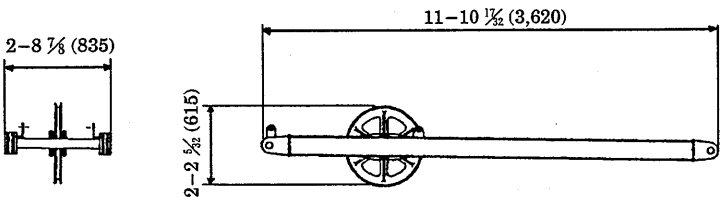
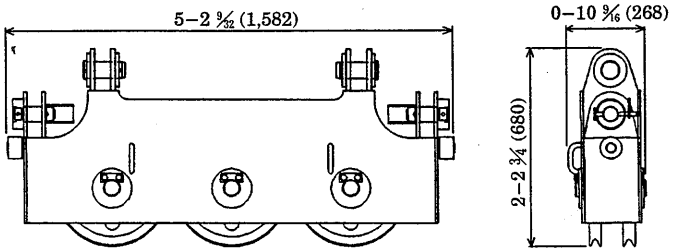
Name	Dimension ft-in (mm)	Weight lbs (kg)
Base Machine With · Base Boom · Gantry · Crawlers · Wire ropes (Boom, Main)		99,770 (45,254)
Base Machine With · Gantry · Crawlers · Wire ropes (Boom, Main)		96,770 (43,893)
Base Machine With · Crawlers · Wire ropes (Boom, Main)		94,010 (42,642)
Base Machine With · Gantry · Wire ropes (Boom, Main)		63,740 (28,913)
Crawler		16,538 (7,500) / 1 piece

9.2.2 COUNTERWEIGHT

Name	Dimension ft−in (mm)	Weight lbs (kg)
No. 1 Upper weight		27,340 (12,400)
No. 2 Upper weight		8,160 (3,700)
No. 3 Upper weight		27,560 (12,500)
Carbody Upper weight (To GD02−01091)		4,410 (2,000) ／ 1 piece
Carbody Upper weight (From GD02−01092)		7,365 (3,340)／ 1 piece

9.2.3 ATTACHMENT

Name	Dimension ft−in (mm)	Weight lbs (kg)
Boom tip		2,580 (1,170)
Boom base		2,514 (1,140)
10' (3.0m) Insert Boom		684 (310)
20' (6.1m) Insert Boom		1,147 (520)
40' (12.2m) Insert Boom		2,117 (960)
40' (12.2m) Insert Boom With lug		2,150 (975)

Name	Dimension ft−in (mm)	Weight lbs (kg)
Jib tip		617 (280)
Jib base		441 (200)
10' (3.0m) Insert jib		221 (100)
20' (6.1m) Insert jib		397 (180)
Jib strut		551 (250)
Upper spreader		600 (272)

9.3 STABILITY IN SWINGING AND TRAVELING

(1) Without carbody weight

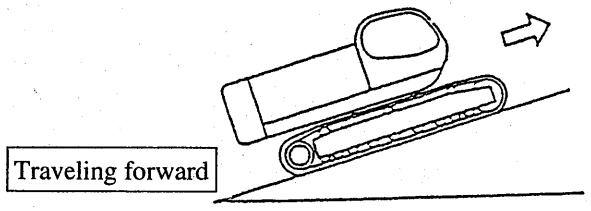
Attachment	Counterweight lbs(kg)	All-round swing		Propelling on slope	
		Crawler Extend	Crawler Retract	Forward	Backward
Without attachment (Base machine only)	0	○	○	○	○
	27,342 (12400) No. 1 Only	○	×	×	○
	35,500 (16100) No. 1+No.2	○	×	×	○
	63,063 (28600) No. 1+No.2+No.3	×	×	×	○
With lower boom (Boom angle: 10° or less)	0	○	○	○	○
	27,342 (12400) No. 1 Only	○	○	○	○
	35,500 (16100) No. 1+No.2	○	×	×	○
	63,063 (28600) No. 1+No.2+No.3	×	×	×	○
With base boom (Boom angle: 30° or less)	0	○	○	○	○
	27,342 (12400) No. 1 Only	○	○	○	○
	35,500 (16100) No. 1+No.2	○	○	○	○
	63,063 (28600) No. 1+No.2+No.3	○	×	×	○

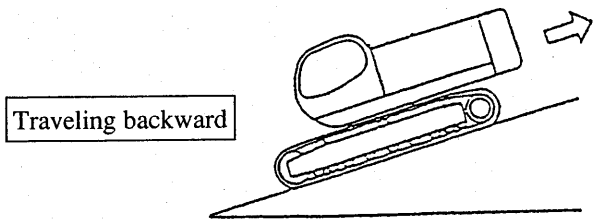
(2) With carbody weight

Attachment	Counterweight lbs(kg)	All-round swing		Propelling on slope	
		Crawler Extend	Crawler Retract	Forward	Backward
Without attachment (Base machine only)	0	○	○	○	○
	27,342 (12400) No. 1 Only	○	×	×	○
	35,500 (16100) No. 1+No.2	○	×	×	○
	63,063 (28600) No. 1+No.2+No.3	×	×	×	○
With lower boom (Boom angle: 10° or less)	0	○	○	○	○
	27,342 (12400) No. 1 Only	○	○	○	○
	35,500 (16100) No. 1+No.2	○	×	×	○
	63,063 (28600) No. 1+No.2+No.3	×	×	×	○
With base boom (Boom angle: 30° or less)	0	○	○	○	○
	27,342 (12400) No. 1 Only	○	○	○	○
	35,500 (16100) No. 1+No.2	○	○	○	○
	63,063 (28600) No. 1+No.2+No.3	○	×	×	○

○ : Operation is available.
× : Operation is unavailable.

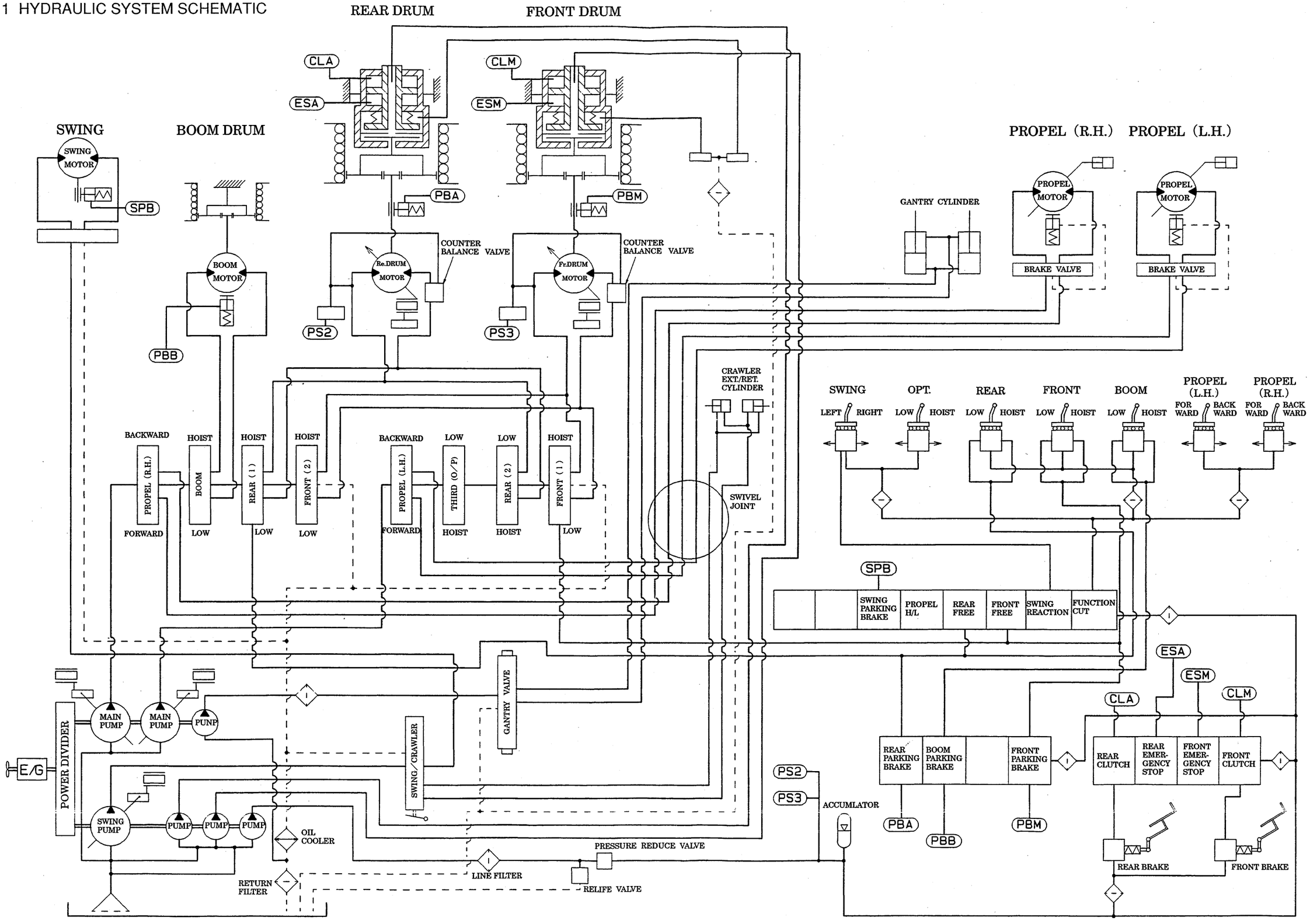
1. The table above shows the values for operation on a firm ground. On a weak ground, operate with care after curing the ground.
2. As a principle, swinging on a trailer is prohibited.
3. Maximum slope angle is 21.8° (40%).
4. Travelling forward means the case, where the counterweight is at the lower slope and the traveling backward, where it is at the upper slope.





