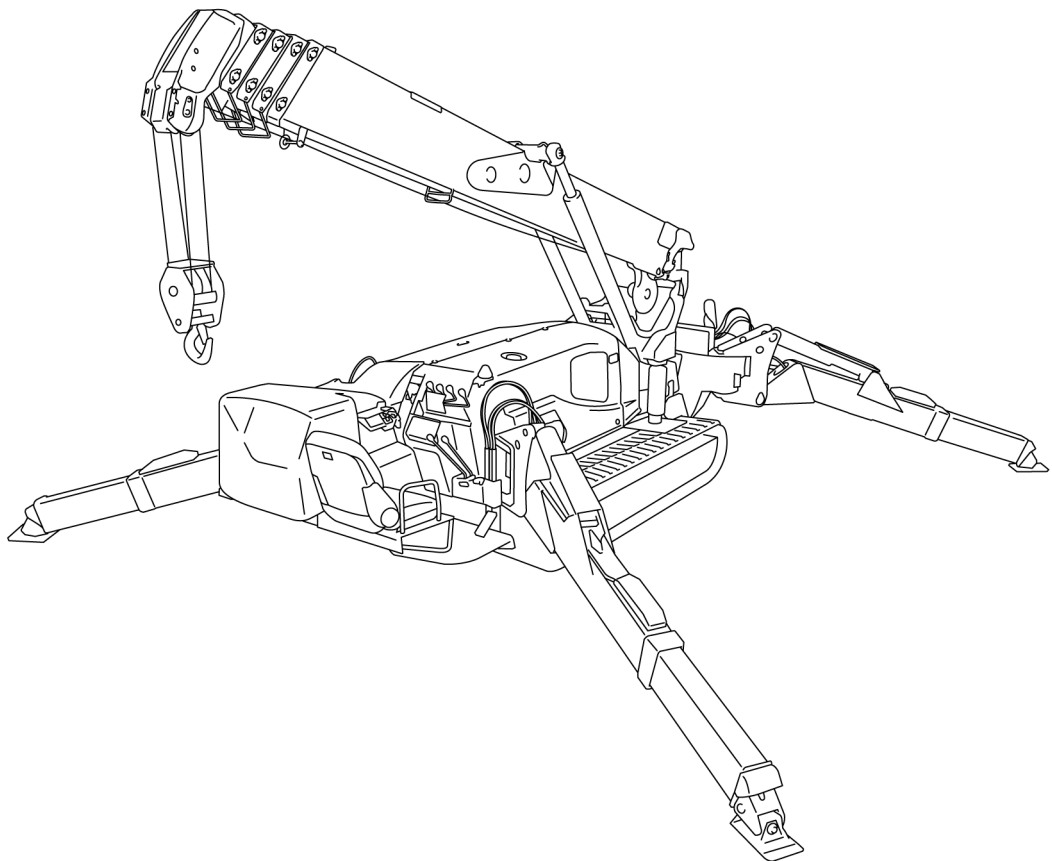




Operation Manual

MC405C-3

Mini-Crawler Crane



 **WARNING**

Improper use of this machine can lead to serious injury.

The operators and maintenance personnel must carefully read this manual and sufficiently understand its contents before operation / inspecting / maintaining the machine.

Keep this manual at hand to read it over anytime.

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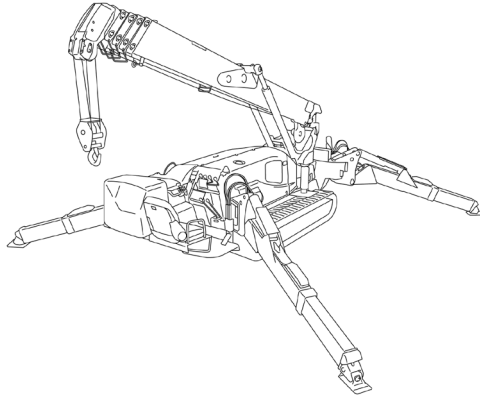
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Section 1

INTRODUCTION

INTRODUCTION

Thank you for purchasing the Maeda Mini Crawler Crane model MC405C-3.

This manual is intended as a guide for the safe and effective use of this machine. This manual describes the procedures for proper operation and maintenance of the machine.

This manual is available in other languages. If a different language manual is necessary, contact your local Maeda distributor for availability.

Save this manual in a designated safe place for future reference. Should this manual be lost or damaged, contact Maeda or a Maeda sales service agency immediately to order a new manual. This manual should remain with this machine upon transfer of the machine to a new owner.

This manual contains information that was available at the time of print.

The contents of this manual, including maintenance specifications, tightening torques, pressure, measuring methods, adjustment values and illustrations, are subject to change upon refinement of the machine, without notice.

Machine maintenance procedures may be updated by Maeda at any time. Always obtain the latest information from Maeda or a Maeda sales service agency before performing maintenance on this machine.

Installation and operation of this machine must comply with all laws and regulations where operated.

Only personnel who have obtained a licence stipulated by the laws and regulations from the place of use are qualified to operate this machine, establish the power connection of the power supply equipment, and inspect and repair the electric system.

Disclaimers:

All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Moreover, because of our continuous product improvement policy, we may modify information, illustrations and/or specifications to explain and/or exemplify a product, service or maintenance improvement. We reserve the right to make any change at any time without notice.

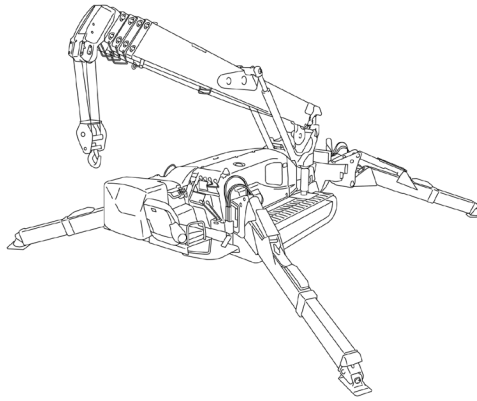
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Section 2

SAFETY

SAFETY DEFINITIONS

Maeda is concerned for your safety and the condition of your mini-crawler crane. Safety statements are one of the primary ways to call your attention to the potential hazards associated with Maeda mini-crawler cranes. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your mini-crawler crane. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if a part needs to be replaced that has a label attached to it, make sure to order the new part and label at the same time.



This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

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

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation which can cause damage to the mini-crawler crane, personal property and/or the environment, or cause the equipment to operate improperly.

SAFETY PRECAUTIONS

There is no substitute for common sense and careful practices. Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation, other bodily injury or death. This information contains general safety precautions and guidelines that must be followed to reduce risk to personal safety. Special safety precautions are listed in specific procedures. Read and understand all of the safety precautions before operating or performing repairs or maintenance. This safety section cannot cover every situation that may occur that is incidental to the use of the machine. Use common sense if you encounter a situation that is not covered to help avoid a hazardous situation.

CAUTION

The safety messages that follow have CAUTION level hazards.

Pre-Operation Hazard



- Never permit anyone to install or operate the machine without proper training.
- Read and understand this *Operation Manual* before operating or servicing the crane to ensure that safe operating practices and maintenance procedures are followed.
- Safety signs and labels are additional reminders for safe operating and maintenance techniques.
- Contact us or our sales service agency for additional training.
- Make sure you are aware of licences, laws and regulations that may be required or in effect where the machine is operated.

 DANGER

The safety messages that follow have **DANGER** level hazards.

Electrocution Hazard

Contact with, or proximity to, an electrically charged power line will result in death or serious injury:

- This unit will not provide protection from contact with, or proximity to, an electrically charged power line when the components at the boom tip are in contact with, or in proximity to, another power line, ground or pole.
- All metal and fiberglass components at the boom tip may become energised.
- Operators must follow safe electrical work practices in accordance with their employers' work rules and applicable government regulations including:
 - Maintain minimum approach distances from electrical power lines.
 - Allow for boom, electric line and load sway.
- If any part of the unit is elevated within the minimum approach distance of an energised conductor, all unauthorised personnel must **KEEP CLEAR**.

 WARNING

The safety messages that follow have **WARNING** level hazards.

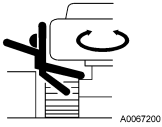
Tip / Boom Failure Hazard

Overloading the crane may cause it to tip over or the boom to fail:

- Before you try to hoist a load, it is essential that you know:
 - Boom angle (use boom angle indicator)
 - Working radius (use operating range chart)
 - Boom length (use rated total load chart)
 - Rated total load (use rated total load chart)
- Never try to hoist a load that exceeds the rated total load. Rated total load is the mass of the load plus weight of the winch lines and the weight of the hook block.
- Always calculate the total load using the rated total load chart before you attempt to hoist the load. Never rely on the moment limiter as the primary means to determine whether a load is safe to lift.
- All the values provided on the rated total load chart assume that the machine is located on a level and firm surface. Always use outrigger pads when you deploy the outriggers on soft or unpaved surfaces.
- The values shown in the operating range chart do not account for boom deflection when the load is raised. Boom deflection will widen the working radius. Use the next largest radius on the operating range chart to account for this.
- Always extend outriggers before lifting load. If the terrain is not completely level and you must adjust the outrigger position to compensate, you must derate the rated total load by the amount indicated for outriggers other than maximum in "RATED TOTAL LOAD CHARTS" on page 3-13. All outrigger monitor lights, other than the boom stowing lamp, must be on.
- Always look at the level gauge when setting the outriggers. Look at the level gauge when making adjustments during operation. Always keep the machine body level when operating.
- Sudden or jerky movement of the travel, crane or outrigger controls can cause the machine to tip over. Always operate these controls smoothly.


WARNING

The safety messages that follow have **WARNING** level hazards.


Crush Hazard

- Keep bystanders away from work area before and during operation.
- Keep all body parts clear of machine components during operation, especially between the boom/post and the boom cylinder, the winch drum and the winch line, the sheaves and the winch line, and between the tracks and the ground.
- Never commence work unless you have clear view of the jobsite or you have a helper to guide you.
- Always lower the load fully to the ground before you leave the operator's position.

Rigging Hazard

- Pay attention to the distance between the hook block and the boom when you raise the hook block or when you extend the boom (as the boom extends, the hook block automatically raises). If the hook block strikes the boom, it could cause the load to fall.
- Never overload the winch line.
- When you are lowering the hook block, make sure there are more than three turns of winch line left on the winch drum when the hook block reaches the final working height.
- Before you hoist the load, make sure the hook block is securely attached to the winch line.
- Make sure the winch line is perpendicular to the ground as you hoist a load to avoid tipping the machine over.
- When you are hoisting a load off the ground, stop hoisting the load momentarily as the load clears the ground to make sure the load is stable.
- Never hoist more than one load at a time.
- When you hoist a long load, such as pipes, clamp the load vertically or secure it at both ends.

Slewing Hazard

- Never slew a load over anyone.
- Always slew the load as smoothly and slowly as possible. Any sudden movement could cause the load to sway and the machine to tip over.
- Keep away from other cranes working in the area to avoid accidental contact.
- Never slew the load over the operator.
- If you need to slew the boom counterclockwise (left), make sure it is raised sufficiently to clear the operator's seat and operator.

Wind Speed Hazard

- If the maximum instantaneous wind speed is 19 to 24 mph (8.5 to 10.7 m/s) or greater, abort the job you are performing and immediately lower the load and secure the boom. This wind speed is called a "fresh wind" on the Beaufort Scale. At that speed, small trees in leaf sway slightly and wavelets form on ponds and lakes.
- Even if the maximum instantaneous wind speed is below 19 to 24 mph (8.5 to 10.7 m/s), be aware that loads with more mass, loads that are hoisted high off the ground and booms that are extended all magnify the effect of the wind on the machine. Stay aware of changing weather conditions.
- If a load is hoisted that has a large surface area, such as a metal plate, the wind can cause the load to sway and subsequently cause the machine to tip over.

High Hydraulic Oil temperature

If hydraulic oil temperature exceeds 80°C hydraulic hoses and seals can be damaged and leak. The leaking hydraulic oil can cause burns. Continuous hook raising and lowering at high speeds and high lifting heights can cause the hydraulic oil to heat up faster.

If hydraulic oil temperature exceeds 80°C stop crane operation and allow the hydraulic oil to cool.

WARNING

The safety messages that follow have **WARNING** level hazards.

Communications Hazard

- Always work with a partner that is on the ground. The partner must keep aware of any hazards in the work area and communicate them to the machine operator.
- Both the machine operator and the partner must decide before work begins on the hand signals that they will use during the job.
- If hand signals are not used, proper radio communications must be set up and tested before the job begins.

Fall Hazard

- Never carry riders on the machine.
- Always use the hand grabs and slip-resistant surfaces when entering or exiting the machine.
- Always maintain three-point contact when entering or exiting the machine.
- Never jump off the machine.

Modification Hazard

Never modify the machine without written consent of the manufacturer. Any modification can affect the safe operation of the machine.

Exposure Hazard

Always wear personal protective equipment, including appropriate clothing, gloves, work shoes, and eye and hearing protection, as required by the task at hand.

**Explosion Hazard**

- While the engine is running or the battery is charging, hydrogen gas is being produced and can be easily ignited. Keep the area around the battery well-ventilated and keep sparks, open flame and any other form of ignition out of the area.
- Always disconnect the negative (-) battery cable before servicing the equipment.
- Do not start the engine by shorting the starter circuit or any other starting method not stated in this manual. Only use the starting procedure as described in this manual to start the engine.
- Never charge a frozen battery. Always slowly warm the battery to room temperature before charging.

Fire and Explosion Hazard

- Diesel fuel is flammable and explosive under certain conditions.
- Never use a shop rag to catch the fuel.
- Wipe up all spills immediately.
- Never refuel with the engine running.
- Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.

Fire Hazard

- Have appropriate safety equipment available. Have all fire extinguishers checked periodically for proper operation and/or readiness.
- Always read and follow safety-related precautions found on containers of hazardous substances like parts cleaners, primers, sealants and sealant removers.
- Undersized wiring systems can cause an electrical fire.

 **WARNING**

The safety messages that follow have **WARNING** level hazards.

Exhaust Hazard



All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisoning:

- Never block windows, vents or other means of ventilation if the crane is operating in an enclosed area.
- Always ensure that all connections are tightened to specifications after repair is made to the exhaust system.

Asbestos Dust Hazard



- Inhalation of air containing asbestos dust may result in lung cancer.
- Make sure you use the appropriate personal protection equipment if you suspect that the worksite may contain asbestos.

- Properly prepare the worksite to prevent asbestos dust from being released into the surrounding environment.

Entanglement / Sever Hazard



- Verify there are no people, obstacles or other equipment near the machine before starting the engine. Sound the horn as a warning before starting the engine.



- Always stop the engine before beginning service.

- If the engine must be serviced while it is operating, remove all jewelry, tie back long hair and keep hands, other body parts and clothing away from moving/rotating parts.

- Verify that all machine guards and covers are attached properly to the machine before starting the engine. Do not start the engine if any guards or covers are not properly installed on the machine.
- Always turn the Starter Switch to the OFF position after operation is complete and remove the key from the switch. Keep the key in your possession when the machine is not operating.
- Attach a “Do Not Operate” tag near the Key Switch while performing maintenance on the equipment.
- Never operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the warning signals.
- Always start the engine or operate the controls while you are seated in the operator’s seat.

Alcohol and Drug Hazard



Never operate the engine while under the influence of alcohol or drugs, or when ill.

Piercing Hazard



- Avoid skin contact with high-pressure hydraulic fluid or diesel fuel spray caused by a hydraulic or fuel system leak such as a broken hydraulic hose or fuel injection line. High-pressure hydraulic fluid or fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure hydraulic fluid or fuel spray, obtain prompt medical treatment.
- Never check for a hydraulic fluid or fuel leak with your hands. Always use a piece of wood or cardboard. Have your authorised Maeda dealer or distributor repair the damage.

Flying Object Hazard



Always wear eye protection when cleaning the machine with compressed air or high-pressure water. Dust, flying debris, compressed air, pressurised water or steam may injure your eyes.

WARNING

The safety messages that follow have **WARNING** level hazards.

Coolant Hazard

Wear eye protection and rubber gloves when handling engine coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.

Burn Hazard

- Some of the engine surfaces become very hot during operation and shortly after shutdown.

- Keep hands and other body parts away from hot engine surfaces.
- Handle hot components with heat-resistant gloves.

Working Under Machine Hazard

- Park the machine on a flat, firm and level surface.
- Fully retract and lower the boom.
- Extend all outriggers to the maximum position so the tracks clear the ground.
- Place jack stands of sufficient strength in strategic locations under the machine to help support it during maintenance.

Working Above Machine Hazard

- Always maintain three-point contact as you climb on or off an elevated work surface.
- Do not jump from the elevated work surface.
- Do not climb on the boom, outrigger or other machine surface.

CAUTION

The safety messages that follow have **CAUTION** level hazards.

Poor Lighting Hazard

Ensure that the work area is adequately illuminated. Always install wire cages on portable safety lights.

Tool Hazard

Always use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.

Slip Hazard

- Immediately clean up any spilled liquid on the shop floor.
- Clean up accumulated dirt and debris on the shop floor at the end of each shift.

Communications Hazard

- Follow the policies and instructions established by your employer and authorities having jurisdiction. The policies have been developed to protect you and your co-workers from needless personal injury.
- Post signs to alert people that are not authorised to be in the shop that they must stay out of the work area.
- If you must run the engine during maintenance procedures, make sure you have a helper to keep bystanders clear of the machine and make observations of moving parts as requested by the operator.

NOTICE**The safety messages that follow have NOTICE level hazards.**

Any part which is found defective as a result of inspection or any part whose measured value does not satisfy the standard or limit must be replaced.

Always tighten components to the specified torque. Loose parts can cause equipment damage or cause it to operate improperly.

Only use replacement parts specified. Other replacement parts may affect warranty coverage.



Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.

Clean all accumulated dirt and debris away from the body of the machine and its components before you inspect the machine or perform preventive maintenance procedures or repairs. Operating a machine with accumulated dirt and debris will cause premature wear of machine components. Accumulated dirt and debris also hinders effective machine inspection.

Retrieve any tools or parts that may have dropped inside of the machine to avoid improper machine operation.

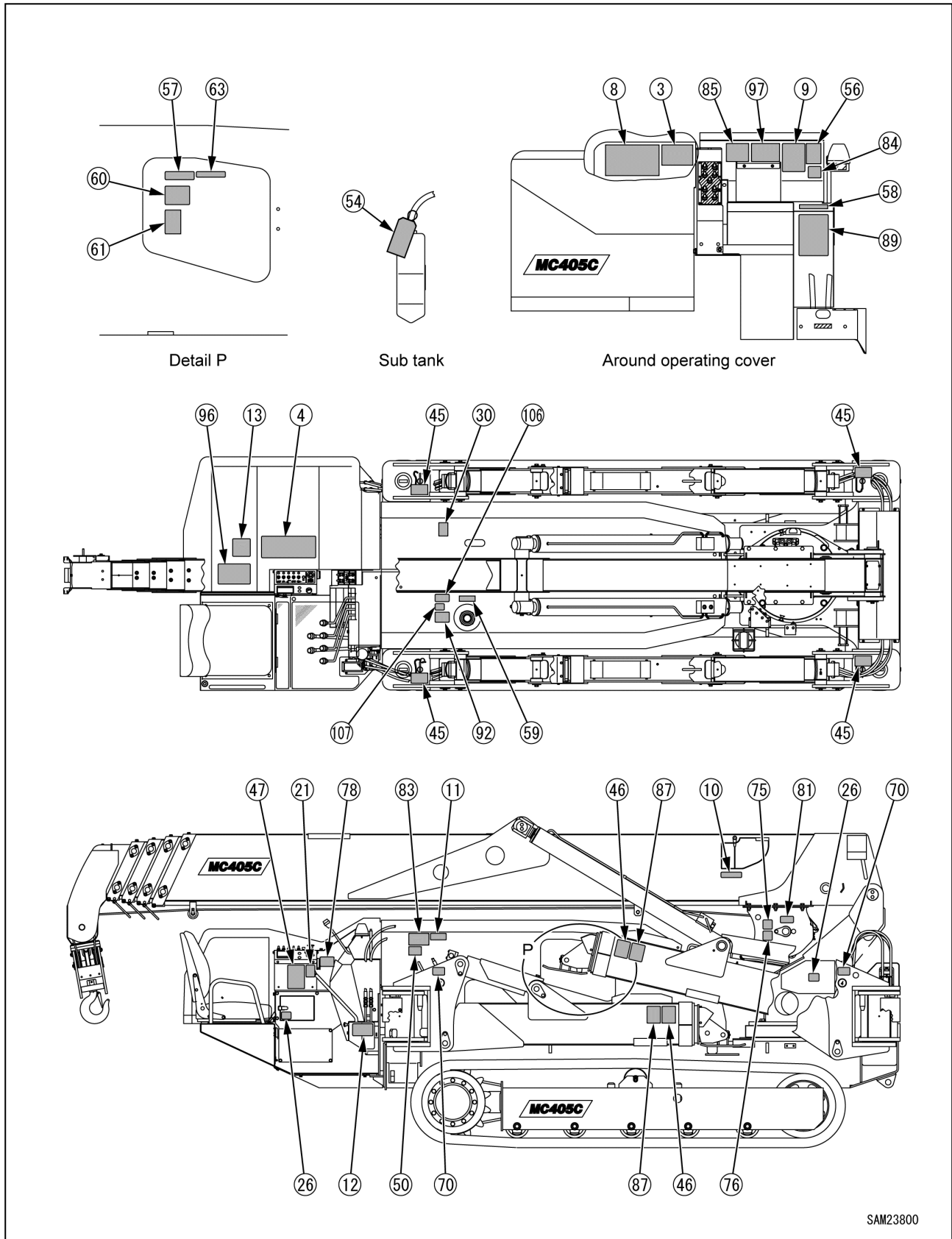
Never dispose of hazardous materials by dumping them into a sewer, on the ground, or into groundwater or waterways.

If any alert indicator illuminates during machine operation, stop the engine immediately. Determine the cause and repair the problem before continuing to operate the machine. Check the following specifications and items before using this machine:

- Maintenance inspection records for completion of periodic inspections and service
- Crane capacity
- Crane maintenance condition
- Problems or failures unique to the crane
- Operating condition of the brakes, clutch and other operating controls
- Condition and operation of lighting, including rotating lights
- Condition and operation of hook, winches, boom, outriggers and related components

SAFETY LABEL LOCATIONS

Machine Body



SAM23800

Fig. 2-1

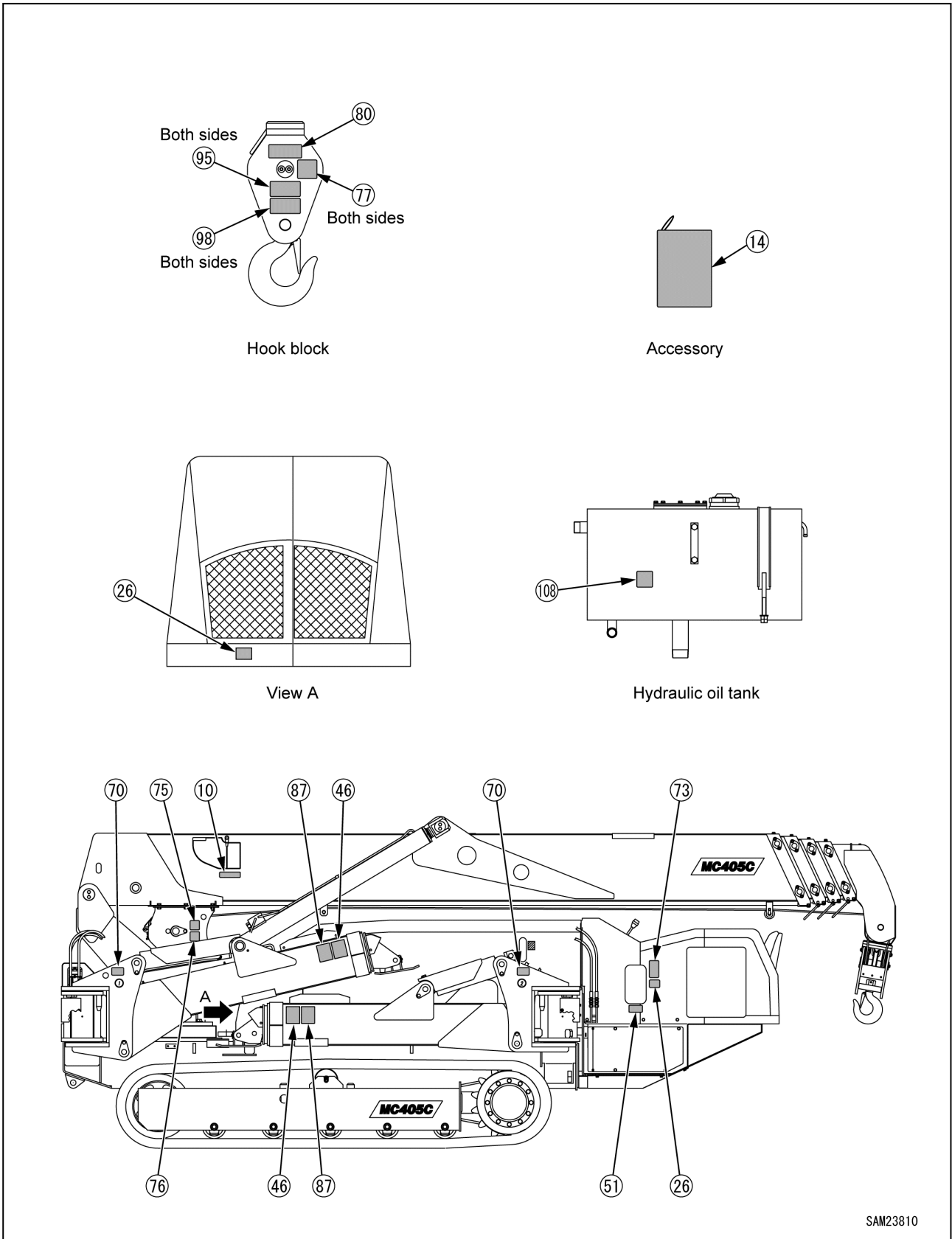
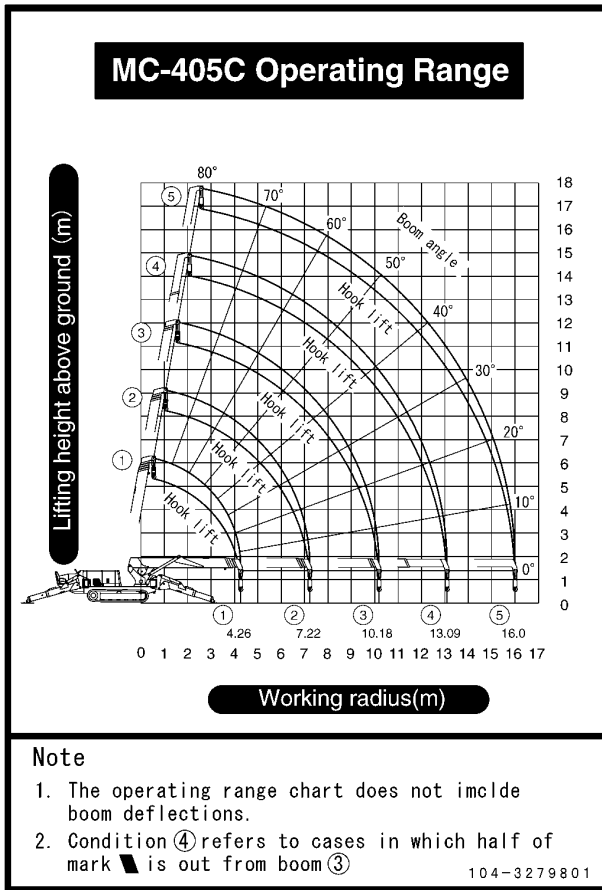


Fig. 2-2



[3] 104-3279801

MC405C-3 Rated Total Load Chart																																																																																												
With outrigger extended to maximum	With outrigger extended to medium	With outrigger extended to minimum																																																																																										
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Notes:
 1. Above Rated Total Load Chart is based on level, hard ground. Be careful as your crane may tip over depending on the surface conditions where outrigger is placed.
 2. The Rated Total Load Chart is based on practical working radius which includes a bend due to loading. Reckless crane work is dangerous even if the load may be within the range shown in this Chart.
 3. Depending on outrigger extension or rounding, tipping over may occur even by lifting a rated load.
 4. The rated load includes the weight of hook block (50kg).

104-3433200

[4-A] 104-3433200

MC405C-3 Rated Total Load Chart			Pattern B																																																																																										
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Notes:
 1. Above Rated Total Load Chart is based on level, hard ground. Be careful as your crane may tip over depending on the surface conditions where outrigger is placed.
 2. The Rated Total Load Chart is based on practical working radius which includes a bend due to loading. Reckless crane work is dangerous even if the load may be within the range shown in this Chart.
 3. Depending on outrigger extension or rounding, tipping over may occur even by lifting a rated load.
 4. The rated load includes the weight of hook block (30kg).

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[4-B] 104-3433300

MC405C-3 Rated Total Load Chart			Pattern C																																																																																										
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Notes:
 1. Above Rated Total Load Chart is based on level, hard ground. Be careful as your crane may tip over depending on the surface conditions where outrigger is placed.
 2. The Rated Total Load Chart is based on practical working radius which includes a bend due to loading. Reckless crane work is dangerous even if the load may be within the range shown in this Chart.
 3. Depending on outrigger extension or rounding, tipping over may occur even by lifting a rated load.
 4. The rated load includes the weight of hook block (30kg).

104-3433400

[4-C] 104-3433400

CHARACTERISTICS OF PERFORMANCE

(1) Even with same working radius, lifting capability varies depending on the stage of boom in use. Further, slight change in working radius causes great change in the load that can be lifted.
 (2) Lifting capacity of crane reduces as its working radius increases.
 (3) Lifting capability varies according to the extension of outrigger (maximum medium or minimum).
 (4) Stability changes depending on the direction of boom (forward, lateral or backward).

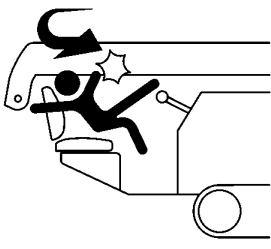
GENERAL RULES FOR USING CRANE

(1) Before work
 1. Read the instruction manual carefully before starting to use your crane.
 2. Always perform the prior-to-work inspection.
 3. For crane work be sure to ground the outriggers so that the machine is in level. Make sure all the four outriggers are grounded.
 4. Outriggers should be set up to maximum extension in principle.
 5. With the outriggers grounded properly, rubber tracks should be lifted off the ground by 50mm.
 6. For setting up the outriggers, insert the rotary position pins securely.
 Use care not to catch your finger in the hole.
 7. Check to see the over-hoist alarm system works properly (that buzzer sounds and hoist motion stops).
 (2) During work
 1. Stable lifting load varies according to outrigger setting and ground condition. Crane work with the outrigger footings lifted off the ground is dangerous and should not to be performed. Be sure to observe the Rated Total Load Chart.
 2. Do not perform overloaded operation which may invite tipping over or other damage to the crane.
 3. Crane work with engine running at high speed is dangerous.
 4. Use care not to allow the load to sway during crane work.
 5. Dragging load laterally, longitudinally or lifting it at angle may damage the crane and should be avoided.
 6. Do not leave your crane with load lifted.
 7. Do not allow anyone to enter under the boom during crane operation.
 8. While crane acceleration button is depressed, crane motion will be faster than normal and particular care should be used.
 (3) During travel
 1. During travel, boom and hook should be stowed away respectively.
 2. Be sure to slow down for making turn or traveling over bad road.
 3. For parking on slope, be sure to apply checks.
 4. For traveling on slope or ramp boards, be sure to position your carrier so that its operator seat comes to higher end.
 (4) After work
 Upon completion of work, be sure to turn OFF the main switch (key switch).
 (5) Inspection
 1. Prior-to-work inspection and monthly as well as annual periodical inspection should be carried out voluntarily.
 2. Any defect should be corrected whenever it is found through inspection.
 3. Replacement of consumables and lubrication, its replenishment or replacement should be carried out in accordance with the standards as provided in instruction manual or the like.

349-3195100

[8] 349-3195100

! DANGER



Counterclockwise swing prohibited with boom fully lowered.
 Whenever operator seat is manned, raise the boom to safe angle before making counterclockwise swing.

349-4420700

[9] 349-4420700

MC405C-3

Overall load at maximum working radius with outriggers extended maximum.
16.00 m × 210 kg

104-4753500

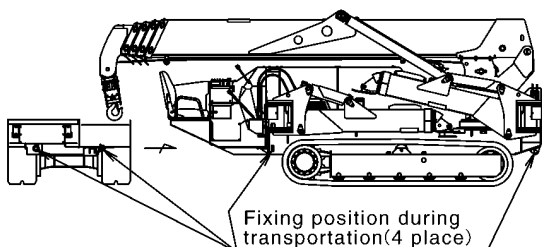
[10] 104-4753500 (2 places)

MC405C-3 MACHINE WEIGHT	
Component	Weight
Main Unit	5600 kg
Electric Unit	+150 kg
850kg Searcher Hook	+30 kg
Fly-Jib	+150 kg

104-4760600

[11] 104-4760600

Fixing position during transportation

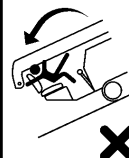


Fixing position during transportation (4 place)

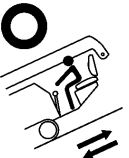
104-4548600

[12] 104-4548600

! WARNING




For traveling on slope or ramp boards, be sure to position your carrier so that its operator seat comes to higher end. Otherwise, should the carrier slips down, injury to the operator may result.



Caution for traveling:
 1. When traveling, be sure to stow away outriggers as well as hook.
 2. Be sure to slow down for making turn or traveling over bad road.
 3. For standing or parking your carrier on slope, be sure to engage checks.

! CAUTION



Do not traverse or make turn on slope as it can result in tipping over, Make a detour to go around the slope for safety.

349-4421100

[13] 349-4421100

CHARACTERISTICS OF PERFORMANCE

(1) Even with same working radius, lifting capability varies depending on the stage of boom in use. Further, slight change in working radius causes great change in the load that can be lifted.
 (2) Lifting capacity of crane reduces as its working radius increases.
 (3) Lifting capability varies according to the extension of outrigger (Maximum, medium or minimum).
 (4) Stability changes depending on the direction of boom (forward, lateral or backward).

GENERAL RULES FOR USING CRANE

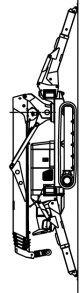
(1) Before work
 1. Read the instruction manual carefully before starting to use your crane.
 2. Always perform the prior-to-work inspection.
 3. For crane work, be sure to ground the outriggers so that the machine is in level.
 Make sure all the four outriggers are rounded.
 4. Outriggers should be set up to maximum extension in principle.
 5. With the outriggers rounded properly, rubber tracks should be lifted off the ground by 50mm.
 6. For setting up the outriggers, insert the rotary position pins securely.
 Use care not to catch your finger in the hole.
 7. Check to see the over-hoist alarm system works properly (that buzzer sounds and hoist motion stops).
 (2) During work
 1. Stable lifting load varies according to outrigger setting and ground condition. Crane work with the outrigger footings lifted off the ground is dangerous and should not be performed. Be sure to observe the Rated Total Load Chart.
 2. Do not perform overloaded operation which may invite tipping over or other damage to the crane.
 3. Crane work with engine running at high speed is dangerous.
 4. Use care not to allow the load to sway during crane work.
 5. Bracing load laterally, longitudinally or lifting it at angle may damage the crane and should be avoided.
 6. Do not leave your crane with load lifted.
 7. Do not allow anyone to enter under the boom during crane operation.
 8. While crane acceleration button is depressed, crane motion will be faster than normal and particular care should be used.
 (3) During travel
 1. During travel, boom and hook should be stowed away respectively.
 2. Be sure to slow down for making turn or traveling over bad road.
 3. For parking on slope, be sure to apply chocks.
 4. For traveling on slope or ramp boards, be sure to position your carrier so that its operator seat comes to higher end.
 (4) After work
 Upon completion of work, be sure to turn OFF the main switch (key switch).
 (5) Inspection and service
 1. Prior-to-work inspection and monthly as well as annual periodical inspection should be carried out voluntarily.
 2. Any defect should be corrected whenever it is found through inspection.
 3. Replacement of consumables and lubrication, its replenishment or replacement should be carried out in accordance with the standards as provided in instruction manual or the like.

Miscellaneous

(1) Improper usage of crane may cause serious accident including death or severe injury.
 (2) Before operating the crane, be sure to read instruction manual and learn its safe operating procedure.

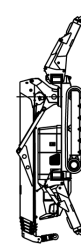
MINI-CRAWLER CRANE MC405C-3
MC405C-3 Rated Total Load Chart

With outrigger extended to maximum



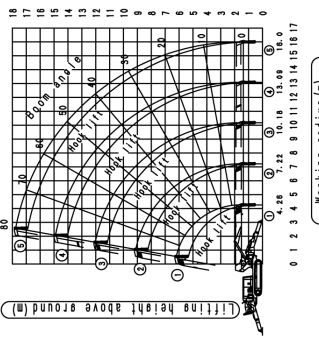
Boom 1 and Boom 1/2	2.7m	3.5	4.0	5.0	6.0	7.0	7.0	7.22
Rated total	3830	3030	2580	2030	1680	1380	1380	1330
Rated total	3830	3030	2580	2030	1680	1430	1160	1120
Boom 1/2/3	When boom 3 is extended to any extent whatever, crane work shall be carried out with the performance of boom configuration of 1/2/3/5.							
Rated total	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.18
Rated total	3030	2580	2030	1680	1380	1130	880	740
Rated total	3030	2580	1680	1430	1130	880	740	490
Boom 1/2/3/4	When boom 4 is extended to any extent whatever, crane work shall be carried out with the performance of boom configuration of 1/2/3/4.							
Rated total	4.5	5.0	6.0	7.0	8.0	9.0	10.18	11.20
Rated total	2230	1830	1630	1330	1080	880	730	550
Rated total	2230	1830	1630	1330	1080	880	730	550
Boom 1/2/3/4/5	When boom 5 is extended to any extent whatever, crane work shall be carried out with the performance of boom configuration of 1/2/3/4/5.							
Rated total	5.0	5.5	6.0	7.0	8.0	9.0	10.18	11.20
Rated total	1130	880	910	730	630	550	480	330
Rated total	1130	880	910	730	630	550	480	330

With outrigger extended to minimum



Boom 1 and Boom 1/2	2.7m	3.5	4.0	5.0	6.0	7.0	7.0	7.22
Rated total	3830	3030	2580	1680	1180	930	780	780
Rated total	3830	3030	2580	1680	1180	930	780	780
Boom 1/2/3	When boom 3 is extended to any extent whatever, crane work shall be carried out with the performance of boom configuration of 1/2/3/5.							
Rated total	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.18
Rated total	3030	2580	1680	1180	860	730	580	400
Rated total	3030	2580	1680	1180	860	730	580	400
Boom 1/2/3/4	When boom 4 is extended to any extent whatever, crane work shall be carried out with the performance of boom configuration of 1/2/3/4.							
Rated total	4.5	5.0	6.0	7.0	8.0	9.0	10.18	11.20
Rated total	2230	1830	1630	1330	1080	880	730	550
Rated total	2230	1830	1630	1330	1080	880	730	550
Boom 1/2/3/4/5	When boom 5 is extended to any extent whatever, crane work shall be carried out with the performance of boom configuration of 1/2/3/4/5.							
Rated total	5.0	5.5	6.0	7.0	8.0	9.0	10.18	11.20
Rated total	1130	880	910	730	630	550	480	330
Rated total	1130	880	910	730	630	550	480	330

MC405C-3 Operating Range



Working radius (m)

Note

- The operating range chart does not include boom deflections.
- Condition ④ refers to cages in which half of mark ④ is out from boom ④.

[14-A] 104-2209900

CHARACTERISTICS OF PERFORMANCE

(1) Even with same working radius, lifting capability varies depending on the stage of boom in use. Further, slight change in working radius causes great change in the load that can be lifted.

(2) Lifting capacity of crane reduces as its working radius increases.

(3) Lifting capability varies according to the extension of outrigger (maximum, medium or minimum).

(4) Stability changes depending on the direction of boom (forward, lateral or backward).

GENERAL RULES FOR USING CRANE

(1) Before work

1. Read the instruction manual carefully before starting to use your crane.
2. Always perform the prior-to-work inspection.
3. For crane work, be sure to ground the outriggers so that the machine is in level. Make sure all the four outriggers are grounded.
4. Outriggers should be set up to maximum extension in principle.
5. With the outriggers grounded properly, rubber tracks should be lifted off the ground by 50mm.
6. For setting up the outriggers, insert the rotary position pins securely.
7. Use care not to catch your finger in the hole.
8. Check to see the over-hoist alarm system works properly (that buzzer sounds and hoist motion stops).

(2) During work

1. Stable lifting load varies according to outrigger setting and ground condition. Crane work with the outrigger footings lifted off the ground is dangerous and should not to be performed; be sure to observe the Rated Total Load Chart.
2. Do not perform overloaded operation which may invite tipping over or other damage to the crane.
3. Crane work with engine running at high speed is dangerous.
4. Use care not to allow the load to sway during crane work.
5. Draining load laterally, longitudinally or lifting it at angle may damage the crane and should be avoided.
6. Do not leave your crane with load lifted.
7. Do not allow anyone to enter under the boom during crane operation.
8. While crane acceleration button is depressed, crane motion will be faster than normal and particular care should be used.

(3) During travel

1. During travel, boom and hook should be stowed away respectively.
2. Be sure to slow down for making turn or traveling over bad road.
3. For parking on slope, be sure to apply checks.
4. For traveling on slope or ramp boards, be sure to position your carrier so that its operator seat comes to higher end.

(4) After work

1. Upon completion of work, be sure to turn OFF the main switch (key switch).
2. Inspection and service

1. Prior-to-work inspection and monthly, as well as annual periodical inspection should be carried out voluntarily.
2. Any defect should be corrected whenever it is found through inspection.
3. Replacement of consumables and lubrication, its replenishment or replacement should be carried out in accordance with the standards as provided in instruction manual or the like.

Miscellaneous

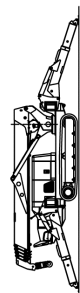
(1) Improper usage of crane may cause serious accident including death or severe injury.

(2) Before operating the crane, be sure to read instruction manual and learn its safe operating procedure.

MINI-CRAWLER CRANE MC405C-3 Pattern B


MC405C-3 Rated Total Load Chart

With outrigger extended to maximum



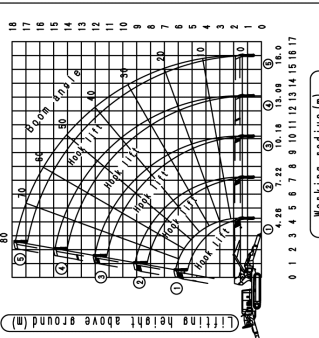
Boom 1 and Boom 1P	2. 1.8	3. 2.8	4. 0	5. 0	6. 0	7. 0	7. 22	
Rated total (t)	3830	3030	2480	1880	1660	1380	1330	
Rated total (t)	3830	3030	2480	1880	1660	1380	1330	
Boom 1P23	When boom 2 is extended to any extent, minimum crane work should be carried out with the performance of boom configuration of 12934.							
Rated total (t)	3. 2.8	4. 0	5. 0	6. 0	7. 0	8. 0	9. 0	
Rated total (t)	3030	2480	1880	1380	1130	880	560	
Boom 1P23P4	When boom 4 is extended to any extent, minimum crane work should be carried out with the performance of boom configuration of 12934.							
Rated total (t)	4. 0	4. 5	5. 0	6. 0	7. 0	8. 0	9. 0	
Rated total (t)	2230	1830	1500	1180	880	730	430	
Boom 1P23P4P5	When boom 5 is extended to any extent, minimum crane work should be carried out with the performance of boom configuration of 12934.							
Rated total (t)	5. 0	5. 8	6. 7	8. 0	9. 0	10. 0	11. 0	
Rated total (t)	1130	880	730	550	440	340	260	

With outrigger extended to minimum



Boom 1 and Boom 1P	2. 1.8	3. 2.8	4. 0	5. 0	6. 0	7. 0	7. 22	
Rated total (t)	3830	3030	2480	1880	1660	1380	780	
Rated total (t)	3830	3030	2480	1880	1660	1380	780	
Boom 1P23	When boom 2 is extended to any extent, minimum crane work should be carried out with the performance of boom configuration of 12934.							
Rated total (t)	3. 2.8	4. 0	5. 0	6. 0	7. 0	8. 0	10. 18	
Rated total (t)	3030	2480	1880	1180	880	730	580	
Boom 1P23P4	When boom 4 is extended to any extent, minimum crane work should be carried out with the performance of boom configuration of 12934.							
Rated total (t)	4. 0	4. 5	5. 0	6. 0	7. 0	8. 0	10. 18	
Rated total (t)	2230	1830	1500	1180	880	550	310	
Boom 1P23P4P5	When boom 5 is extended to any extent, minimum crane work should be carried out with the performance of boom configuration of 12934.							
Rated total (t)	5. 0	5. 8	6. 7	8. 0	9. 0	10. 0	11. 0	
Rated total (t)	1130	880	730	550	420	330	240	

MC405C-3 Operating Range



Note

1. The operating range chart does not include boom deflections.
2. Condition ① refers to cases in which half of mark ① is out from boom ①.

104-2210200

[14-B] 104-2210200

CHARACTERISTICS OF PERFORMANCE

(1) Even with same working radius, lifting capability varies depending on the stage of boom in use. Further, slight change in working radius causes great change in the load that can be lifted.

(2) Lifting capacity of crane reduces as its working radius increases.

(3) Lifting capability varies according to the extension of outrigger, maximum, medium or minimum.

(4) Stability changes depending on the direction of boom (forward, lateral or backward).

GENERAL RULES FOR USING CRANE

(1) Before work

1. Read the instruction manual carefully before starting to use your crane.
2. Always perform the prior-to-work inspection.
3. For crane work, be sure to ground the outriggers so that the machine is in level. Make sure all the four outriggers are grounded.
4. Outriggers should be set up to maximum extension in principle.
5. With the outriggers grounded properly, rubber tracks should be lifted off the ground by 50mm.
6. For setting up the outriggers, insert the rotary position pins securely.
7. Use care not to catch your finger in the hole.
8. Check to see the over-hoist alarm system works properly (that buzzer sounds and hoist motion stops).

(2) During work

1. Stable lifting load varies according to outrigger setting and ground condition. Crane work with the outrigger footings lifted off the ground is dangerous and should not to be performed; be sure to observe the Rated Total Load Chart.
2. Do not perform overloaded operation which may invite tipping over or other damage to the crane.
3. Crane work with engine running at high speed is dangerous.
4. Use care not to allow the load to sway during crane work.
5. Draining load laterally, longitudinally or lifting it at angle may damage the crane and should be avoided.
6. Do not leave your crane with load lifted.
7. Do not allow anyone to enter under the boom during crane operation.
8. While crane acceleration button is depressed, crane motion will be faster than normal and particular care should be used.

(3) During travel

1. During travel, boom and hook should be stowed away respectively.
2. Be sure to slow down for making turn or traveling over bad road.
3. For parking on slope, be sure to apply checks.
4. For traveling on slope or ramp boards, be sure to position your carrier so that its operator seat comes to higher end.

(4) After work

1. Upon completion of work, be sure to turn OFF the main switch (key switch).
2. Inspection and service

1. Prior-to-work inspection and monthly, as well as annual periodical inspection should be carried out voluntarily.
2. Any defect should be corrected whenever it is found through inspection.
3. Replacement of consumables and lubrication, its replenishment or replacement should be carried out in accordance with the standards as provided in instruction manual or the like.

Miscellaneous

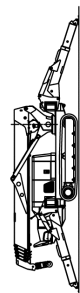
(1) Improper usage of crane may cause serious accident including death or severe injury.

(2) Before operating the crane, be sure to read instruction manual and learn its safe operating procedure.

MINI-CRAWLER CRANE MC405C-3 Pattern C

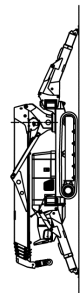
MC405C-3 Rated Total Load Chart

With outrigger extended to maximum




Boom 1 and Boom 1P	2.0	2.63	3.0	4.0	5.0	6.0	7.0	7.22
Working radius (m)	2.0	2.63	3.0	4.0	5.0	6.0	7.0	7.22
Rated total load (kN)	3830	3030	2650	1980	1590	1330	1130	1100

With outrigger extended to medium



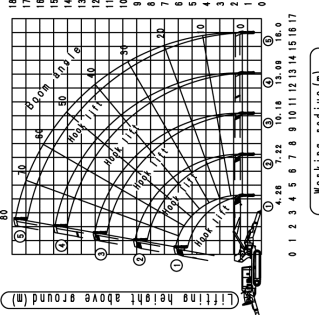
Boom 1 and Boom 1P	2.0	2.63	3.0	4.0	5.0	6.0	7.0	7.22
Working radius (m)	2.0	2.63	3.0	4.0	5.0	6.0	7.0	7.22
Rated total load (kN)	3830	3030	2650	1980	1590	1330	1130	1100

With outrigger extended to minimum



Boom 1 and Boom 1P	2.0	2.63	3.0	4.0	5.0	6.0	7.0	7.22
Working radius (m)	2.0	2.63	3.0	4.0	5.0	6.0	7.0	7.22
Rated total load (kN)	3830	3030	2650	1980	1590	1180	930	760

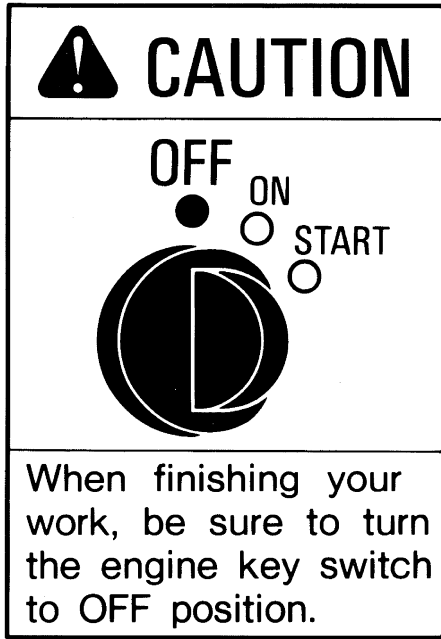
MC405C-3 Operating Range



Note

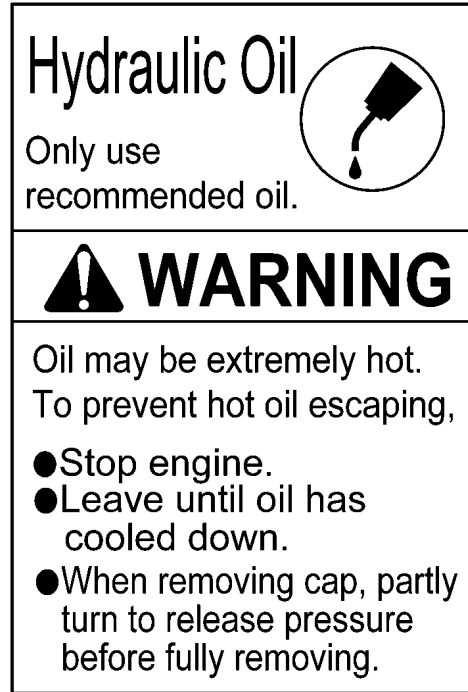
1. The operating range chart does not include boom deflections.
2. Condition ① refers to cages in which half of mark ① is off from boom ①.

[14-C] 104-2210300



349-4421400

[21] 349-4421400

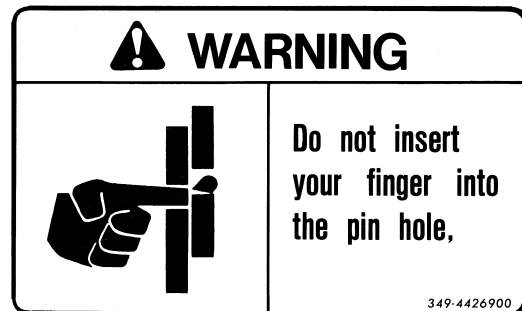


104-4550800

[30] 104-4550800



[26] 350-4539700 (4 places)

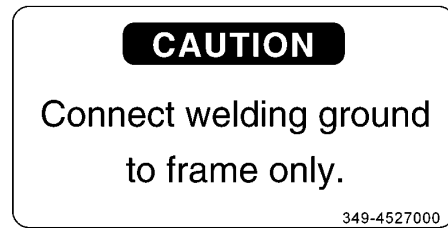


349-4426900

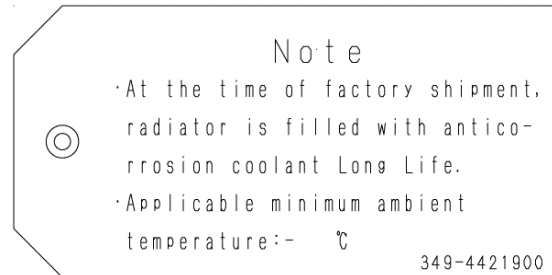
[45] 349-4426900 (4 places)



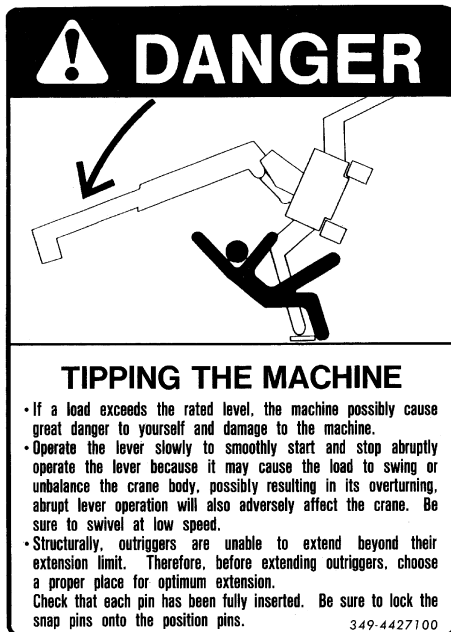
[46] 349-4427000 (4 places)



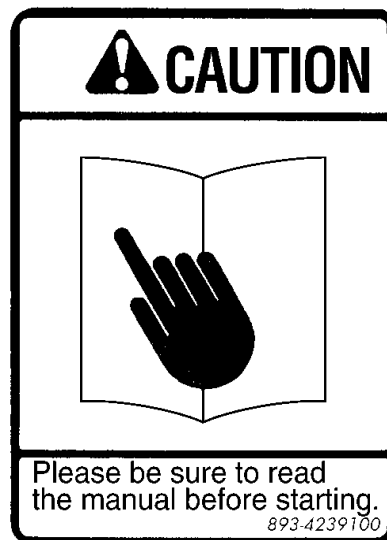
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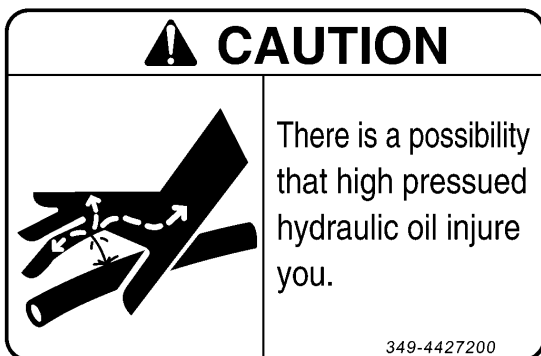
[54] 349-4421900



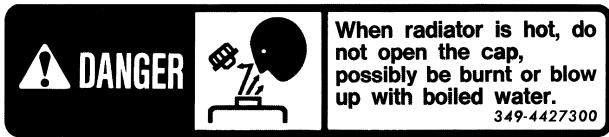
[47] 349-4427100



[56] 893-4239100



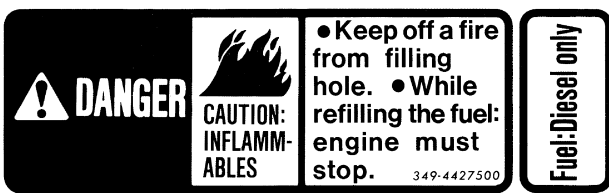
[50] 349-4427200



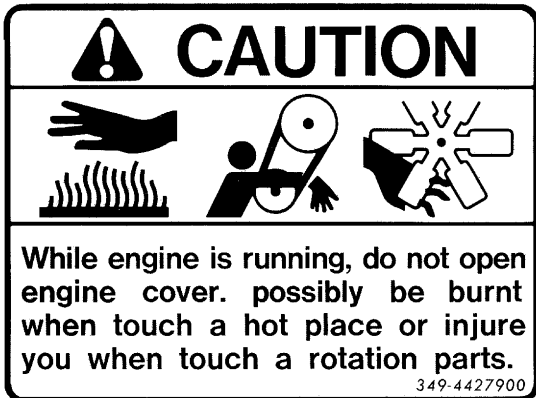
[57] 349-4427300



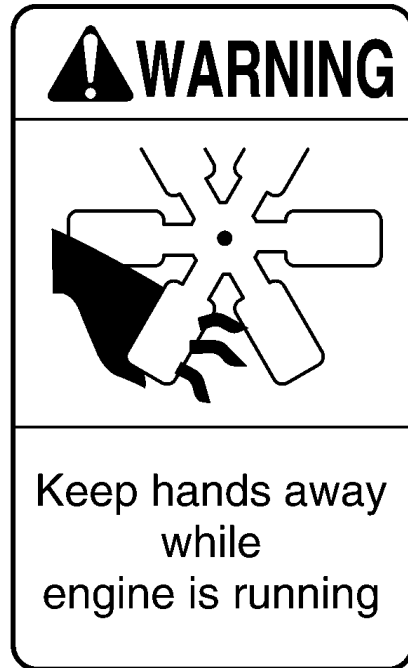
[58] 349-4427400



[59] 349-4427500



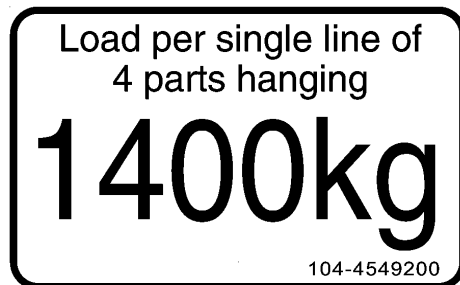
[60] 349-4427900



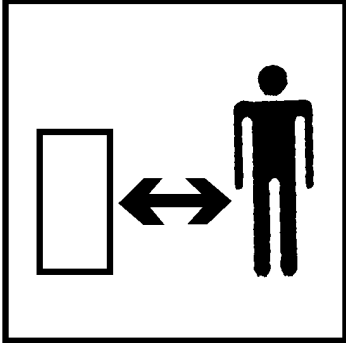
[61] 349-4526900



[63] 349-4427800

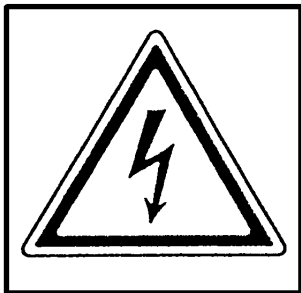


[70] 104-4549200 (4 places)



349-4422000

[73] 349-4422000



553-4267300

[75] 553-4268000 (2 places)



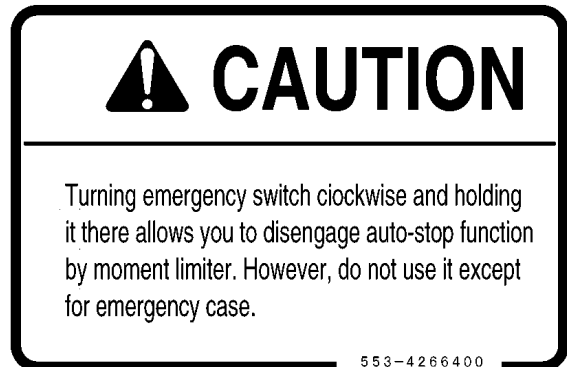
553-4267500

[76] 553-4267500 (2 places)

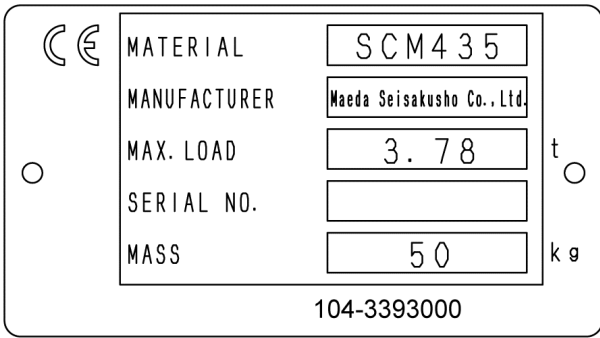


553-4267400

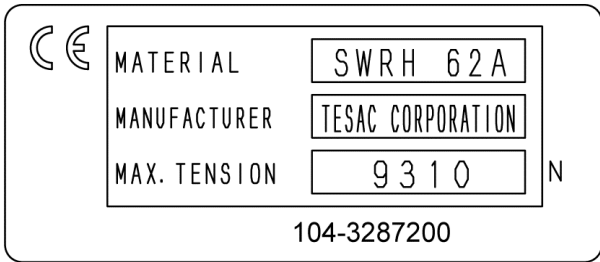
[77] 553-4267400 (2 places)



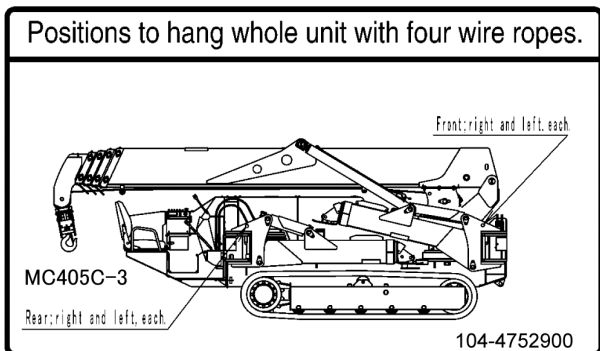
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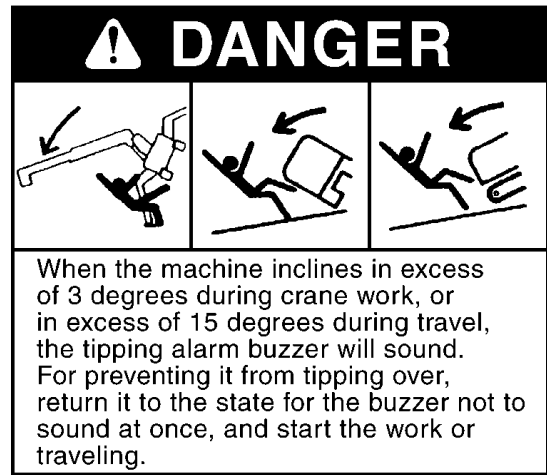
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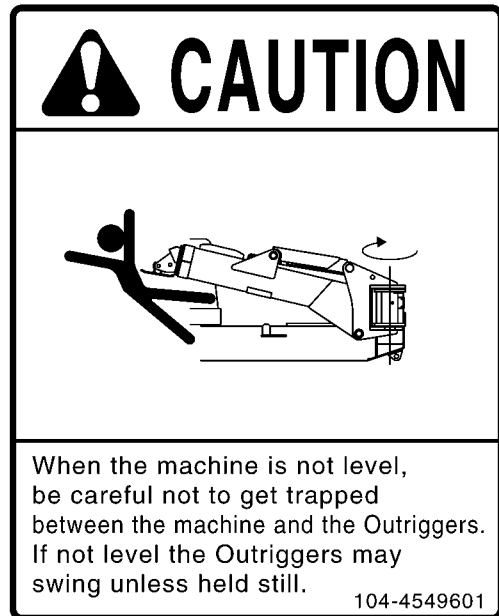
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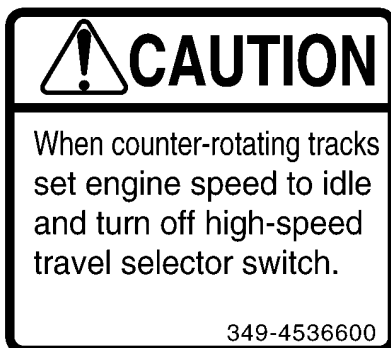
[83] 104-4752900



[85] 353-4488600



[87] 104-4549601 (4 places)



[84] 349-4536600

Pick & Carry Duties Operating Range

Working radius (m)	Lift height (m) at 70°	Lift height (m) at 57°
0	0	0
1.0	~5.5	~4.5
2.0	~4.5	~3.5
3.0	~3.5	~2.5

Lift above ground (m) (y-axis)

Working radius(m) (x-axis)

500kg (load capacity)

70° and **57°** (boom angles)

1.32 and **2.26** (radius markers)

⚠ DANGER

When using pick&carry duties, follow these rules to prevent machine from tipping over.