9.4 SYSTEM SCHEMATIC

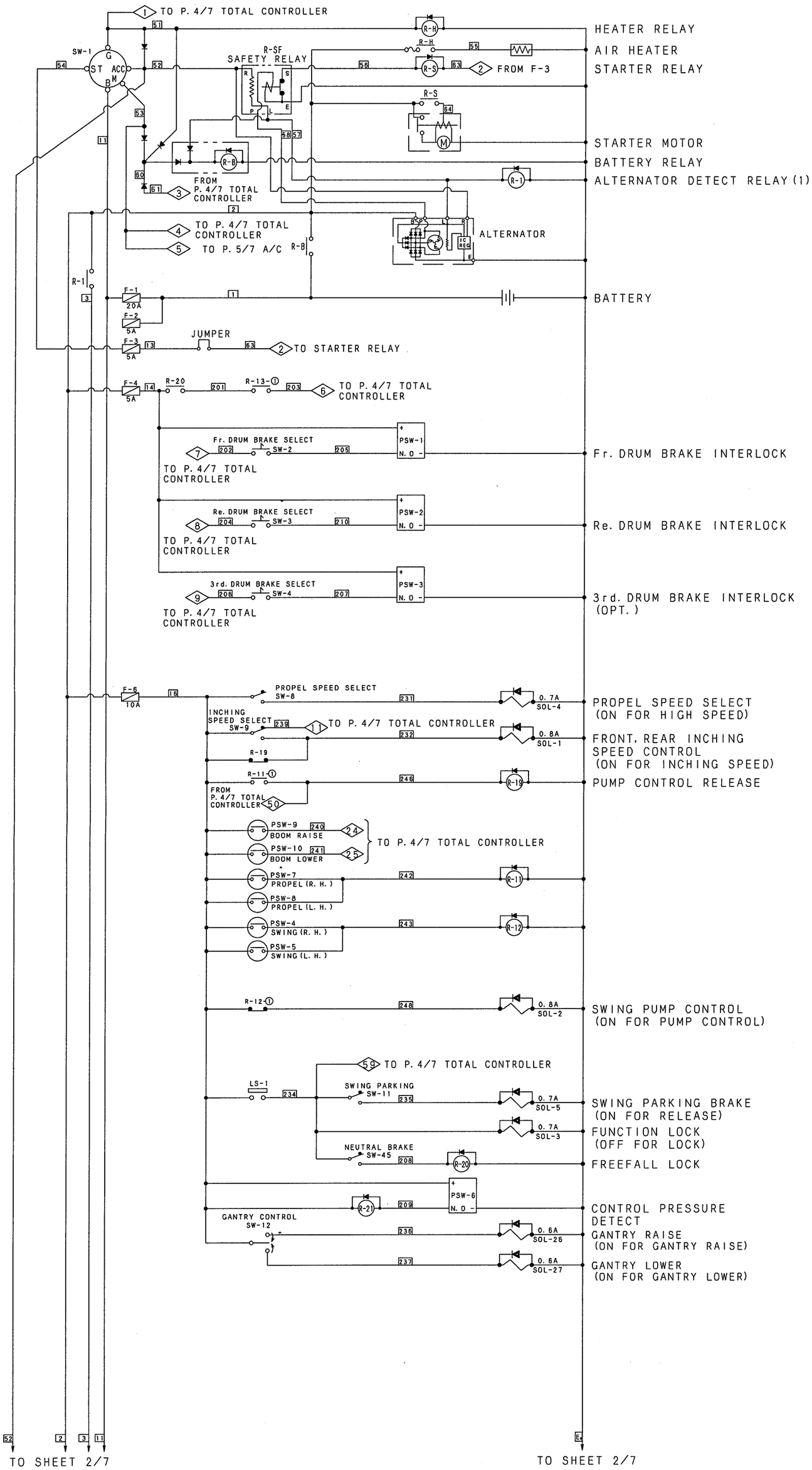
9.4.1 HYDRAULIC SYSTEM SCHEMATIC

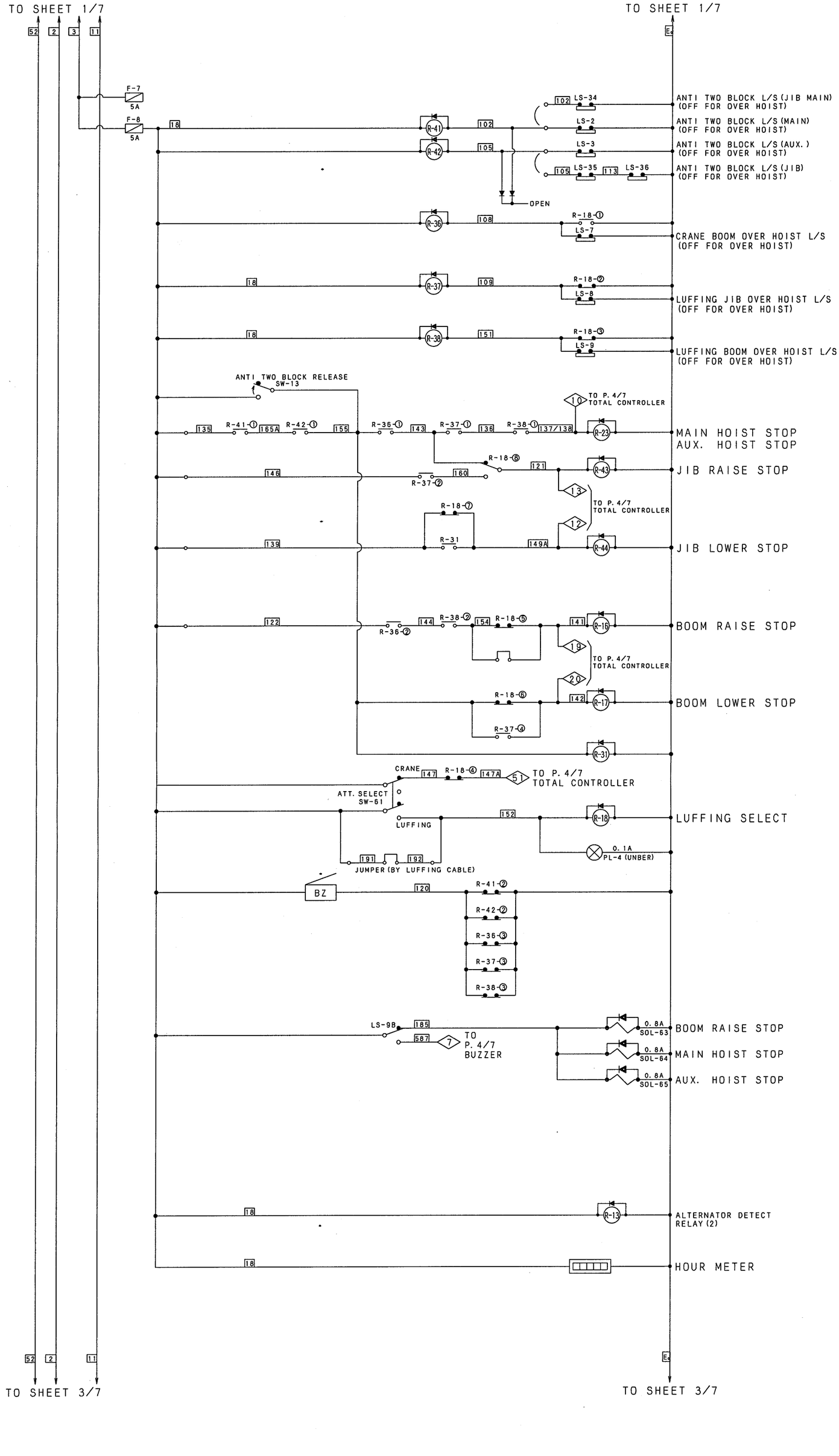


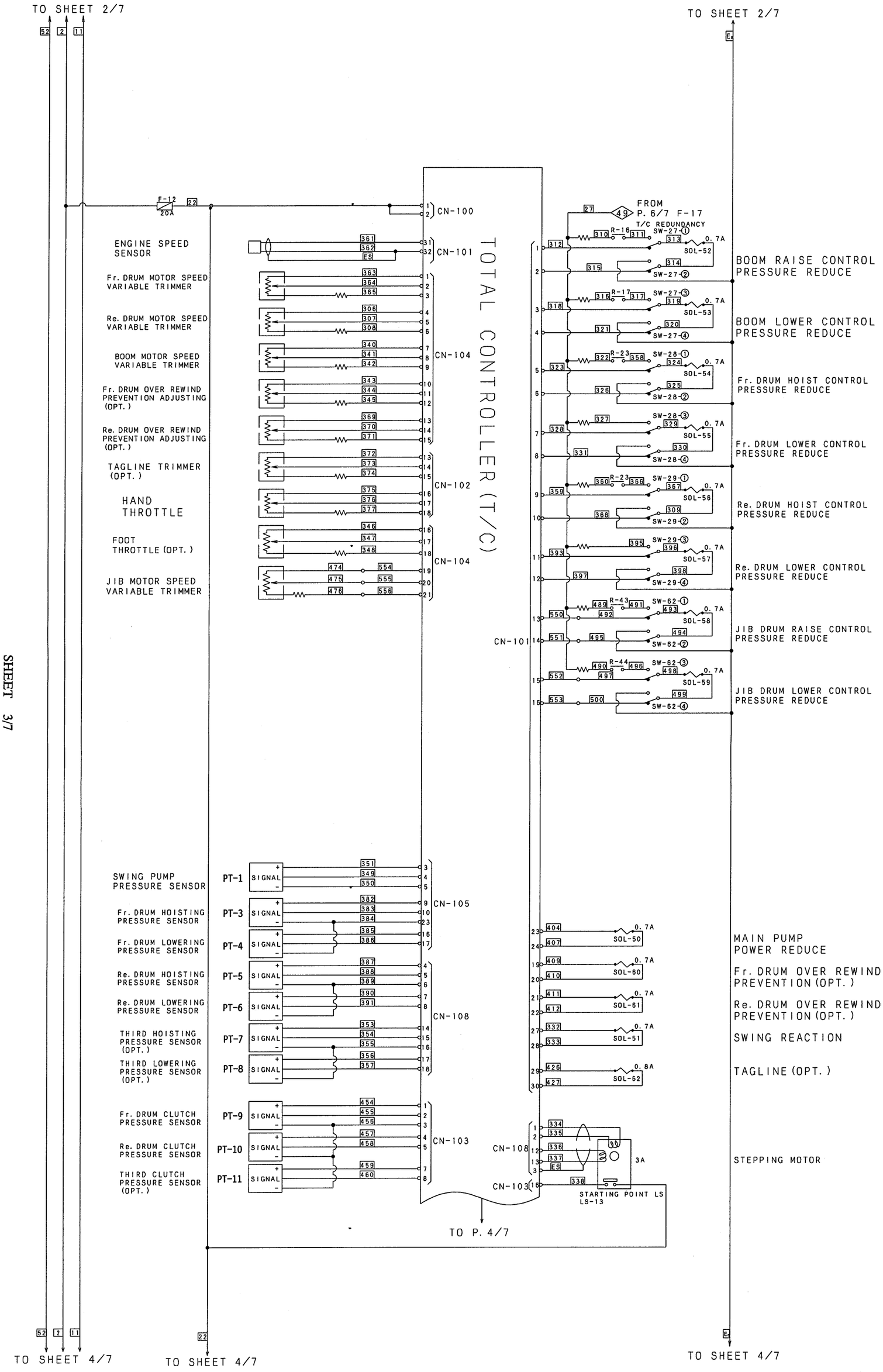
KEY SWITCH

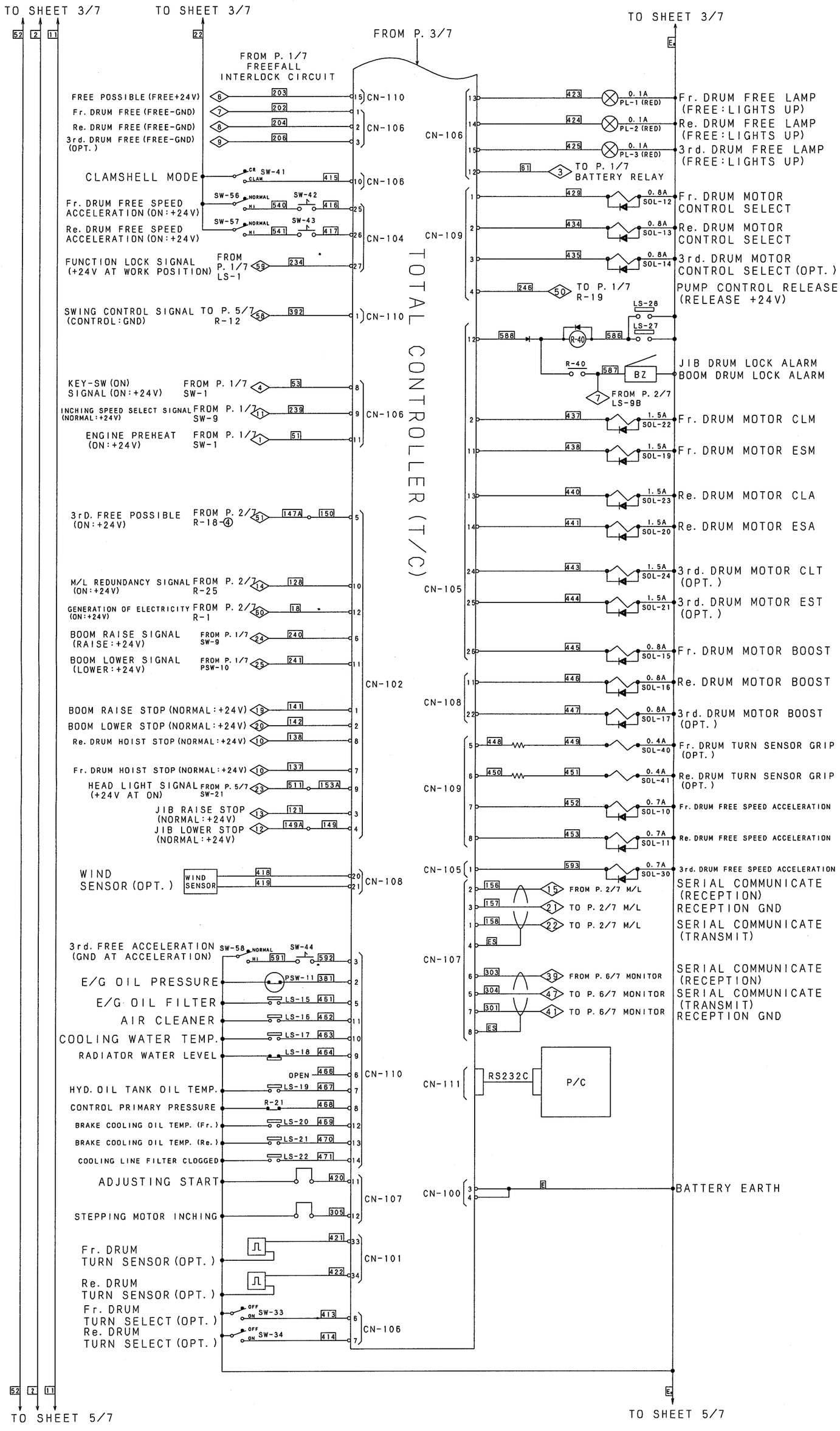
	B	G	ACC	M	ST
HEAT	○	○			
OFF	○				
ACC	○		○		
ON	○		○	○	
START	○	○		○	○

NOTE:
1. This drawing is luffing of CK1000.

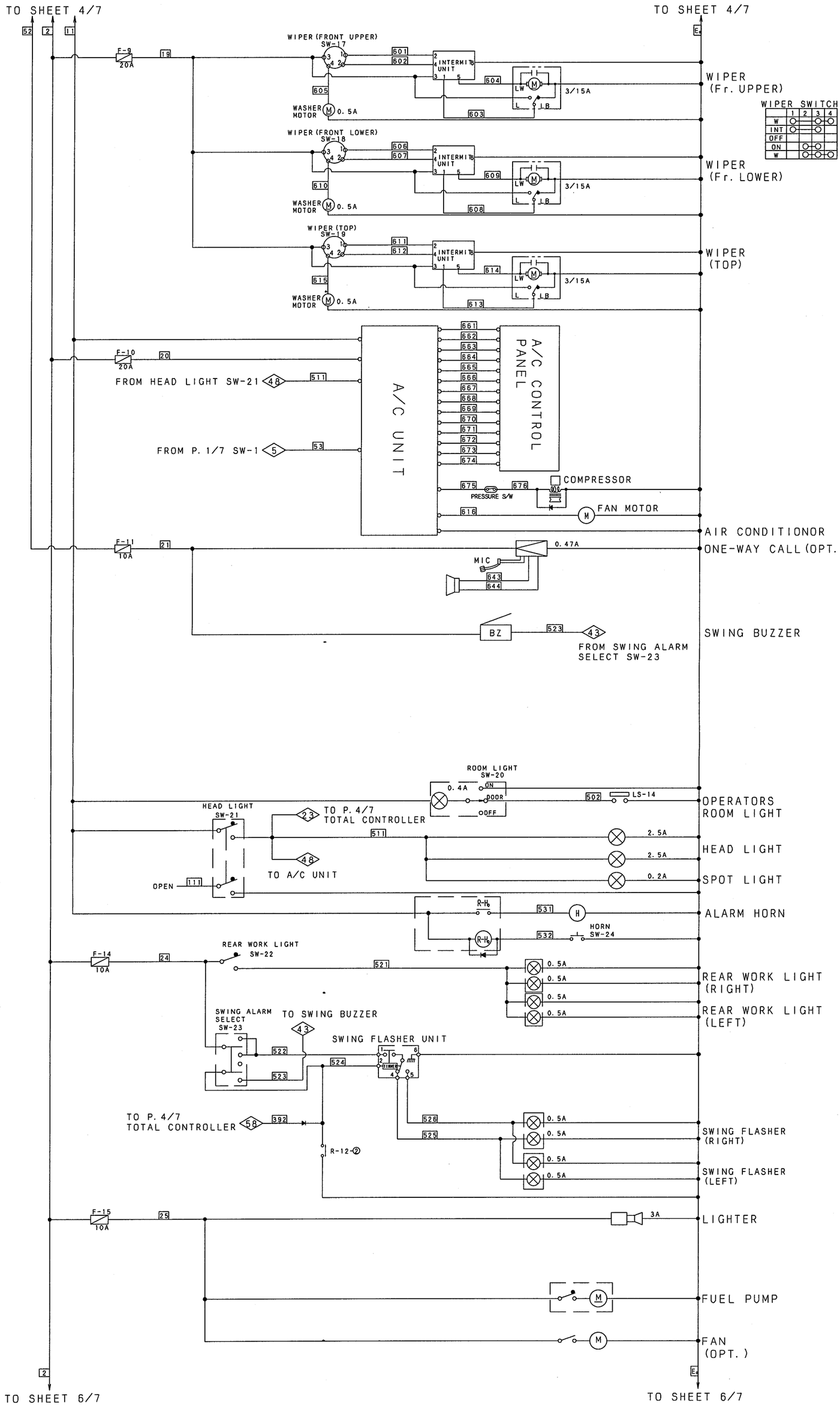


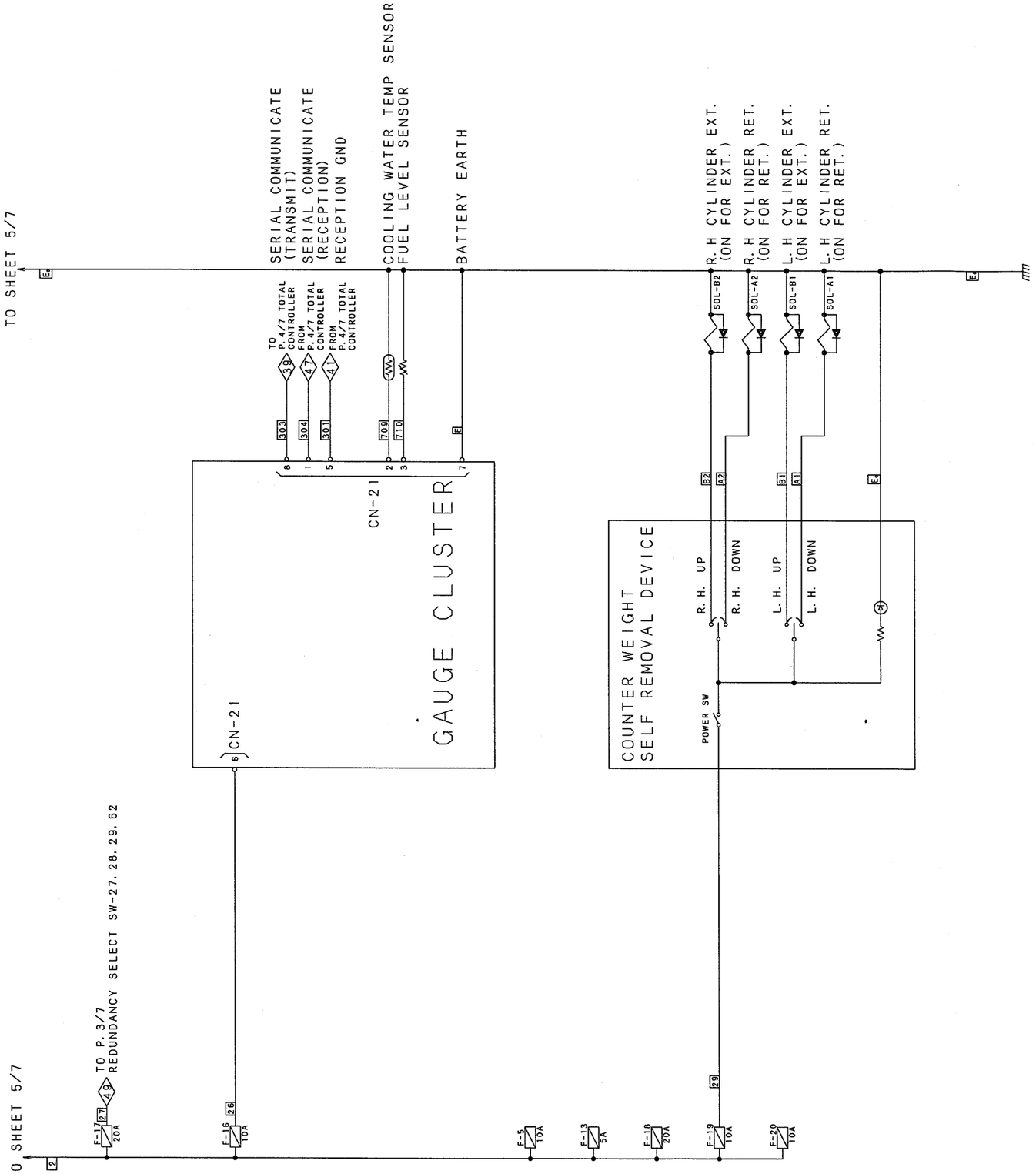






SHEET 4/7





SWITCH			
SW-No.	LINE NO.	USE	PART No.
SW- 1	11 — 51, 52, 53, 54	ENG. KEY SWITCH	EZ50S00016P1
SW- 2	202 — 205	Fr. DRUM BRAKE SELECT	GG50E00004F1
SW- 3	204 — 210	Re. DRUM BRAKE SELECT	GG50E00004F1
SW- 4	206 — 207	3rd. DRUM BRAKE SELECT	GG50E00004F1
SW- 8	16 — 231	PROPEL SPEED SELECT	2479Z2872
SW- 9	16 — 239, 232	INCHING SPEED SELECT	(GG50M01032F1)
SW-11	234 — 235	SWING PARKING	(GB20E00001F2)
SW-12	16 — 236, 237	GANTRY CONTROL	2479Z293
SW-13	18 — 155	ANTI TWO BLOCK RELEASE	GB50S00040P1
SW-17	19 — 601, 602, 605	WIPER (Fr. UPPER)	EZ50S00015P1
SW-18	19 — 606, 607, 610	WIPER (Fr. LOWER)	EZ50S00015P1
SW-19	19 — 611, 612, 615	WIPER (TOP)	EZ50S00015P1
SW-20	11 — E6, 502	OPERATORS ROOM LIGHT	2456R315
SW-21	11 — 511; 111 — E6	HEAD LIGHT	GB50S00007D1
SW-22	24 — 521	REAR WORK LIGHT	GB50S00007D1
SW-23	24 — 522, 523 — 524	SWING ALARM SELECT	GB50S00008D1
SW-24	532 — E6	HORN	(GB20E00001F2)
SW-27	311, 312, E6, 315, 317, 318, E6, 321 — 313, 314, 319, 320	BOOM DRUM REDUNDANCY	2479Z349
SW-28	358, 323, E6, 326, 327, 328, E6, 331 — 324, 325, 329, 330	Fr. DRUM REDUNDANCY	2479Z349
SW-29	366, 359, E6, 368, 395, 393, E6, 397 — 367, 309, 396, 398	Re. DRUM REDUNDANCY	2479Z349

SWITCH			
SW-No.	LINE NO.	USE	PART No.
SW-33	E6 — 413	Fr. DRUM TURN SELECT	2479Z1813
SW-34	E6 — 414	Re. DRUM TURN SELECT	2479Z1813
SW-37	18 — 124, 159	M/L REDUNDANCY	79Z1657
SW-41	22 — 415	CLAMSHELL MODE	2479Z2872
SW-42	540 — 416	Fr. DRUM FREE ACCELERATION	(GG50M01030F1)
SW-43	541 — 417	Re. DRUM FREE ACCELERATION	(GG50M01030F1)
SW-44	591 — 592	3rd. DRUM FREE ACCELERATION	(GG50M01030F1)
SW-45	234 — 208	FREE LOCK	GG50S00005P1
SW-56	22 — 540	Fr. DRUM FREE SPEED ACCELERATION	2479Z2872
SW-57	22 — 541	Re. DRUM FREE SPEED ACCELERATION	2479Z2872
SW-58	E6 — 591	3rd. DRUM FREE SPEED ACCELERATION	2479Z2872
SW-58	18 — 135; 18 — 152	ATT. SELECT	GB50S00020D4
SW-62	491, 492, E6, 495, 496, 497, E6, 500 — 493, 494, 498, 499	JIB DRUM REDUNDANCY	2479Z349

LIMIT SWITCH				
LS-No.	TYPE	LINE NO.	USE	PART No.
LS- 1	N. O.	16 — 234	FUNCTION LOCK	GB50S00036F1
LS- 2	N. C.	102 — E6	ANTI TWO BLOCK (MAIN HOIST)	24100N6192F3
LS- 3	N. C.	105 — E6	ANTI TWO BLOCK (AUX. HOIST)	24100N6192F3
LS- 7	N. C.	108 — E6	CRANE BOOM OVER HOIST	GG50S00004P1
LS- 8	N. C.	109 — E6	JIB OVER HOIST (LUFFING JIB)	JJ50S00001D1
LS- 9	N. C.	151 — E6	BOOM OVER HOIST (LUFFING BOOM)	GG50S00004P1
LS- 9B	N. C.	18 — 185	BOOM OVER HOIST (LUFFING BOOM)	GG50S00004P1
	N. O.	18 — 587		
LS-13	N. O.	22 — 338	STEPPING MOTOR (STARTING POINT)	(2406U197F4)
LS-14	N. O.	502 — E6	OPERATORS ROOM LIGHT	2479R638
LS-15	N. O.	461 — E6	E/G OIL FILTER	-
LS-16	N. O.	462 — E6	AIR CLEANER	2450R163S1
LS-17	N. O.	463 — E6	WATER TEMP.	-
LS-18	N. C.	464 — E6	WATER LEVEL	(2427U1416F1)
LS-19	N. O.	467 — E6	HYD. OIL TEMP.	2479U285
LS-20	N. O.	469 — E6	BRAKE COOLING OIL TEMP. (Fr.)	GG50S00002D1
LS-21	N. O.	470 — E6	BRAKE COOLING OIL TEMP. (Re.)	GG50S00002D1
LS-22	N. O.	471 — E6	COOLING LINE FILTER CLOGGED	(GG50V00001F1)
LS-27	N. O.	586 — E6	BOOM DRUM LOCK	GB52S00002P1
LS-28	N. O.	586 — E6	JIB DRUM LOCK	GB52S00002P1
LS-34	N. C.	102 — E6	ANTI TWO BLOCK (JIB MAIN)	24100N6192F3
LS-35	N. C.	105 — 113	ANTI TWO BLOCK (JIB)	24100N6192F3
LS-36	N. C.	113 — E6	ANTI TWO BLOCK (JIB AUX.)	24100N6192F3

SHEET 6/7

RELAY

R-No.	COIL LINE NO.	TERMINAL LINE NO.	TYPE	USE	PART No.
R- B	57, 60 — Eo	1 — 2	N. O.	ELECTRIC POWER SOURCE	EZ24S00027F1
R- H	51 — Eo	2 — 55	N. O.	AIR HEATER	GG24S00003P1
R- Ho	11 — 532	11 — 531	N. O.	HORN	4079Z22
R- S	56 — 63	2 — 64	N. O.	STARTER	-
R-SF	58 — Eo	56 — Eo	N. C.	SAFETY	GG24S00004P1
R- 1	57 — Eo	2 — 3	N. O.	GENERATION OF ELECTRICITY SENSOR	EZ24S00010P1
R-11	242 — Eo	16 — 246	N. O.	PUMP CONTROL	GG24E00023F1
		647 — Eo	N. O.	-	
R-12	243 — Eo	16 — 248	N. C.	PUMP CONTROL	
		524 — Eo	N. O.	SWING ALARM	
R-13	18 — Eo	201 — 203	N. O.	GENERATION OF ELECTRICITY SENSOR	
R-16	141 — Eo	310 — 311	N. O.	BOOM RAISE STOP	
R-17	142 — Eo	316 — 317	N. O.	BOOM LOWER STOP	
R-18	152 — Eo	108 — Eo	N. O.	LUFFING SELECT	
		109 — Eo	N. C.	LUFFING SELECT	
		151 — Eo	N. C.	LUFFING SELECT	
		147 — 148	N. C.	LUFFING SELECT	
		154 — 141	N. C.	LUFFING SELECT	
		155 — 142	N. C.	LUFFING SELECT	
		139 — 149A	N. C.	LUFFING SELECT	
		136 — 121	N. C.	LUFFING SELECT	
		160	N. O.	LUFFING SELECT	
R-19	246 — Eo	16 — 232	N. C.	PUMP CONTROL	
R-20	208 — Eo	14 — 201	N. O.	FREE LOCK	
R-21	16 — 209	468 — Eo	N. C.	CONTROL PRESSURE DETECT	
R-23	137 — Eo	322 — 358	N. O.	HOIST STOP (MAIN/AUX.)	
R-25	118 — Eo	124 — 128	N. C.	M/L REDUNDANCY	
		159 — 586	N. C.	M/L REDUNDANCY	
R-31	155 — Eo	139 — 149A	N. O.	ANTI TWO BLOCK	
R-36	18 — 108	155 — 143	N. O.	BOOM OVER HOIST	
		122 — 144	N. O.	BOOM OVER HOIST	
		120 — Eo	N. C.	BOOM OVER HOIST	
R-37	18 — 109	143 — 136	N. O.	LUFFING JIB OVER HOIST	
		146 — 160	N. O.	LUFFING JIB OVER HOIST	
		120 — Eo	N. C.	LUFFING JIB OVER HOIST	
		155 — 142	N. O.	LUFFING JIB OVER HOIST	
R-38	18 — 151	136 — 137	N. O.	LUFFING BOOM OVER HOIST	
		144 — 154	N. O.	LUFFING BOOM OVER HOIST	
		120 — Eo	N. O.	LUFFING BOOM OVER HOIST	
R-40	588 — 586	588 — 587	N. O.	BOOM DRUM LOCK ALARM	
R-41	18 — 102	135 — 165A	N. O.	ANTI TWO BLOCK (MAIN)	
		120 — Eo	N. C.	ANTI TWO BLOCK (MAIN)	
R-42	18 — 105	165A — 155	N. O.	ANTI TWO BLOCK (AUX.)	
		120 — Eo	N. C.	ANTI TWO BLOCK (AUX.)	
R-43	121 — Eo	588 — 587	N. O.	JIB RAISE STOP	
R-44	141A — Eo	588 — 587	N. O.	JIB LOWER STOP	

SOLENOID VALVE

SOL-No.	LINE NO.	USE	PART No.
SOL- 1	232 — Eo	INCHING SPEED CONTROL	GB35V00002F2
SOL- 2	248 — Eo	SWING CONTROL	GB35V00002F2
SOL- 3	234 — Eo	FUNCTION LOCK	GB35V00002F1
SOL- 4	231 — Eo	PROPEL SPEED	GB35V00002F1
SOL- 5	235 — Eo	SWING PARKING	GB35V00002F1
SOL-10	452 — Eo	Fr. DRUM FREE ACCELERATION	GB35V00002F1
SOL-11	453 — Eo	Re. DRUM FREE ACCELERATION	GB35V00002F1
SOL-12	429 — Eo	Fr. DRUM MOTOR CONTROL SELECT	GB35V00002F2
SOL-13	434 — Eo	Re. DRUM MOTOR CONTROL SELECT	GB35V00002F2
SOL-14	435 — Eo	3rd. DRUM MOTOR CONTROL SELECT	GB35V00002F2
SOL-15	445 — Eo	Fr. DRUM MOTOR BOOST	GB35V00002F2
SOL-16	446 — Eo	Re. DRUM MOTOR BOOST	GB35V00002F2
SOL-17	447 — Eo	3rd. DRUM MOTOR BOOST	GB35V00002F2
SOL-18	148 — Eo	HOIST STOP (3rd)	GB35V00002F2
SOL-19	438 — Eo	Fr. DRUM MOTOR ESM	GG35V00001F1
SOL-20	441 — Eo	Re. DRUM MOTOR ESA	GG35V00001F1
SOL-21	444 — Eo	3rd. DRUM MOTOR EST	GG35V00001F1
SOL-22	437 — Eo	Fr. DRUM MOTOR CLM	GG35V00001F1
SOL-23	440 — Eo	Re. DRUM MOTOR CLA	GG35V00001F1
SOL-24	443 — Eo	3rd. DRUM MOTOR CLT	GG35V00001F1
SOL-26	236 — Eo	GANTRY RAISE	(GG30V00007F1)
SOL-27	237 — Eo	GANTRY LOWER	(GG30V00007F1)
SOL-30	593 — Eo	3rd. DRUM FREE ACCELERATION	GB35V00002F2
SOL-40	449 — Eo	Fr. DRUM TURN DETECT GRIP	GB50M01093F1
SOL-41	451 — Eo	Re. DRUM TURN DETECT GRIP	GB50M01093F1
SOL-50	404 — 407	MAIN PUMP POWER REDUCE	GB34V00002F2
SOL-51	332 — 333	SWING REACTION	GB34V00001F1
SOL-52	313 — 314	BOOM RAISE PRESSURE REDUCE	GB34V00001F3
SOL-53	319 — 320	BOOM LOWER PRESSURE REDUCE	GB34V00001F3
SOL-54	324 — 325	Fr. DRUM HOIST PRESSURE REDUCE	GB34V00001F4
SOL-55	329 — 330	Fr. DRUM LOWER PRESSURE REDUCE	GB34V00001F4
SOL-56	367 — 309	Re. DRUM HOIST PRESSURE REDUCE	GB34V00001F3
SOL-57	396 — 398	Re. DRUM LOWER PRESSURE REDUCE	GB34V00001F3
SOL-58	493 — 494	JIB RAISE PRESSURE REDUCE	GB34V00001F3
SOL-59	498 — 499	JIB LOWER PRESSURE REDUCE	GB34V00001F3
SOL-60	409 — 410	Fr. DRUM OVER REWIND REWIND PREVENTION	(24100U1708F1)
SOL-61	411 — 412	Re. DRUM OVER REWIND REWIND PREVENTION	(24100U1708F1)
SOL-62	426 — 427	TAGLINE	(GB22V00007F1)
SOL-63	185 — Eo	BOOM HOIST STOP	GB35V00002F2
SOL-64	185 — Eo	MAIN HOIST STOP	GB35V00002F2
SOL-65	185 — Eo	AUX. HOIST STOP	GB35V00002F2

PILOT LAMP

PL-No.	LINE NO.	USE	PART No.
PL- 1	423 — Eo	Fr. DRUM FREEFALL	GG80S00003F1
PL- 2	424 — Eo	Re. DRUM FREEFALL	GG80S00003F1
PL- 3	425 — Eo	3rd. DRUM FREEFALL	GG80S00004F1
PL- 4	152 — Eo	LUFFING MODE	GB80S00007F2

FUSE

F-NO.	RATED	LINE NO.	USE	PART No.
F- 1	20A	1 — 11	ELECTRIC POWER SOURCE	24100R215S2
F- 2	5A	1 —	SPEAR	24100R215S4
F- 3	5A	54 — 13	E/G START	24100R215S4
F- 4	5A	2 — 14	NEUTRAL FREE	24100R215S4
F- 5	10A	2 —	SPEAR	24100R215S3
F- 6	10A	2 — 16	EACH SOLENOID	24100R215S3
F- 7	5A	3 —	SPEAR	24100R215S4
F- 8	5A	3 — 18	M/L ELECTRIC POWER SOURCE	24100R215S4
F- 9	20A	2 — 19	WIPER	24100R215S2
F-10	20A	2 — 20	AIR CONDITIONER	24100R215S2
F-11	10A	52 — 21	RADIO (OPT.)	24100R215S3
F-12	20A	2 — 22	TOTAL CONTROLLER	24100R215S2
F-13	5A	2 —	SPEAR	24100R215S4
F-14	10A	2 — 24	SWING FLASHER	24100R215S3
F-15	10A	2 — 25	FUEL PUMP LIGHTER	24100R215S3
F-16	10A	2 — 26	GAGE CLUSTER	24100R215S3
F-17	20A	2 — 27	REDUNDANCY CIRCUIT	24100R215S2
F-18	20A	2 —	SPEAR	24100R215S2
F-19	10A	2 — 29	C/W SELF RE. MOVAL DEVICE	24100R215S3
F-20	10A	2 —	SPEAR	24100R215S3

PRESSURE SENSOR

PT-No.	LINE No.	USE	SHEET No.	PART No.
PT- 1	351, 349 — 350	SWING PUMP PRESSURE SENSOR	3	LC52S00002P1
PT- 3	382, 383 — 384	Fr.DRUM HOISTING PRESSURE SENSOR	3	LC52S00001P2
PT- 4	385, 386 — 384	Fr.DRUM LOWERING PRESSURE SENSOR	3	LC52S00001P2
PT- 5	387, 388 — 389	Re.DRUM HOISTING PRESSURE SENSOR	3	LC52S00001P2
PT- 6	390, 391 — 389	Re.DRUM LOWERING PRESSURE SENSOR	3	LC52S00001P2
PT- 7	353, 354 — 355	3rd.DRUM HOISTING PRESSURE SENSOR	3	LC52S00001P2
PT- 8	356, 357 — 355	3rd.DRUM LOWERING PRESSURE SENSOR	3	LC52S00001P2
PT- 9	454, 455 — 456	Fr.DRUM CLUTCH PRESSURE SENSOR	3	GG52S00004P1
PT-10	457, 458 — 456	Re.DRUM CLUTCH PRESSURE SENSOR	3	GG52S00004P1
PT-11	459, 460 — 472	3rd.DRUM CLUTCH PRESSURE SENSOR	3	GG52S00004P1

PRESSURE SWITCH

PSW-No.	RATED	LINE No.	USE	SHEET No.	PART No.
PSW- 1	N. O.	14, 205 — Eo	Fr.DRUM FOOT BRAKE PRESSURE SW.	1	GG50S00006P1
PSW- 2	N. O.	14, 210 — Eo	Re.DRUM FOOT BRAKE PRESSURE SW.	1	GG50S00006P1
PSW- 3	N. O.	14, 207 — Eo	3rd.DRUM FOOT BRAKE PRESSURE SW.	1	GG50S00006P1
PSW- 4	N. O.	16 — 243	SWING CONTROL DETECT SW. (R.H.)	1	GG50S00003P1
PSW- 5	N. O.	16 — 243	SWING CONTROL DETECT SW. (L.H.)	1	GG50S00003P1
PSW- 6	N. O.	16, 209 — Eo	CONTROL PRIMARY PRESSURE DETECT SW.	1	GB50S00048P1
PSW- 7	N. O.	16 — 242	PROPEL CONTROL DETECT SW. (R.H.)	1	GG50S00003P1
PSW- 8	N. O.	16 — 242	PROPEL CONTROL DETECT SW. (L.H.)	1	GG50S00003P1
PSW- 9	N. O.	16 — 240	BOOM RAISE CONTROL DETECT SW.	1	GG50S00003P1
PSW-10	N. O.	16 — 241	BOOM LOWER CONTROL DETECT SW.	1	GG50S00003P1
PSW-11	N. C.	381 — Eo	ENGINE OIL PRESSURE SW.	4	-

10. OPERATION OF COUNTERWEIGHT SELF REMOVAL DEVICE (OPTIONAL)

The counterweight self removal device is the auxiliary device for assembly and disassembly used when removing or installing the counterweights. It comprises the components shown below.

- Counterweight lift cylinders installed in gantry.
- Backstop spacers and fixing pins.
- Links connecting lift cylinders and counterweights.

Prior to work, check the items shown below.

1. LOCATION

(1) The space is enough to install the counterweights, and the ground is firm and level.
(2) The route for entry of vehicles which carry members required for assembly is secured.

2. CHECK OF WORK PROCEDURES AND SAFETY

Prior to assembly, persons related to the work are required to have a meeting to check the work procedures, safety, and their roles and charge of the work.

3. START-UP CHECK

Perform start-up check of the machine.

⚠ DANGER

- To prevent accidents of being caught in the counterweight and hit by the dropping counterweight, clear away from around the counterweight temporarily stood on the ground unless otherwise removing the fixing pin. Also, clear away from the area above or under the lifted counterweight and the area between the counterweight and the machine.
- Use a safety belt to prevent falling during working at high places.

Failure to observe these precautions may result in serious injury or loss of life.

⚠ WARNING

To prevent any injury, DO NOT put your fingers or hands into pin holes when inserting or removing pins.

10.1 PREPARATIONS FOR OPERATION

10.1.1 INSTALLATION OF MACHINE

(1) Unload the basic machine from the trailer, with boom base attached.

(2) Unload the boom tip section from the truck.

(3) Attached the boom tip section and guy line as in (Fig. 10-1).

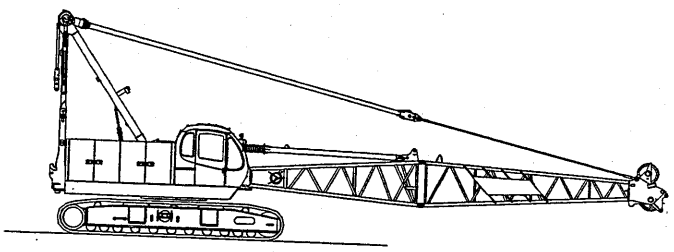


Fig 10−1

10.1.2 SETTING OF MACHINE

(1) Place the crane on a firm and level ground.

(2) Place the counterweights (No.1, No.2 and No.3) on a firm and level ground as in (Fig.10-2).

⚠ DANGER

Lay the No. 2 counterweight down on the ground to avoid an accident due to fall down. Failure to observe this precaution may result in serious injury or loss of life.

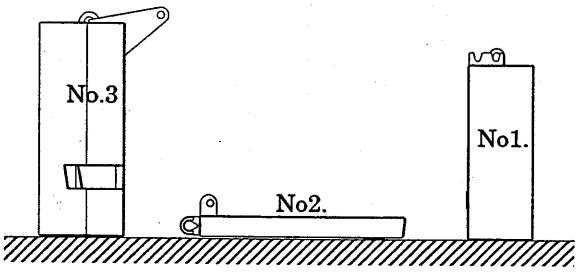


Fig 10−2

(3) Turn the upper structure so that the upper structure is parallel to the crawlers, and secure clearances of 20 ft (6 m) from each of the front and back of the crawler frame (Fig. 10-3).

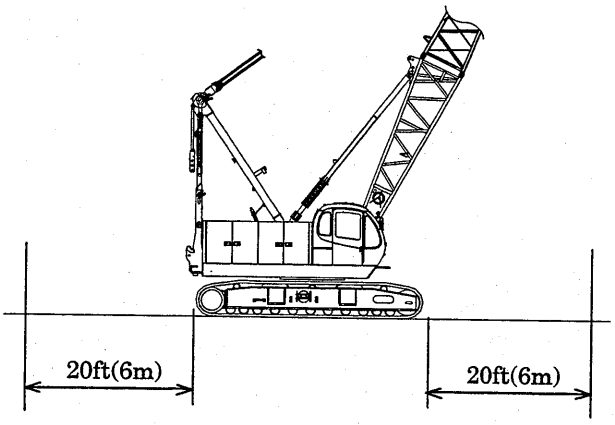


Fig 10−3

10.1.3 INSTALLATION OF BACKSTOP SPACER

(1) Adjust the boom angle to approx. 65° , and fit the backstop spacers ⑭.
Backstop spacers are stored in bracket Ⓑ with the bolts, nuts and washers.

10.1.4 REMOVAL OF GANTRY TENSION MEMBER PIN

(1) With the posture shown in (Fig. 10-4), operate the gantry raising cylinder with a switch in the operator's cab (refer to the crane operator's manual) , and remove the tension member pin Ⓐ.

⚠ DANGER

To prevent accidents by sudden dropping of the gantry, clear away from the area under the gantry. Failure to observe this precaution may result in serious injury or loss of life.

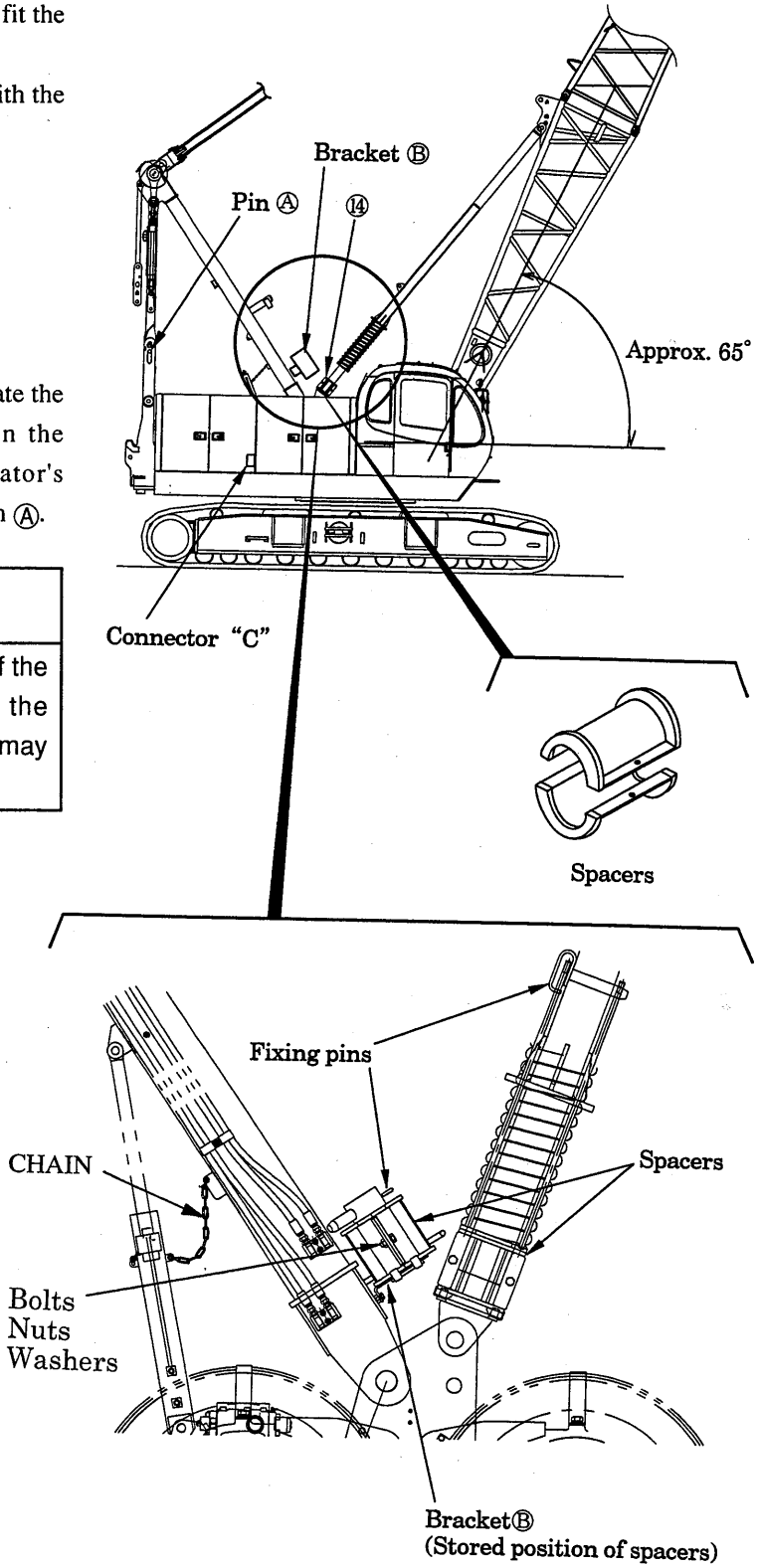


Fig 10−4

10.1.5 INSERTION OF BACKSTOP FIXING PIN

(1) Further raise the boom from the boom height shown in (Fig. 10-4), and insert the backstop fixing pin ⑮ to connect the inner and outer (Fig.10-5).
The pins are stored in bracket Ⓑ. (See Fig. 10-4)
(The pin can be inserted when the boom angle is approx. 80° .)
Check the flag between the pins are visible. (Fig. 10-6)

⚠ DANGER

Insert the backstop fixing pin when the pin hole on the inner side can be seen (Fig. 10-6). To raise the boom until the pin hole has passed or after the pin is inserted will cause the damage of the boom or backstop. Failure to observe this precaution may result in serious injury or loss of life.