1. Do not travel on a slope, soft ground or uneven ground.
2. Do not slow. Avoid any sharp movements when stopping or starting.
3. When traveling with a load, keep it as low to the ground as possible.
4. If the load swings, stop traveling until the load is still.

104-4569800

[89] 104-4569800

DIESEL

- Drain water from tank in every 50 hours.
- For specified fuel, see Operation Manual.

553-4267100

[92] 553-4267100

(4FALLS)

3.8t

104-4557900

[95] 104-4557900 (2 places)

⚠ DANGER

Moment Limiter Display
Location of mode selector switch

CRUSH/TIPPING HAZARD

Before operation, always verify the actually used number of wire falls (or parts of line) and operating mode, and then keep pressing the mode selector switch of the moment limiter for 2 seconds or more. The setting of the mode changes. To shift to each mode, each time press the switch for 2 seconds or more.

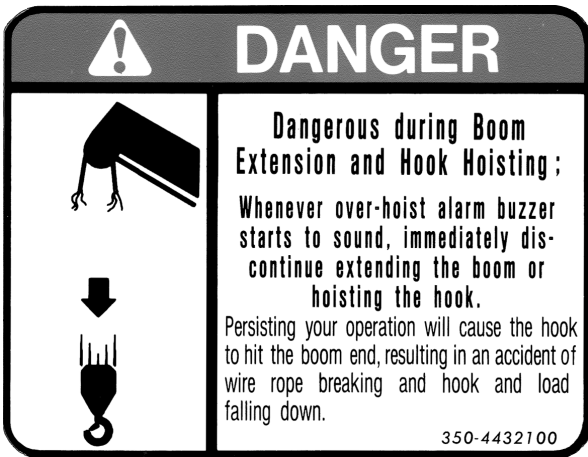
MODE (Wire fall or parts of line indicator LED combination)

Single fall / 1 Part of line	LED" 1" lits only
2 falls / 2 Part of line	LED" 2" lits only
4 falls / 4 Part of line	LED" 4" lits only
Searcher hook (optional equipment)	all LEDs lit
Fly-jib (optional equipment)	LED" 1" flashes only

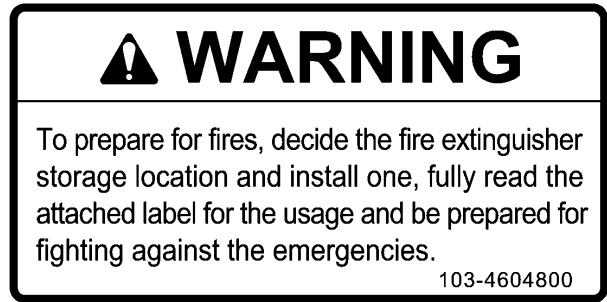
Moment limiter doesn't work properly if actual operating mode and mode selector switch do not match.
There is optional equipment that cannot be selected according to the model.

104-3327800

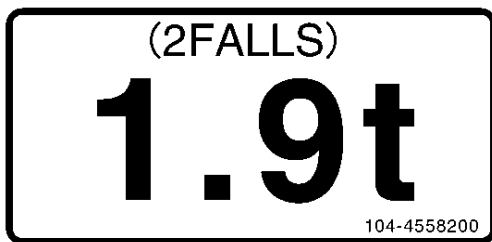
[96] 104-3327800



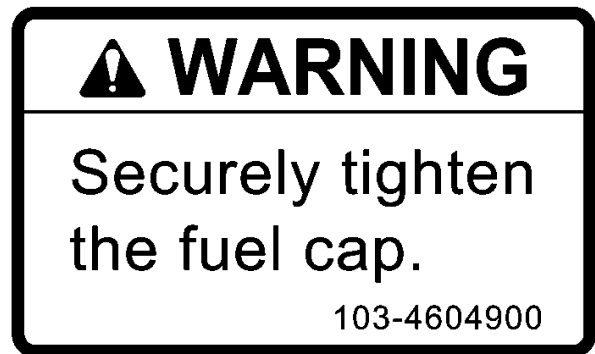
[97] 350-4432100



[106] 103-4604800



[98] 104-4558200 (2 places)



[107] 103-4604900



[108] 553-4267700

Remote Control System

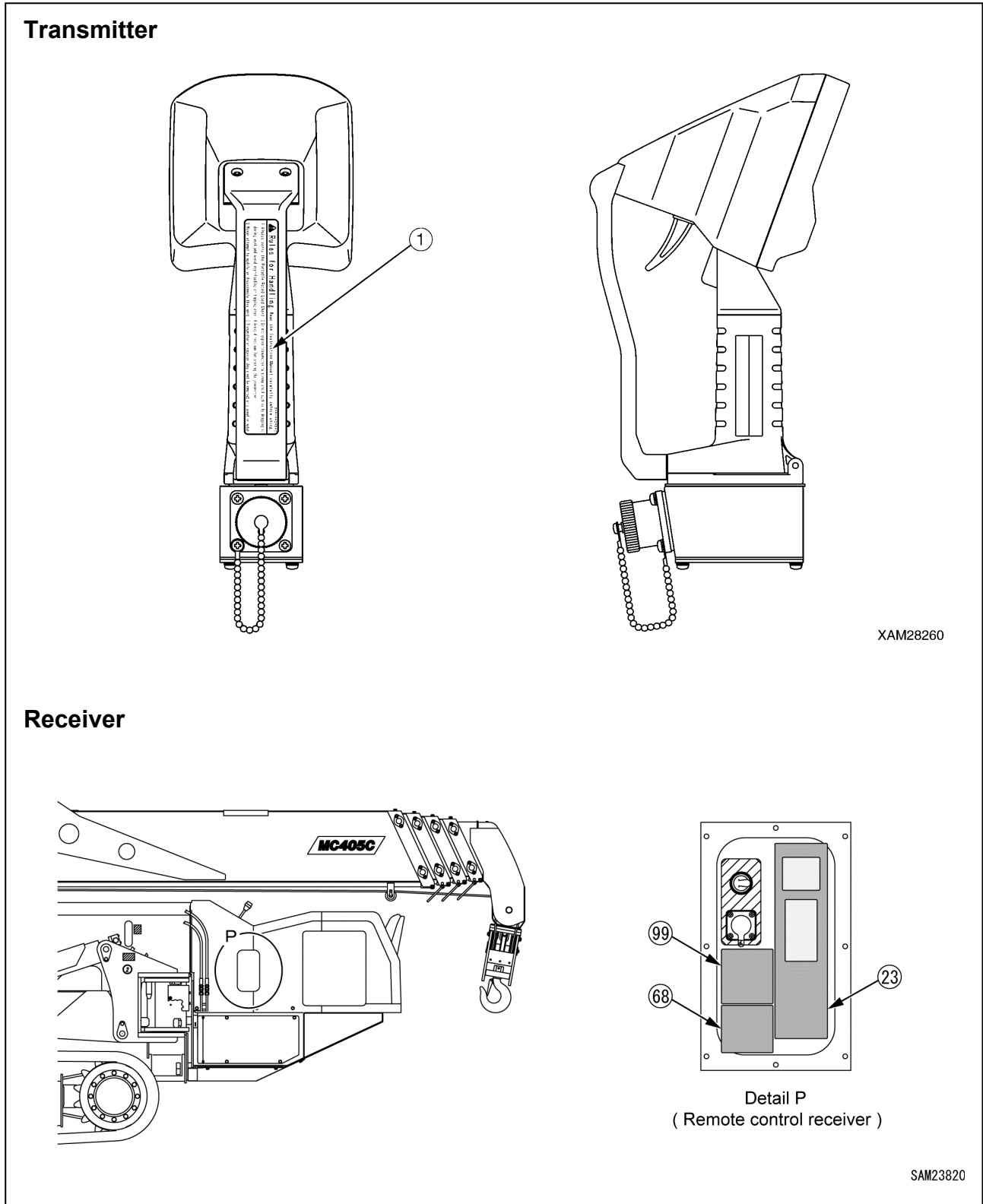


Fig. 2-3

349-4428500

⚠ Rules for Handling Read the Instruction Manual carefully before using.

1. Always carry the Portable Rated Load Chart 3. Do not expose transmitter to strong shock such as by dropping it, during work and avoid over-loading or tipping over. 4. Avoid direct sun for storing the transmitter.

2. Never attempt to modify or disassemble this unit. 5. Transmitter or receiver should not be immersed or cleaned in water.

[1] 349-4428500

M A E D A model MCT300

MONITOR DISPLAY

ERROR CODES

If a problem is detected one of the following codes will be shown.

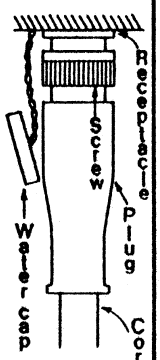
Error Code	Trouble
E1	Emergency stop activated.
E2	Receiver or Transmitter unit fault.
E3	Transmitter internal cable broken.
E4	For starting, transmitter volume position incorrect.
E5	For resetting, transmitter volume position incorrect.
E6	Problem with receiver EEPROM.
E7	Problem with receiver CPU.
E9	For starting transmitter switch position incorrect.
E0	Transmission error.

104-4559300

[23] 104-4559300

CAUTION

1. To insert plug, hold it in line with receptacle guide, push it in, and tighten screw.
2. To pull plug out, do not pull cord, but pull the plug itself. After removing plug, be sure to cover receptacle with water cap.



[68] 300-4214000

⚠ CAUTION

- Be sure to read the instruction manual.
- Modification or disassembly strictly prohibited.
- Have the power supply turned off whenever radio control or remote control is not in use.
- Direct washing prohibited.
- Cover the receptacle with water-tight cap provided whenever remote control is not in use.

104-4559400

[99] 104-4559400

Electric Motor (Option)

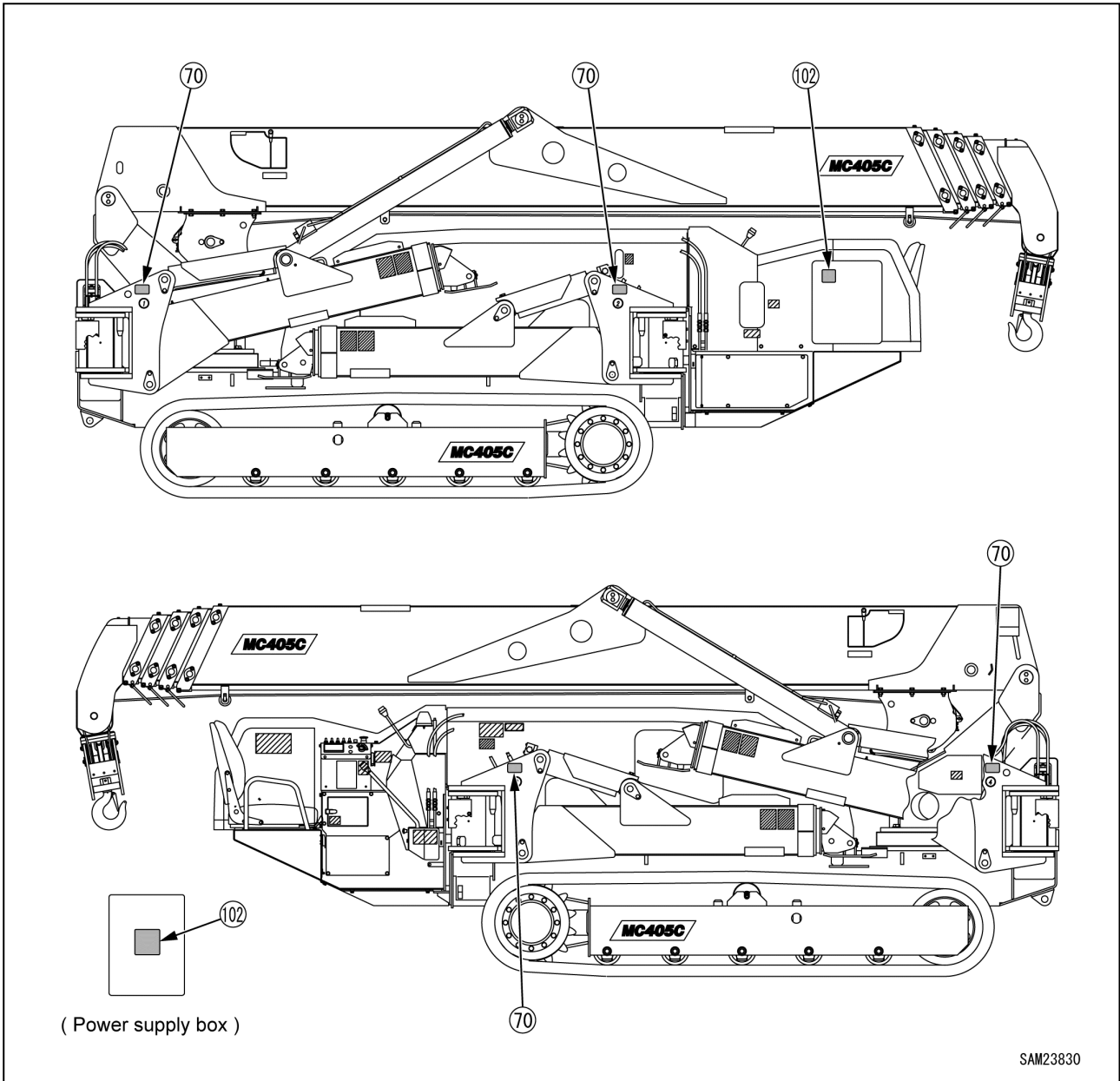
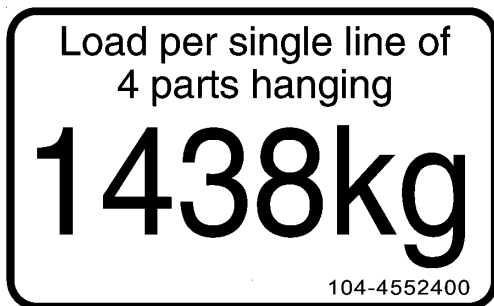
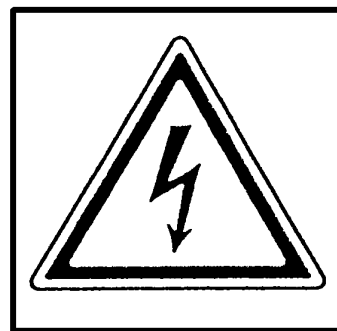


Fig. 2-4



[70] 104-4552400 (4 places)



553-4267300

[102] 553-4267300 (2 places)

850kg Searcher Hook (Option)

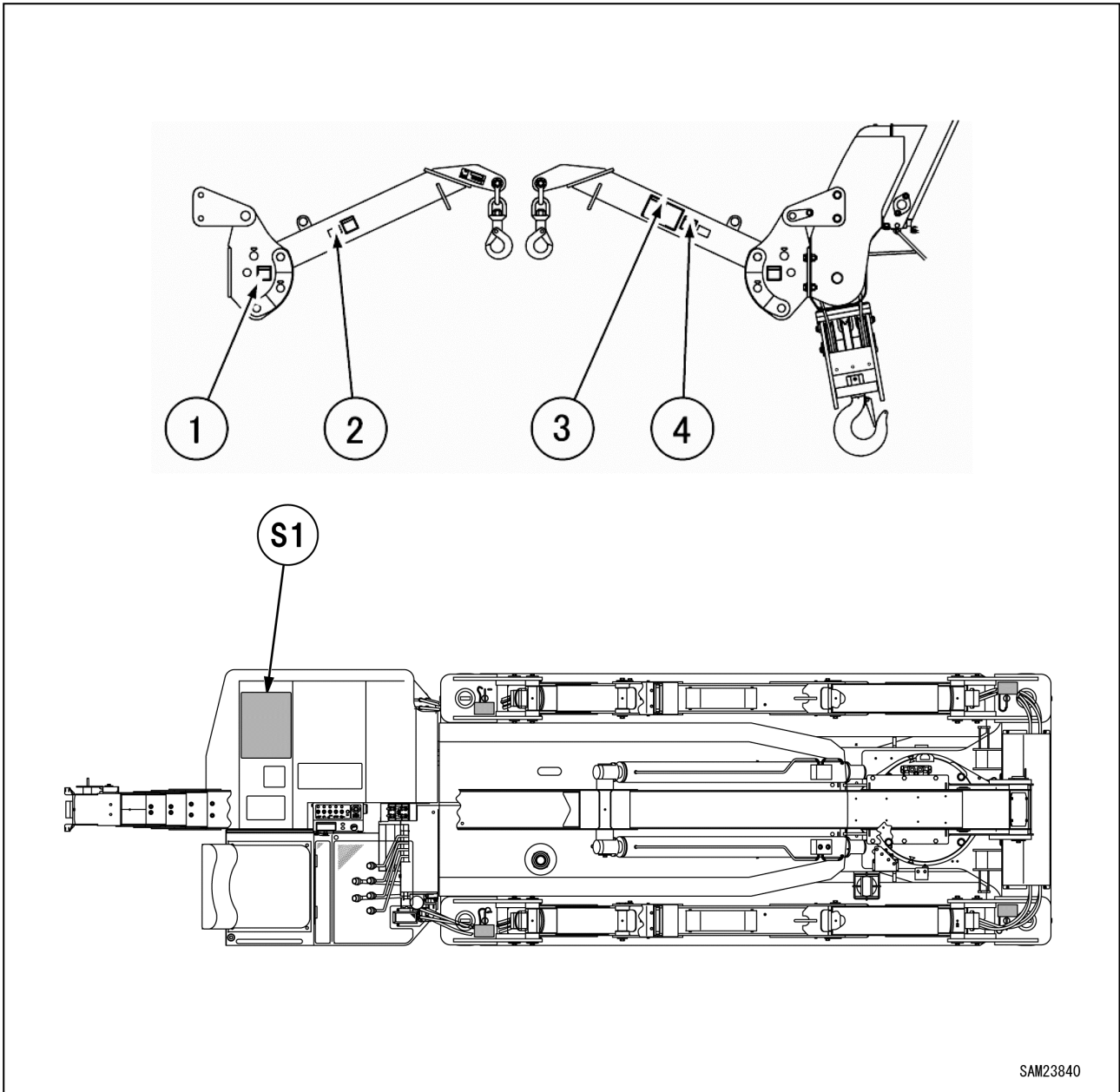


Fig. 2-5



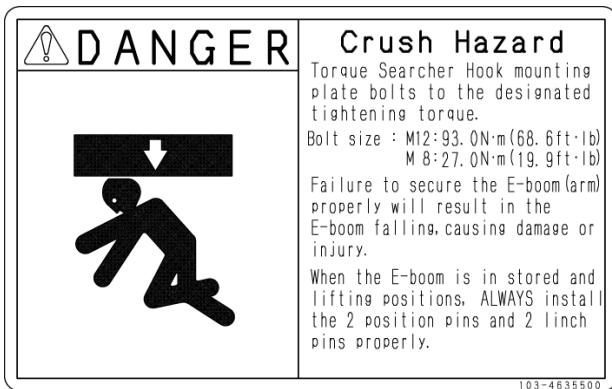
[1] 102-4608500 (2 places)



[4] 102-4621200 (2 places)



[2] 103-4635800



[3] 103-4635500

MC405C OPERATING RANGE for 850kg SEARCHER HOOK

RATED TOTAL LOAD CHART for 850kg SEARCHER HOOK The unit of loads:kg

OFFSET POSITION SH1

Working Radius (m)	① 4.735m BOOM				② 7.695m BOOM				③ 10.655m BOOM				④ 13.565m BOOM				⑤ 16.475m BOOM				
	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	
4.0	37.5	850	850	850	40.0 OR MORE	RESTRICTED					40.0 OR MORE	RESTRICTED									
5.2	4.5	850	850	850																	
6.5					36.0	850	850	850			39.0	850	800	660							
7.0					30.0	850	850	850			25.5	690	580	450							
8.2					0.0	850	850	640			8.5	530	440	350							
8.5											4.5	500	420	330							
10.0																					
11.0																					
13.0																					
14.1																					
15.0																					
16.96																					

OFFSET POSITION SH2

Working Radius (m)	① 4.735m BOOM				② 7.695m BOOM				③ 10.655m BOOM				④ 13.565m BOOM				⑤ 16.475m BOOM				
	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	
2.7	62.5	850	850	850	72.5	850	850	850			73.0	850	850	850							
3.5	52.0	850	850	850	67.0	850	850	850			70.5	850	850	850							
4.0	44.0	850	850	850	63.0	850	850	850			65.0	850	850	850							
5.0	21.5	850	850	850	55.0	850	850	850			64.0	850	850	850							
5.2	3.0	850	850	850	53.0	850	850	850			58.0	850	850	850							
6.0					45.5	850	850	850			53.0	850	850	850							
7.0					34.0	850	850	850			45.5	850	840	710							
8.1					9.5	850	850	700			38.0	690	580	450							
10.0											3.0	500	420	330							
11.1																					
13.0																					
14.0																					
16.0																					
16.90																					

OFFSET POSITION SH3

Working Radius (m)	① 4.735m BOOM				② 7.695m BOOM				③ 10.655m BOOM				④ 13.565m BOOM				⑤ 16.475m BOOM				
	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	LOADED BOOM ANGLE (Deg)	OUTRIGGER POSITION	MAX	MID	MIN	
2.7	63.5	850	850	850	74.5	850	850	850			74.5	850	850	850							
3.5	51.0	850	850	850	68.0	850	850	850			71.5	850	850	850							
4.0	41.0	850	850	850	64.0	850	850	850			70.5	850	850	850							
4.6	29.5	850	850	850	58.5	850	850	850			68.0	850	850	850							
5.0					54.5	850	850	850			65.5	850	850	850							
6.0					44.0	850	850	850			62.5	850	850	850							
7.0					29.5	850	850	850			53.0	850	850	850							
7.5					15.5	850	850	840			49.0	850	850	790							
8.0											45.0	850	850	720							
10.5											9.5	550	480	370							
13.4																					
14.0																					
15.0																					
16.32																					

⚠ DANGER

TIPPING HAZARD

When using searcher hook, Moment limiter "number of fall" must be set to 850kg searcher hook mode, and select searcher hook offset position.

Before start working, always make sure moment limiter is correctly set to the actual working condition.

Do not use searcher hook and main hoist hook block/ball simultaneously to hoist load.

Notes:

- This Rated Total Load Chart shows maximum allowable capacities. These rated total loads are based on the machine standing level on a firm ground supporting surface, under ideal job conditions and a freely suspended load.
- Sufficient design tolerance must be used to ensure adequate ground support surface design. The rated total loads are for static conditions only, and do not include dynamic effects of slowing, extending, retracting, lowering, raising, wind or adverse conditions. Crane users must reduce rated total loads ratings to take all conditions into account.
- The working radius shown in the Rated Total Load Chart is based on practical working radius including boom deflection due to loading. The crane user must calculate and compensate for boom deflection as the load is lifted.
- Deductions from Searcher Hook Rated Total Load must be made for the weight of the searcher hook, block/ball and all rigging.
- All capacities above the bold line are based on structural strength and other limitations. All other rated total loads are based on stability, not exceeding 75% of tipping loads.
- Crane users must consult the Operators Manual for complete details about assembly, operation, maintenance, configuration, and its limitations. Modifications to the crane, other than what is specified or supplied by the original equipment manufacturer, can result in a reduction of rated total load ratings.
- This operating range chart does not include boom deflections.
- At certain working conditions, moment limiter may display bigger load value than actual load.
- RESTRICTED AREA: At high boom angles, E-Boom (arm) and the hook will interfere with each other. To avoid this interference: In SH1 position do not operate above 40 degree boom angle.

MAEDA SE (SAKUSHO) CO., LTD.

EU 104-1165400

[S1] 104-1165400

1/2019 MC405C-3

2-29

Fly-Jib (Option)

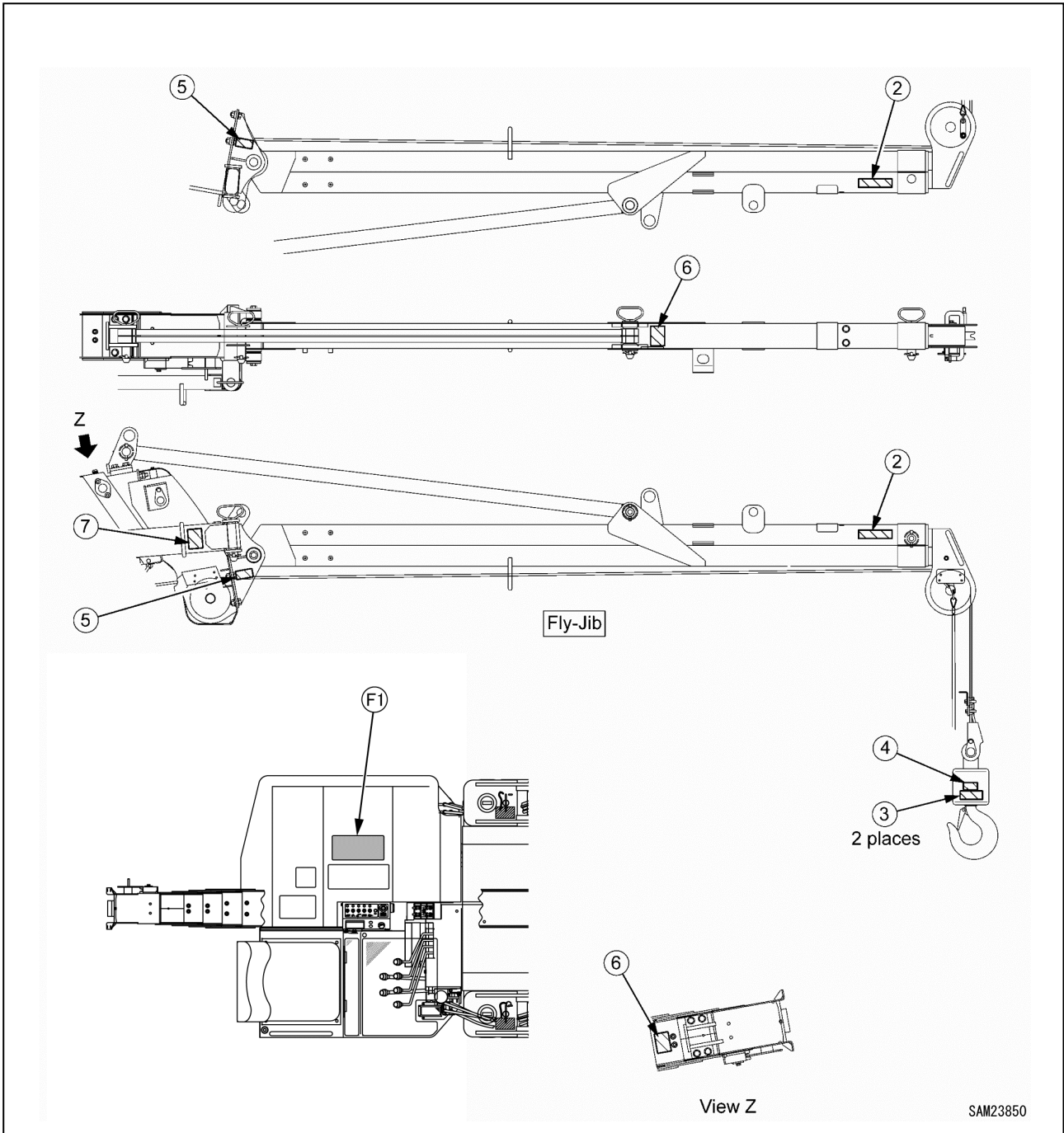


Fig. 2-6

MC-405C Overall load at maximum working radius.
[Fly Jib]
12.5 m × 170 kg
104-4568200

[2] 104-4568200 (2 places)

0.5t
104-4568300

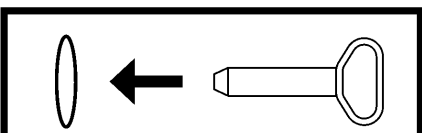
[3] 104-4568300 (2 places)

CE MATERIAL **S45C**
MANUFACTURE Maeda Seisakusyo Co.Ltd.
MAX. LOAD **0.5 t**
104-3300300

[4] 104-3300300

! DANGER
Fly-Jib fix bolt must be tightened with tightening torque at 93 Nm to avoid Fly-Jib to fall off.
104-4572700

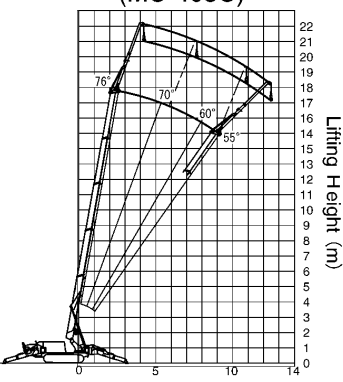
[5] 104-4572700 (2 places)


Direction to insert pin
Pin must be inserted to the direction this arrow is showing.
104-4572800

[6] 104-4572800 (2 places)

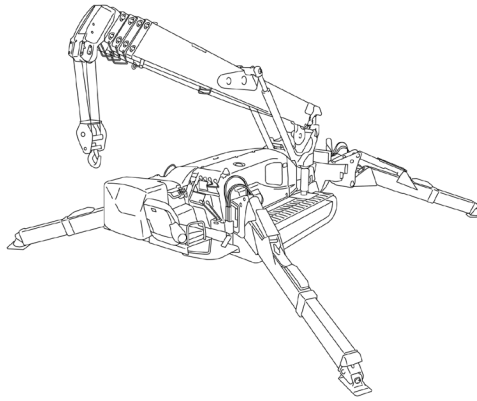
! CAUTION
Fly-Jib Setting
After setting fly jib and before operation the stowage bar must be retracted and the rotary pin returned to its original position.
Failure to do this will cause damage to the fly jib.
104-4579800

[7] 104-4579800

<p>Working Range Chart For Fly-Jib (MC-405C)</p>  <p>Working radius (m)</p>	<p>Total Rated Load For Fly-Jib (MC-405C)</p> <table border="1"> <thead> <tr> <th colspan="2">Total Rated Load Chart</th> </tr> <tr> <th>Boom angle (deg)</th> <th>Total Rated Load (kg)</th> </tr> </thead> <tbody> <tr> <td>72 and over</td> <td>520</td> </tr> <tr> <td>69</td> <td>420</td> </tr> <tr> <td>66</td> <td>320</td> </tr> <tr> <td>63</td> <td>250</td> </tr> <tr> <td>60</td> <td>220</td> </tr> <tr> <td>55</td> <td>170</td> </tr> </tbody> </table> <p>Including 20kg hook block weight</p>	Total Rated Load Chart		Boom angle (deg)	Total Rated Load (kg)	72 and over	520	69	420	66	320	63	250	60	220	55	170	<p>! DANGER</p> <ul style="list-style-type: none"> When using the fly-jib, be sure to set fly-jib mode for moment limiter. The Working Range Chart does not take into account boom deflection under load. When using the fly-jib, always follow the Total Rated Load Chart for Fly-Jib whatever boom length is in use. The fly-jib is secured by three pins. Before using the crane ensure that these pins are secured in position with the snap-pins provided. After mounting the fly-jib, before starting work always check that the overhoist prevention device is functioning properly. <p>104-3300200</p>
Total Rated Load Chart																		
Boom angle (deg)	Total Rated Load (kg)																	
72 and over	520																	
69	420																	
66	320																	
63	250																	
60	220																	
55	170																	

[F1] 104-3300200

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Section 3

SPECIFICATIONS, TERMINOLOGY AND CAPACITY CHARTS

MACHINE FEATURES

This machine is only to be used for crane operation.

This machine is a mobile crane with a rubber track travelling dolly (carrier) mounted with a boom crane.

This self-propelled crane is capable of travelling on a worksite and craning an object weighing within the rated total load capacity. This crane can be operated with a remote control system.

Main Features

Viewed from the travel lever, the front, back, left and right of the machine are illustrated in this manual from the front of the machine. Boom slewing motion is determined with the machine viewed from directly above; slew clockwise (right) denotes right-handed motion and slew counterclockwise (left) denotes left-handed motion.

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

Travelling Dolly

The travelling dolly is composed of a travelling gear, engine, travelling operation unit and crane operation unit.

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

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

Crane

The crane is composed of a telescoping system, boom system, hook block, winch system and outrigger system.

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

A remote control system allows remote crane operation.

Safety Devices

The following safety devices are used on this machine:

- Over winding detector
- Rope over unwinding detector
- Automatic stop device (Moment limiter)
- Angle indicator
- Hydraulic safety valve
- Hydraulic automatic locking device
- Latch
- Alarm buzzer
- Audio alarm
- Level gauge
- Crane tip-over alarm (an alarm issued in the event of crane operation at 3-degree inclination and travelling at 15-degree inclination)
- Travelling lever lock
- Travelling/crane/outrigger selector switch (designed to prevent the machine from craning at travelling)
- Outrigger safety device (outrigger interlock and crane interlock)
- Working envelope limited
- Working status lamp
- Outrigger un-set warning lamp

CRANE TERMINOLOGY

Terms and Definitions

Rated Total Load

This is the maximum load that can be applied according to a boom length and angle. The load includes the mass (weight) of hoisting accessories (hooks) and slinging ropes. For additional information, see "RATED TOTAL LOAD CHARTS" on page 3-13.

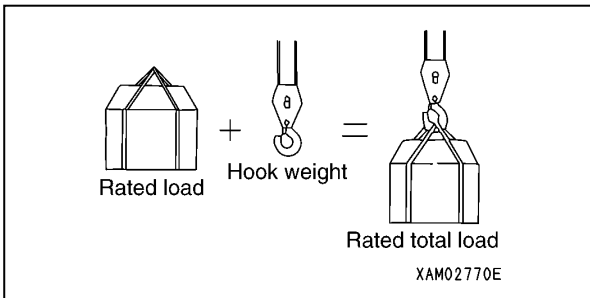


Fig. 3-1

Rated Load

A load derived by subtracting the mass (weight) of hoisting accessories (hooks) and slinging ropes from the rated total load.

Working Radius

A horizontal distance between the axis of slewing and the hook centre.

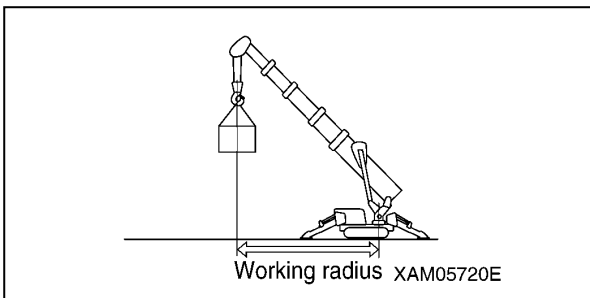


Fig. 3-2

Boom Length

A distance between the boom primary pin and the sheave pin of the end boom.

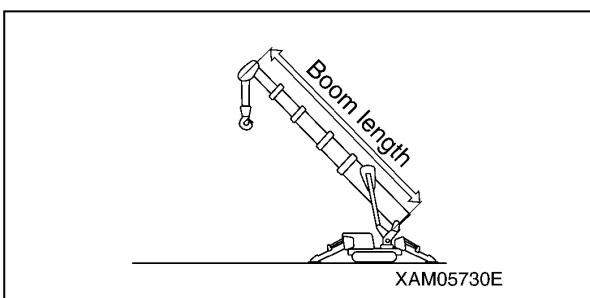


Fig. 3-3

Boom Angle

An angle which the boom forms with the horizon.

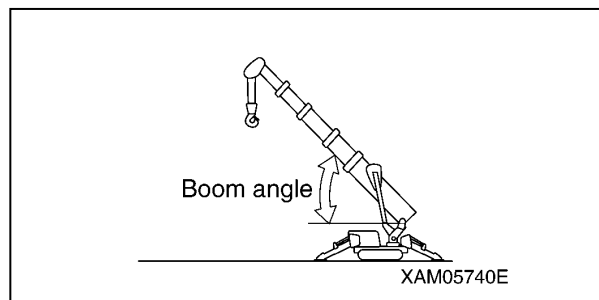


Fig. 3-4

Lifting Height Above Ground

A vertical distance between the hook bottom and the ground with the hook raised to the upper limit.

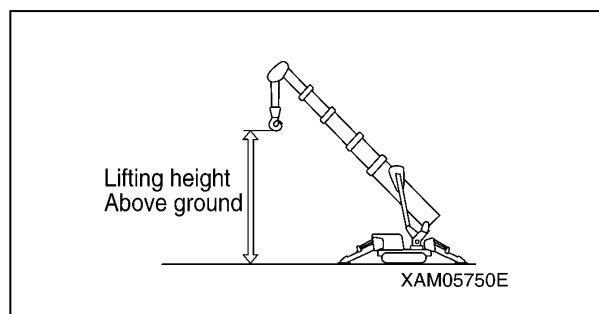


Fig. 3-5

PRINCIPLE SPECIFICATIONS LIST

Standard and Electric Motor Option Specifications

System / Item		MC405C-3 Standard	MC405C-3 Electric motor option
Mass and dimensions	Machine mass	5600kg	5750kg
	Overall length × width × height	4980mm × 1380mm × 1980mm	
	Distance between idler and sprocket	2100mm	
	Track gauge	1060mm	
	Track width	320mm	
Capacity	Maximum rated total load × working radius	3.83t × 2.7m	
	Maximum working radius	16m	
	Maximum lifting height	16.8m	
Winch system	Method	Fixed displacement axial piston motor, Planetary reduction gear, Built-in disc brake, With counter balance valve	
	Winding speed (4th drum, 4 ropes)	18.0m/min	11.7m/min
	Hoisting rope	IWRC 6 × WS (26) 0/0 Type B φ8 × 92m	
Boom telescoping system	Method	Sequentially telescoping hydraulic cylinder (3 pieces) + Sheave-embedded wire rope expansion device (1 piece), (With a hydraulic automatic locking device)	
	Boom type	Pentagonal section, hydraulic automatic extension, 5-stage boom (Stage 2/3: Sequentially telescoping, Stage 4/5: Simultaneous telescoping)	
	Boom length	4.735m – 7.695m – 10.655m – 13.565m – 16.475m	
	Boom telescoping stroke/time	11.7 m/54.2 sec (0.22 m/sec)	11.7 m/61.6 sec (0.19 m/sec)
Derrick system	Method	Direct push-type hydraulic double-acting cylinder (2 pieces), (With a hydraulic automatic locking device)	
	Derrick angle/ time	0 to 80 deg/24.5 sec (3.27 deg/sec)	0 to 80 deg/24.4 sec (3.28 deg/sec)
Slewing system	Method	Slew bearing, hydraulic motor drive, Reduction gear: Worm + Reduction spur gear, Brake: Worm-selflock	
	Slewing angle/ speed	360 deg. (continuous)/ 28.6sec (2.1min ⁻¹)	360 deg. (continuous)/ 33.7sec (1.8min ⁻¹)
Outrigger system	Method	Extension/ground: Direct push-type hydraulic cylinder (With a hydraulic automatic locking device)	
	Overall width of extended outriggers	(Front) 5118mm × (Right/left) 5786mm × (Rear) 5520mm	
Travelling system	Method	Hydraulic two-speed motor drive, Variable speed, Built-in brake	
	Travel speed	Forward/backward: 0 – 2.9 km/h (engine operation)	
	Gradeability	20 deg.	
	Ground pressure	49.0kPa (0.50kgf/cm ²)	
Hydraulic system	Hydraulic pump	Double-throw variable piston pump (17cc/rev × 2)	Double-throw variable piston pump (13cc/rev × 2)
	Rated pressure	Travelling: 20.6MPa (210kgf/cm ²) Crane high-pressure relief: 20.1MPa (205kgf/cm ²) Crane low-pressure relief: 4.41 to 6.37MPa (45 to 65kgf/cm ²)	

System / Item		MC405C-3 Standard	MC405C-3 Electric motor option
	Hydraulic oil tank capacity	70L	
Engine	Model	Yanmar 3TNV88F-EPMB	
	Type	Vertical in-line 3-cylinder, Water cooled, 4-cycle (Direct injection type)	
	Displacement	1.642L (1642cc)	
	Rated output (continuous)	17.5 kW/2400min ⁻¹ (23.8 PS/2400rpm)	
	Fuel tank capacity	Diesel fuel/ 60L	
Battery	Model	115D31R (DC12V × 1 piece)	
Electric motor	Motor specifications		Three-phase induction motor: 7.5kW 4P 380 V 50/60 Hz
	Starting method		Inverter-controlled (30 to 60Hz), energy-saving mode available (Crane mode: 10-Hz operation after 5-minute consecutive no operation, automatic power off in 30 minutes)
Safety device	Over winding detector / automatic stop device, three-winding stop alarm / automatic stop device, angle indicator, hydraulic safety valve, hydraulic automatic locking device, slinging rope detachment protector, alarm buzzer, audio alarm, level gauge, crane tip-over alarm (an alarm issued in the event of the crane operation at 3-degree inclination and travelling at 15-degree inclination), travelling lever lock, travelling/crane/outrigger selector switch (designed to prevent the machine from craning at travelling), outrigger safety device (outrigger interlock and crane interlock), moment limiter (working envelope limited), working status lamp, outrigger un-set warning lamp		
Classification	Mobile crane ISO4301/2 Group A1		

Remote Control System Specifications

System / Item		MCT310	
Waterproof protection		IP65	
System configuration		Manual and Remote control, both-way	
Operation monitor		LCD monitor panel • Operation status monitor • Battery monitor • Message • Error code	
Safety devices		Emergency stop equipment	
		Abnormal signal detector unit at the engine start	
		Automatic power cut unit (Automatic Power-OFF)	
		Voltage drop limiter	
		Warning switch	
Voice messages		(1) Danger, rope over winding	
		(2) Do not store hook until boom is in travel mode	
		(3) Remote control is ready	
		(4) Signal not received	
		(5) Danger, defective safety device	
		(6) Danger, defective remote control	
		(7) Danger, set outriggers	
		(8) Danger, overload	
Control unit voltage		Power for the Crane (DC 12V)	
Control unit power consumption		Approximately 70 watts (maximum, per single function)	
Operating ambient temperature		-10°C to +55°C	
Storage ambient temperature		-20°C to +70°C	
Transmitter weight		540g	
Transmitter functions	Lever switches	Boom raise/lower	Raising and lowering
		Hook raise/lower	Raising and lowering
		Boom telescoping	Extending and retracting
		Slewing	Counterclockwise (left) / clockwise (right)
	Push button switches	Power	ON/OFF
		Horn	Warning signal
		Hook stow/Setting	Hook stowing/Mode setting
		Speed/Mode	Speed control/Mode selection
		Start/Reset	Engine start/Reset
		Stop/EMO	Engine stop/Emergency stop
	Trigger type accelerator	Hydraulic control + Engine control	

850 kg Searcher Hook Specifications

System / Item		MC405C-3 Standard	MC405C-3 Electric motor option
Mass and dimensions	Machine mass	5630 kg	5780 kg
	Stowed length × width × height	5210 × 1380 × 2060 mm	
Performance	Crane capacity	850 kg	
	Maximum working radius	17.0 m	

Fly-Jib Specifications

System / Item		MC405C-3 Standard	MC405C-3 Electric motor option
Mass and dimensions	Machine mass	5750 kg	5900 kg
Performance	Crane capacity	520 kg	

DIMENSIONAL DRAWINGS

Machine Dimensional Drawing

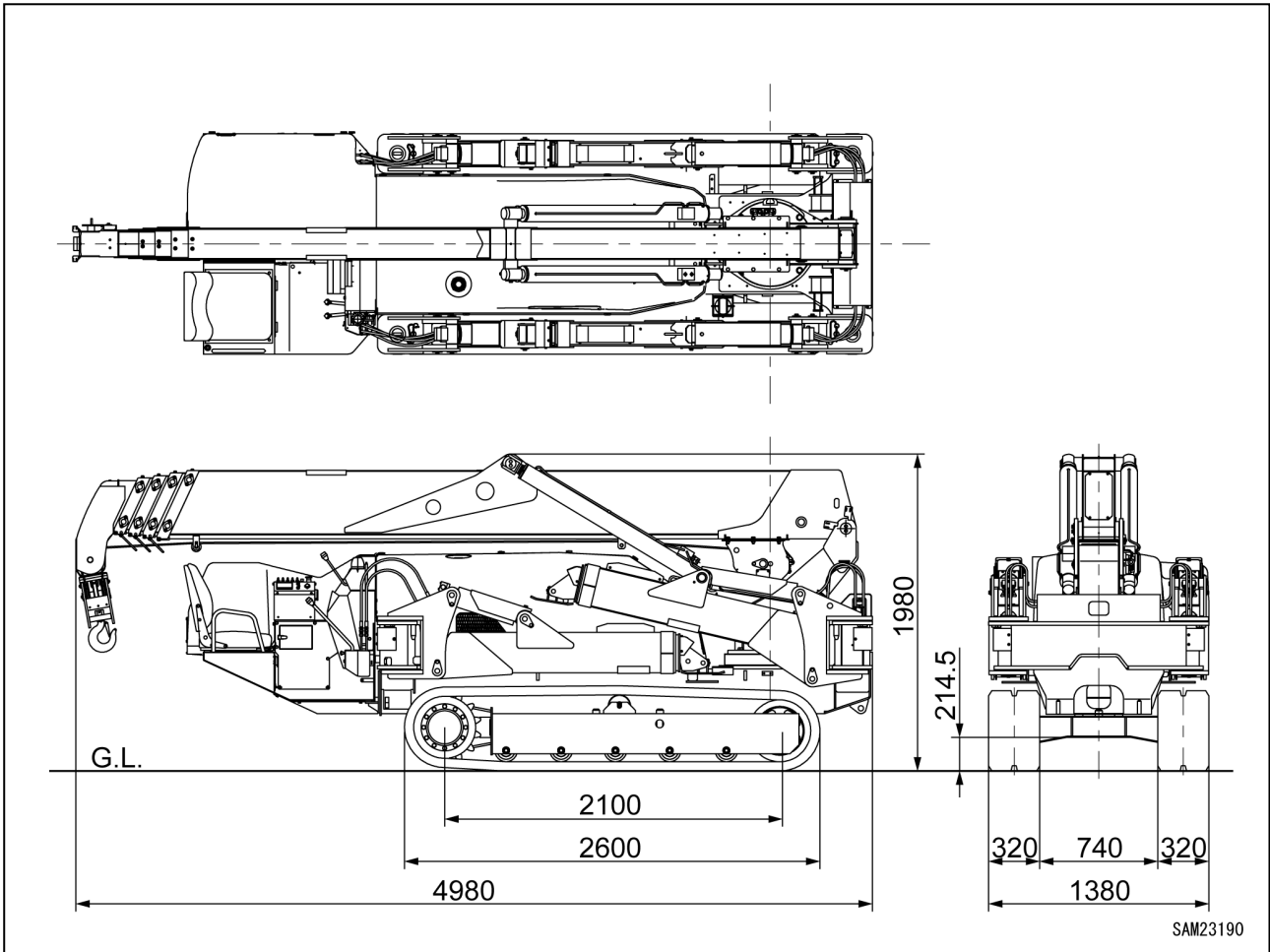


Fig. 3-6

850 kg Searcher Hook Dimensional Drawing

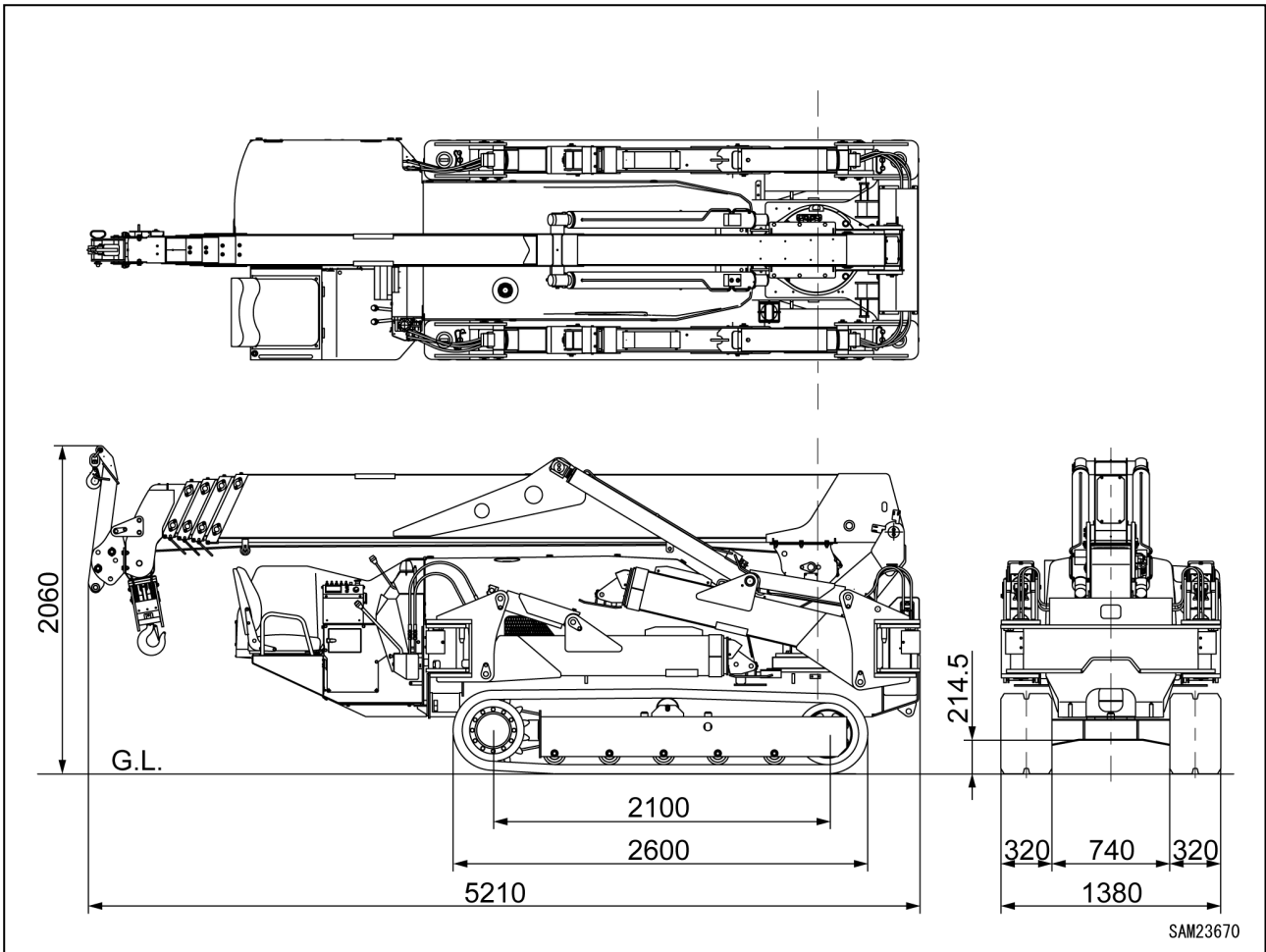


Fig. 3-7

Fly-Jib Dimensional Drawing

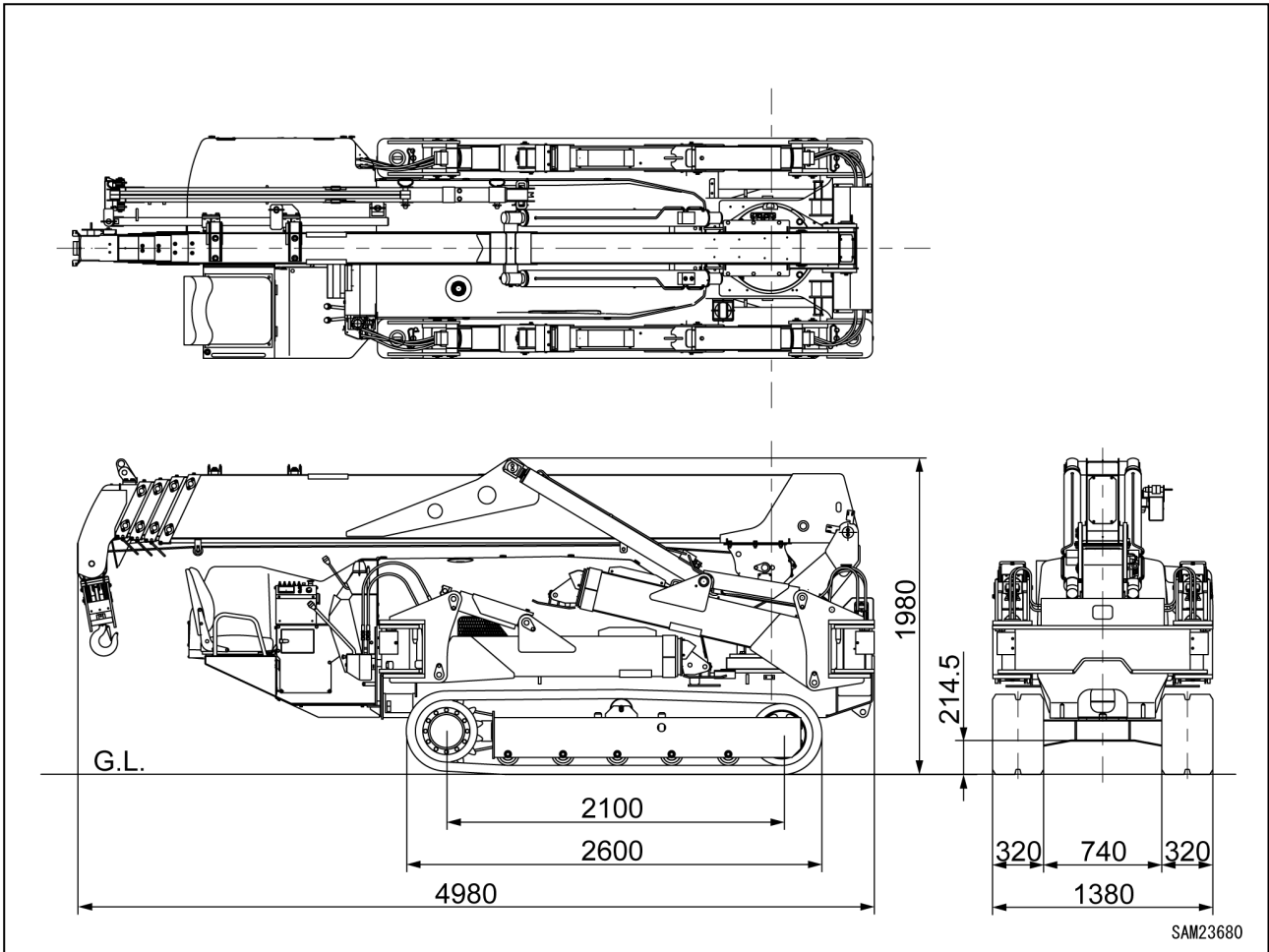


Fig. 3-8

Outrigger Width Dimensional Drawing

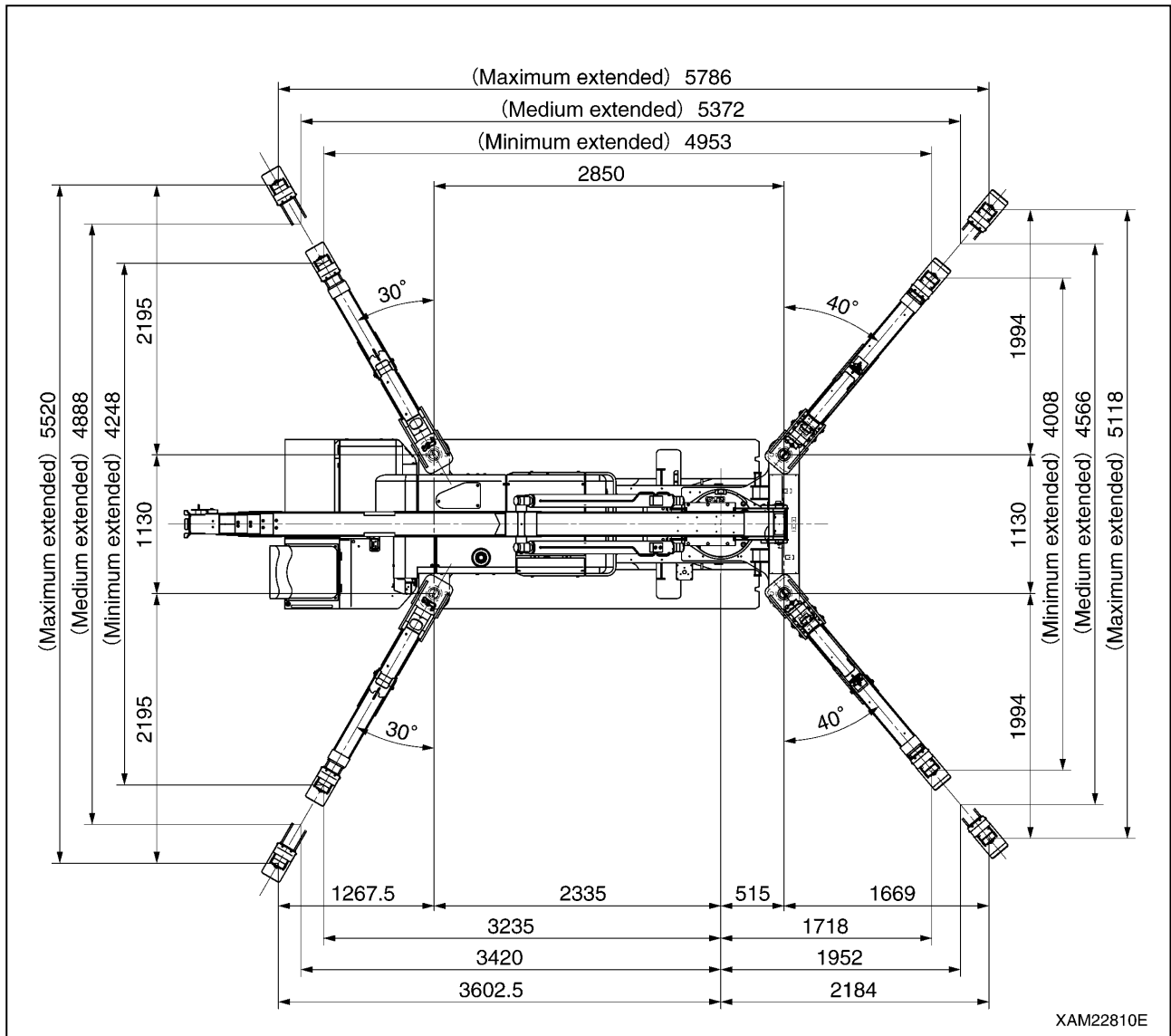


Fig. 3-9

RATED TOTAL LOAD CHARTS

CAUTION:

- All the values provided in the rated total load chart are based on the assumption that the machine is placed on a level and firm surface.
The machine may topple over if proper outrigger setting or ground condition fails to be assured. Exercise due caution when performing crane operation.
- The values in the rated total load chart are determined based on the working radius allowing for deflection that is developed when load is applied to the boom.
- When extending boom (3) even if only slightly, crane operation should proceed to the extent of performance of "Boom (1) + (2) + (3)".
- When extending boom (4) even if only slightly, crane operation should proceed to the extent of performance of "Boom (1) + (2) + (3) + (4)".
- When half of the "▲" mark passes boom (3), crane operation should proceed to the extent of performance of "Boom (1) + (2) + (3) + (4) + (5)".
- If the working radius exceeds that stated in the table even if only slightly, crane operation should proceed with respect to the rated total load corresponding to the working radius in the following table.
- The rated total load is a load including the mass of a hoisting accessory (hook: 50kg).
- When the crane is used with the outriggers extended other than at the maximum, crane operation should proceed with respect to the values specified in the rated total load chart corresponding to "When the crane is used with the outriggers extended at the minimum/medium".

Programmable Moment Limiter

WARNING! Tip Hazard. The following precautions should always be observed when reading the "rated total load" provided by the programmable moment limiter.

- The outriggers should be placed on a level and firm surface.
- The outriggers should be at maximum extension as much as possible.
- The weight of an object, including that of a hoisting accessory and slinging rope, must remain below the rated total load for hoisting objects. With the boom length (number of stages) and angle specified, make a comparison between the rated total load provided by the programmable moment limiter and the weight of the object.

The programmable moment limiter provides readouts on the rated total load under the following conditions:

- The outriggers are placed on a level and firm surface.
- No deflection is developed in the boom.

Reading the Angle Indicator

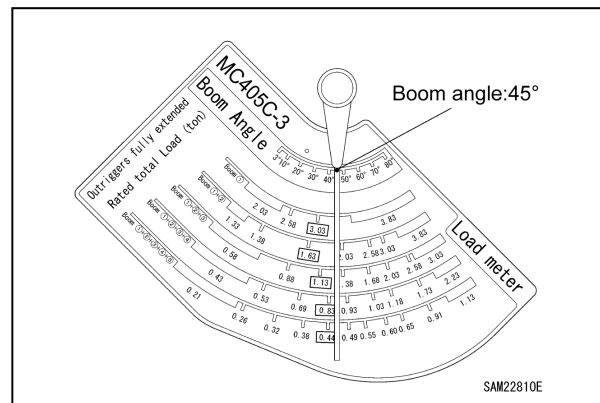


Fig. 3-10

1. Boom angle
The boom angle is approximately 45 degrees.
2. Rated total load when outriggers are fully extended
3.08 t if boom (1).
1.63 t if booms (1) + (2).
1.13 t if booms (1) + (2) + (3).
0.83 t if booms (1) + (2) + (3) + (4).
0.44 t if booms (1) + (2) + (3) + (4) + (5).

Boom Length

The following figures illustrate the condition of the booms, "Boom (1)", "Boom (1) + (2)", "Boom (1) + (2) + (3)", "Boom (1) + (2) + (3) + (4)", and "Boom (1) + (2) + (3) + (4) + (5)" in the preceding boxes in the rated total load chart.

1. "Boom (1)": All the booms are retracted.



Fig. 3-11

2. "Boom (1) + (2)": With booms (3), (4), and (5) retracted, boom (2) is fully extended. "Boom (1) + (2)" is to apply to crane operation with boom (2) extended even if only slightly.

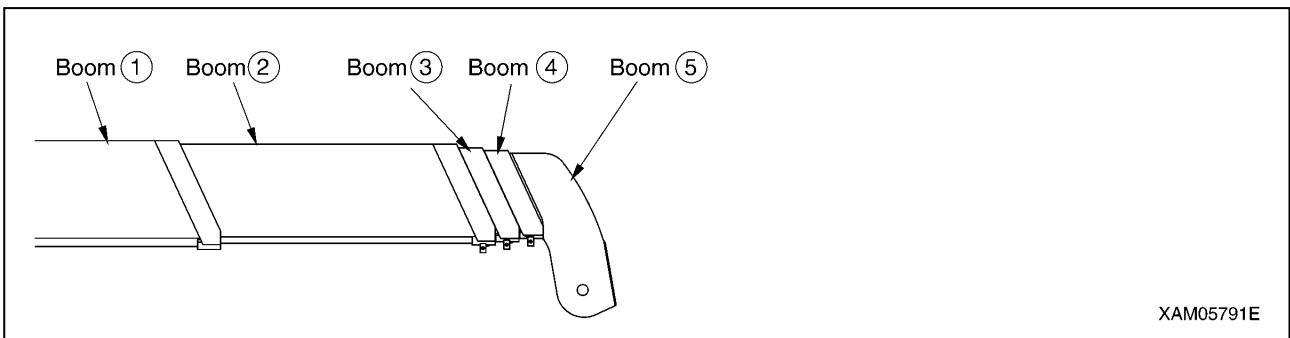


Fig. 3-12

3. "Boom (1) + (2) + (3)": With booms (4) and (5) retracted, booms (2) and (3) are fully extended. "Boom (1) + (2) + (3)" is to apply to crane operation with boom (3) extended even if only slightly.