⚠ WARNING

Do not insert fingers to the holes in backstop to prevent bodily injury.

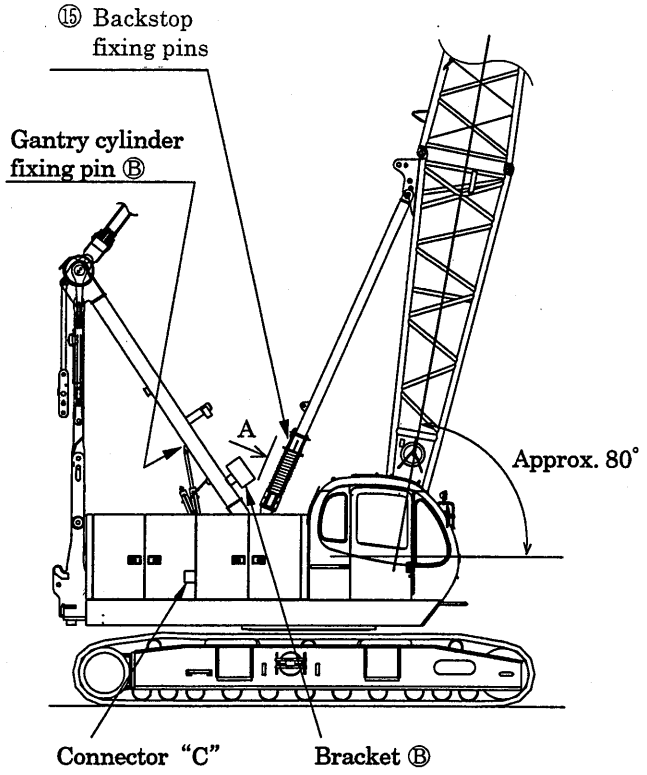


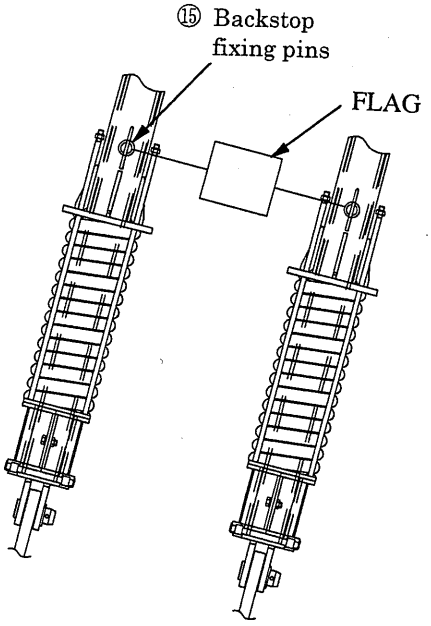
Fig 10−5

10.1.6 REMOVAL OF GANTRY CYLINDER FROM GANTRY

(1) With the posture shown in (Fig. 10-5), remove the gantry cylinder pin Ⓑ (before removing the cylinder pin Ⓑ, check that the cylinder is connected to the gantry compression member with a chain.). (See Fig. 10-4)

⚠ WARNING

Be extremely careful not to pinch your hands and fingers in the cylinder.



VIEW A

Fig 10−6

10.1.7 CONNECTION OF CONTROL BOX AND CONTROL LINE

(1) If the hydraulic tagline (optional) is equipped, replace the P line coupler for tagline with that for the counterweight self removal device (Fig. 10-7). Check that the P line coupler is securely connected.

⚠ CAUTION

Operation of the machine with insecure connection may lead to the damage of the hydraulic pump.

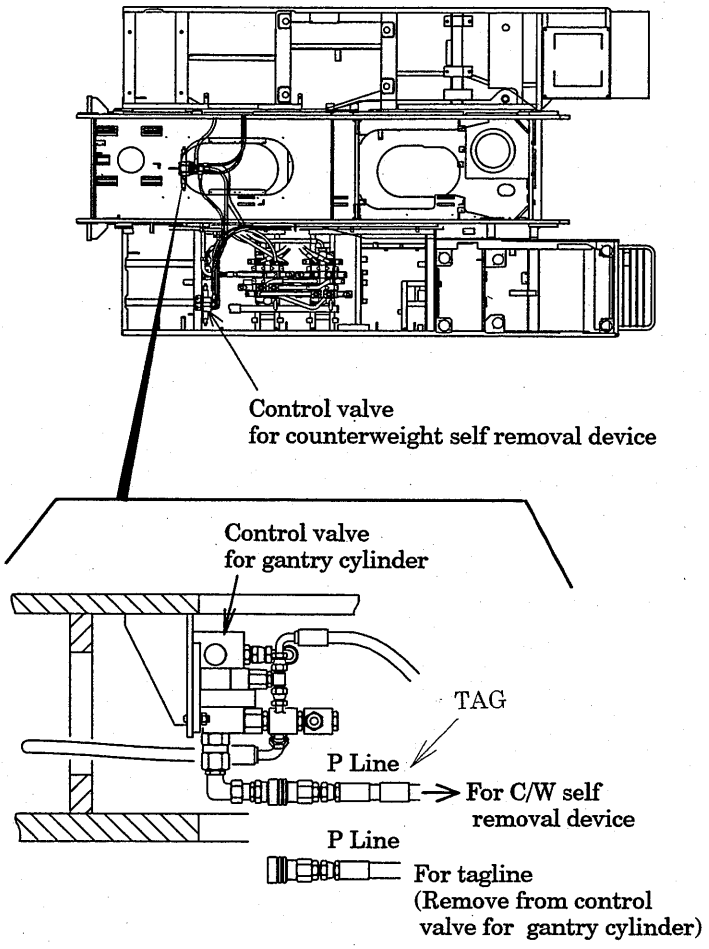


Fig 10−7

(2) Stop the engine. Then, open the right guard door, and connect the control box to the connector inside of the guard (Fig. 10-4, Fig. 10-8).

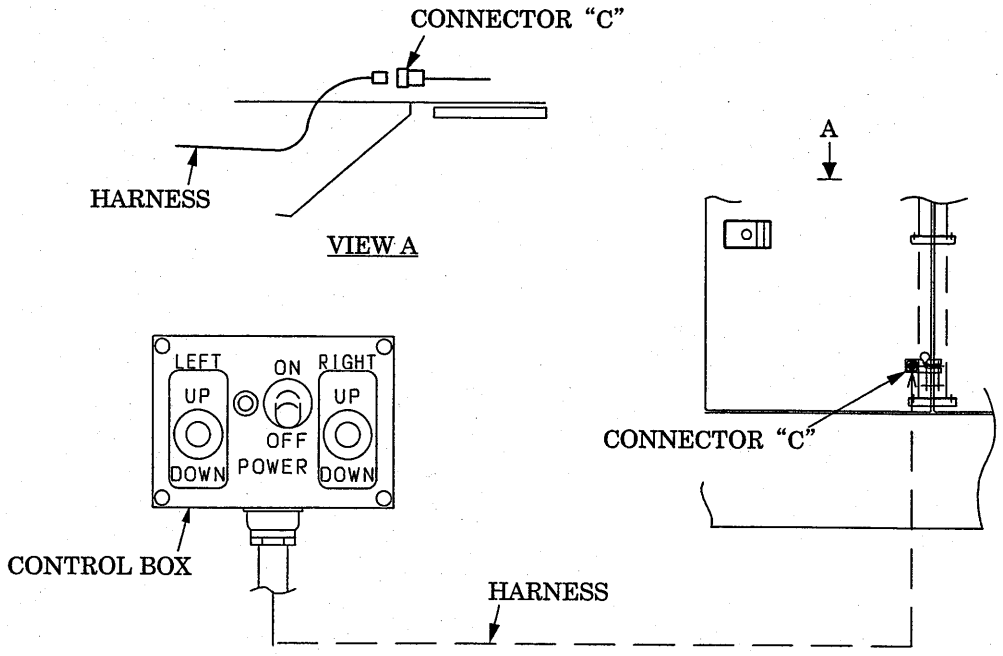


Fig 10−8

(3) The right and left sides of the cylinder are determined by viewing from the back of the machine.

⚠ DANGER

To prevent accidents of being caught in the counterweight and hit by the dropping counterweight, clear away from the area above or under the lifted counterweight and the area between the counterweight and the machine. Failure to observe this precaution may result in serious injury or loss of life.

⚠ DANGER

The counterweight stood up on the ground is unstable, and may cause serious accidents. To prevent accidents when the counterweight is fallen over, clear away from the area above or under the counterweight. Failure to observe this precaution may result in serious injury or loss of life.

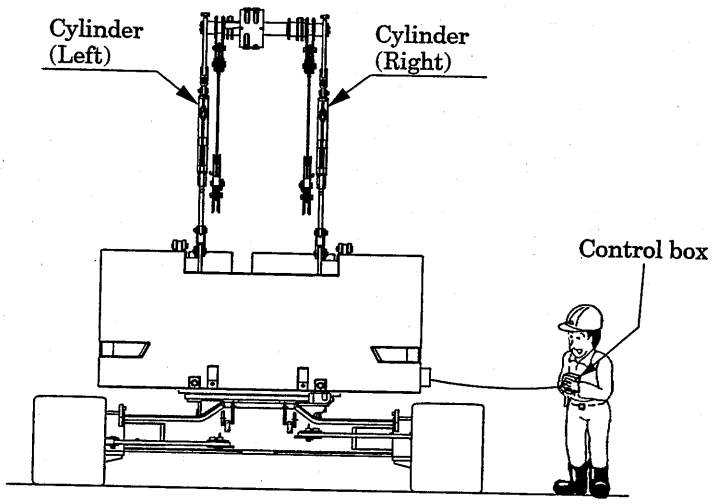


Fig 10–9

10.2 INSTALLATION PROCEDURES

10.2.1 PRECAUTION FOR OPERATING CONTROL BOX (FIG.10-9, FIG.10-9A)

(1) The engine should be at a low speed (Approx. 1000 rpm) during operation.

(2) Activate the power switch of the control box only when operating the lift cylinders ①.

(3) Operate the right and left lift cylinders ① separately with the control box, while keeping a balance of right and left.

10.2.2 INSTALLATION OF COUNTER-WEIGHT NO.1 (FIG. 10-9A, FIG. 10-9B, FIG. 10-10)

(1) Place the machine so that the rear end of the deck is approx. 4.3 ft (1.3 m) apart from the counterweight No. 1. Then, fully retract the right and left lift cylinders ①, and set the gantry as per the "Position III" shown in the right figure by boom lowering operation (Fig. 10-9A).

(2) Connect the link ⑥ and the link ⑤ with the pin ⑩ (Fig. 10-9B).

(3) Connect the link ⑥ and the counterweight No. 1 with the pin (lower) ⑩ (Fig. 10-9B).

(4) Raise the gantry by boom raising operation so that the gantry is as per the "Position VI" shown in (Fig. 10-9A).

(5) Lower the counterweight No. 1 onto the swing frame by operating the control box, while keeping a balance of the right and left lift cylinders ① (Fig. 10-9A).

(6) Place the portion "A" of No. 1 weight to the portion "B" of the basic machine and install the pin "C" and the lock pin (Fig. 10-10).

(7) Pass the bolt "D" through the No. 1 weight, and fix the No. 1 weight to the frame with the nut "E". Then, lock it with the lock nut.
Tightening torque: 636 lbs·ft (863 N·m)

(8) Remove the pins (lower) ⑩ of the link ⑥ from the counterweight No. 1.

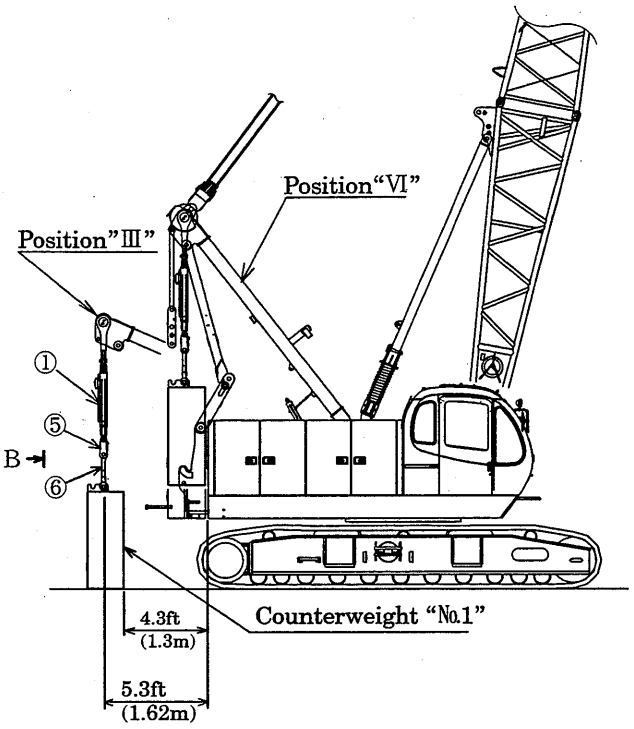


Fig 10−9A

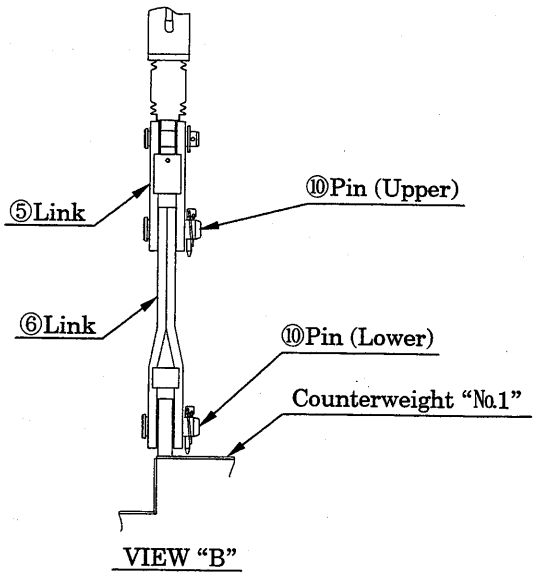


Fig 10−9B

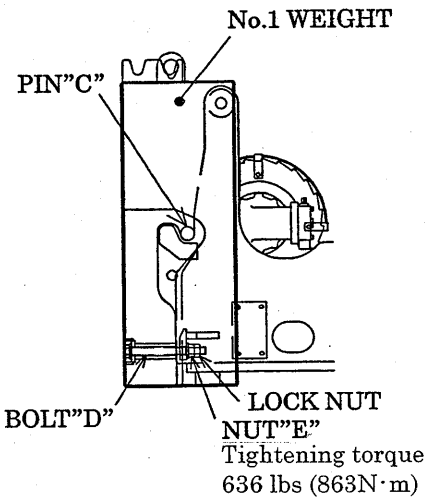
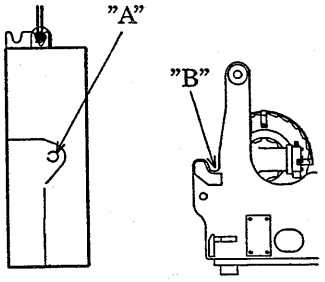


Fig10−10



10.2.3 INSTALLATION OF COUNTER-WEIGHT NO. 2 (FIG. 10-11, FIG. 10-12, FIG. 10-13)

(1) Place the machine so that the rear end of the deck is approx. 6.2 ft (1.9 m) apart from the hanger of the counterweight No. 2. Then, fully retract the right and left lift cylinders ①, and lower the gantry as per the "Position I" shown in the figure 10-11 by boom lowering operation.

(2) Extend the lift cylinders ①, and connect the link ⑥ and the counterweight No. 2 with the lower pin ⑩ of the link ⑥ (Fig.10-12).

(3) Raise the gantry as per the "Position V" shown in the figure 10-11 by gantry raising operation. If necessary, travel the machine forward to straighten up the counterweight No. 2.

(4) Lower the counterweight No. 2 onto the counterweight No. 1 by operating the control box, while keeping a balance of right and left lift cylinders ① (Fig 10-13).

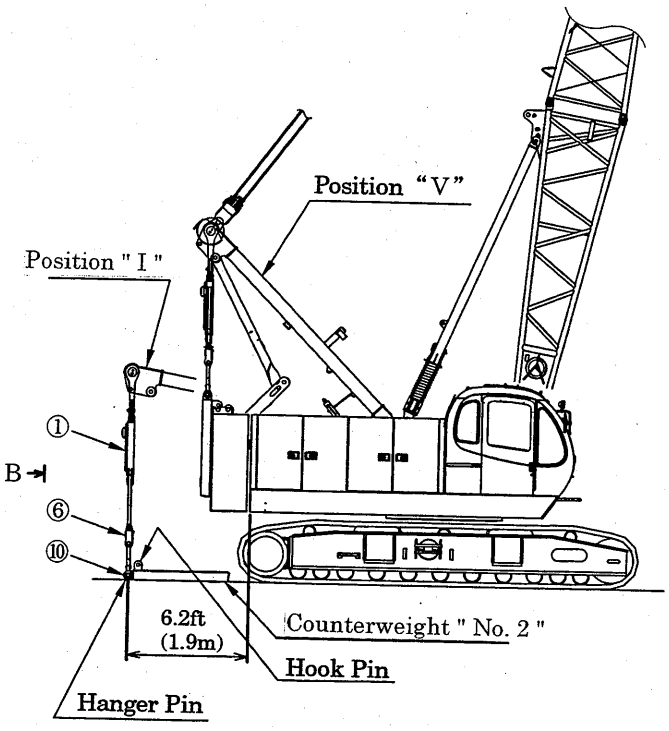


Fig 10–11

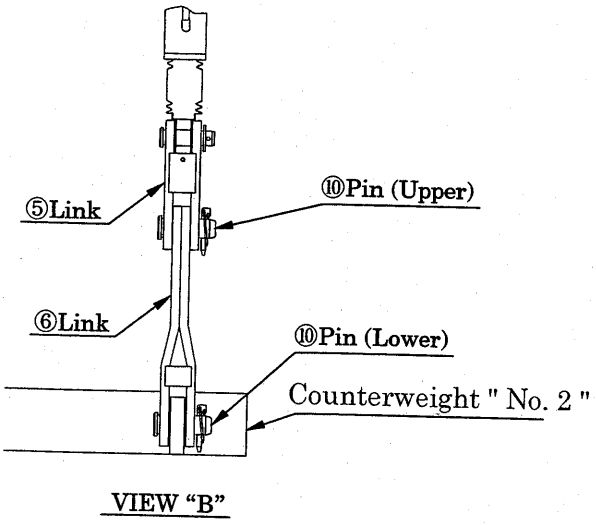


Fig 10–12

(5) Align the portion "F" of the counterweight No. 2 with the portion "F" of the counterweight No. 1, and attach the counterweight No. 2 (Fig. 10-13) to the back of the counterweight No. 1.

(6) Remove the pin (upper) ⑩ between the link ⑥ and link ⑤ (Fig. 10-12).

(7) Lay the link ⑥ attached to the counterweight No.2 down onto the top face of counterweight toward the counterweight No.1 side.