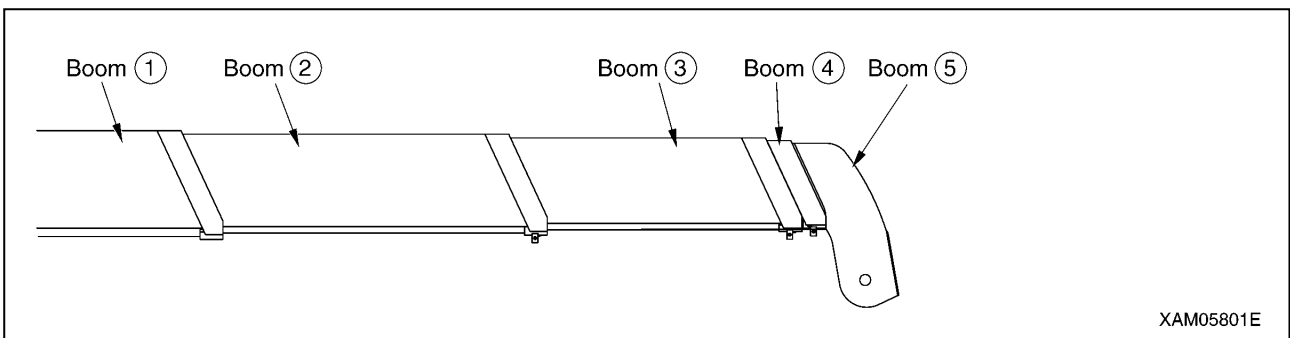


Fig. 3-13

4. "Boom (1) + (2) + (3) + (4)": With booms (2) and (3) fully extended, booms (4) and (5) are extended at the medium (half of the "▀" mark" passes boom (3)).
 "Boom (1) + (2) + (3) + (4)" is to apply to crane operation with booms (4) and (5) extended even if only slightly.

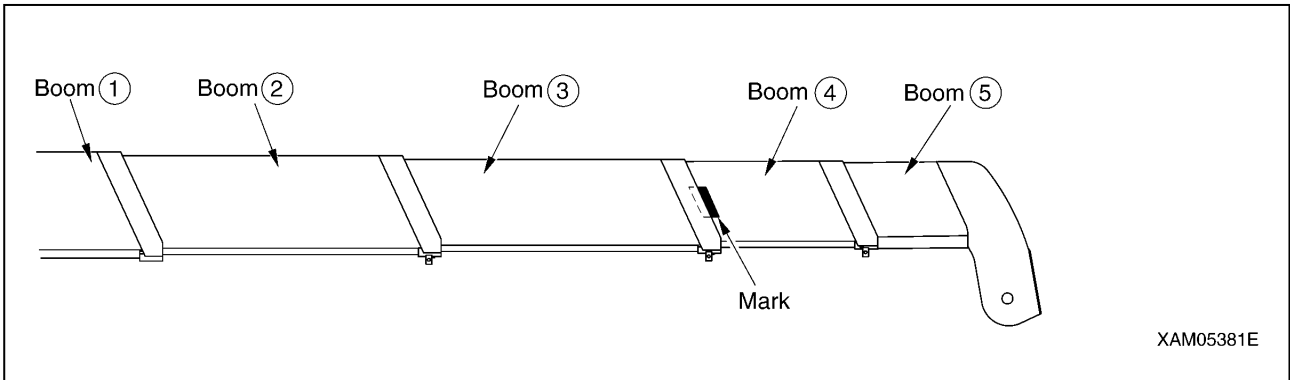


Fig. 3-14

5. "Boom (1) + (2) + (3) + (4) + (5)": All the booms are fully extended.
 "Boom (1) + (2) + (3) + (4) + (5)" is to apply to crane operation with half of the "▀" mark" on boom (4) passes boom (3).

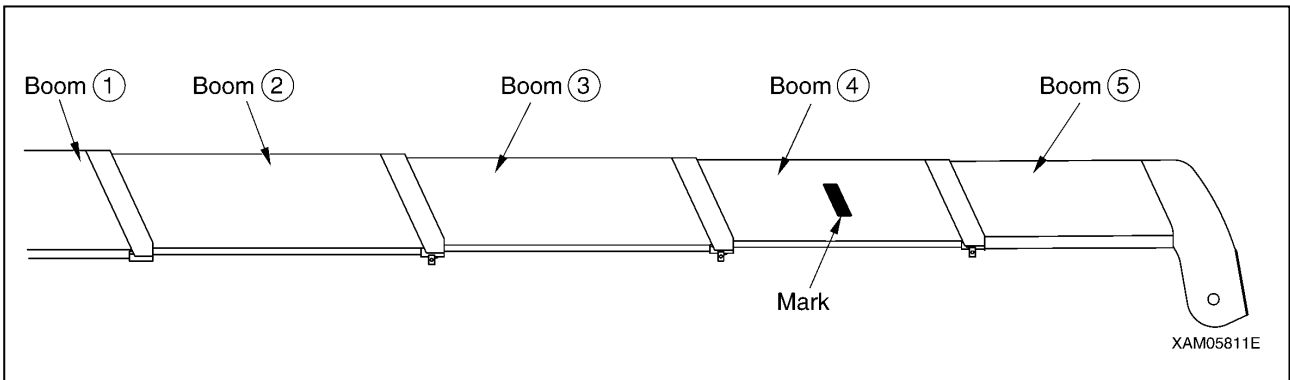


Fig. 3-15

Rated Total Load Chart for Standard Specification

1. All rated total loads are indicated in kilograms.
2. This load radius shown in this chart is based on practical working including boom deflection due to loading. The crane user must calculate and compensate for boom deflection as the load is lifted.
3. Deductions from rated total loads must be made for the weight of hook block, ball/hook, slings, rigging or other suspended gear.
4. The slewing range will be restricted if the outrigger angle is not at the standard extension.
5. The Rated Total Load Chart capacities are based on using the factory supplied Standard Wire Rope. If you replace the wire rope, use the correct specification, that meets or exceeds the standard wire rope strength and specification.
6. Standard wire rope specification: 6xWs (26) IWRC, 8 mm diameter, 92 m
Specified breaking load: 42.4 kN

Rated Total Load Chart - 4 Falls

* The rated total load is a load including the mass of a hoisting accessory (hook: 50kg).

OUTRIGGER EXTENDED TO MAXIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	3830	3.50	3030	4.00	2230	5.00	1130
3.50	3030	4.00	2580	4.50	1930	5.50	980
4.00	2580	5.00	2030	5.00	1730	6.00	910
5.00	2030	6.00	1680	6.00	1400	7.00	760
6.00	1680	7.00	1380	7.00	1180	8.00	650
7.00	1380	8.00	1130	8.00	1030	9.00	600
7.25	1330	9.00	880	9.00	930	10.00	550
--	--	10.20	580	10.00	830	11.00	490
--	--	--	--	11.00	690	12.00	440
--	--	--	--	12.00	530	13.00	380
--	--	--	--	13.10	430	14.00	320
--	--	--	--	--	--	15.00	260
--	--	--	--	--	--	16.00	210

OUTRIGGER EXTENDED TO MEDIUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	3830	3.50	3030	4.00	2230	5.00	1130
3.50	3030	4.00	2580	4.50	1830	5.50	980
4.00	2580	5.00	1880	5.00	1630	6.00	910
5.00	1880	6.00	1430	6.00	1330	7.00	730
6.00	1430	7.00	1130	7.00	1080	8.00	630
7.00	1160	8.00	880	8.00	880	9.00	550
7.25	1120	9.00	740	9.00	730	10.00	480
--	--	10.20	490	10.00	530	11.00	430
--	--	--	--	11.00	480	12.00	380
--	--	--	--	12.00	430	13.00	330
--	--	--	--	13.10	330	14.00	280
--	--	--	--	--	--	15.00	220
--	--	--	--	--	--	16.00	180

OUTRIGGER EXTENDED TO MINIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	3830	3.50	3030	4.00	2230	5.00	1130
3.50	3030	4.00	2580	4.50	1830	5.50	980
4.00	2580	5.00	1680	5.00	1630	6.00	880
5.00	1680	6.00	1180	6.00	1180	7.00	730
6.00	1180	7.00	880	7.00	830	8.00	530
7.00	930	8.00	730	8.00	680	9.00	450
7.25	780	9.00	580	9.00	550	10.00	420
--	--	10.20	400	10.00	430	11.00	370
--	--	--	--	11.00	380	12.00	330
--	--	--	--	12.00	350	13.00	280
--	--	--	--	13.10	310	14.00	240
--	--	--	--	--	--	15.00	190
--	--	--	--	--	--	16.00	150

Rated Total Load Chart - 2 Falls

* The rated total load is a load including the mass of a hoisting accessory (hook: 50kg).

OUTRIGGER EXTENDED TO MAXIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	1930	3.50	1930	4.00	1930	5.00	1130
3.50	1930	4.00	1930	4.50	1930	5.50	980
4.00	1930	5.00	1930	5.00	1730	6.00	910
5.00	1930	6.00	1680	6.00	1400	7.00	760
6.00	1680	7.00	1380	7.00	1180	8.00	650
7.00	1380	8.00	1130	8.00	1030	9.00	600
7.25	1330	9.00	880	9.00	930	10.00	550
--	--	10.20	580	10.00	830	11.00	490
--	--	--	--	11.00	690	12.00	440
--	--	--	--	12.00	530	13.00	380
--	--	--	--	13.10	430	14.00	320
--	--	--	--	--	--	15.00	260
--	--	--	--	--	--	16.00	210

OUTRIGGER EXTENDED TO MEDIUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	1930	3.50	1930	4.00	1930	5.00	1130
3.50	1930	4.00	1930	4.50	1830	5.50	980
4.00	1930	5.00	1880	5.00	1630	6.00	910
5.00	1880	6.00	1430	6.00	1330	7.00	730
6.00	1430	7.00	1130	7.00	1080	8.00	630
7.00	1160	8.00	880	8.00	880	9.00	550
7.25	1120	9.00	740	9.00	730	10.00	480
--	--	10.20	490	10.00	530	11.00	430
--	--	--	--	11.00	480	12.00	380
--	--	--	--	12.00	430	13.00	330
--	--	--	--	13.10	330	14.00	280
--	--	--	--	--	--	15.00	220
--	--	--	--	--	--	16.00	180

OUTRIGGER EXTENDED TO MINIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	1930	3.50	1930	4.00	1930	5.00	1130
3.50	1930	4.00	1930	4.50	1830	5.50	980
4.00	1930	5.00	1680	5.00	1630	6.00	880
5.00	1680	6.00	1180	6.00	1180	7.00	730
6.00	1180	7.00	880	7.00	830	8.00	530
7.00	930	8.00	730	8.00	680	9.00	450
7.25	780	9.00	580	9.00	550	10.00	420
--	--	10.20	400	10.00	430	11.00	370
--	--	--	--	11.00	380	12.00	330
--	--	--	--	12.00	350	13.00	280
--	--	--	--	13.10	310	14.00	240
--	--	--	--	--	--	15.00	190
--	--	--	--	--	--	16.00	150

Rated Total Load Chart - Single Fall

* The rated total load is a load including the mass of a hoisting accessory (hook: 20kg).

OUTRIGGER EXTENDED TO MAXIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	970	3.50	970	4.00	970	5.00	970
3.50	970	4.00	970	4.50	970	5.50	970
4.00	970	5.00	970	5.00	970	6.00	900
5.00	970	6.00	970	6.00	970	7.00	750
6.00	970	7.00	970	7.00	970	8.00	640
7.00	970	8.00	970	8.00	970	9.00	590
7.25	970	9.00	870	9.00	920	10.00	540
--	--	10.20	570	10.00	820	11.00	480
--	--	--	--	11.00	680	12.00	430
--	--	--	--	12.00	520	13.00	370
--	--	--	--	13.10	420	14.00	310
--	--	--	--	--	--	15.00	250
--	--	--	--	--	--	16.00	200


OUTRIGGER EXTENDED TO MEDIUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	970	3.50	970	4.00	970	5.00	970
3.50	970	4.00	970	4.50	970	5.50	970
4.00	970	5.00	970	5.00	970	6.00	900
5.00	970	6.00	970	6.00	970	7.00	720
6.00	970	7.00	970	7.00	970	8.00	620
7.00	970	8.00	870	8.00	870	9.00	540
7.25	970	9.00	730	9.00	720	10.00	470
--	--	10.20	480	10.00	520	11.00	420
--	--	--	--	11.00	470	12.00	370
--	--	--	--	12.00	420	13.00	320
--	--	--	--	13.10	320	14.00	270
--	--	--	--	--	--	15.00	210
--	--	--	--	--	--	16.00	170

OUTRIGGER EXTENDED TO MINIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	970	3.50	970	4.00	970	5.00	970
3.50	970	4.00	970	4.50	970	5.50	970
4.00	970	5.00	970	5.00	970	6.00	870
5.00	970	6.00	970	6.00	970	7.00	720
6.00	970	7.00	870	7.00	820	8.00	520
7.00	920	8.00	720	8.00	670	9.00	440
7.25	770	9.00	570	9.00	540	10.00	410
--	--	10.20	390	10.00	420	11.00	360
--	--	--	--	11.00	370	12.00	320
--	--	--	--	12.00	340	13.00	270
--	--	--	--	13.10	300	14.00	230
--	--	--	--	--	--	15.00	180
--	--	--	--	--	--	16.00	140

Rated Total Load Chart for 850 kg Searcher Hook

DANGER!

- When using the searcher hook, be sure to set searcher hook mode for moment limiter.
- Fall mode/option mode and searcher hook position must be set as "searcher hook mode" when 850 kg searcher hook is used. Searcher hook position must be displayed on moment limiter boom length window.
- Never use the searcher hook and the crane hook simultaneously.

1. This Rated Total Load Chart shows the maximum allowable capacities. These rated total loads are based on the machine standing level on a firm ground supporting surface, under ideal job conditions and a freely suspended load.
2. Sufficient design tolerance must be used to ensure adequate ground support surface design. The rated total loads are for static conditions only, and do not include dynamic effects of slewing, extending, retracting, lowering, raising, wind or adverse conditions. Crane users must reduce rated total loads ratings to take all conditions into account.
3. The Working radius shown in the Rated Total Load Chart is based on practical working radius including boom deflection due to loading. The crane user must calculate and compensate for boom deflection as the load is lifted.
4. Deductions from Searcher Hook Rated Total Load must be made for the weight of 850 kg searcher hook (30 kg), block/ball and all rigging.
5. The capacity when using the searcher hook refers to the capacity with the crane hook detached.
6. If boom (3) is extended to any extent, work should be performed within the capacity for "10.655m Boom".
7. If boom (4) is extended to any extent, work should be performed within the capacity for "13.565m Boom".
8. When more than one half of the third  mark is exposed from the boom (3), work should be carried out within the performance for the "16.475m Boom".
9. All capacities above the bold line are based on structural strength and other limitations. All other rated total loads are based on stability not exceeding 75% of tipping loads.
10. Crane users must consult the Operators Manual for complete details about assembly, operation, maintenance, configuration, and its limitations. Modifications to the crane, other than what is specified or supplied by the original equipment manufacture, can result in a reduction of rated total load ratings.
11. This operating range chart does not include boom deflections.
12. At certain working conditions, moment limiter may display bigger load value the actual load.
13. RESTRICTED AREA : At high boom angles, E-Boom (arm) and the hook will interfere with each other.
To avoid this interference : In SH1 position, do not operate above 40 degree boom angle.

OFFSET POSITION SH1


Working Radius (m)	① 4.735m BOOM				② 7.695m BOOM				③ 10.655m BOOM				④ 13.565m BOOM				⑤ 16.475m BOOM				Working Radius (m)					
	BOOM FULLY RETRACTED					WHEN BOOM 2 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 4.735m-7.695m BOOM					WHEN BOOM 3 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 7.695m-10.655m BOOM					WHEN BOOM 4 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 10.655m-13.565m BOOM						WHEN THE MARK  ON BOOM 4 IS EXPOSED, USE RATINGS FOR 13.565m-16.475m BOOM				
	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE						
	MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			
4.0	37.5	850	850	850	RESTRICTED	36.0	850	850	850	RESTRICTED	39.0	850	800	660	RESTRICTED	37.5	700	440	350	RESTRICTED	39.0	360	310	260		
5.2	4.5	850	850	850			30.0	850	850			850	25.5	690			580	450	37.0			690	440	350	33.0	310
6.5					0.0	850	850	850																		
7.0																										
8.2																										
8.5																										
10.0																										
11.0																										
11.1																										
13.0																										
14.1																										
15.0																										
17.0																										

Fig. 3-16

OFFSET POSITION SH2


Working Radius (m)	① 4.735m BOOM				② 7.695m BOOM				③ 10.655m BOOM				④ 13.565m BOOM				⑤ 16.475m BOOM				Working Radius (m)					
	BOOM FULLY RETRACTED					WHEN BOOM 2 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 4.735m-7.695m BOOM					WHEN BOOM 3 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 7.695m-10.655m BOOM					WHEN BOOM 4 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 10.655m-13.565m BOOM						WHEN THE MARK  ON BOOM 4 IS EXPOSED, USE RATINGS FOR 13.565m-16.475m BOOM				
	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE						
	MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			
2.7	62.5	850	850	850	72.5	850	850	850	73.0	850	850	850														
3.5	52.0	850	850	850	67.0	850	850	850	70.5	850	850	850														
4.0	44.0	850	850	850	63.0	850	850	850	65.0	850	850	850	74.5	850	850	850										
5.0	21.5	850	850	850	55.0	850	850	850	64.0	850	850	850	70.5	850	850	850	74.0	850	850	850						
5.2	0.0	850	850	850	53.0	850	850	850	65.0	850	850	850	69.5	850	850	850	73.0	850	850	850						
6.0					45.5	850	850	850	66.0	850	850	850	66.0	850	850	850	70.5	850	850	850						
7.0					34.0	850	850	850	59.0	850	850	850	61.5	850	850	850	67.0	730	710	700						
8.1					9.5	850	850	700	53.0	850	850	850	56.5	850	840	660	62.5	610	590	510						
10.0									45.5	850	840	710	46.5	800	560	430	55.0	510	450	380						
11.1									28.5	690	580	450	39.5	690	440	350	50.0	450	400	340						
13.0									0.0	500	420	330	24.0	430	330	280	41.5	360	310	260						
14.0													0.0	370	280	260	36.0	310	260	220						
16.0																	21.0	190	160	130						
16.9																	3.5	160	140	110						

Fig. 3-17

OFFSET POSITION SH3


Working Radius (m)	① 4.735m BOOM				② 7.695m BOOM				③ 10.655m BOOM				④ 13.565m BOOM				⑤ 16.475m BOOM				Working Radius (m)					
	BOOM FULLY RETRACTED					WHEN BOOM 2 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 4.735m-7.695m BOOM					WHEN BOOM 3 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 7.695m-10.655m BOOM					WHEN BOOM 4 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 10.655m-13.565m BOOM						WHEN THE MARK  ON BOOM 4 IS EXPOSED, USE RATINGS FOR 13.565m-16.475m BOOM				
	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION			40.0 OR MORE						
	MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			MAX	MID	MIN			
2.7	63.5	850	850	850	74.5	850	850	850	74.5	850	850	850														
3.5	51.0	850	850	850	68.0	850	850	850	71.5	850	850	850														
4.0	41.0	850	850	850	64.0	850	850	850	68.0	850	850	850	75.5	850	850	850										
4.6	20.5	850	850	850	58.5	850	850	850	66.0	850	850	850	73.0	850	850	850										
5.0					54.5	850	850	850	65.5	850	850	850	71.0	850	850	850	74.5	850	850	850						
6.0					44.0	850	850	850	59.5	850	850	850	66.5	850	850	850	71.0	850	850	850						
7.0					29.5	850	850	850	53.0	850	850	850	62.0	850	850	850	67.5	730	710	700						
7.5					15.5	850	850	840	49.0	850	850	790	59.5	850	850	730	65.5	670	650	620						
8.0									45.0	850	850	720	57.0	850	850	670	63.5	620	600	520						
10.5									9.5	550	460	370	42.5	760	470	380	53.0	490	420	360						
13.4													7.5	390	290	270	38.0	340	290	240						
14.0																	34.0	310	260	220						
15.0																	26.5	250	210	180						
16.32																	3.5	170	150	120						

Fig. 3-18

Rated Total Load Chart for Fly-Jib

CAUTION: The rated total load is a load including the mass of a hoisting accessory (hook: 20kg).

Rated total load chart	
Boom angle (deg)	Rated total load (kg)
72 and over	520
69	420
66	320
63	250
60	220
55	170

WORKING RADIUS/LIFTING HEIGHT

Standard

WARNING!

- The diagram of working radius and lifting height shows the relationships the working radius of this machine, boom angle, and lifting height above the ground with no object hoisted. The diagram has been made allowing for no deflection in the boom.
- The boom (4) in the diagram of working radius and lifting height represents a state that half of the "▲ mark" passes boom (3).

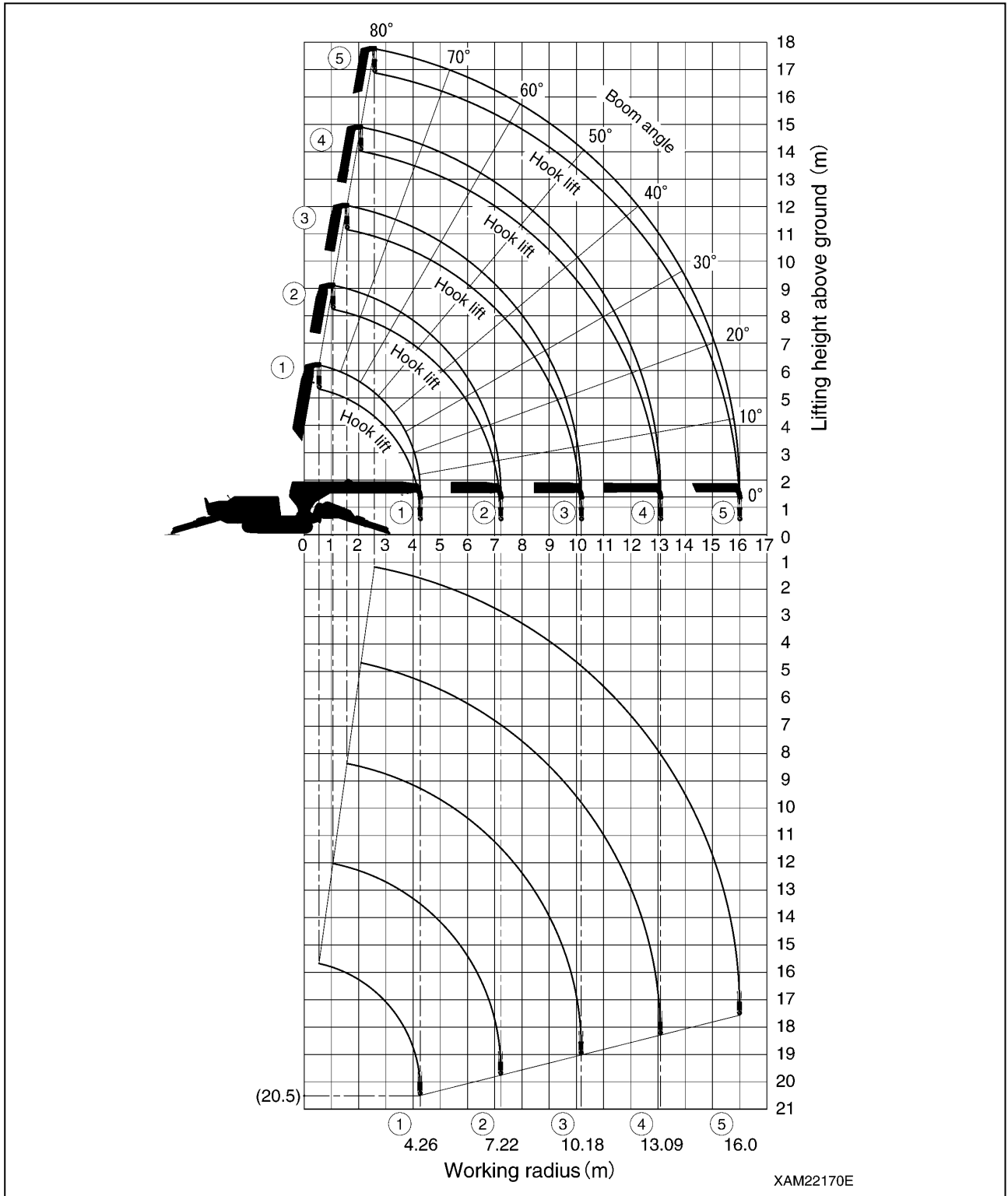


Fig. 3-19

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

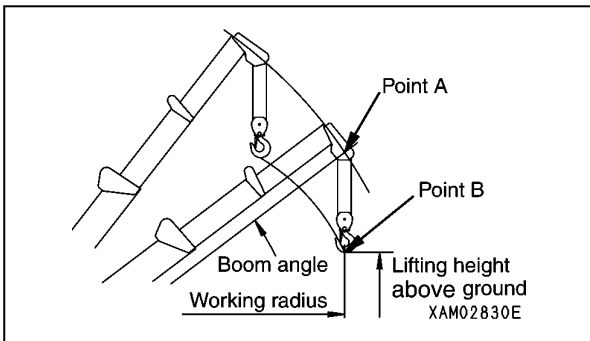


Fig. 3-20

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

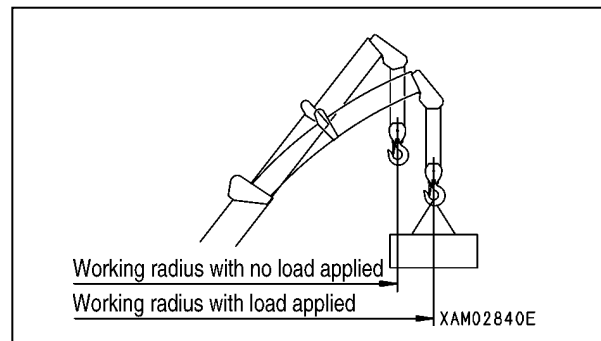


Fig. 3-21

During Pick & Carry

DANGER! When using Pick & Carry duties, follow these rules to prevent machine from tipping over.

1. Do not travel on a slope, soft ground or uneven ground.
2. Do not slew. Avoid any sharp movements when stopping or starting.
3. When travelling with a load, keep it low to the ground as possible.
4. If the load slews, stop travelling until the load is still.

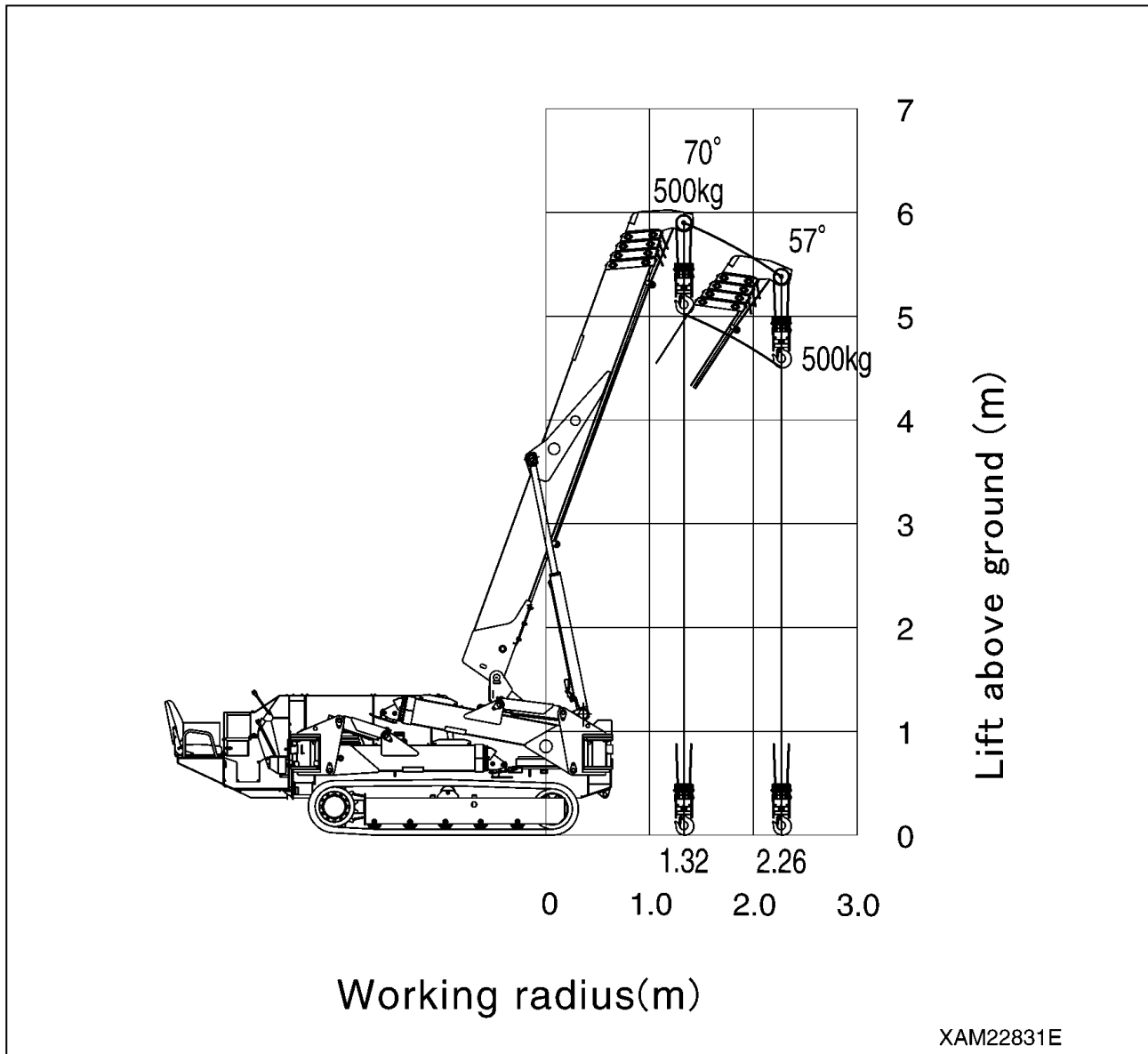


Fig. 3-22

Working Radius/Lifting Height for 850 kg Searcher Hook

DANGER!

- When using 850 kg searcher hook, be sure to set searcher hook mode for moment limiter.
- Number of falls mode and searcher hook offset position must be set as “850 kg searcher hook mode” when 850 kg searcher hook is used. Searcher hook offset position must be displayed on moment limiter boom length window.
- Never use the searcher hook and the crane hook simultaneously.