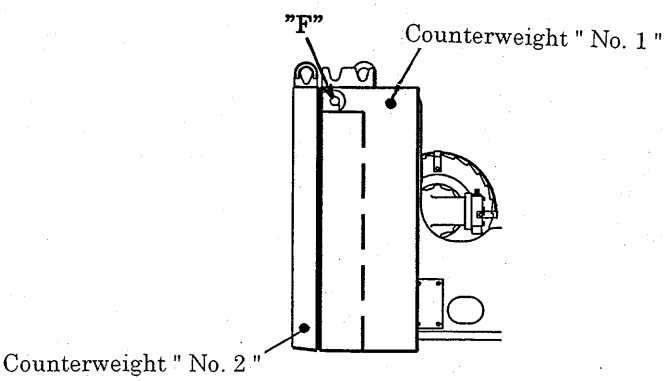


Fig10–13

10.2.4 INSTALLATION OF COUNTER-WEIGHT NO. 3 (FIG. 10-14, FIG. 10-15, FIG. 10-16)

(1) Place the machine so that the rear end of the deck is approx. 5.2 ft (1.6 m) apart from the counterweight No. 3. Then, fully retract the right and left lift cylinders ①, and lower the gantry as per the "Position II" shown in the figure 10-14 by lowering the gantry.

(2) Connect the link ⑤ to counterweight No. 3 with the pin ⑩ (link ⑥ is not used).

(3) Raise the gantry as per the "Position IV" shown in the figure 10-14 by raising the gantry .

(4) Attach the counterweight No. 3 to the counterweight No. 2 by operating the control box, while keeping a balance of right and left lift cylinders ①.

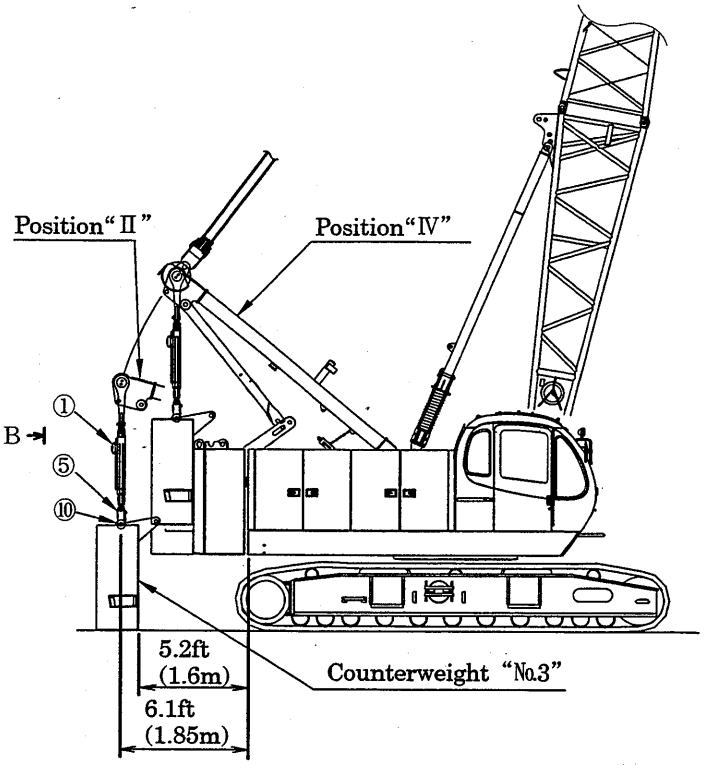


Fig 10−14

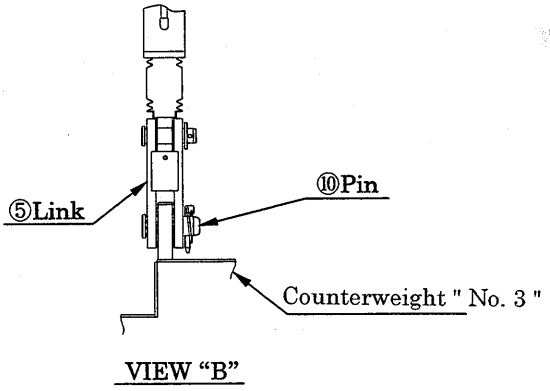


Fig 10−15

(5) Align the portion "G" (Fig. 10-16) of the counterweight No. 3 with the portion "F" (Fig. 10-13) of the counterweight No. 1, and attach the counterweight No. 3 to the back of the counterweight No. 2.

(6) Pass the bolt "H" (Fig. 10-16) through the weights, and fix all of them with the nut "J" (Fig. 10-16). Then, lock it with the lock nut.
Tightening torque: 636 lbs·ft (863 N·m)
Weight of the bolt "H"····· 401 lbs (18.2kg)

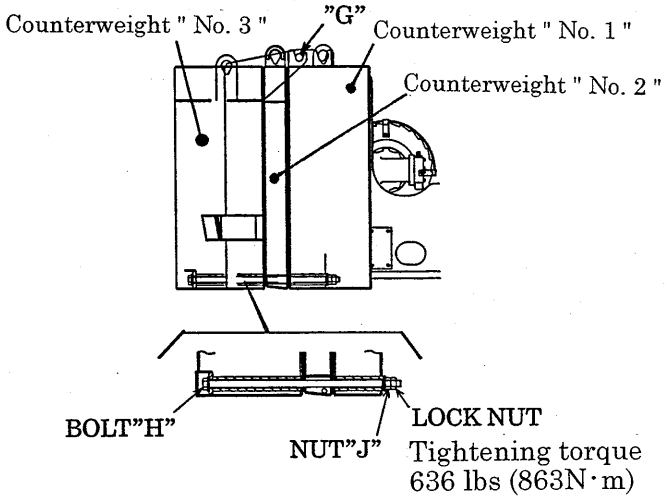


Fig 10−16

(7) Remove the pin ⑩ from the counterweight No. 3 and the link ⑤ (Fig. 10-15). Then, raise the gantry until the gantry is set to the high gantry position (Fig. 10-17).

(8) Insert the tension member pin Ⓐ to fix the tension member (Fig. 10-17).

(9) Install gantry cylinder to compression member by pin Ⓑ (Fig. 10-17).

(10) After the installation of the counterweights, be sure to remove spacer ⑭ and backstop pin ⑮ (Fig. 10-17).

(11) Fully retract lift cylinders ①, and fix with the hook of the link ⑤ to the tension member.

⚠ CAUTION

Lowering of the boom with the spacer (Fig. 10-17) attached will cause the interference of the spacer with the winch guard.

(12) Remove the control box from the connector in the guard.

⚠ DANGER

In order to prevent accidents of being caught in the counterweight by the dropping counterweight, do not suddenly operate the boom. Failure to observe this precaution may result in serious injury or loss of life.

10.2.5 RESTORATION

(1) Insert the gantry cylinder pin Ⓑ (Fig. 10-17).

(2) Remove the pins ⑮ with flags inserted into the backstop. The pins can be easily removed by raising the boom a little (Fig. 10-18). Store the pins (with flags) in the bracket "B" (See Fig.10-4).

⚠ DANGER

Overhoisting the boom when removing the pin ⑮ may damage the backstop or the boom base, and may cause serious injury or loss of life.

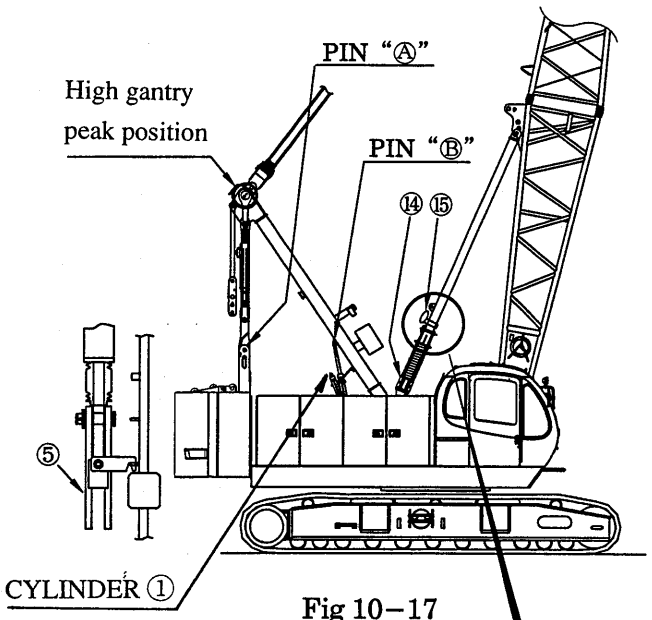


Fig 10−17

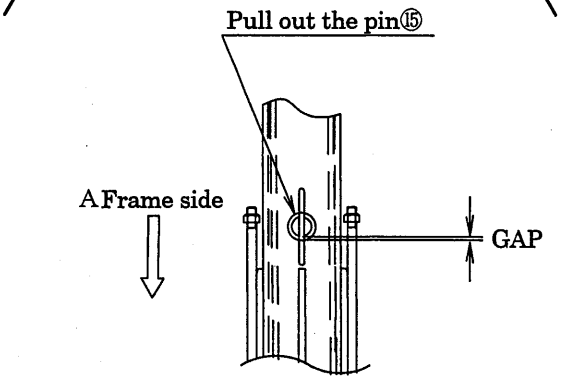


Fig 10−18

⚠ DANGER

Raising the boom without removing the pin ⑮ (Fig. 10-18) will damage the backstop or the boom base, and may cause serious injury or loss of life.

(3) Remove the backstop spacer ⑭ (Fig. 10-4). Lowering the boom with the backstop spacer attached will lead to the interference with the winch guard. Store the backstop spacers in the bracket "B" (See Fig.10-4).

(4) If the hydraulic tagline (optional) is equipped, switch the P line coupler to the original connections (See Fig. 10-7).

Check that the P line coupler is securely connected.

⚠ CAUTION

Insecure connection of the P line will lead to the damage of hydraulic equipment.

(5) Connect the wiring connector of the swing flasher located on the counterweight side.

(6) Stop the engine. Then, disconnect the connector of the control box (Fig. 10-19).

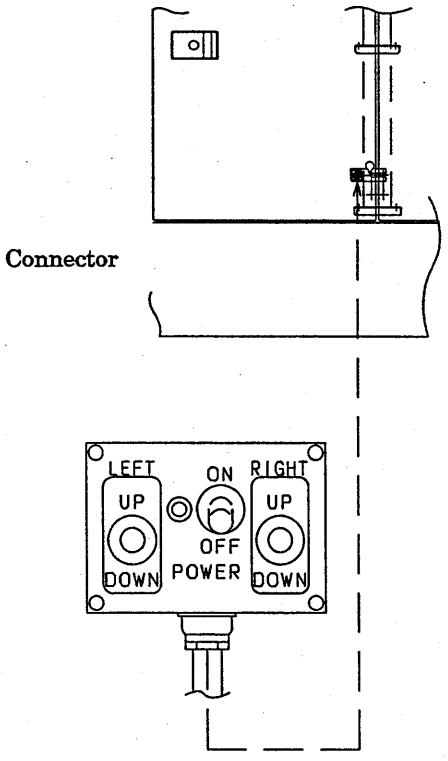


Fig 10−19

10.3 DISASSEMBLY PROCEDURES

10.3.1 DISCONNECTION OF SWING FLASHER WIRING

(1) Disconnect the wiring connector of the swing flasher located on the counterweight side.

10.3.2 REMOVAL OF COUNTER-WEIGHT NO. 3 (FIG. 10-20)

(1) Remove the hook for the lift cylinder and tension bar (Fig. 10-17). Then, lower the gantry as per the "Position IV" shown in (Fig. 10-20) by lowering the boom.

(2) Connect the link ⑤ and the counterweight No. 3 with the pin ⑩.

(3) Detach the mounting bolts of the counterweight No. 3.

(4) Lift the counterweight No. 3 by operating the control box to fully retract the right and left lift cylinders ①, while keeping a balance of right and left.

(5) Lower the gantry by boom lowering operation to position "II". The counterweight No. 3 down onto the ground. Then extend lift cylinder ① to ground the counterweight.

(6) Remove the pin ⑩ from the counterweight No. 3.

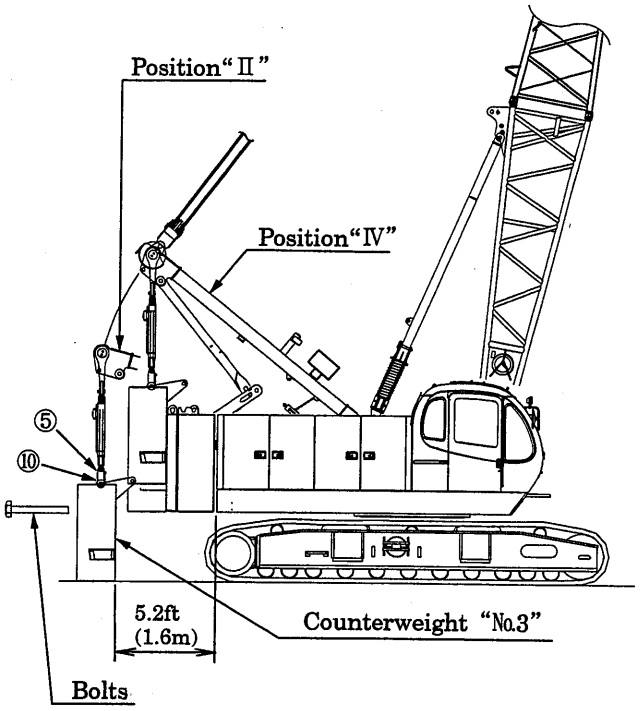


Fig 10−20

10.3.3 DISASSEMBLY OF COUNTER-WEIGHT NO. 2 (FIG. 10-21)

(1) To secure a space to lay the counterweight No. 2 down on the ground, travel the machine forward about 10 ft, or turn the machine 180° .

(2) Retract the lift cylinder, and raise the gantry as per the "Position V" shown in (Fig. 10-21) by boom raising operation.

(3) Connect the link ⑤ and long link ⑥ attached to the counterweight No. 2 with the pin ⑩ (Fig. 10-12)

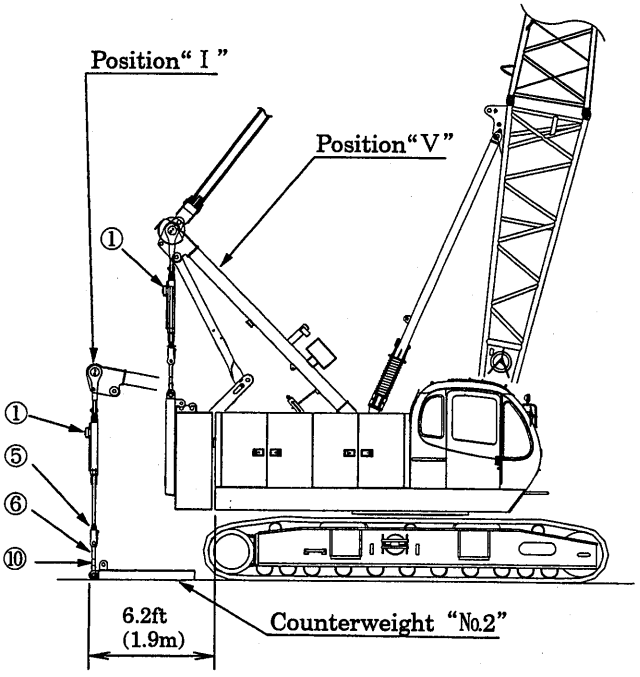


Fig 10−21

(4) Lift the counterweight No. 2 by operating the control box to fully retract the right and left lift cylinders ①, while keeping a balance of right and left sides of it.

(5) Lower the gantry to the "Position I" shown in the figure 10-21 by boom lowering operation.

(6) Extend the lift cylinder until the counterweight No. 2 is completely laid down on the ground to backward. If necessary, travel the machine backward to lay down the counterweight No. 2 on the ground.

⚠ DANGER

Clear away from the area backward of the counterweight No. 2 until the counterweight is completely laid down on the ground. Failure to observe this precaution may result in serious injury or loss of life.

10.3.4 DISASSEMBLY OF COUNTER-WEIGHT NO. 1 (FIG. 10-22)

(1) To secure a space to lay the counterweight No. 1 down on the ground, travel the machine forward, or turn the machine 180° .

(2) Retract the lift cylinder, and raise the gantry as per the "Position VI" shown in (Fig. 10-22) by boom raising operation.

(3) Connect the link ⑥ and the counterweight No. 2 with the pin ⑩.

(4) Remove the mounting bolts of the counterweight No. 1.

(5) Lift the counterweight No. 1 by operating the control box to fully retract the right and left lift cylinders ①, while keeping a balance of right and left.

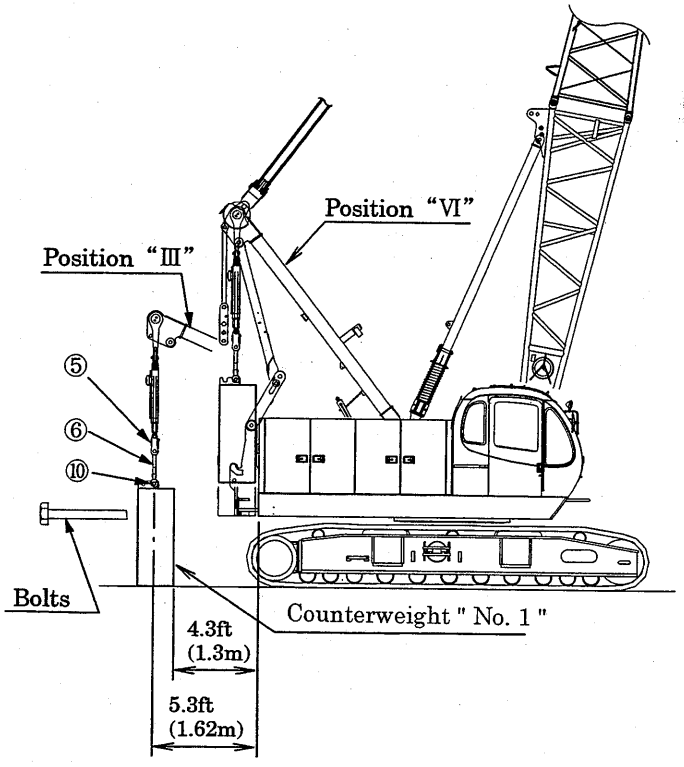


Fig 10−22

(6) Lower the gantry by boom lowering operation to the position "III". Then extend lift cylinder ① to lay the counterweight No. 1 down onto the ground.

(7) Remove the pin ⑩ from the counterweight No. 1.

(8) Travel the machine forward by 6.6 to 9.8 ft (2 to 3 m), or turn the machine 180° .

10.3.5 RESTORATION (FIG. 10-23)

(1) Insert the gantry cylinder pin Ⓑ (See Fig. 10-17).

(2) Remove the pins ⑮ with flag inserted into the backstop. The pins can be easily removed by raising the boom a little (Fig. 10-23). Store the pins (with flag) in the bracket "B" (See Fig.10-4).

⚠ DANGER

Overhoisting the boom when removing the pin ⑮ may damage the backstop or the boom base, and may cause serious injury or loss of life.

⚠ DANGER

Raising the boom without removing the pin ⑮ will damage the backstop or the boom base, and may cause serious injury or loss of life.

(3) Remove the backstop spacer ⑭. Lowering the boom with the backstop spacer attached will lead to the interference with the winch guard. Store the backstop spacers in the bracket "B" (See Fig.10-4).

(4) If the hydraulic tagline (optional) is equipped, switch the P line coupler to the original connections (See Fig. 10-7).

Check that the P line coupler is securely connected.

⚠ CAUTION

Insecure connection of the P line will lead to the damage of hydraulic equipment.

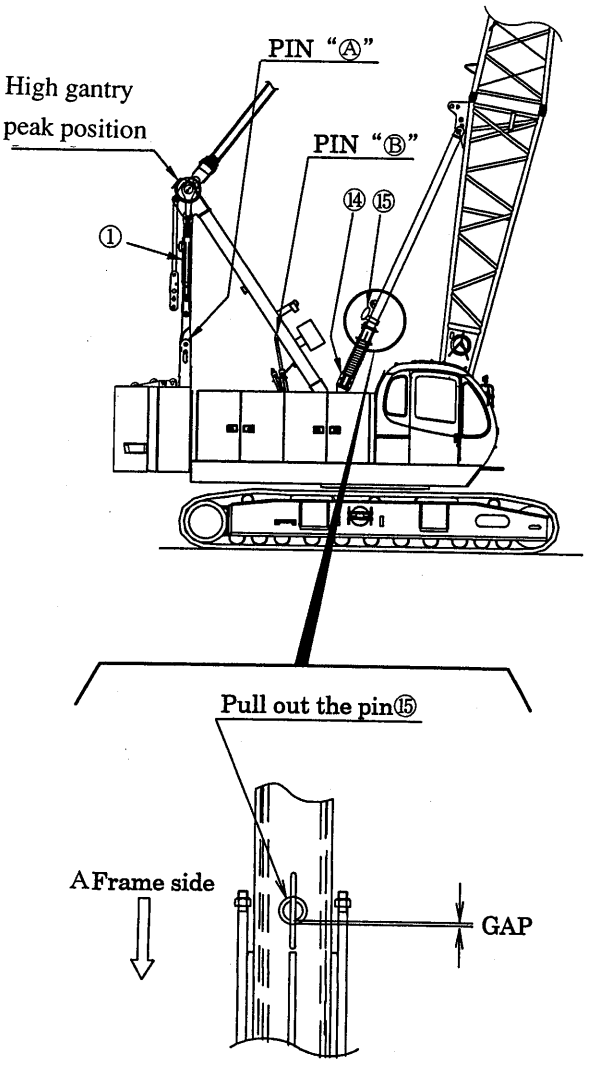


Fig 10−23

(5) Connect the wiring connector of the swing flasher located on the counterweight.

(6) Stop the engine. Then, disconnect the connector of the control box, and remove the box (Fig. 10-24).

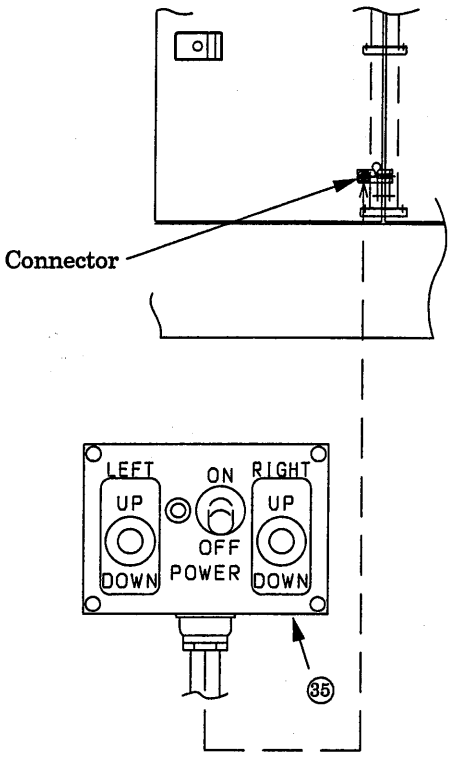


Fig 10–24

10.4 OPERATION OF CYLINDER WHEN SETTING LOW GANTRY POSITION (FIXATION OF TENSION BAR CONNECTION) (FIG. 10-25)

10.4.1 WHEN NO COUNTERWEIGHT IS EQUIPPED

(1) Lower the gantry to the lower end (low gantry position) by gantry raising cylinder operation.

(2) Fix the link ⑰ to the link ㉕ with the pins ⑩ and ⑳. Then, retract the right and left lift cylinders by operating the control box while keeping a balance of right and left so that they are looser than the gantry tension bar.

⚠ CAUTION

If any force is applied to the lift cylinder before applied to the gantry tension bar, the cylinder may be damaged.

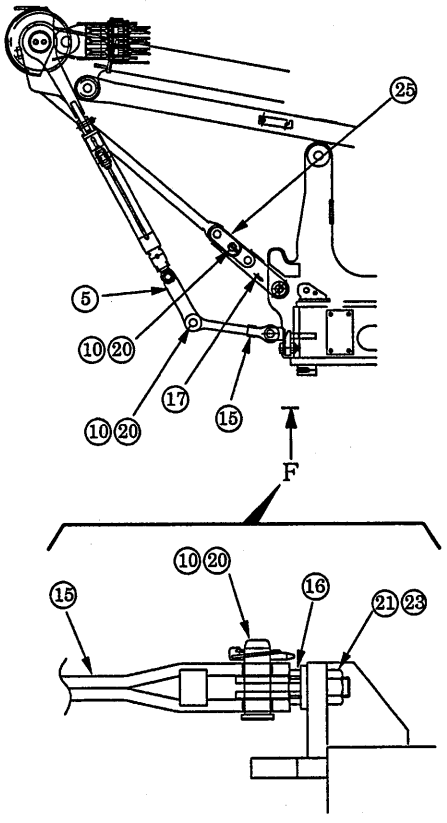


Fig 10–25

(3) Fix the link ⑮ to the link ⑤ with the pin ⑩ and ⑳. Then fix the link ⑯ to the revolving frame with the capscrew ㉑ and nut ㉓.
Finally, connect link ⑮ to the link ⑯ with pins ⑩ and ⑳.

10.4.2 WHEN ALL THE THREE COUNTERWEIGHTS ARE EQUIPPED (SEE FIG. 10-26)

(1) Lower the gantry to the lowest end (low gantry position) by gantry lifting cylinder operation.

(2) Fix the link ⑰ to the link ⑤ with the pins ⑩ and ⑳. Fix the link ⑯ to the counterweight with the counterweight fixing bolt. Then, fully retract the right and left lift cylinders ① by operating the control box while keeping a balance of right and left (Fig. 10-26).
Finally, connect link ⑰ with link ⑯ with pins ⑩ and ⑳.

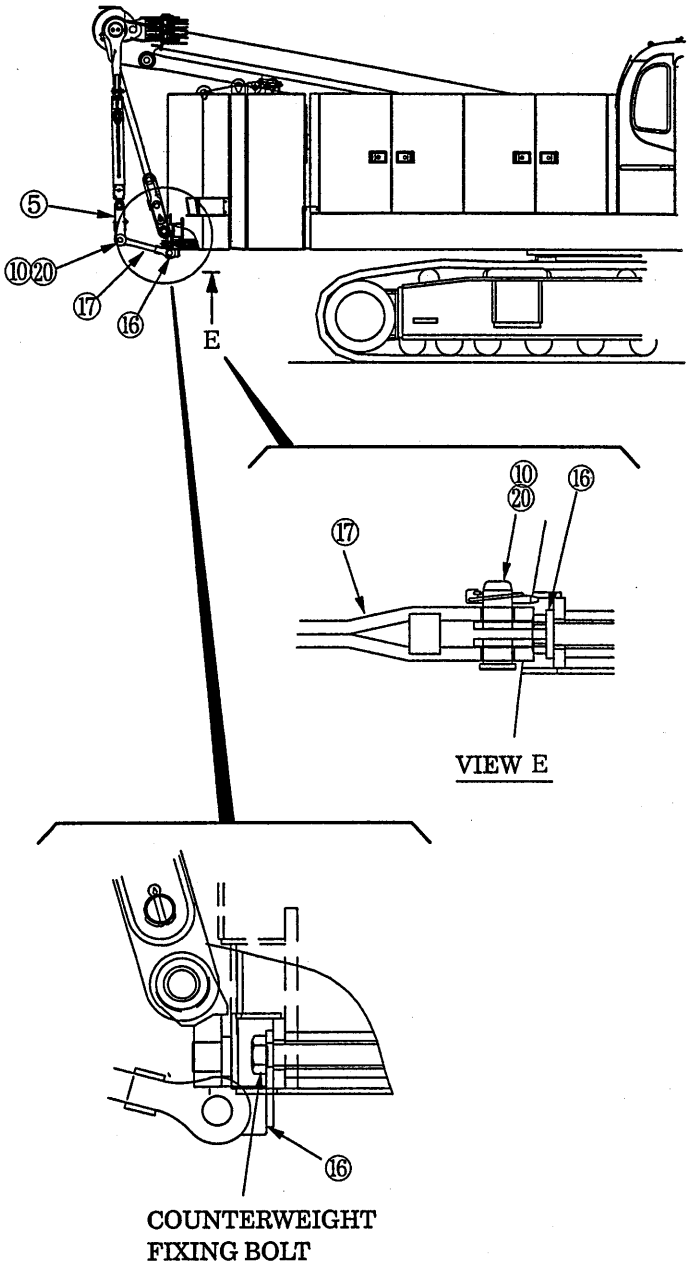


Fig 10−26

11. OPERATION OF CRAWLER SELF REMOVAL DEVICE (OPTIONAL)

The crawler self removal device is the auxiliary device for assembly and disassembly used when removing or installing the right and left crawlers, loading or unloading parts into or from the trailer. These procedures are based on using four beam trailers only. It comprises the components shown below.

- Auxiliary sheave assembly (for crawler removal) to be installed to the tip of the boom base
- Hook overhoist preventive limit switch assembly (the limit switch assembly for main winch is used)
- Hook block (which enables reeving of two parts of lines)

Also tools shown below should be prepared:

- Wooden block (4 pieces)
- Hand jack (2 pieces: 15 ton capacity)
- Slings (2 pieces: length --------- 10 ft
  diameter ------ 1 1/8 inch)
- Shackles (4 pieces)
- Protective material (4 pieces)
- Chain block

Prior to work, check the items shown below.

1. LOCATION

(1) The space is enough to install the crawlers, and the ground is firm and level.
(2) The route for entry of vehicles which carry members required for assembly is secured.

2. CHECK OF WORK PROCEDURES AND SAFETY

Prior to assembly, persons related to the work are required to have a meeting to check the work procedures, safety, and their roles and charge of the work.

3. START-UP CHECK

Perform start-up check of the machine.

⚠ WARNING

To prevent any injury, DO NOT put your fingers or hands into pin holes when inserting or removing pins.

11.1 ASSEMBLY AND DISASSEMBLY OF CRAWLER SELF REMOVAL DEVICE

11.1.1 ASSEMBLY OF CRAWLER SELF REMOVAL DEVICE

Install the device to the machine under the following conditions.

(1) The boom base and backstop are equipped.
(2) The gantry is raised.
(3) The crawlers are fully extended.
(4) The counterweights and carbody weights are removed.
(5) The upper spreader is connected to the boom base.
(6) The main winch wire rope is wound onto the drum.

1. INSTALLATION OF AUXILIARY SHEAVE FOR CRAWLER REMOVAL

(1) Align the auxiliary sheave for crawler removal with the pin hole located on the upper side of the boom base. Then, drive in the pin, and insert the spring pin. For easier alignment with the pin hole, place a wooden block under the auxiliary sheave. (Fig. 11-1)

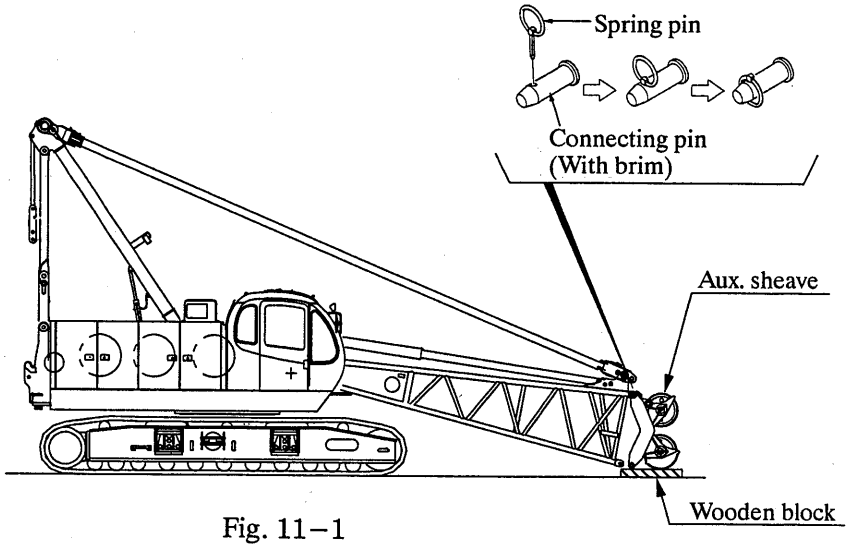


Fig. 11−1

(2) Raise the lower boom until the lower side pin is aligned with the pin hole. Then, drive in the connecting pin (both sides tapered pin), and insert the spring pin into the both sides. (Fig. 11-2)

⚠ DANGER

To prevent any accident by a dropped boom, clear away from the area in or under the boom. Failure to observe this precaution may result in serious injury or loss of life.

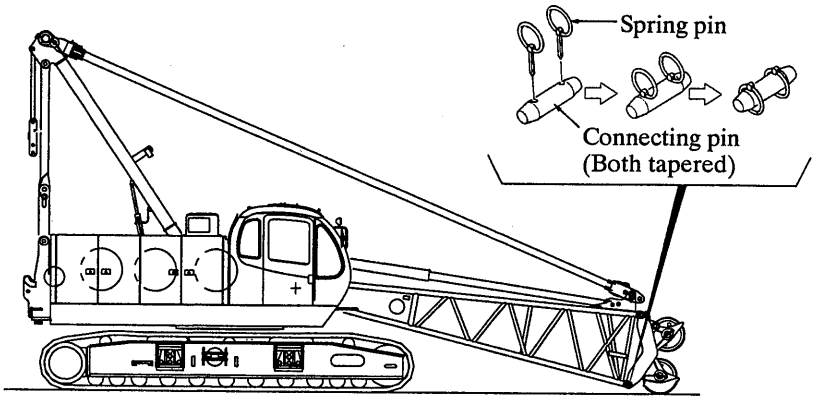


Fig. 11–2

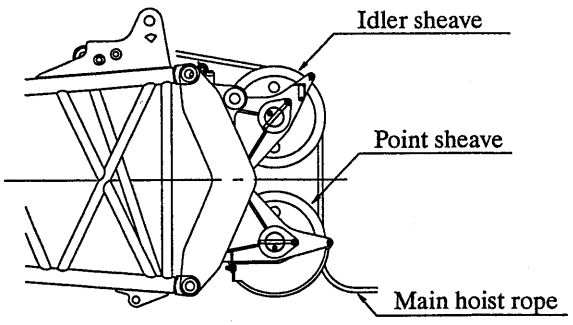
2. REEVING OF MAIN WINCH WIRE ROPE

⚠ DANGER

To prevent injury while handling of the wire rope, wear skin gloves. Watch out for the moving wire rope to prevent any accident caused by being caught by the machine or components. Failure to observe this precaution may result in serious injury or loss of life.

(1) Prepare the hook to be used, limit switch for overhoist prevention, weight, socket, etc. near the tip of the auxiliary sheave for crawler removal.

(2) Set the main winch drum control lever to the lowering side. Then, unwind the wire rope to the tip of the auxiliary sheave for crawler removal, and reeve it through the idler sheave and the center point sheave. (Fig. 11-3)



(3) Install the hook overhoist preventive limit switch and weight to the auxiliary sheave tip bracket for crawler removal. Use a split cotter pin to prevent the coming-off of the shackles pin.

(4) Reeve the main winch wire rope through the hook and boom point sheave in order as shown in the right figure. Be sure to remember to reeve it through the weight for the hook overhoist preventive limit switch. (Fig. 11-4)

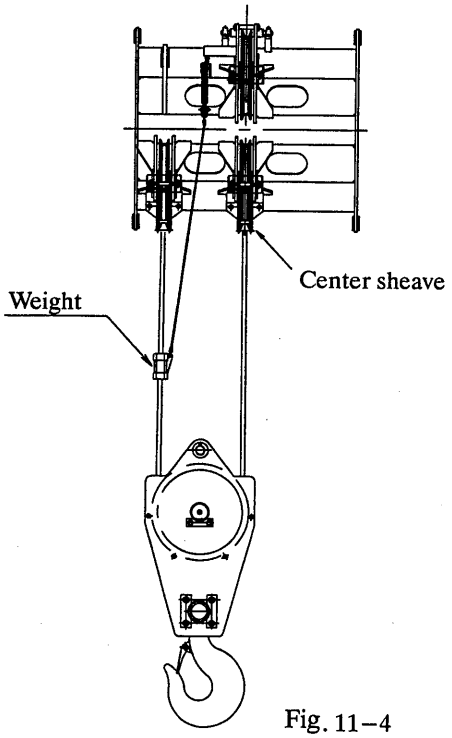


Fig. 11–4

⚠ CAUTION

The boom may be tilted backward with only one part of line. Be sure to reeve two parts of lines.

(5) Fix the wire rope end to the mounting section of the auxiliary sheave tip with the rope socket. (Fig. 11-5)

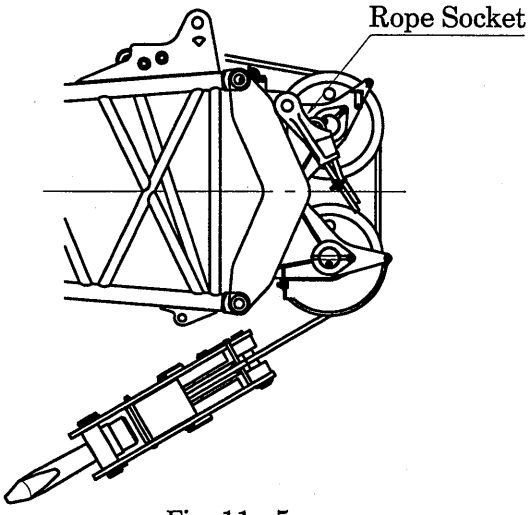


Fig. 11–5

3. WIRING OF HOOK OVERHOIST PREVENTIVE DEVICE LIMIT SWITCH

(1) Connect the cable for hook overhoist preventive device wound onto the cable reel of the boom base to the limit switch.

The auxiliary sheave is equipped with the thimble hook to support the cable. Unless the cable is supported with the thimble hook, excessive force will be applied to the hook limit connector. Be sure to hook the thimble on this hook.

(2) Connect the short-circuit cap to the connector for the auxiliary winch.

11.2 CRAWLER REMOVAL ON TRAILER

11.2.1 REMOVAL OF CRAWLERS ON TRAILER

The removal procedures are started under the conditions shown below. (Fig. 11-6)

(1) The crawler removal device (auxiliary sheave at the boom base) is installed.

(2) The gantry is connected to the machine with the transporting link at the stowing position.

(3) The crawlers are retracted, and the extension adapter and the clearance adjusting shim are removed.

(4) The hook with a sheave is installed.

(5) The machine facing forward is loaded on the trailer, and the swing brake is actuated with the swing lock engaged.

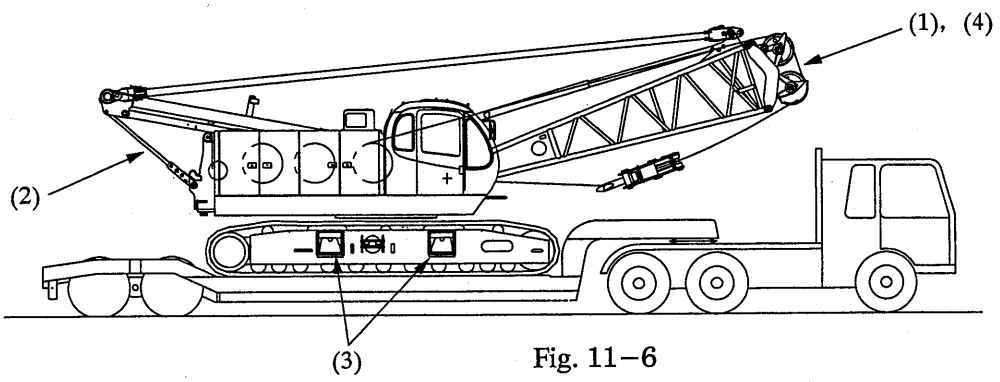


Fig. 11−6

1. PREPARATIONS

Prior to removal, perform steps shown below as preparations.