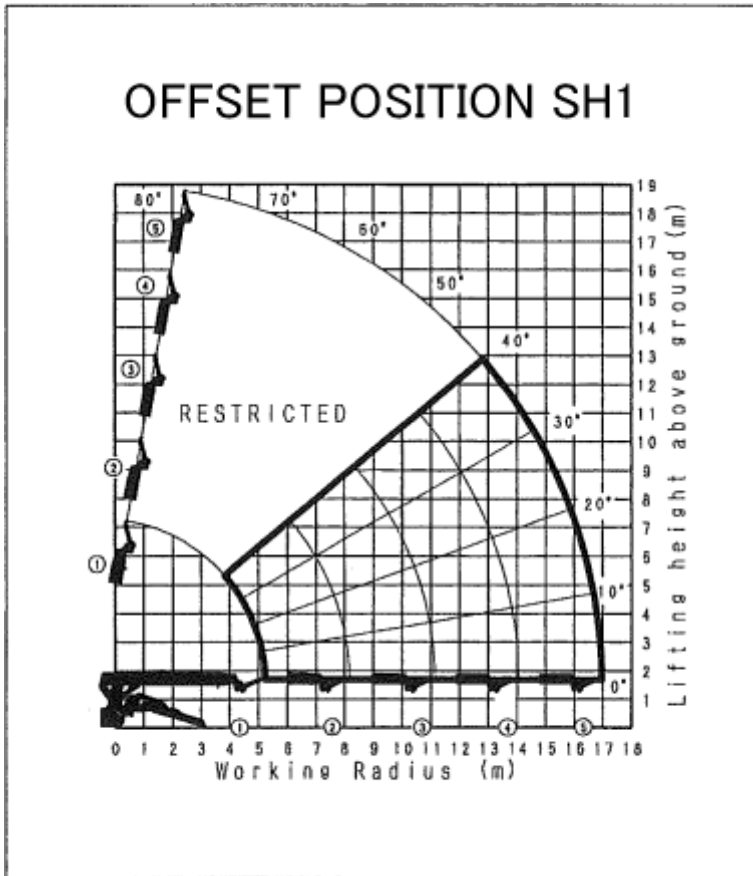


Fig. 3-23

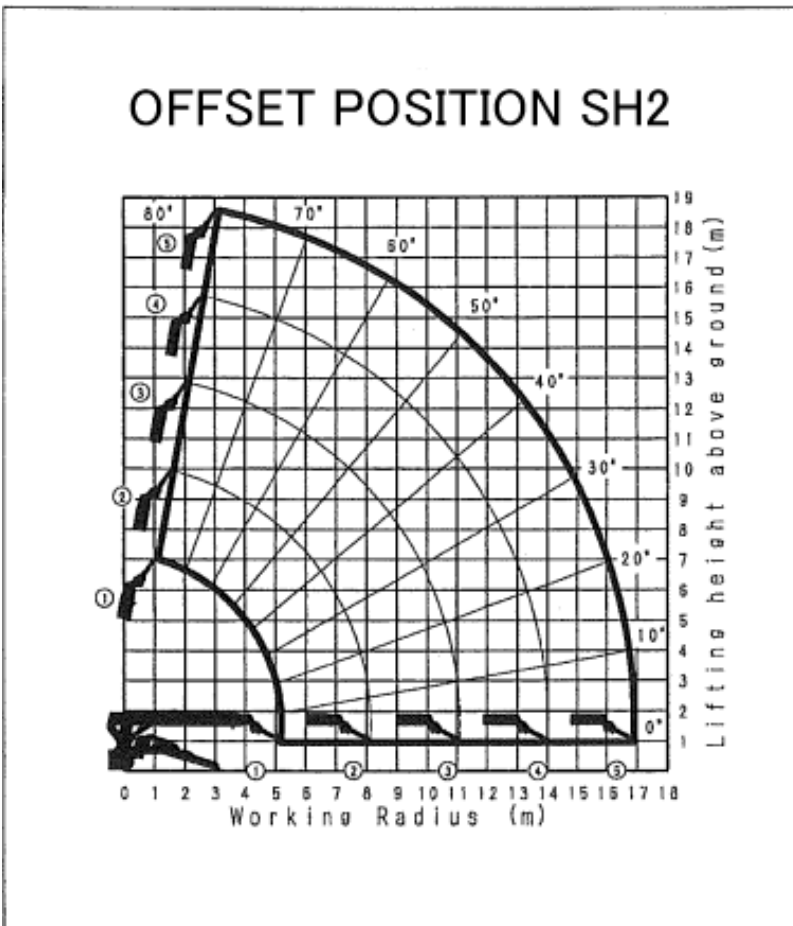


Fig. 3-24

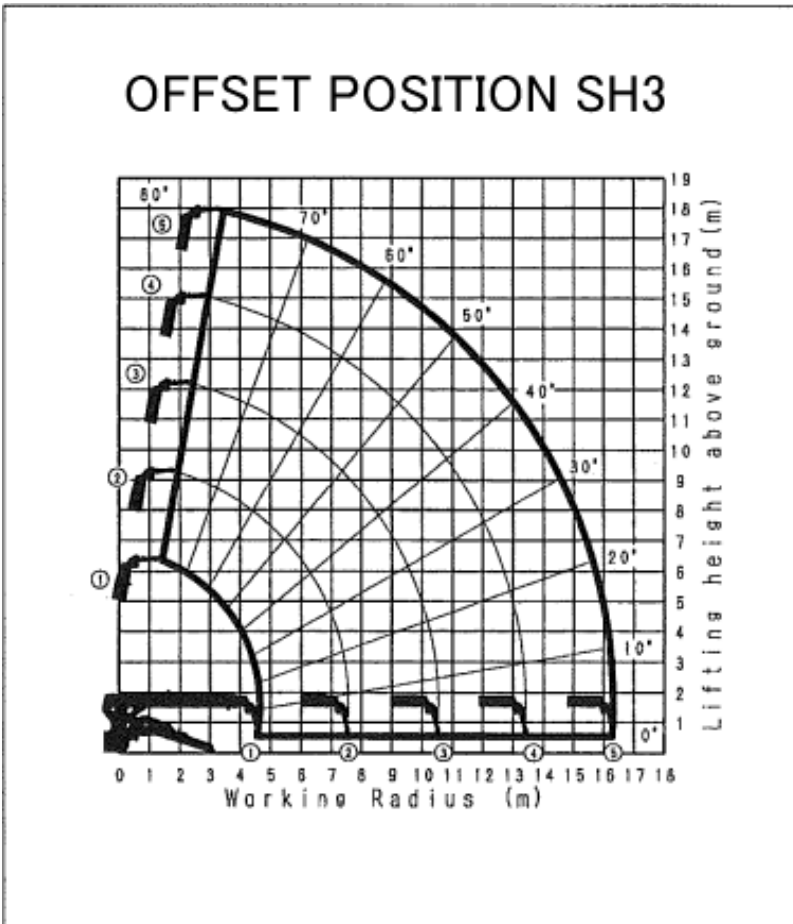


Fig. 3-25

Working Radius/Lifting Height for Fly-jib

WARNING! The diagram of working radius and lifting height shows the relationships the working radius of this machine, boom angle, and lifting height above the ground with no object hoisted. The diagram has been made allowing for no deflection in the boom.

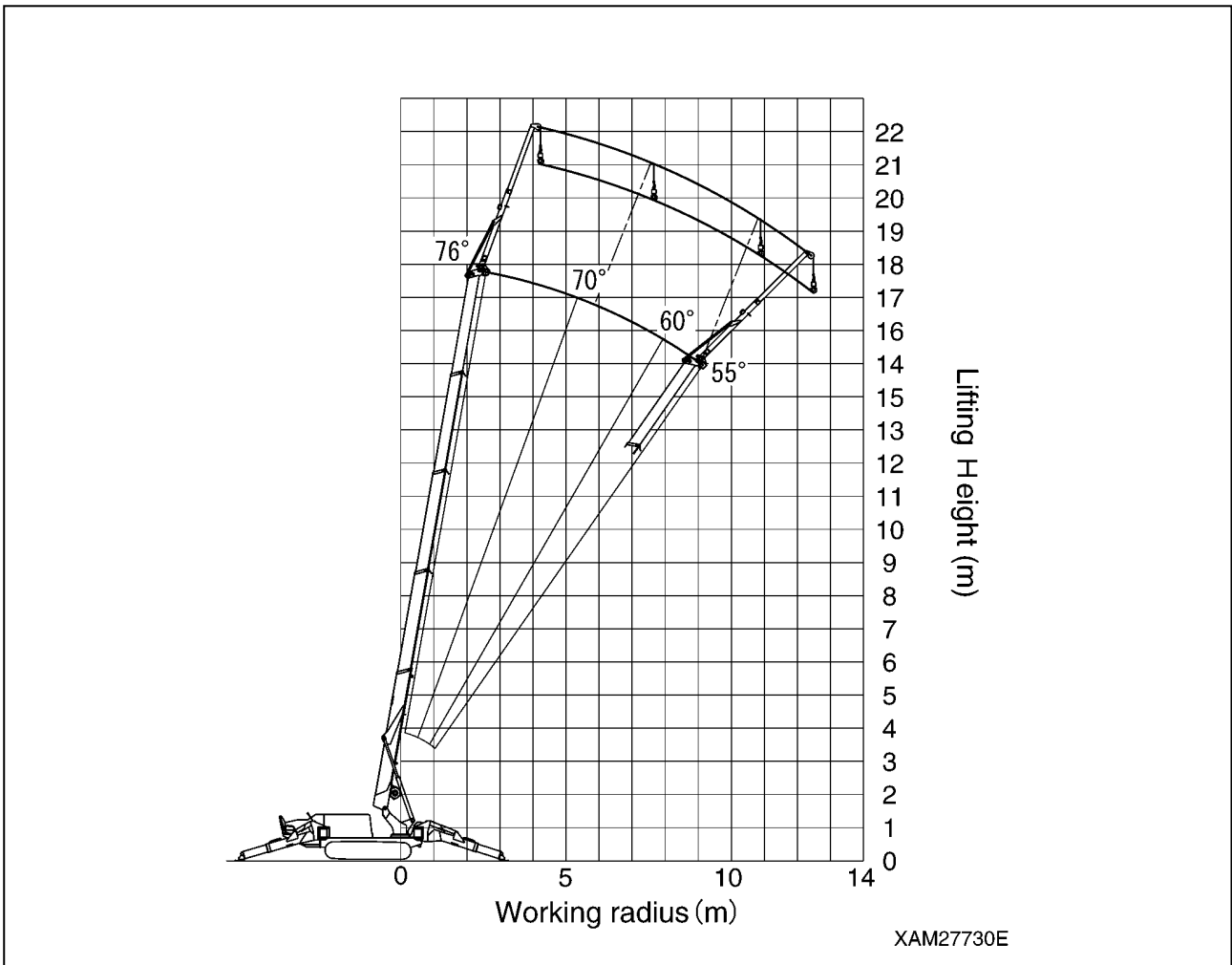
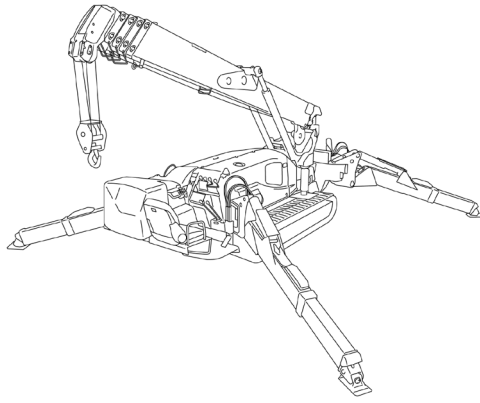
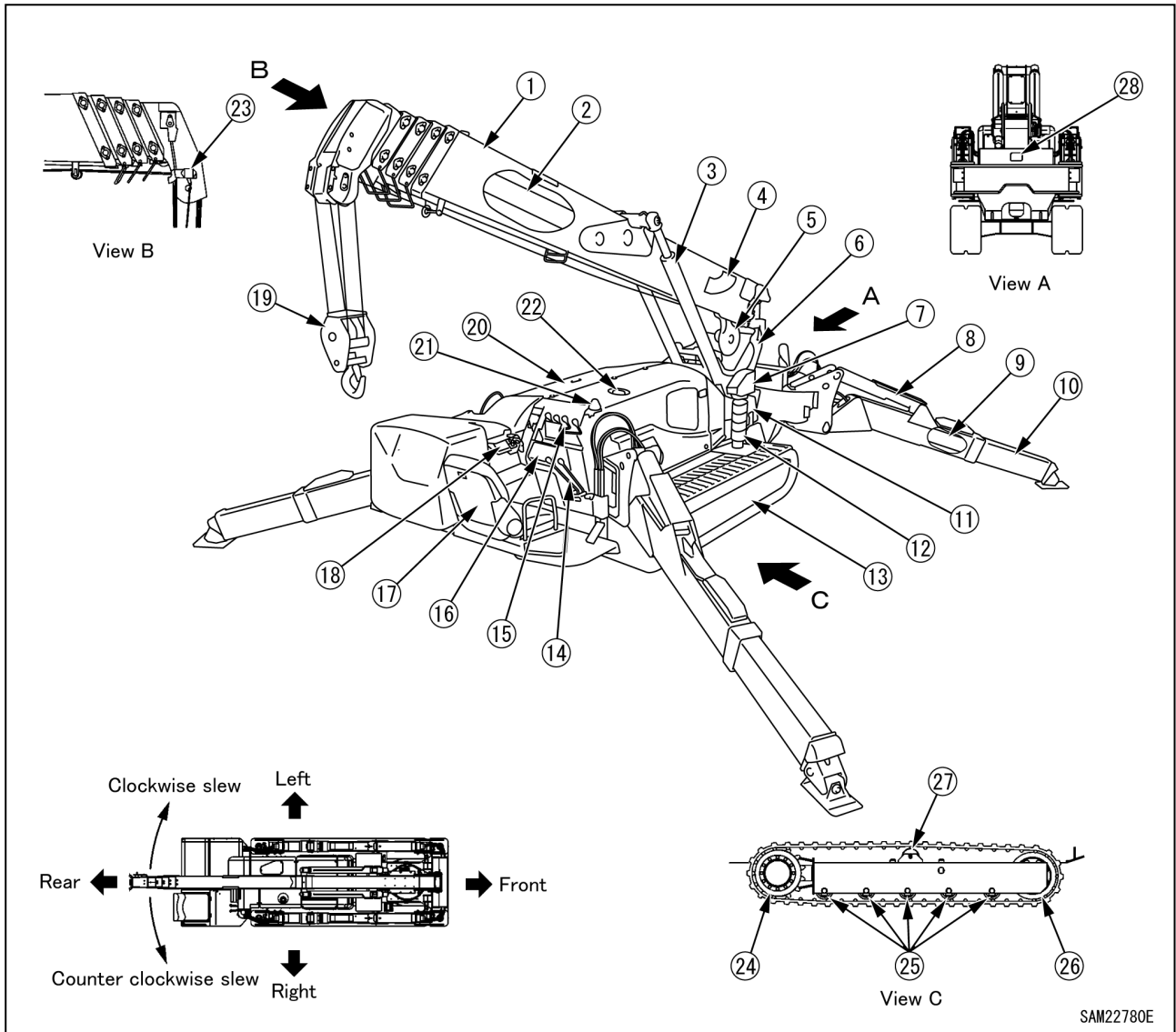


Fig. 3-26



Section 4
OPERATION

MACHINE COMPONENTS



SAM22780E

Fig. 4-1

- | | |
|---|--|
| 1 - Boom | 15 - Crane control |
| 2 - Boom telescoping cylinder (Inside the boom) | 16 - Moment limiter display unit |
| 3 - Boom derricking cylinder | 17 - Operation seat |
| 4 - Angle indicator | 18 - Instrument panel |
| 5 - Winch | 19 - Hook block |
| 6 - Post | 20 - Hydraulic oil tank (Inside machinery cover) |
| 7 - Moment limiter converter | 21 - Outrigger un-set warning lamp |
| 8 - Outrigger setting cylinder | 22 - Fuel tank (Inside machinery cover) |
| 9 - Outrigger extension cylinder (Built in the box) | 23 - Over winding detector |
| 10 - Outrigger | 24 - Travelling motor and sprocket |
| 11 - Slewing device | 25 - Track roller |
| 12 - Working status lamp | 26 - Idler |
| 13 - Rubber track | 27 - Carrier roller |
| 14 - Travel control | 28 - Working light |

Boom

A boom with a 5-stage telescoping mechanism.

Boom Telescoping Cylinder

A telescoping cylinder built into the boom.

Boom Derrick Cylinder

A cylinder for lifting the main boom.

Angle Indicator

An angle meter for reading the boom angle by eye, located on either side of the boom.

See “Reading the Angle Indicator” on page 3-13 on how to read the angle indicator.

Winch

A device for winding and unwinding winch wire, composed of a motor and drum.

For operational methods for the winch, see “Hook Raising/Lowering Operation” on page 4-63.

Post

A frame of the slewing part on which the working machine is mounted.

Moment Limiter Converter, Moment Limiter Display

A safety device to detect the machine’s status from various sensors and prevent it from being overloaded.

Outrigger Setting Cylinder, Outrigger Extension Cylinder, Outrigger

Four devices to maintain the vehicle body level and stabilize.

For more information on how to set the outriggers in place, see “OUTRIGGER SETTING” on page 4-42. For information on how to stow the outriggers, see “OUTRIGGER STOWING” on page 4-49.

Slewing device

A device to slew the crane.

Rubber Tracks, Travel Motor and Sprocket, Track Roller, Idler, Carrier Roller

Travel device for travelling.

Travel Control

A part for travel control of the machine.

For operation method of travelling, see “TRAVELLING CONTROLS AND OPERATION” on page 4-23.

Crane Control

A part for controlling the crane.

Operation Seat

The spot where the operator sits.

For more information, see “OPERATION SEAT” on page 4-13.

Instrument Panel

Features various operation switches and monitors.

For more information, see “INSTRUMENT PANEL SECTIONS” on page 4-7.

Hook Block

A hook block to hoist the load.

Hydraulic Oil Tank

A tank for putting hydraulic oil in to operate the hydraulic oil equipment.

Outrigger un-set warning lamp

A lamp that flashes to alert the operator if the outriggers are not properly set in place.

For more information, see “OUTRIGGER UN-SET WARNING LAMP (YELLOW)” on page 4-39.

Fuel Tank

A tank for putting fuel in to operate the engine.

Over Winding Detector

A safety device to prevent the over-winding of the winch wire.

For more information on the device, see “Over Winding Detector” on page 4-80.

Working Status Lamp

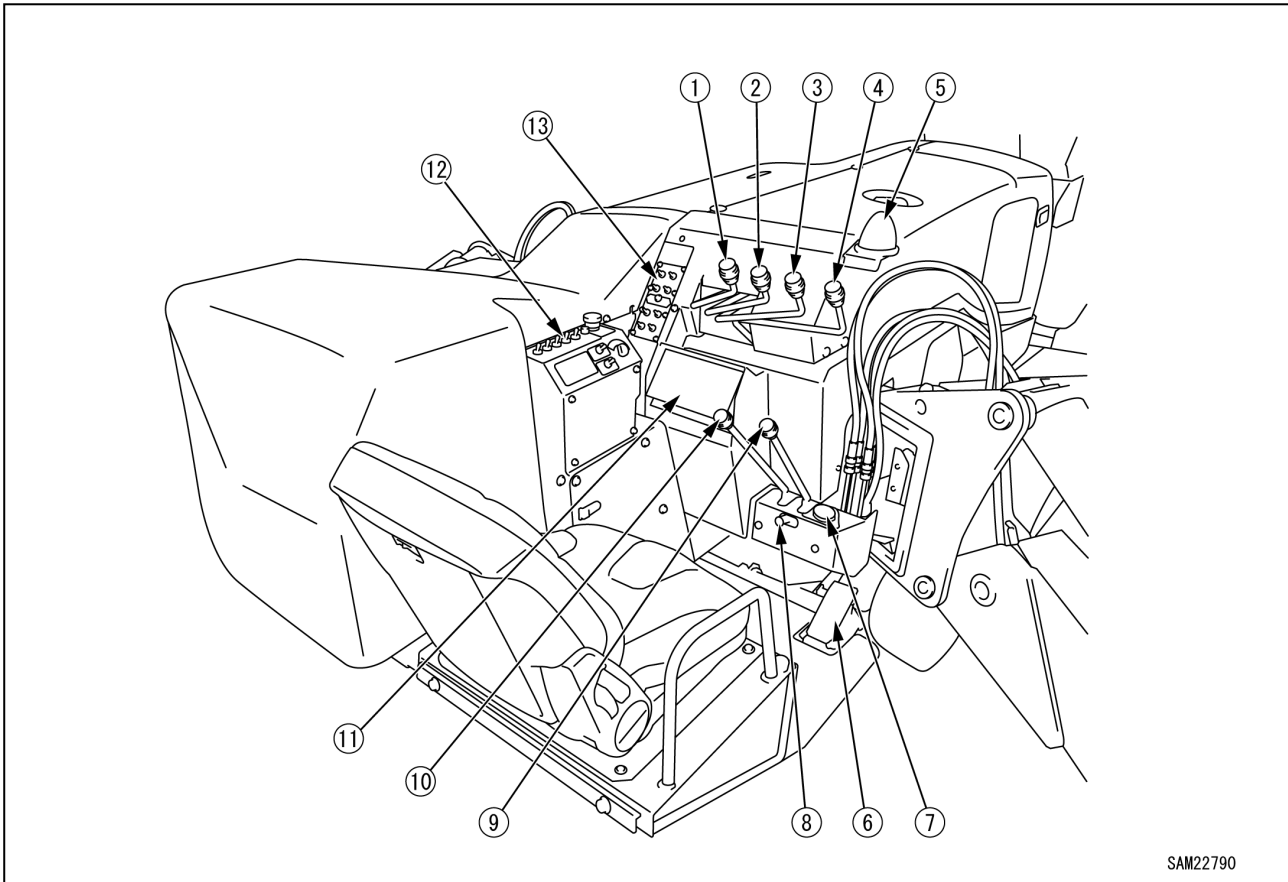
Red, yellow and green lamps light up according to the operational status of the machine.

Working Light

A working light to illuminate the front.

TRAVEL AND CRANE CONTROLS

Control Location



SAM22790

Fig. 4-2

- | | |
|-----------------------------------|-----------------------------------|
| 1 - Slewing lever | 8 - Travelling lock lever |
| 2 - Boom telescoping lever | 9 - Right travelling lever |
| 3 - Winch lever | 10 - Left travelling lever |
| 4 - Boom derricking lever | 11 - Moment limiter display panel |
| 5 - Outrigger un-set warning lamp | 12 - Instrument panel |
| 6 - Acceleration pedal | 13 - Outrigger operation panel |
| 7 - Level | |

Acceleration Pedal

Use the pedal to adjust the engine speed or output.

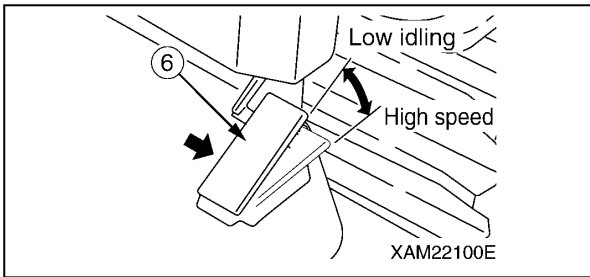


Fig. 4-3

- Low idling: Release your foot from the pedal.
- Full speed: Press down fully on the acceleration pedal.

NOTICE: Press down on the acceleration pedal to the position necessary for the work.

Slewing Lever

Use the lever to slew the crane boom and post.

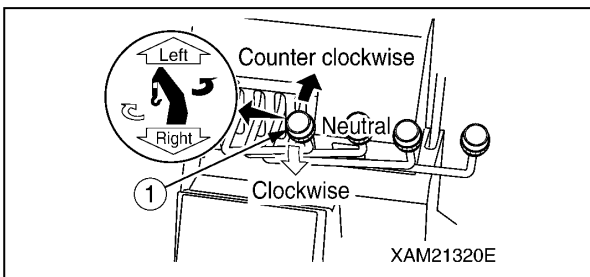


Fig. 4-4

- Slew counterclockwise (left):
Press the lever forward (Left).
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the slewing stops.
- Slew clockwise (right):
Pull the lever toward you (Right).

Boom Telescoping Lever

Use this lever for telescoping the crane boom.

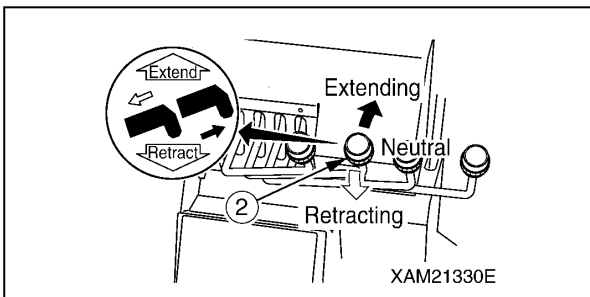


Fig. 4-5

- Extend: Push the lever forward (Extend).
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the boom telescoping stops.
- Retract: Pull the lever toward you (Retract).

Winch Lever

Use this lever to raise/lower the hook block of the crane.

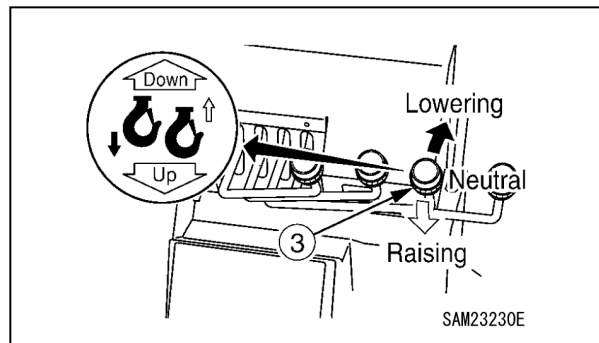


Fig. 4-6

- Lower: Push the lever forward (Down).
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the machine automatically brakes. The lowering/raising of the hook block stops.
- Raise: Pull the lever toward you (Up).

Boom Derricking Lever

Use this lever to raise/lower the hook block of the crane.

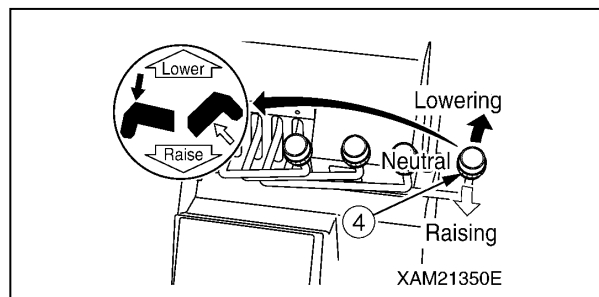


Fig. 4-7

- Lower: Push the lever forward (Lower).
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the boom derricking stops.
- Raise: Pull the lever toward you (Raise).

Travelling Lock Lever

Use this lever to "lock" the travelling levers.

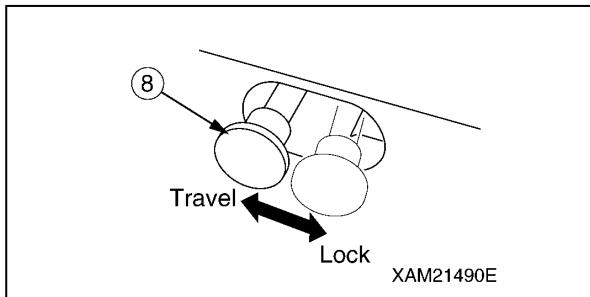


Fig. 4-8

- Lock: Push the lever to the right.
- Travel: Push the lever to the left.

NOTICE: Operate the travelling lock lever while the left and right travelling levers are at the "Neutral" position.

Left/Right Travelling Lever

Use these levers to move the machine forward/backward, stop, slew, and to adjust the travelling speed.

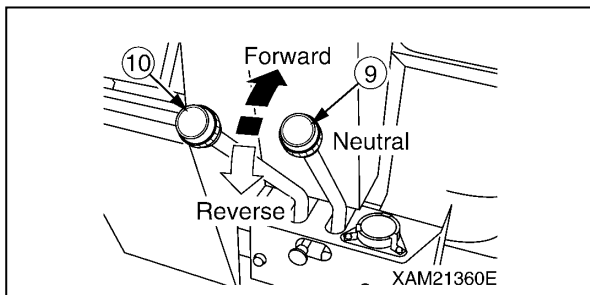


Fig. 4-9

- Forward: Push the left and right levers forward at the same time.
- Neutral: Release your hands from left and right levers at the same time. The levers return to the "Neutral" position and the machine automatically brakes and stops at that position.
- Backward: Pull the left and right levers toward you at the same time.
- Left turn: Release your hand from the left lever and operate the right lever forward or backward.
- Right turn: Release your hand from the right lever and operate the left lever forward or backward.
- Spin turn: Operate the left and right levers to the opposite direction. The left and right crawlers turn to the opposite direction, allowing you to make the spin turn.

Level Gauge

WARNING! When installing the outrigger, make adjustments while looking at the level so that the machine body will be levelled. Performing the crane operation with the body tilted will cause overturning.

This device indicates how much the machine body is tilted.

The bubble position shows how much the machine is tilted in which direction.

Use this device to verify that the machine is levelled when setting the outriggers.

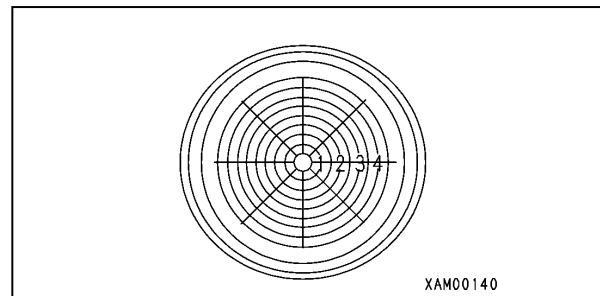


Fig. 4-10

Outrigger Un-Set Warning Lamp (Yellow)

The lamp flashes if one of the four outriggers is not set properly.

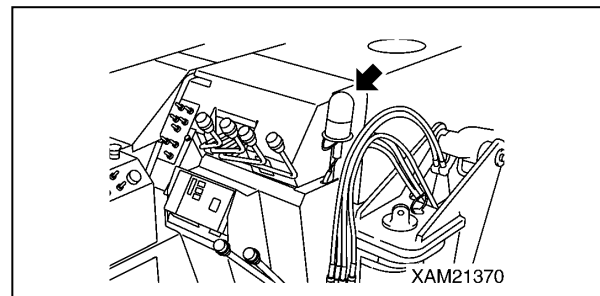


Fig. 4-11

NOTICE:

- If the extension or setting of one of the four outriggers cannot be detected, the outrigger un-set warning lamp flashes.
- The outrigger un-set warning lamp is linked with the working status lamp for moment limiter (red). As the outrigger un-set warning lamp flashes, the working status lamp (red) also rotates and lights up.