(1) In order to prevent the trailer from swaying, place four wooden blocks under the trailer as shown in the figure below, or support with jacks. (Fig. 11-7)

(2) Check that the trailer is not damaged when the machine is jacked up at the specified position or is supported through the wooden blocks. Check the position of the trailer's frame members for jack-up.

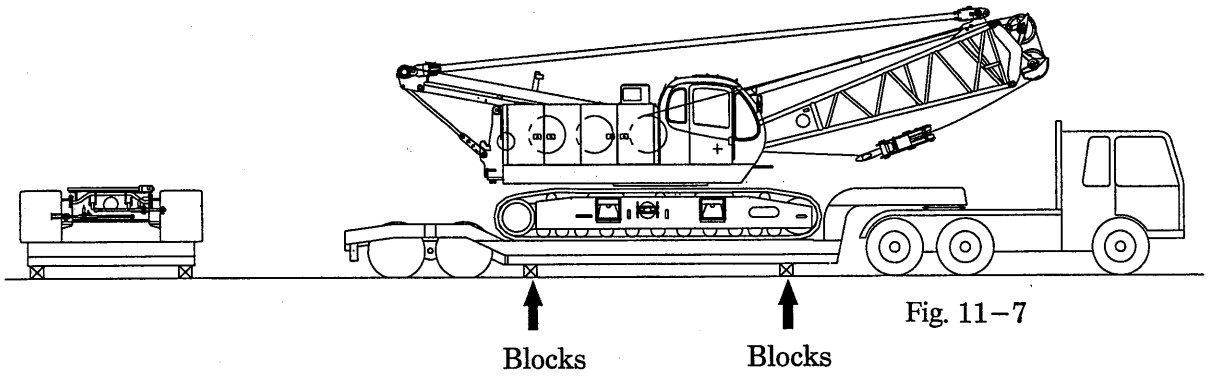


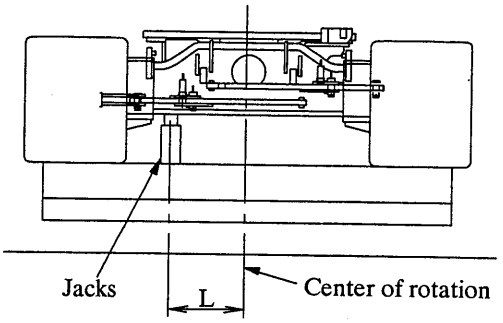
Fig. 11−7

⚠ DANGER

The unstableness of trailer may cause the turnover of the machine during work. Be sure to support the machine securely. Failure to observe this precaution may result in serious injury or loss of life.

2. EXTENSION OF CRAWLERS TO WORKING POSITION

(1) With the machine loaded on the trailer (the machine is parallel to the crawler, and the swing brake is actuated with the swing lock engaged), fit jacks to the specified positions on the axle (2 pos. on one side), and jack up the machine until the lower roller is slightly raised. (Fig. 11-8)



L = Approx. 2.0ft (0.6m)

Fig. 11−8

⚠ DANGER

To prevent turnover accidents, be sure to jack up the machine with a jack fit to the specified positions. Failure to observe this precaution may result in serious injury or loss of life.

⚠ WARNING

To prevent turnover of the machine, DO NOT perform swing operation with the machine jacked up.
Failure to observe this precaution may result in serious injury or loss of life.

(2) Remove the connecting pin "A" of the link connecting the crawler to be extended with the axle from the hole (1), and insert it into the hole (2). (Fig. 11-9)

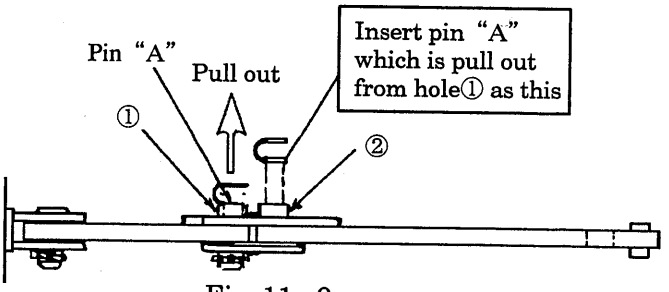


Fig. 11−9

(3) Check that no obstacle is on the crawler extension side, and set the crawler extension and retraction control lever to the "Extension" side to extend the crawler.
When the crawler is extended to the working position, the fixing pin "A" is dropped and inserted. At this time, it is unnecessary to insert the lock pin into the fixing pin "A". (Fig. 11-10)

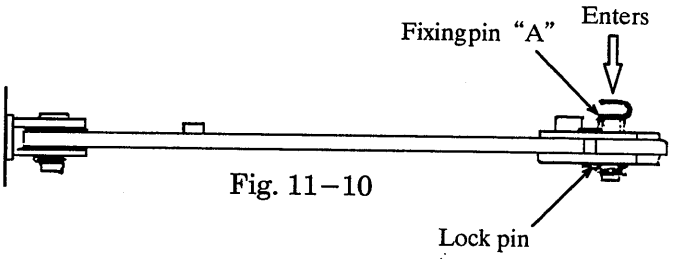


Fig. 11−10

⚠ CAUTION

The right and left cylinders are telescoped simultaneously. Fix the crawler on the opposite side to the axle securely with the connecting link to prevent it from being moved.

(4) Extend the side of crawler which has no fixing pins and place wooden blocks under the machine on the extended crawler side as far as possible from the center of rotation. (Fig. 11-11)

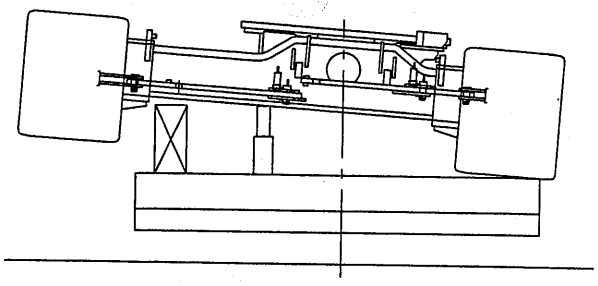


Fig. 11−11

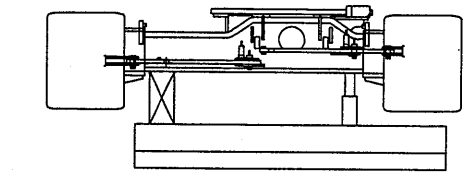


Fig. 11−12

(5) Remove the jack on the wooden block side, and fit it to the specified positions on the axle (2 pos. on one side), and jack up the machine until the lower roller is slightly raised. (Fig. 11-12)

(6) Extend the crawler on the opposite side in the similar manner shown in the steps (2) thru (6). (Fig. 11-13)

⚠ DANGER

The right and left cylinders are telescoped simultaneously. Fix the crawler on the opposite side to the axle securely with the connecting link to prevent it from being moved. Failure to observe this precaution may result in serious injury or loss of life.

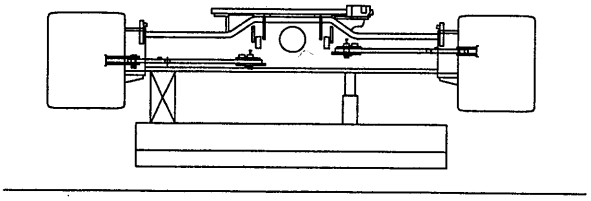


Fig. 11−13

(7) Place a wooden block under the machine on the extended crawler side. (Fig. 11-14)

(8) Remove the jacks. (Fig. 11-15)

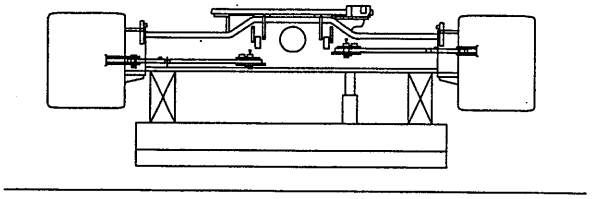


Fig. 11−14

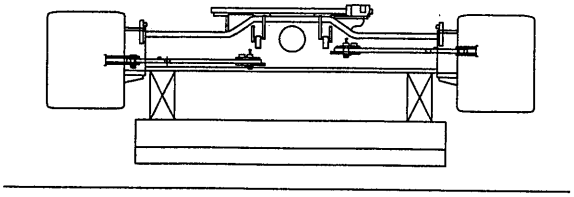


Fig. 11−15

3. REMOVAL OF CRAWLERS

(1) Remove the right and left motor covers.

(2) Disconnect the right and left hydraulic hoses for travel at the quick coupler section (4 pos. on one side). (Fig. 11-16)

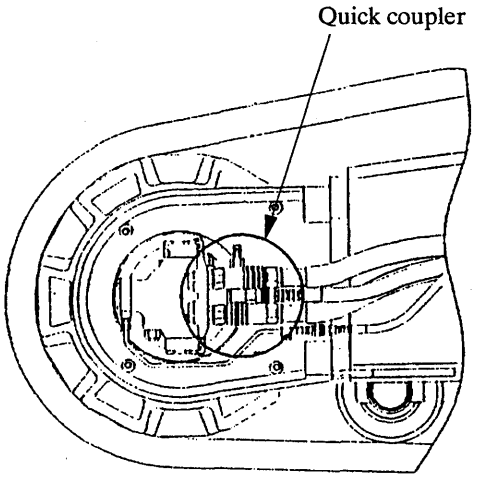


Fig. 11−16

⚠ DANGER

In order to prevent any accident caused by being caught in the machine or components, do not perform swing operation during the removal or installation of the crawler travel hydraulic hoses. Failure to observe this precaution may result in serious injury or loss of life.

⚠ CAUTION

When the hoses have been removed, wipe away dusts and dirt from the hoses, and be sure to cap the hoses with attached dust caps to avoid dirt on the hoses. If the ring of the coupler is too tighten and hardly moved, lightly tap the rim of the ring with a wooden hammer. Do not use a steel hammer.

(3) Carefully swing so that the upper structure is vertical to the crawlers. The front of the machine (operator's cab side) must be directed to the side of crawler which will be removed. (Fig. 11-17)

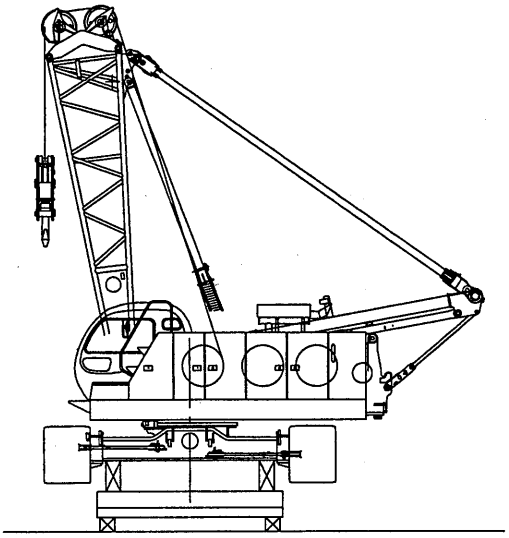


Fig. 11−17

⚠ DANGER

To prevent turnover accidents, avoid sudden swing operation. Failure to observe this precaution may result in serious injury or loss of life.

(4) Lift the crawler with the slings and the hook. When lifting, use protective material to prevent the crawler from being caught in between the shoes. (Fig. 11-18)

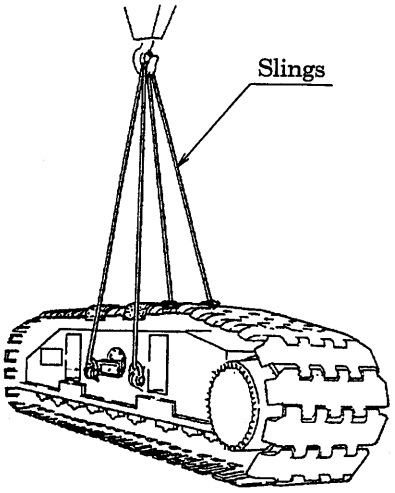


Fig. 11−18

(5) Remove the connecting pins "C" (front and rear) of the link connecting the crawler to be removed with the axle. (Fig. 11-19)

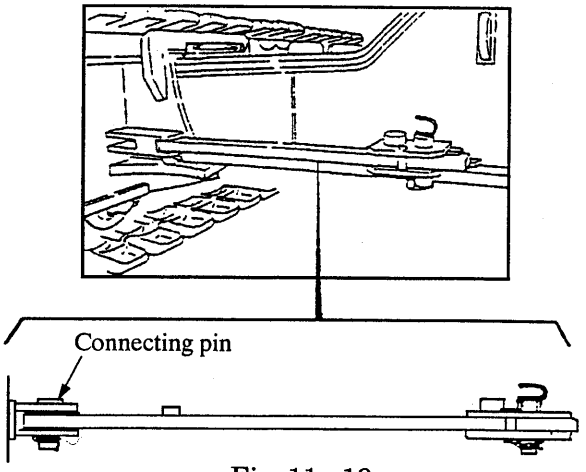


Fig. 11−19

(6) Extend the crawler with the horizontal cylinder. (Fig. 11-20)

⚠ CAUTION

The right and left cylinders are telescoped simultaneously. Fix the crawler on the opposite side to the axle with the connecting link to prevent it from being moved.

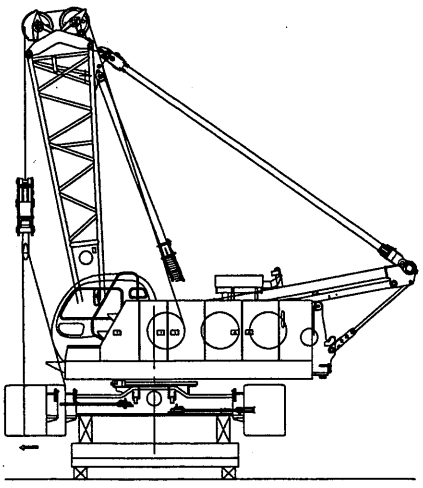


Fig. 11−20

(7) Detach the pin at the horizontal cylinder tip of the crawler to be removed, and retract the cylinder. Then, lift the crawler. (Fig. 11-21, Fig. 11-22)

⚠ WARNING

To prevent turnover of the machine, Do not perform swing operation with the crawler lifted. Switch to the inching speed, and swing carefully and slowly. Failure to observe this precaution may result in serious injury or loss of life.

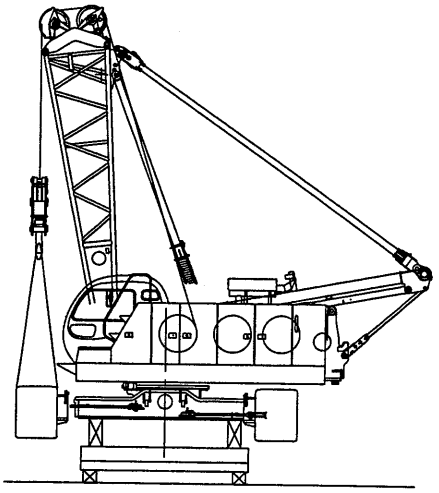


Fig. 11−21

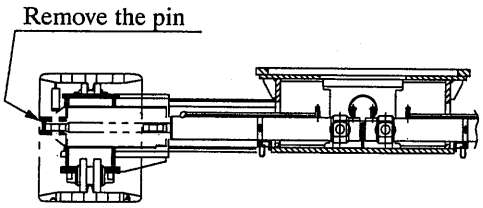


Fig. 11−22

(8) Place a trailer for transporting crawlers beside the machine, and lay the crawler on the trailer. (Fig. 11-23)

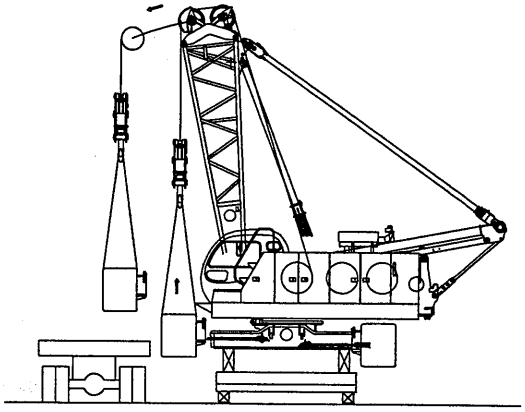


Fig. 11−23

(9) Remove another crawler in a similar manner. (Fig. 11-24)

⚠ WARNING

The right and left cylinders are telescoped simultaneously. Since the cylinder on the opposite side is also telescoped, clear away from the area near the cylinders to prevent any accident caused by being caught in the machine. Keep obstacles away from the cylinders. Failure to observe this precaution may result in serious injury or loss of life.

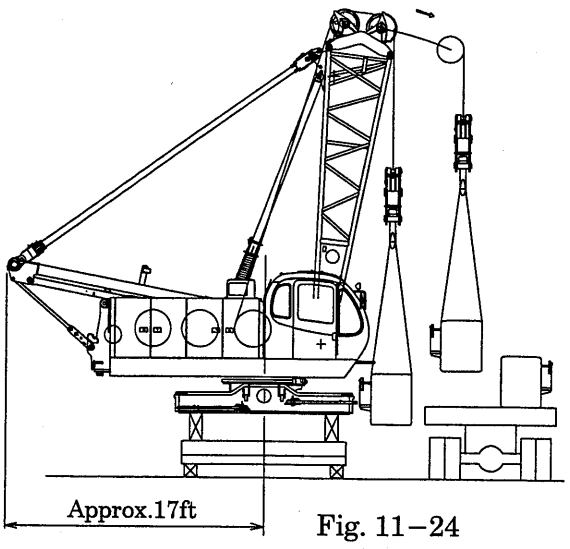


Fig. 11−24

(10) Fully retract the horizontal cylinder, and fix the cylinder to the stowing position. (Fig. 11-25)

(11) Securely fix the hook to the revolving frame with the slings. (Fig. 11-26)

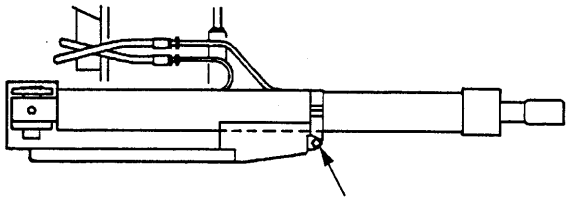


Fig. 11−25

(12) Swing until the boom faces backward (forward). Then, actuate the swing brake, and engage the swing lock. (Fig. 11-26)

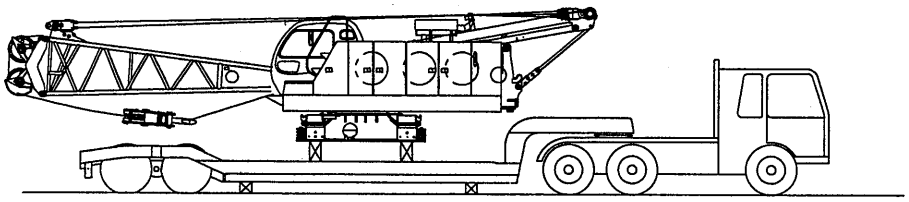


Fig. 11−26

(13) Fix the machine to the trailer, and remove the wooden blocks under the trailer. (Fig. 11-27)

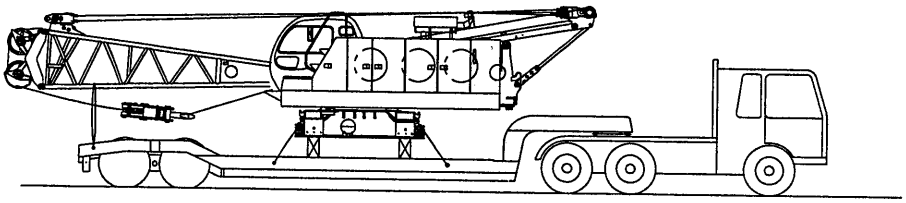


Fig. 11−27

(14) Retract the front and back, right and left crawler links to their maximum retracting positions, and insert the connecting pin "A" of the link into the hole (1).