INSTRUMENT PANEL SECTIONS

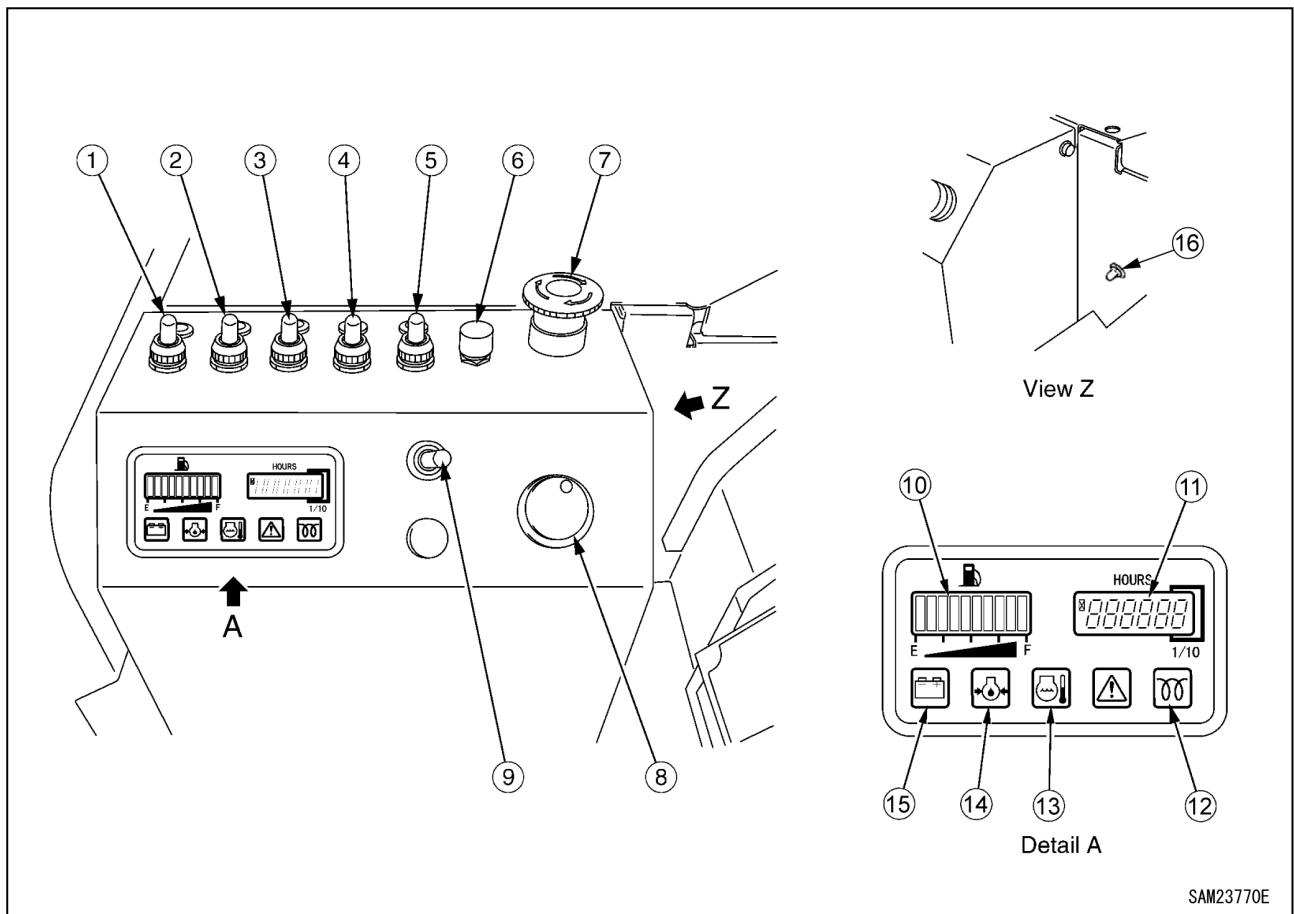


Fig. 4-12

- | | |
|--|---------------------------------------|
| 1 - Working light switch | 9 - Pick & Carry switch |
| 2 - Crane high-speed switch | 10 - Fuel gauge |
| 3 - Hook stowing switch | 11 - Hour meter |
| 4 - Travelling high-speed switch | 12 - Pre-heat monitor |
| 5 - Boom stowing switch | 13 - Engine water temperature monitor |
| 6 - Horn switch | 14 - Engine oil pressure monitor |
| 7 - Engine emergency stop switch (EMO) | 15 - Battery charge monitor |
| 8 - Starter switch | 16 - Boom lift bypass switch |

Switches

Working Light Switch

Use this switch to turn on the working lights on front of the machine. The pilot lamp at the switch section lights up when the switch is set to the "ON" position and extinguishes at the "OFF" position.

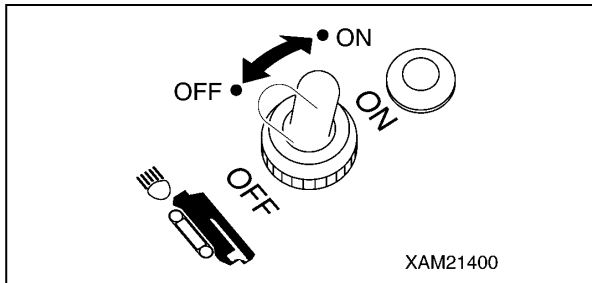


Fig. 4-13

- ON: Push the switch forward. The working lights turn on.
- OFF: Push the switch toward you. The working lights turn off.

NOTICE: The working lights do not light up even if the working lights switch is operated when the starter switch is at the "OFF" position.

Crane High-Speed Switch

Use this switch to change the operating speed of the crane during the crane operation.

The pilot lamp at the switch section lights up when the switch is operated to the "ON" position and extinguishes at the "OFF" position.

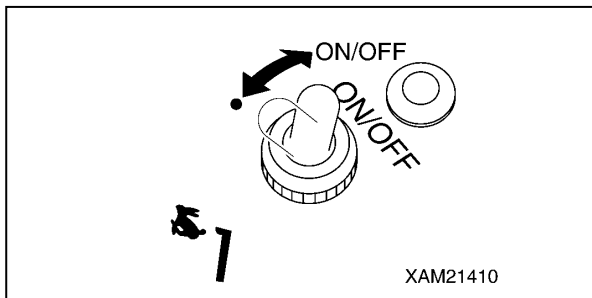


Fig. 4-14

- ON: Push the switch forward, and when the pilot lamp lights up the switch turns "ON" and the crane operating speed increases.
- OFF: Push the switch forward again, and when the pilot lamp goes off the switch turns "OFF" and the crane operating speed returns to normal.

NOTICE: Always set the work selector switch on the outrigger operation panel to the "Crane" position. If the work selector switch is at other position than "Crane", the crane high-speed switch does not work.

Hook Stowing Switch

WARNING!

- The hook stowing switch cancels the auto-stop function of the over winding detector. Operate the winch lever carefully when stowing the hook block. Pay sufficient attention not to let the hook block collide with the boom.
- Use this switch only when stowing the hook block.

Use this switch to stow the hook block at the tip of the boom. The pilot lamp at the switch section lights up when the switch is operated to the "ON" position and extinguishes at the "OFF" position.

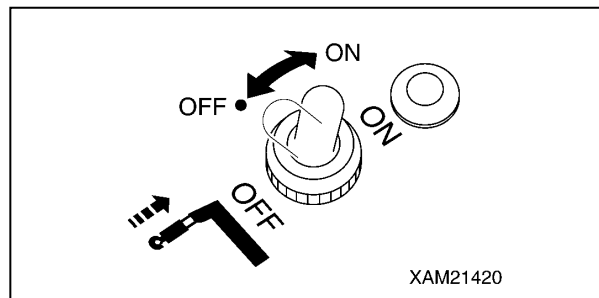


Fig. 4-15

- ON: Keep pushing the switch forward and operate the winch lever to "RAISE" side. The hook block is raised and can be stowed in the tip of the boom.
- OFF: Release your finger from the switch. The switch returns to the original position and the auto-stop function of the over winding detector will be activated.

Travelling High-Speed Switch

NOTICE:

- During Pick & Carry, the machine will not be in high-speed mode even when the travelling high-speed switch is operated to the "ON" position.
- It may be difficult to change the direction in the high-speed travelling mode. In that case, switch to the low-speed travelling mode.

Use this switch to change the mode of the machine travelling speed.

The pilot lamp at the switch section lights up when the switch is operated to the "ON" position and extinguishes at the "OFF" position.

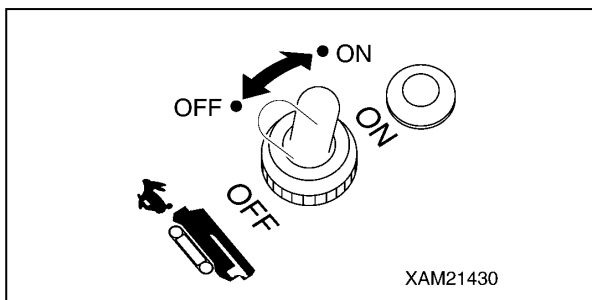


Fig. 4-16

- ON: Push the switch forward. The travelling speed mode changes to high-speed travelling mode.
- OFF: Push down the switch toward you. The travelling speed mode changes to low-speed travelling mode.

Boom Stowing Switch

WARNING!

- The boom stowing switch cancels the auto-stop function of the lower-limit detecting interlock device during the boom "lowering" operation. Operate the boom derricking lever carefully when stowing the boom. Pay sufficient attention not to let the boom collide with the machine body.
- Use the boom stowing switch only when stowing the boom.

Use this switch to stow the boom.

The pilot lamp at the switch section lights up when the switch is set to the "ON" position and extinguishes at the "OFF" position.

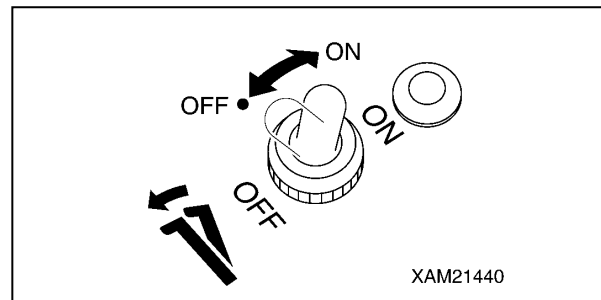


Fig. 4-17

- ON: Keep pushing the switch forward and operate the boom derricking lever to "LOWER" side. The boom lowers and can be stowed.
- OFF: Release your finger from the switch. The switch returns to the original position and the auto-stop function of the lower-limit detecting interlock device will be activated.

Horn Switch

Use this switch to honk the horn.

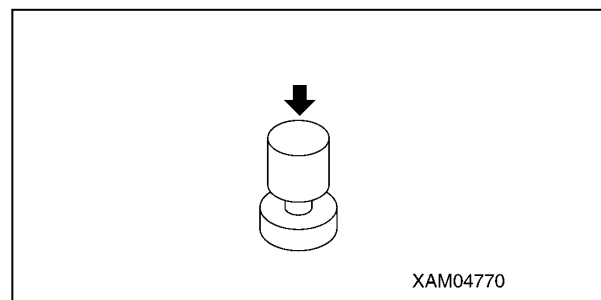


Fig. 4-18

- Honking the horn: Press the switch.

NOTICE: The horn will stop when you release your finger from the switch.

Engine Emergency Stop Switch (EMO)

Use this switch in case of an error in the machine to stop the machine for emergency.

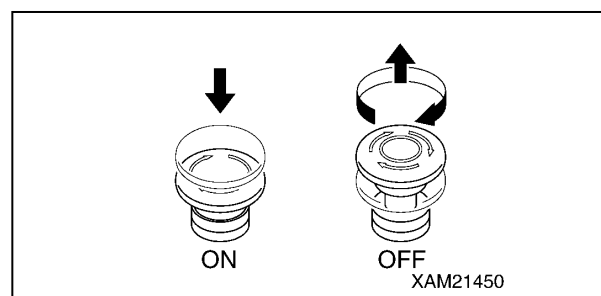


Fig. 4-19

- ON: Press the switch. The engine stops.
- OFF: Turn the switch clockwise (direction of the arrow in the figure). The switch returns to the original position.

NOTICE: When restarting the engine after overriding, be sure to turn the engine emergency stop switch (EMO) to the "OFF" position before starting the engine.

Starter Switch

CAUTION: Always turn the starter switch to the "OFF" position after completing the work.

NOTICE: When inserting the key for the starter switch, slide the cover to the right so that you can see the keyhole of the switch, and then insert the key.

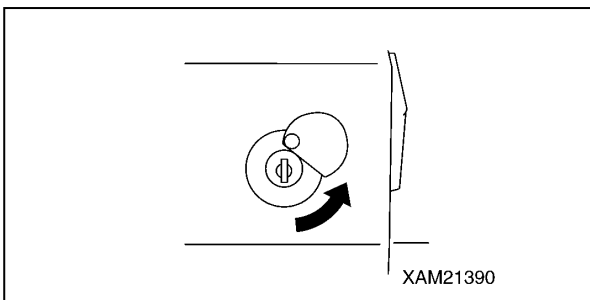


Fig. 4-20

Use this switch to start and stop the engine.

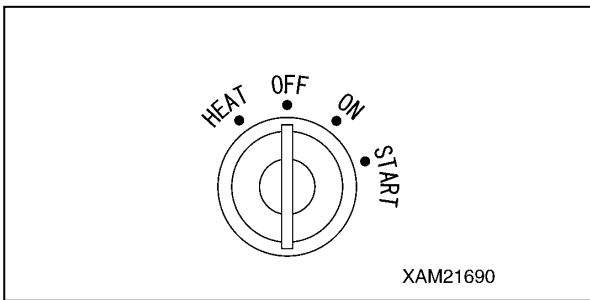


Fig. 4-21

- **HEAT:** Turn the key to this position when starting the engine in the cold weather.
- **OFF:** You can insert/remove the key at this position. All the switches in the electrical system are turned off and the engine stops.
- **ON:** Electricity runs into all the circuits.
- **START:** When the engine has started, release your hand from the key. The key automatically returns to the "ON" position.

Pick & Carry Switch

WARNING! As a rule, Pick & Carry is prohibited since the machine will be very unstable and it accompanies the risk of overturning.

If you have to perform Pick & Carry by necessity, strictly observe the following cautions.

- Strictly maintain the "Pick & Carry posture" and observe "Rated total load chart for Pick & Carry".
- Carefully study the situation at the worksite and travel on the flat and solid ground. Do not travel on soft ground, irregular ground or ground with many obstacles, in the water, in the snow, and on the frozen surface.
- Switch the engine speed to low during Pick & Carry. Do not make sudden start, sudden stop, and sudden direction change. Keep the hoisted load near ground so that it will not slew.
- The overturning alarm buzzer will sound when the machine tilts during crane operation or Pick & Carry. Stop the work immediately when the alarm buzzer sounds, and try to avoid the danger of overturning.
- Always keep the moment limiter override switch at "OFF" position when performing Pick & Carry.

For more information, see "Pick & Carry Operation" on page 4-84.

Use this switch when performing Pick & Carry.

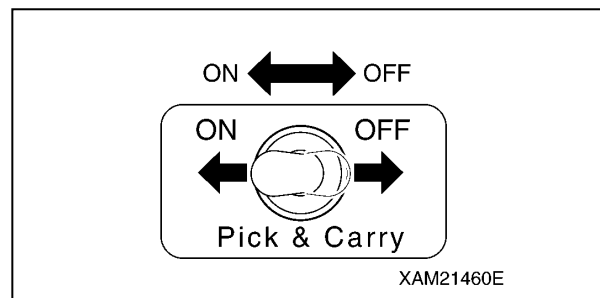


Fig. 4-22

- **ON:** Push down the switch to the left. The machine is now in the Pick & Carry posture mode.
- **OFF:** Push down the switch to the right. The Pick & Carry posture mode is cancelled.

Boom Lift Bypass Switch

Use this switch to raise the boom in overload condition.

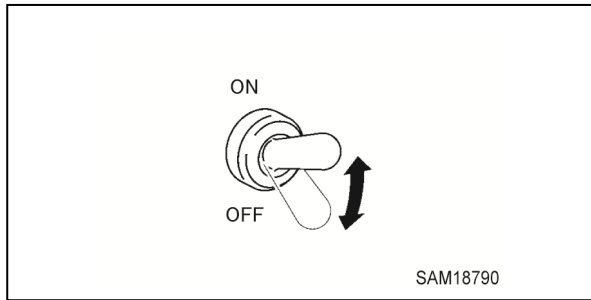


Fig. 4-23

- **ON:** Keep pushing the switch upward. This releases boom raise restriction under overload condition and you can raise the boom.
- **OFF:** Release your finger from the switch. The switch returns to the original position and the auto-stop function of boom raise under overload condition will be activated.

For more information about how to use this switch, see "Moment Limiter Operations" on page 4-70.

Moment Limiter Override Switch

Override Switch is a function that disables the moment limiter function.

For more information on how to use this switch, see "Moment Limiter Override Switch" on page 4-83.

Monitors

CAUTION: If the monitor flashes during the work, stop the operation immediately and check, adjust, or repair the relevant section.

Fuel Gauge

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

Turn the starter switch to the "ON" position and the gauge indicates the remaining amount of the fuel with the "bar".

When only one "bar" lights up on the "E" side, there is not much fuel left.

Stop the operation immediately and refuel.

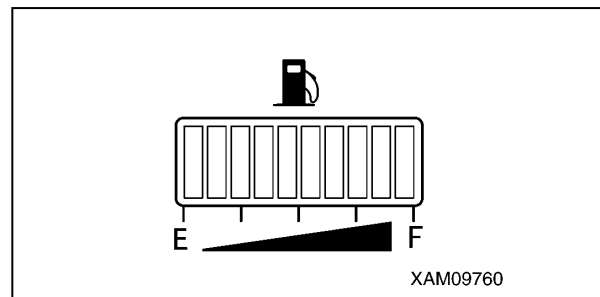


Fig. 4-24

NOTICE:

- At the end of a day, fuel to full (until all the bars (10 bars) light up.)
- The remaining amount indicated may not be correct for a while after the starter switch is turned to the "ON" position. This is normal.

Hour Meter

This meter shows the total running hours of the machine.

Use this value as the reference for periodical check interval.

If the engine is in operation, the meter indication advances even if the machine is not travelling.

The meter indication advances for "1" when the machine has been running for 1 hour regardless of the engine rotation speed.

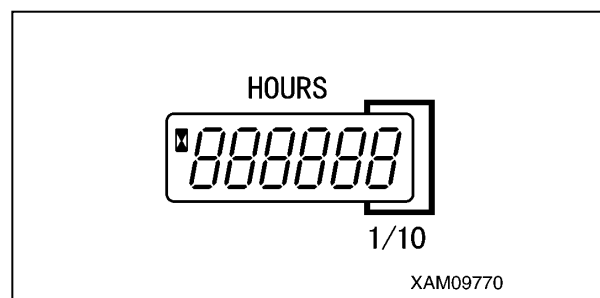


Fig. 4-25

Preheat Monitor

The monitor lights up during the preheating operation when starting the engine.

It lights up when the starter switch is operated to the "HEAT" (preheat) position and goes off in several seconds to indicate the completion of preheating.

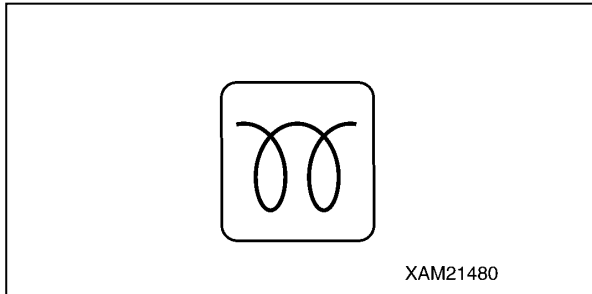


Fig. 4-26

Engine Water Temperature Monitor

This monitor indicates errors with the engine coolant temperature.

The temperature is normal if this monitor is OFF during the operation.

If it lights up during the operation, it means that the engine coolant temperature exceeded the normal temperature.

Promptly switch the engine rotation to low idling and wait until the monitor goes off (engine coolant temperature goes down).

Then, stop the operation and check the water leakage from the radiator, clogging in the radiator core, and damage and tension of the alternator belt.

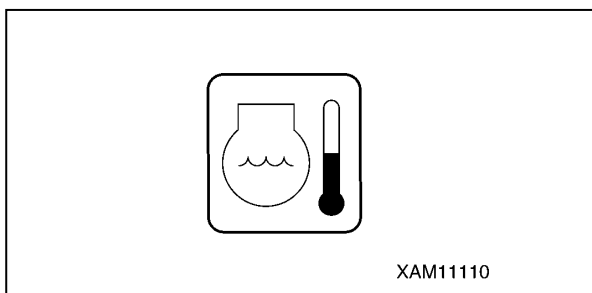


Fig. 4-27

Engine Oil Pressure Monitor

This monitor indicates the drop in the engine oil pressure.

If it lights up when the starter switch is turned to the "ON" position and goes off as the engine rotation increases after the engine is started, the engine oil pressure is normal.

If it lights up during the operation, the engine oil pressure has dropped.

Immediately stop the machine and check the clogging of the engine oil filter and engine lubricant level.

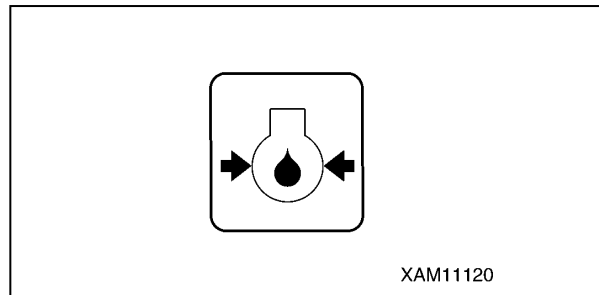


Fig. 4-28

Battery Charge Monitor

This monitor indicates errors in the battery charge system.

If it lights up when the starter switch is turned to the "ON" position and goes off as the engine rotation increases after the engine is started, the battery charge system is normal.

If it lights up during the operation, there is an error in the battery charge system.

Immediately stop the machine and check the tension of the alternator belt.

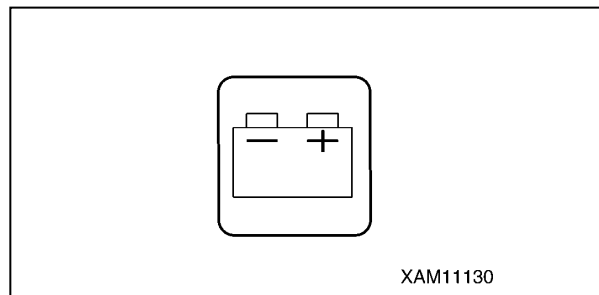


Fig. 4-29

OPERATION SEAT

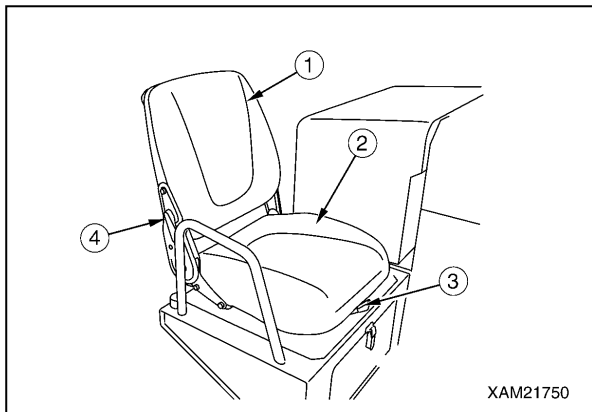


Fig. 4-30

- 1 - Back seat
- 2 - Seat
- 3 - Slide adjusting lever
- 4 - Reclining adjusting lever

WARNING!

- **Adjust the operation seat before operation.**
Be sure to make adjustment especially after someone else has used it.
- **Press your back against the back seat of the operation seat and adjust the operation seat so that you can operate the acceleration pedal, control levers and travelling lever without any difficulty.**
- **Never adjust the operation seat while operating the machine.**

Seat Forward/Backward Slide Adjustment

Use the slide adjusting lever (3) to make adjustment.

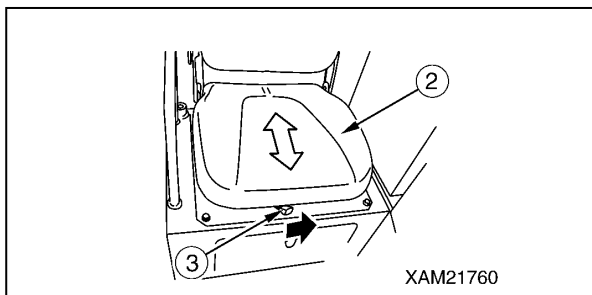


Fig. 4-31

1. While pushing the slide adjusting lever (3) leftward, move the seat (2) forward/backward.
2. After adjusting the seat (2), release your hand from the slide adjusting lever (3).
The seat (2) is fixed to the position.

NOTICE: The forward/backward slide adjustment distance is 120 mm in 6 steps.

Reclining Adjustment

Use the reclining adjusting lever (4) to make adjustment.

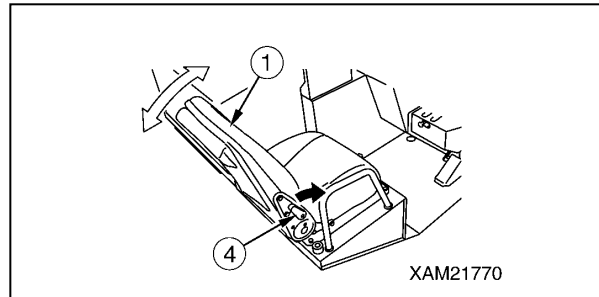


Fig. 4-32

1. While pushing the reclining adjusting lever (4) forward, move the backseat (1) forward/backward.
2. After adjusting the back seat (1), release your hand from the reclining adjusting lever (4).
The back seat (1) is fixed to the position.

NOTICE: The reclining adjustment angle is 75 degrees in 7 steps forward and 23 steps in backward.

OPERATION RELATED PRECAUTIONS

Before Starting Engine

Establish Safety of Working Site

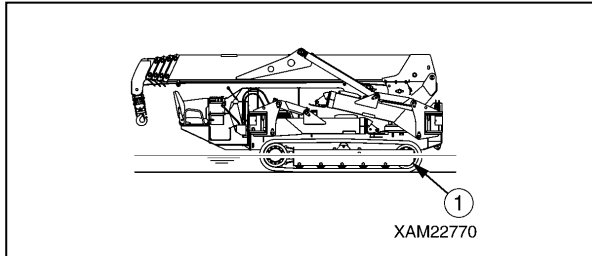


Fig. 4-33

- Confirm that no danger is present at the working site before starting work.
- Investigate the ground and road surface condition of the working site and decide the best working method.
- Flatten the inclination of the working site as much as possible before starting work. Also, if sands and gravels are excessive, spray water before work.
- When working over the roadway, enforce keep out by for instance placing guides or surrounding by barriers, and ensure the safety of the traffic vehicles and pedestrians.
- Enforce keep out to prevent people from entering the working site and apply measures to prevent people from approaching. Attempt to approach travelling machine may result in hard collision by contact or pinching, and may result in serious bodily accidents and deaths.
- When travelling in the water or crossing over shallow water, check the ground condition, depth and water velocity beforehand and make sure not to exceed the allowable water depth (no higher than centre of idler (1)).

Inspection Before Starting Engine

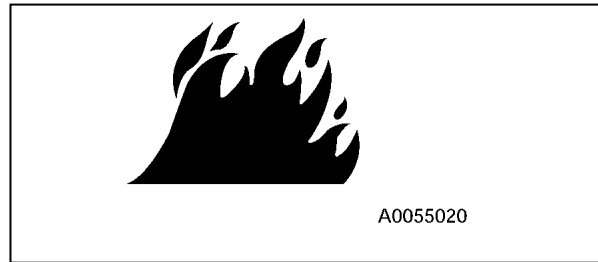


Fig. 4-34

Execute following inspections before the first engine startup of the day.

Omitting these inspections may result in serious bodily accidents.

- Inspect for the fuel/oil leak, accumulation of combustibles around the engine and battery systems, and similar phenomenon.
For more information, see "Checking Before Operation" on page 4-18.
- Inspect the fuel quantity, coolant quantity, hydraulic oil tank quantity, air cleaner blockage, electrical wiring damage, and check operations of safety devices and instruments.
For more information, see "Checking Before Operation" on page 4-18.
- Make sure the operation levers are at neutral position.
Check that the operation linkages operate adequately.
Always repair if any result of the above is faulty.

Cautions When Starting Engine

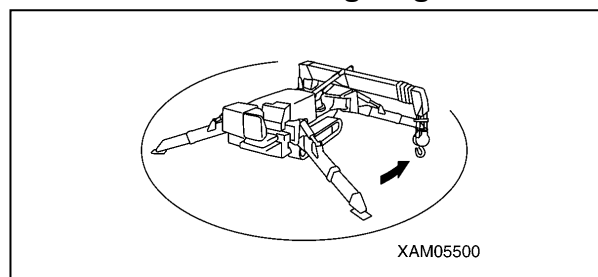


Fig. 4-35

- Make sure no person or object is within the boom slewing radius area before starting engine.
- Blow the horn for warning before starting the engine.
- Do not start the engine by short-circuiting the starter circuit. Such may cause a fire.

After Starting Engine

Inspection After Starting Engine

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

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

- Inspect the equipment operation conditions, machine travelling conditions, outrigger operation conditions, winch winding up and down, boom derricking, and crane operation conditions such as extension, retraction and slewing.
- Inspect the sound, vibration, heat and odour of the machine, and check for instrument errors, air leaks, oil leaks, fuel leaks, water leaks and other bad factors. Be extra careful with fuel leaks.
- Always repair broken part whenever an abnormality is found.
Attempt to use without servicing may result in unexpected bodily accidents and/or machine failures.

Cautions When Starting to Move Machine

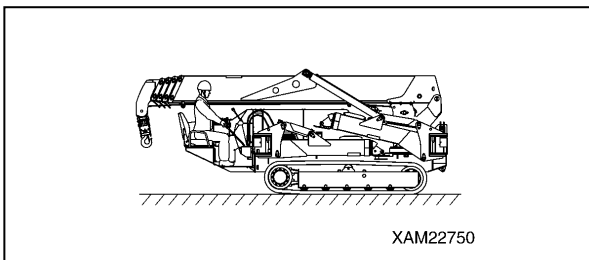


Fig. 4-36

To prevent serious injuries and death accidents, always execute the followings before travelling the machine.

- Set the machine to the travelling posture in the right diagram.
Do not travel when the hook block is not contained.
- Make the boom fully lowered and retracted.
- Fix the hook block to the containment position.
- Make the outrigger contained.
For more information, see "TRAVELLING POSITION" on page 4-23.
- Make sure again that no one or object is in the vicinity before starting to move.

- Blow the horn for warning before starting to move.
- Always remain seated in the cab seat during travelling operation of the machine.
- The machine is prohibited to travel when a person or load is on the travelling dolly or the boom.
- When travelling, stow hook and outrigger, and make sure the surrounding safety.
- When stowing outriggers, insert each position pins completely to lock.

Cautions When Travelling Forward/Backward or Changing Direction

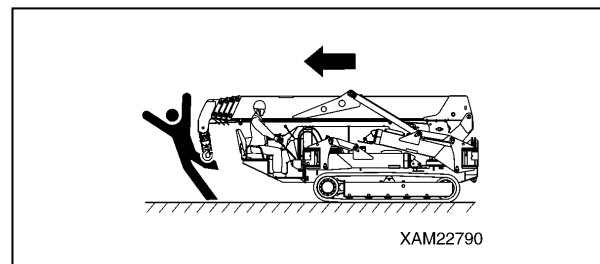


Fig. 4-37

Always observe followings to prevent serious injuries and deaths when travelling the machine.

- Drop the speed early and wait until the machine stops before changing from forward to backward, or backward to forward.
- Blow the horn and alert to the people nearby before changing between forward/backward movements or changing direction.
- Check that no one is around the machine.
The front of the machine frame requires special attention because certain part of vision is blocked, so stop the machine as necessary and make sure no one is at front or around.
- Place a guide if the location is hazardous or with bad view.
- Make sure to prevent people from crossing the travelling direction or be at the direction to be changed.

COLD WEATHER OPERATION

Cautions When Snow Covered or Frozen

WARNING! ALWAYS observe followings to prevent serious injuries and death accidents when travelling over a snow covered ground or frozen road for unavoidable reason.

- The snow covered grounds and frozen roads cause slips even when the inclination is small, so decrease the speed when travelling and avoid starting sudden, stopping sudden stop and slewing sudden. Uphill and downhill are especially likely to cause slips and thus dangerous.
- Ground of the frozen road becomes soft when the air temperature rises and causes the Machine travels and other operations to be unstable. Be very careful.
- Under cold weather, check that the load to be hoisted is not frozen stuck to the ground or other substance. Attempt to hoist without knowing the load is frozen stuck to the ground or other substance is dangerous.
- Do NOT directly contact metal surface with your body part such as a finger or hand under cold weather.
Attempt to contact the metal surface of the Machine under harsh cold weather may cause the skin to stuck frozen to the metal surface.
- Remove snow and/or ice laid on the Machine that causes the safety nameplates to be hard to read. Be especially careful to securely remove those that are on the boom and thus may fall.

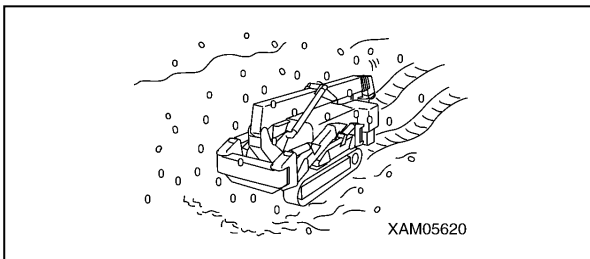


Fig. 4-38

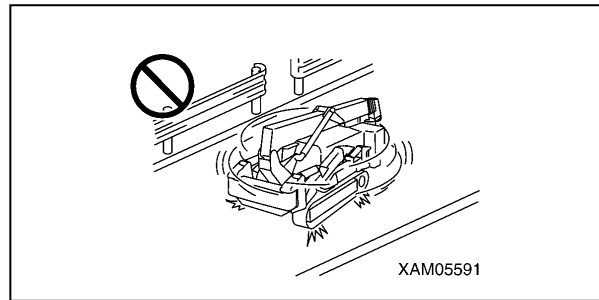


Fig. 4-39

Cautions under Cold Weather

WARNING!