11.2.2 INSTALLATION OF CRAWLERS ON TRAILER

The installation procedures are started under the conditions shown below. (Fig. 11-28)

(1) The crawler removal device is installed.

(2) The gantry is connected to the machine with the transporting link at the stowing position.

(3) The machine is loaded on the trailer, and the axle is supported at the specified positions with wooden blocks.

(4) The machine facing rearward is loaded on the trailer, and the swing brake is actuated with the swing lock engaged.

(5) The hook is fixed to the revolving frame with the slings.

(6) The crawler links are fixed at their maximum retracting position.

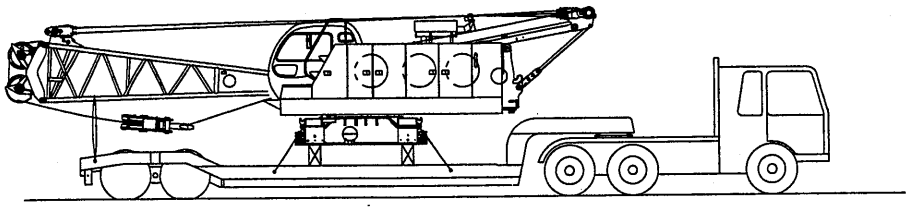


Fig. 11−28

1. PREPARATIONS

Prior to installation, perform steps shown below as preparations.

(1) In order to prevent the trailer from swaying, place wooden blocks under the four corners of the trailer as shown in the figure below, or support with a jack. (Fig. 11-29)

(2) Check that the trailer is not damaged when the machine is jacked up at the specified position or supported through the wooden blocks. Check the position of the members of the trailer's frame for jack-up.

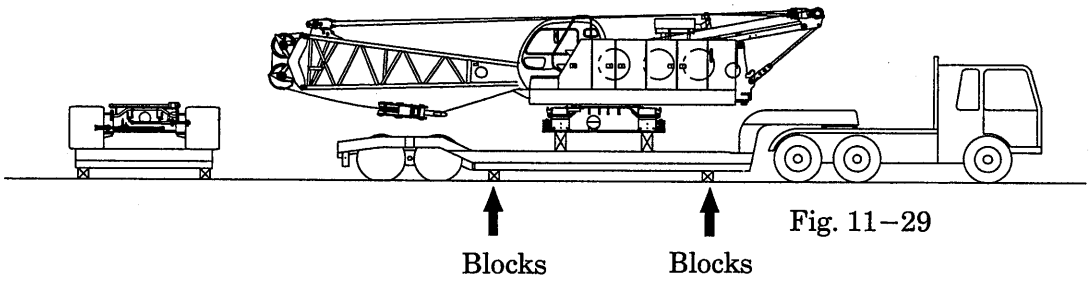


Fig. 11−29

⚠ DANGER

The unstableness of trailer may cause the turnover of the crane during work. Be sure to support the machine securely. Failure to observe this precaution may result in serious injury or loss of life.

2. INSTALLATION OF CRAWLERS

(1) Place a trailer for transporting crawlers beside the machine.

(2) Carefully swing so that the upper structure is vertical to the crawlers. The front of the machine (operator's cab side) must be directed to the side of crawler which will be installed. (Fig. 11-30)

⚠ DANGER

To prevent turnover accidents, avoid sudden swing operation. Failure to observe this precaution may result in serious injury or loss of life.

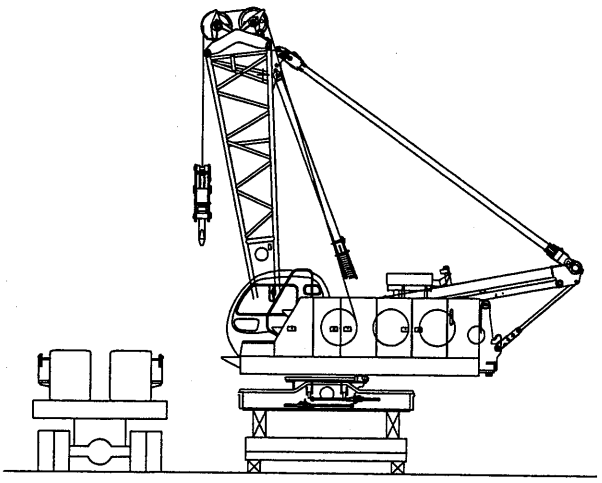


Fig. 11−30

(3) Slightly lift off the crawler, and check that the machine will not turn over.

(4) For smoother sliding of the crawler, apply grease to the upper face and side face of the axle.

(5) Lift the crawler with the slings and the hook. When lifting, use protective material to prevent the crawler from being caught in between the shoes. To remove slack in the shoes, raise the lower side of the shoes with a chain block. (Fig. 11-31)

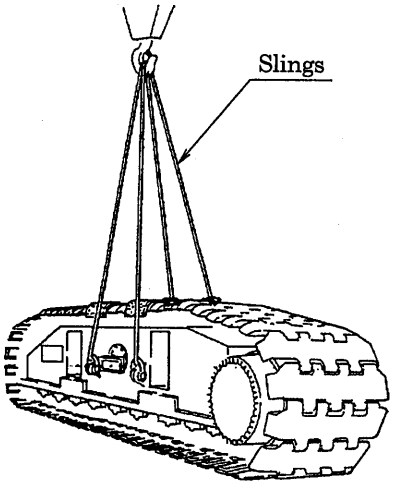


Fig. 11−31

⚠ WARNING

To prevent turnover of the machine, do not perform swing operation with the crawler lifted. Switch to the inching speed, and swing carefully and slowly. Failure to observe this precaution may result in serious injury or loss of life.

(6) Raise the boom, and allow the crawler to lay on the axle. (Fig. 11-32)

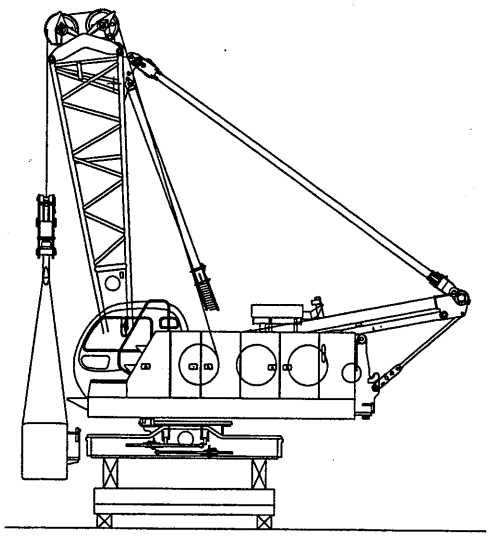


Fig. 11−32

(7) Remove the pin fixing the horizontal cylinder to the stowing position. Then, extend the cylinder, and connect the crawler to the cylinder with the pin. (Fig. 11-33, Fig. 11-34)

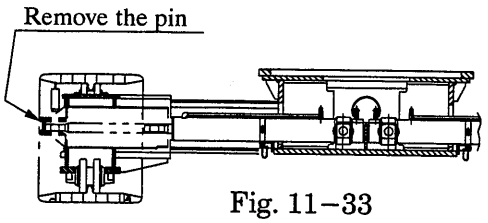


Fig. 11−33

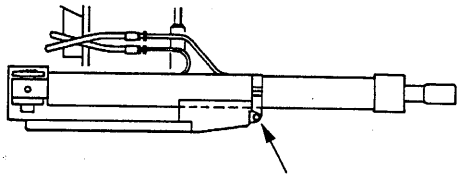


Fig. 11−34

⚠ WARNING

The right and left cylinders are telescoped simultaneously. Since the cylinder on the opposite side is also telescoped, clear away from the area near the cylinders to prevent any accident caused by being caught in the machine or components. Failure to observe this precaution may result in serious injury or loss of life. Keep obstacles away from the cylinders.

(8) With the crawler supported with the boom, retract the horizontal cylinder to retract the crawler to the working position. (Fig. 11-35)

⚠ DANGER

To prevent any accident caused by being caught in the machine or component, check that nobody is in the area between the crawlers and the machine.

⚠ DANGER

To prevent any turnover accident, do not retract the horizontal cylinder until the crawler comes in contact with the wooden blocks supporting the axle. Failure to observe this precaution may result in serious injury or loss of life.

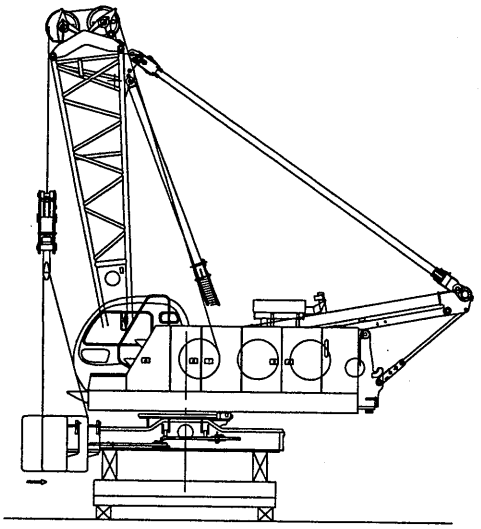


Fig. 11−35

(9) After the crawler is inserted, extend the link, and insert the pin "C". Then, extend the horizontal cylinder, and insert the pin "A". (Fig. 11-36)

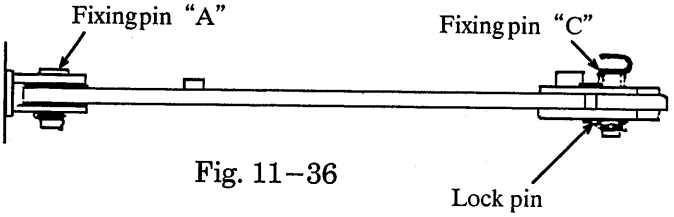


Fig. 11−36

(10) Slowly swing toward the opposite side. Then, install another crawler in a similar manner. Sudden swing may lead to unstable support of the machine. (Fig. 11-37)

⚠ CAUTION

The right and left cylinders are telescoped simultaneously. Fix the crawler on the opposite side to the axle with the connecting link to prevent it from being moved.

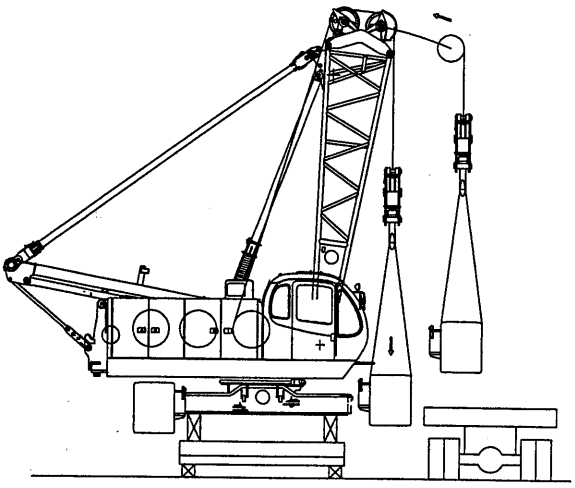


Fig. 11−37

(11) Disconnect the right and left hydraulic hoses for travel at the quick c11oupler section (4 pos. on one side). (Fig. 11-38)

⚠ DANGER

In order to prevent any accident caused by being caught in the machine or components, do not perform swing operation during the removal or installation of the crawler travel hydraulic hoses. Failure to observe this precaution may result in serious injury or loss of life.

⚠ CAUTION

Insecure connection of the hoses may lead to the damage to the travel motor and reducer.

(12) Install the right and left motor covers.

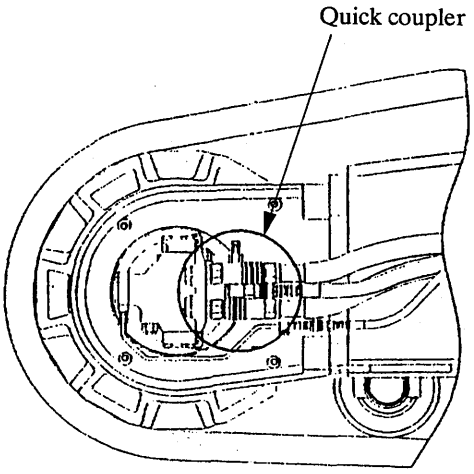


Fig. 11−38

3. RETRACTION OF CRAWLERS

(1) Swing the machine forward. Then, actuate the swing brake, and engage the swing lock.
Fix the hook block to the revolving frame.
(Fig. 11-39)

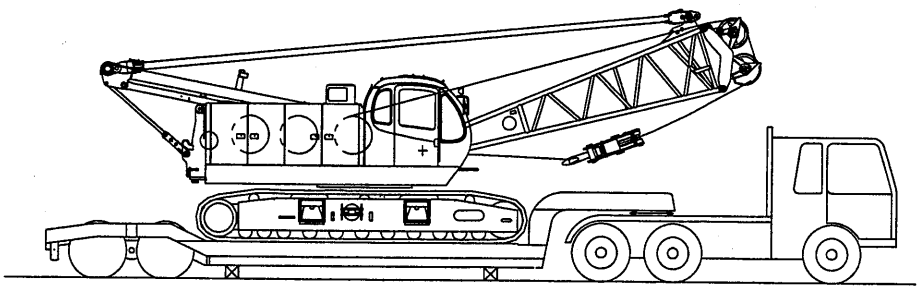


Fig. 11−39

(2) Remove the connecting pin "A" of the link connecting the crawler to be retracted and the axle from the hole (2), and insert the pin into the hole (1). (Fig. 11-40)

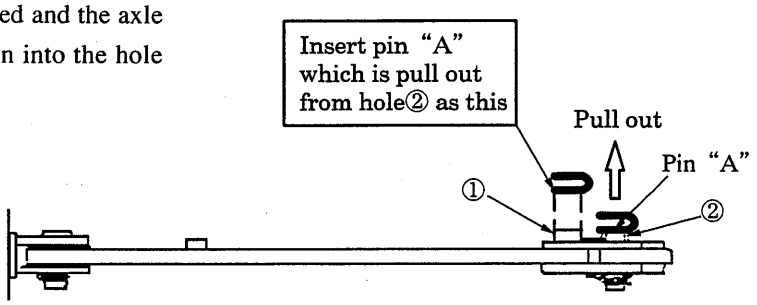


Fig. 11−40

(3) Fit jacks to the appropriate positions on the axle (2 pos. on one side), and jack up the machine slightly. (Fig. 11-41)
Select the position of the jacks that crawler does not interfere with jacks when retracted. (Approx. 2 ft from center of rotation)

⚠ DANGER

To prevent turnover accidents, be sure to jack up the machine with a jack fit to the specified positions. Failure to observe this precaution may result in serious injury or loss of life.

⚠ WARNING

To prevent turnover of the machine, do not perform swing operation with the machine jacked up. Failure to observe this precaution may result in serious injury or loss of life.

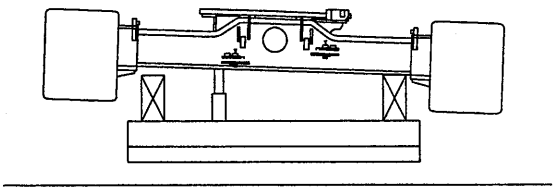


Fig. 11−41

(4) Remove the wooden block on the side of the crawler to be retracted. Then, check that no obstacle is on the crawler retraction side, and set the crawler extension and retraction control lever to the "Retraction" side to retract the crawler. (Fig. 11-42)

When the crawler is retracted to the retracting position, the fixing pin "A" is dropped and inserted. Insert the lock pin into the fixing pin "A". (Fig. 11-43)

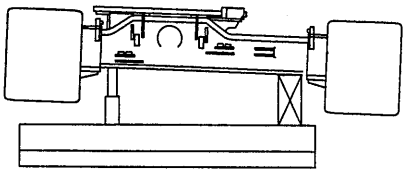


Fig. 11−42

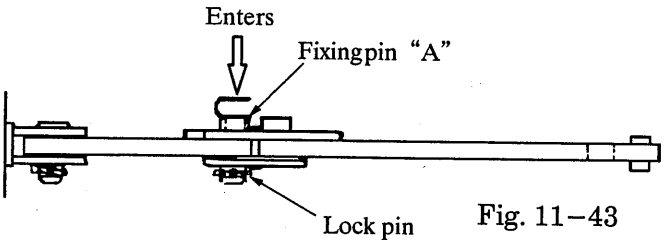


Fig. 11−43

CAUTION

The right and left cylinders are telescoped simultaneously. Securely fix the crawler on the opposite side to the axle with the connecting link to prevent it from being moved.

(5) Retract jacks, and lower the crawlers onto the trailer. Remove the jacks. (Fig. 11-44)

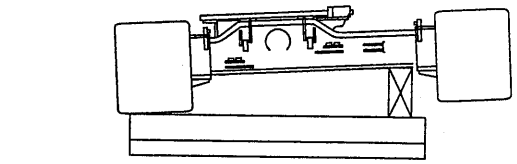


Fig. 11−44

(6) Fit jacks to the appropriate positions on the axle (2 pos. on one side), and jack up the machine slightly. (Fig. 11-45)

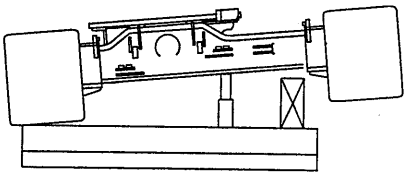


Fig. 11−45

(7) Remove the blocks and retract the crawler. (Fig. 11-46).

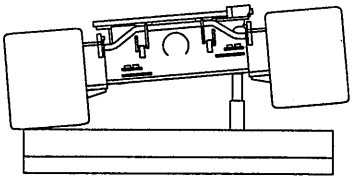


Fig. 11−46

CAUTION

The right and left cylinders are telescoped simultaneously. Securely fix the crawler on the opposite side to the axle with the connecting link to prevent it from being moved.

(8) Retract jacks, and lower the crawlers onto the trailer. (Fig. 11-47)

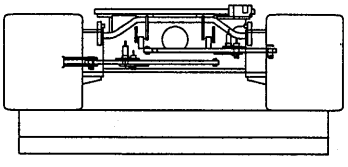


Fig. 11−47

(9) Fix the machine to the trailer, and remove the wooden blocks under the trailer.

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT

YOUR WARRANTY RIGHT AND OBLIGATIONS

The California Air Resources Board and Mitsubishi Motors Corporation (hereinafter referred to as ARB and MMC) is pleased to explain the emission control system warranty on your 1996 and later heavy-duty off-road engines. In California, new heavy-duty off-road engines must be designed, built and equipped to meet the State's stringent anti-smog standards. MMC must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, MMC will repair your heavy-duty off-road engine at no cost to you including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE:

- The 1996 and later heavy-duty off-road engines are warranted for a period of five years or 3,000 hours of operation, whichever occurs first. In the absence of a device to measure hours of use, the engine shall be warranted for a period of five years. If any emission-related part on your engine is defective, the part will be repaired or replaced by MMC.

OWNER'S WARRANTY RESPONSIBILITIES:

- As the heavy-duty off-road engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. MMC recommends that you retain all receipts covering maintenance on your heavy-duty off-road engine, but MMC cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

- As the heavy-duty off-road engine owner, you should however be aware that MMC may deny you warranty coverage if your heavy-duty off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

- Your engine is designed to operate on commercially available diesel fuel only.

- You are responsible for initiating the warranty process. The ARB suggests that you present your heavy-duty off-road engine to a MMC dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, you should contact at the office as shown below.

Mitsubishi Engine North America, Inc.
1250 Greenbriar Drive, Suite E Addison,
Illinois 60101-1065 U.S.A.

Tel.No.: 708-268-0750
Fax.No.: 708-268-9293

or

California Air Resource Board
9528 Telstar Avenue, El Monte,
CA 91731

Tel.No.: 818-575-6800
Fax.No.: 818-575-6685