- Remove snow from and defreeze the slewing gear, boom and winch related parts, and check the movements before work.
- Warm up enough.
Attempt to operate the operation levers and switches without enough warm-up causes the Machine to react dull, and may result in unexpected accidents.
- Avoid acutely accelerating the engine during short time after starting the engine.
- Increase the oil temperature of the hydraulic circuit by relieving the oil pressure (let the pneumatic oil to escape to the hydraulic oil tank by raising to above the hydraulic circuit set pressure) by using operation lever. Doing so improves the Machine reactions and prevents improper operations.
- If the battery fluid is frozen, do NOT charge battery or start the engine using other power source.
Such act may cause the battery to catch fire.
Before charging or starting up using other power source, defreeze the battery fluid and check that failures such as battery fluid leak do not exist.
- After end of the work, wipe off and apply wraps if substances such as condensation, snow or mud are stuck to the wire harness, connector ①, switches, sensors or similar part.
If the infiltrated condensation and/or similar substance freezes, the Machine may operate improperly upon the next use and cause unexpected accidents.

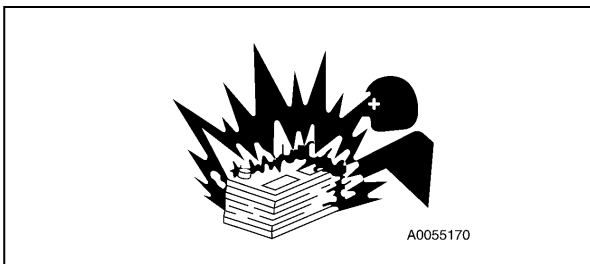


Fig. 4-40

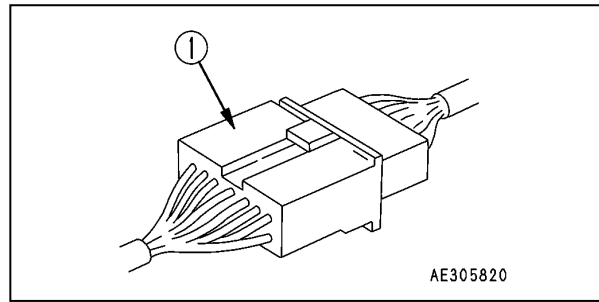


Fig. 4-41

STARTING ENGINE

Checking Before Operation

Perform the steps described in this section before starting work each day.

Visible Checks

For more information on inspection, see "Pre-Start Visible Checks" on page 5-22.

Checking Before Starting Engine

For more information on inspection, see "Pre-Start Inspection - Before Starting Engine" on page 5-24.

Checking After Starting Engine

For more information on inspection, see "Post-Start Inspection - After Starting Engine" on page 5-31.

WARNING! Verify that there is no one and obstacle around when starting the engine. Honk a horn and start the engine.

Normal Engine Start

CAUTION:

- If it is hard to start the engine due to low ambient temperature, see "Starting Engine in Cold Weather" on page 4-19 for the engine starting operation.
- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge.
Wait for about 1 minute before attempting to start the engine again if it did not start.
- Verify that the fuel lever of the water separator pot is at the vertical position (open) before starting the engine.
- Verify that the main switch on the receiver is at the "OFF" position.

1. Lightly step on the acceleration pedal (6) to operate the engine at low speed.

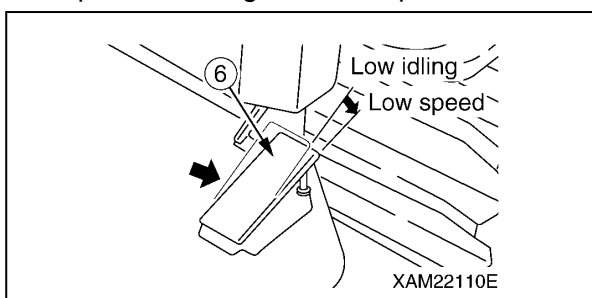


Fig. 4-42

2. Insert the key into the starter switch and turn the key to the "START" position.

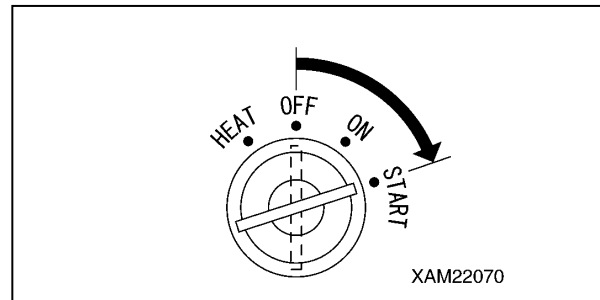


Fig. 4-43

3. Release your hand from the key once the engine has started. The key will automatically return to the "ON" position.

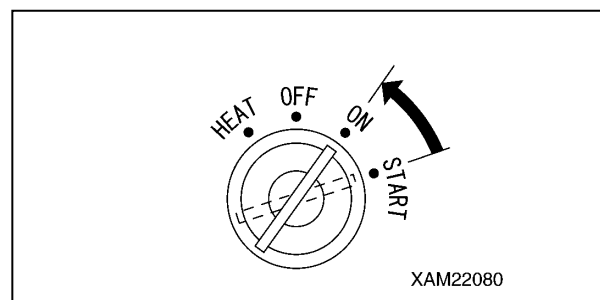


Fig. 4-44

Starting Engine in Cold Weather

CAUTION:

- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge.
Wait for about 1 minute before attempting to start the engine again if it did not start.
- Verify that the fuel lever of the water separator pot is at the vertical position (open) before starting the engine.
- Verify that the main switch on the Receiver is at the "OFF" position.

Start the engine as follows when it is cold.

1. Insert the key into the starter switch and turn the key to "HEAT" (preheat) position. Keep the position until the "preheat monitor" goes off.
Release your hand, and the key will automatically return to the "ON" position.

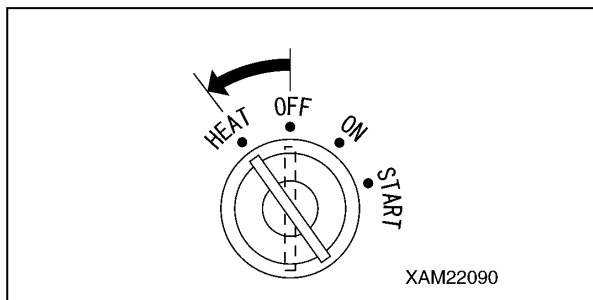


Fig. 4-45

NOTICE: When the starter switch is operated to the "HEAT" (preheat) position, the "preheat monitor" lights up, indicating that the engine is preheated.

When the engine preheating has completed, the "preheat monitor" goes off.

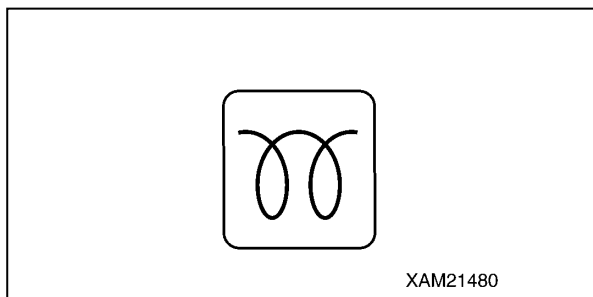


Fig. 4-46

2. Step on the acceleration pedal (6) to the half of the full stroke and operate the engine at medium speed.

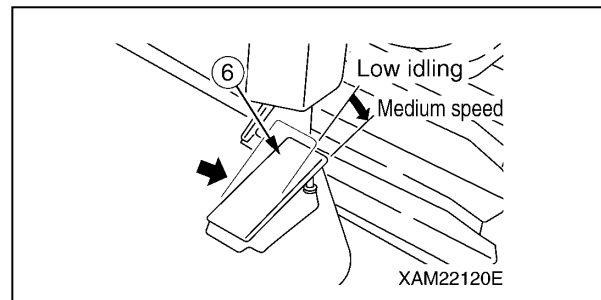


Fig. 4-47

3. When the "preheat monitor" goes off, turn the key to the "START" position.

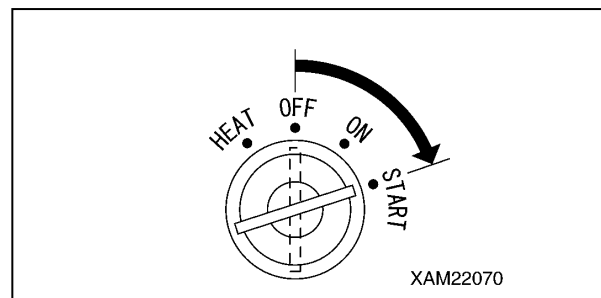


Fig. 4-48

4. Release your hand from the key once the engine has started.
The key will automatically return to the "ON" position.

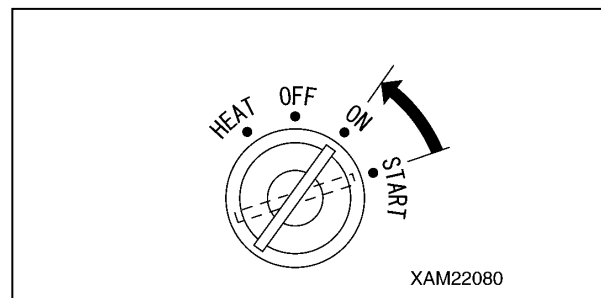


Fig. 4-49

OPERATIONS AND CHECKS AFTER STARTING ENGINE

DANGER! Never refuel (diesel oil) while the engine is in operation.

Always stop the engine when refuelling.

WARNING!

- If any abnormal condition takes place during the warm-up operation, immediately press the engine emergency stop switch (EMO) to stop the engine for emergency. Then, turn the starter switch to the "OFF" position. The power to the electrical system will be shut off.
- Always perform the warm-up operation. The sufficient warm-up operation is necessary particularly when it is cold. Insufficient warm-up operation will slow down the movement response of the travelling system or crane system to the operation levers, resulting in serious accidents.
- Always check the operation of the crane after warm-up operation. Be careful not to let the hook block interfere or collide with the boom.
- Be careful not to let the boom hit the operator or this machine when slewing the boom.
- If you find any abnormality during the crane operation check, stop the machine immediately for emergency and repair. Using the system in abnormal condition can result in serious accidents.

CAUTION:

- The appropriate temperature of the hydraulic oil is 50 to 80 °C. Even when operating at low temperature by necessity, increase the temperature of the hydraulic oil to about 20 °C.
- Do not idle away suddenly until the warm-up operation is done.
- When the engine has started, check if the "battery charge monitor" and "engine oil pressure monitor" went off. If there is any abnormality, repair.
- Do not leave the engine in low idling or high idling for more than 20 minutes.

If idling is necessary, apply load from time to time or operate at the medium engine speed.

When using the engine at low speed, idle away the engine for about 5 minutes once a day.

Perform the warm-up operation as follows once the engine has started.

1. Leave your foot away from the acceleration pedal (6). Keep the engine idling and continue the operation with no load for about 5 minutes.

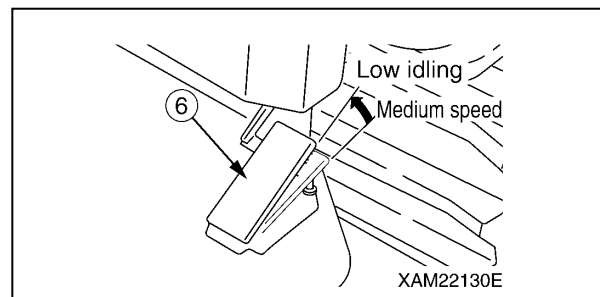


Fig. 4-50

2. Check if there is any abnormality with the engine exhaust gas colour, noise, and vibration. If there is any abnormality, repair.
3. Operate the work selector switch to the "Outrigger" position.

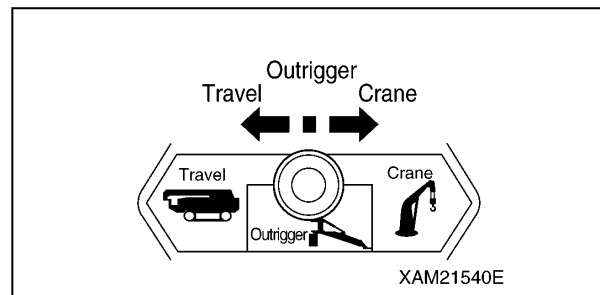


Fig. 4-51

4. See "OUTRIGGER SETTING" on page 4-42 and set the outriggers.
5. See "Before Crane Operations" on page 4-62 to loosen the hook block from the stowing position.

- Step on the acceleration pedal (6) to the half of the full stroke and operate the engine at medium speed.

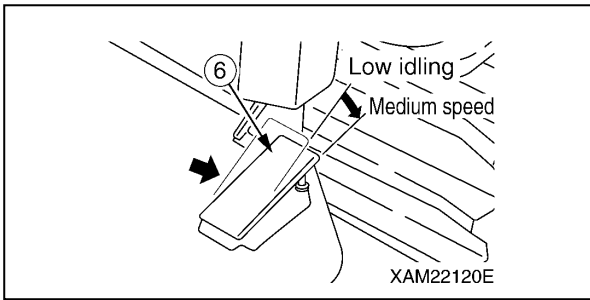


Fig. 4-52

- Operate the boom derricking lever (4) slowly forward / backward and move the derricking cylinder up/down until it reaches the stroke end. Check if there is any abnormality with the operation.
If there is any abnormality, repair.

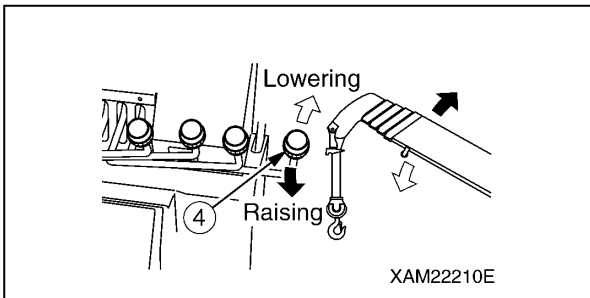


Fig. 4-53

- Operate the boom telescoping lever (2) slowly forward / backward to extend/retract the boom until it reaches the stroke end. Check if there is any abnormality with the operation.
If there is any abnormality, repair.

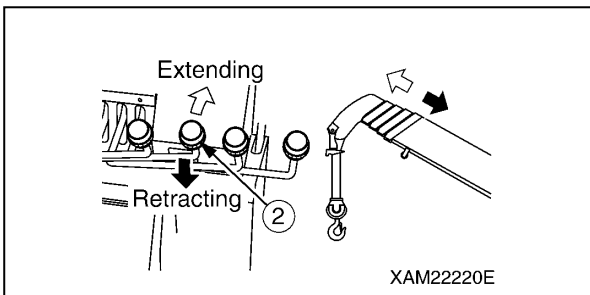


Fig. 4-54

- Operate the winch lever (3) slowly forward/backward to check if the hook block is smoothly raised/lowered. Also check if the hook block immediately stops and the winch drum does not wind in mess when the winch lever returns to the "Neutral" position. If there is any abnormality, repair.

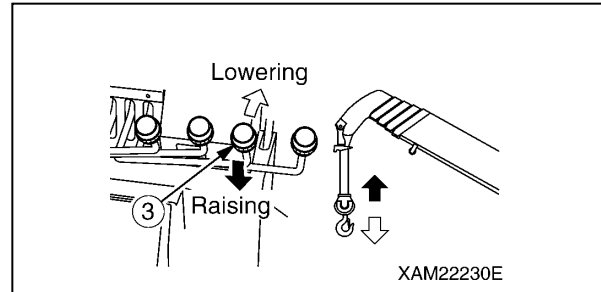


Fig. 4-55

- Operate the slewing lever (1) slowly forward/backward to check if the crane smoothly slews clockwise (right) and counterclockwise (left) for 360 degrees or more. Also check if the crane stops immediately when the slewing lever returns to the "Neutral" position. If there is any abnormality, repair.

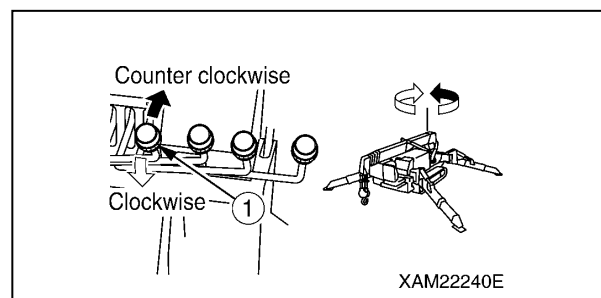


Fig. 4-56

STOPPING ENGINE

CAUTION:

- Stopping the engine before it sufficiently cools down may shorten the life of engine units. Do not stop the engine suddenly except for emergency.
- When the engine is overheated, do not stop the engine suddenly. Change the engine speed to low speed, and gradually cool down the engine before stopping the engine.
- Verify that the main switch at the control box unit of remote control system is at the "OFF" position.

1. Release your foot from the acceleration pedal (6) and change the engine speed to idling. Continue the no-load operation for about 5 minutes.

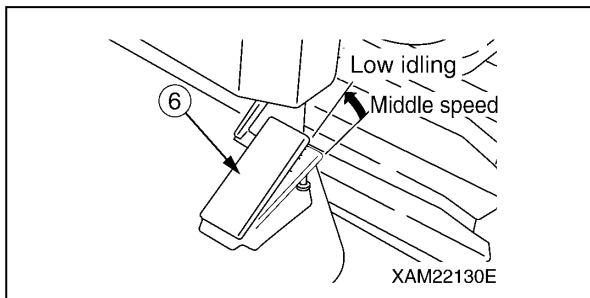


Fig. 4-57

2. Turn the starter switch key to the "OFF" position. The engine will stop.

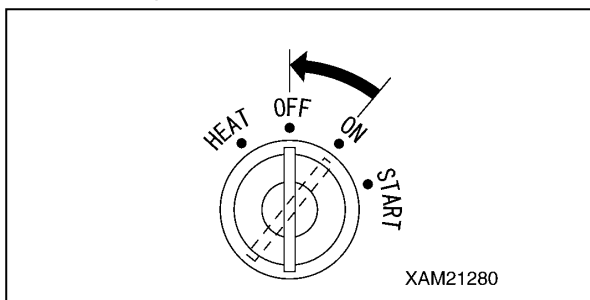


Fig. 4-58

3. Remove the starter switch key.

INSPECTION AFTER STOPPING ENGINE

1. Visibly check for oil leakage, fuel leakage, and water leakage, and check around the crawlers, crane, and exterior of the machine. If you find any leakage or abnormality, fix the problem.
2. Top off the fuel tank.
3. Dead leaves and papers around the engine will cause fire. Remove the dead leaves and papers.
4. Clean off mud on the crawlers and outriggers.

TRAVELLING POSITION

WARNING!

- When travelling this machine self-propelled, take the "travelling posture" with which the boom, hook block, and outriggers are stowed.
- Travelling with the boom extended or Pick & Carry with the boom extended is essentially prohibited. This will overturn the machine, causing serious injury accidents. If you have to perform Pick & Carry by necessity, see "Pick & Carry Operation" on page 4-84 and strictly observe the methods described and cautions given.
- Do not use this machine for other purpose than the major purpose such as using it for carrying the load on the machine.
- Follow the local laws and regulations if travelling the machine on public roads.

Take the travelling posture shown in the figure when travelling the machine.

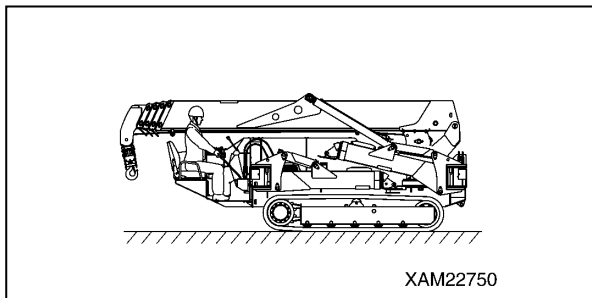


Fig. 4-59

1. See "Crane Stowing Operation" on page 4-66 to stow the crane. Stow the hook block in the specified position.
2. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers.

TRAVELLING CONTROLS AND OPERATION

WARNING! Not observing these cautions in travelling will result in serious accidents.

Cautions When Travelling

- When travelling, stow hook and outrigger, and make sure the surrounding safety.
- When stowing outriggers, insert each position pins completely to lock.
- Be seated to operate travelling.
- Travelling over the boulder stones or a stump not only causes the overturning of the machine, but also gives an impact to the machine (especially around crawlers), causing breakage.

Avoid or remove the obstacles not to travel over it whenever possible.

If you have to travel over the obstacles by necessity, be sure to take the "travelling posture" to lower the centre of gravity, and reduce the travelling speed as much as possible so that the machine will go over the obstacles at the centre of the crawlers.

NOTICE: See "TRAVELLING POSITION" on page 4-23 for the travelling posture of the machine.

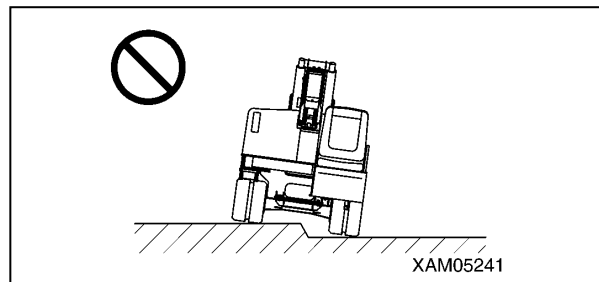


Fig. 4-60

Allowable Water Depth

Use this machine in the water of the depth of under the centre of the idler (1) where the muffler beneath the machine body doesn't go under water.

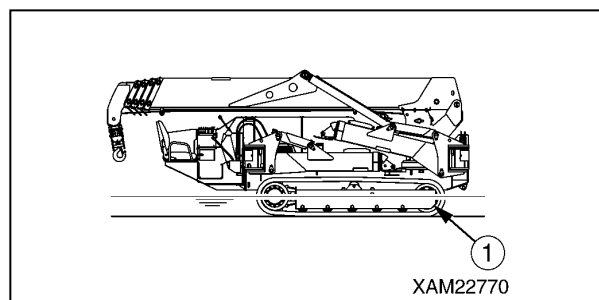


Fig. 4-61

Cautions on Upward/Downward Slope

WARNING!

- If the machine tilts for “15 degrees” or more forward, backward, leftward, or rightward while travelling, the machine may overturn. Do not travel on the slope of more inclination.
- Be sure to switch the travelling high-speed switch to the “OFF” (low speed) position when travelling on the slope. Travelling on the slope in the high-speed travelling mode may result in overrun on the downward slope.
- The slopes inclined for 15 degrees or more presents overturning hazard. Do not travel on these slopes.
- Be sure to switch the travelling high-speed switch to the “OFF” (low speed) position when travelling on the slope. The machine may overrun.
- Never change the direction on the slope or cut the slope horizontally.
Travel safely such as by going down to the level ground and taking a detour.

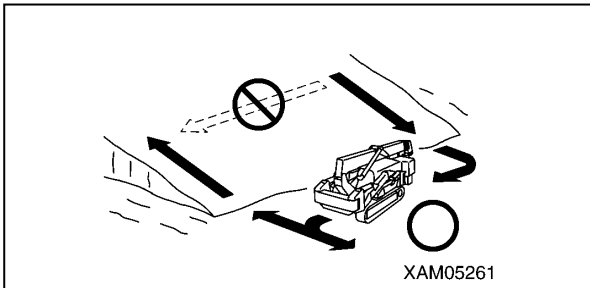


Fig. 4-62

- Operate the acceleration pedal and travelling levers to decrease the travelling speed as much as possible when going down the slope. Operating the travelling lever to the "Neutral" position automatically brakes the machine, but may overrun when going down the slope at high speed.

- Direct the machine perpendicular to the slope and the operation seat must be the side of the uphill when travelling on the slope.

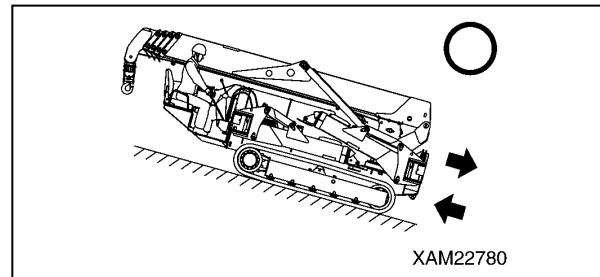


Fig. 4-63

- If the engine stops on the slope, return the travelling levers to the "Neutral" position and start the engine.

STARTING TRAVELLING MACHINE

WARNING!

- Do not allow anyone to come around the machine.
- Put away all the obstacles on the travelling path.
Check for projections and grooves on the travelling path especially when going backward.
Fix the travelling path.
- Check the safety around the machine and honk a horn before starting travelling the machine.
- Adjust the engine speed to low and operate the left and right travelling levers slowly at the same time. Check the travelling speed of the machine.
Do not make sudden start especially when you are going backward. You can cause serious accidents.
- The front of the machine will be the blind corner. Be extremely careful when travelling forward.
- If you cannot verify the safety because the travelling direction is the blind corner, stop travelling and check the safety in the travelling direction. Staff a guide person if necessary depending on the work site situation.
- Operate the work selector switch to the "Travel" position and the travelling lock lever to the "Travel" position.

Preparation Before Starting Travelling

1. Operate the work selector switch on the outrigger operation panel to the "Travel" position.

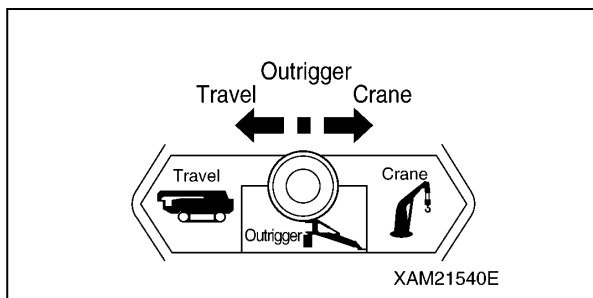


Fig. 4-64

2. Push down the travelling lock levers (8) to the "TRAVEL" position.

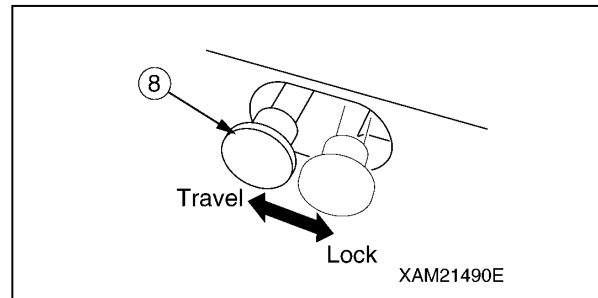


Fig. 4-65

Travelling Forward

Operate the left and right travelling levers at the same time.

- Push the left and right travelling levers slowly forward to move forward.

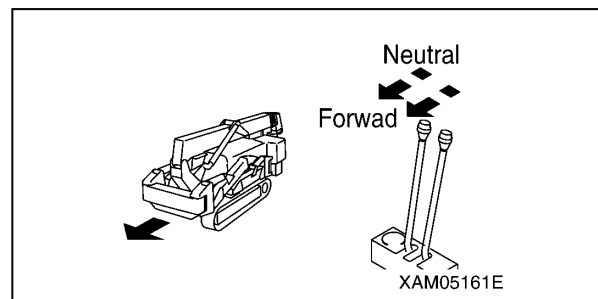


Fig. 4-66

Travelling Backward

Operate the left and right travelling levers at the same time.

- Pull the left and right travelling levers slowly toward you to move backward.

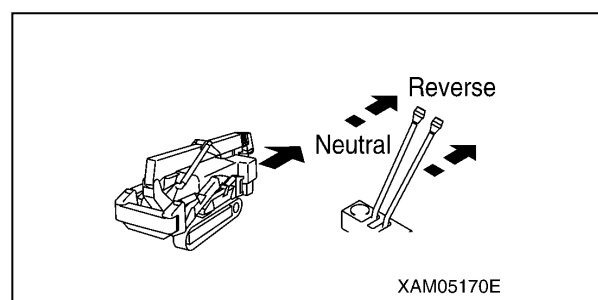


Fig. 4-67

CHANGING MACHINE TRAVELLING MODE

WARNING!

- Choose the appropriate travelling speed to the ground and road surface conditions while travelling the machine.
You can operate the travelling levers or choose "high-speed travelling mode" or "low-speed travelling mode" with the operation position of the travelling high-speed switch to change the travelling speed.
- Always set the travelling high-speed switch to the "OFF" (low speed) when travelling on the slope. Travelling on the slope in the high-speed travelling mode may cause overrun on the downward slope.
- Be sure to stop the machine before changing the travelling speed mode.

Changing Travelling Speed Mode

Operate the travelling high-speed switch on the instrument panel.

- Push down the travelling high-speed switch to the back.
The pilot lamp of the switch section lights up and the machine will be in the "high-speed travelling mode".
- Push down the travelling high-speed switch toward you.
The pilot lamp of the switch section goes off and the machine will be in the "low-speed travelling mode".

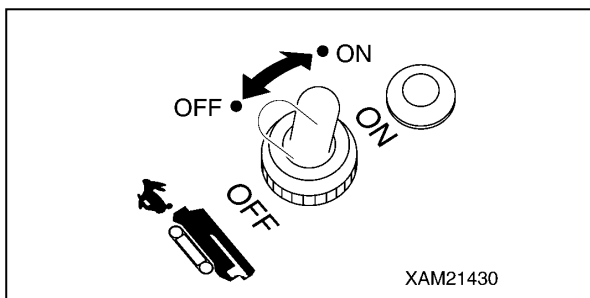


Fig. 4-68

DIRECTIONAL CONTROLS

WARNING!

- Sudden steering or unnecessary spin turns at high speed not only damages the rubber track and hydraulic devices, but also may result in collision with other objects.
Stop the machine, then adjust the engine speed to low speed before performing the spin turns.
- Do not change the path on the slope. The machine may slip to the side. Be especially careful on the soft ground and clay soil.

Changing the Machine Direction While Being Stopped

Left Turn

Operate the right travelling lever.

Tilt the travelling lever forward to turn to the left in the forward direction.

Tilt the travelling lever toward you to turn to the left in the backward direction.

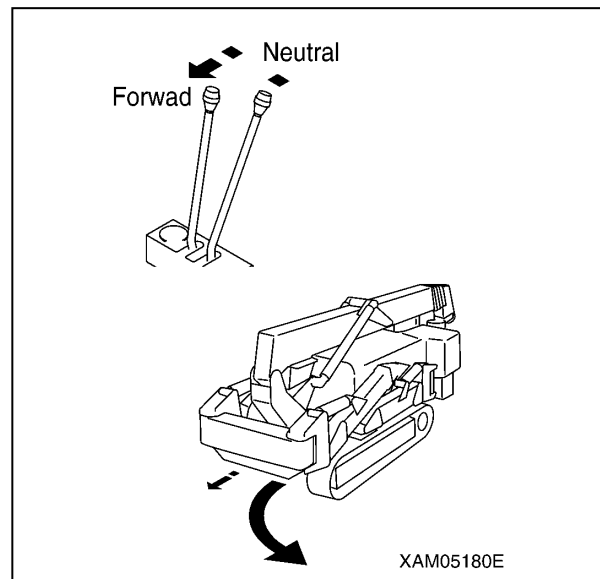


Fig. 4-69

Right Turn

Operate the left travelling lever.

Tilt the left travelling lever forward to turn to the right in the forward direction.

Tilt the left travelling lever toward you to turn to the right in the backward direction.

Spin Turns

Left Spin Turn

Tilt the right travelling lever forward while tilting the left travelling lever toward you to rotate the left and right rubber tracks in the opposite direction for left spin turn.

Right Spin Turn

Tilt the left travelling lever forward while tilting the right travelling lever toward you to rotate the left and right rubber tracks in the opposite direction for right spin turn.

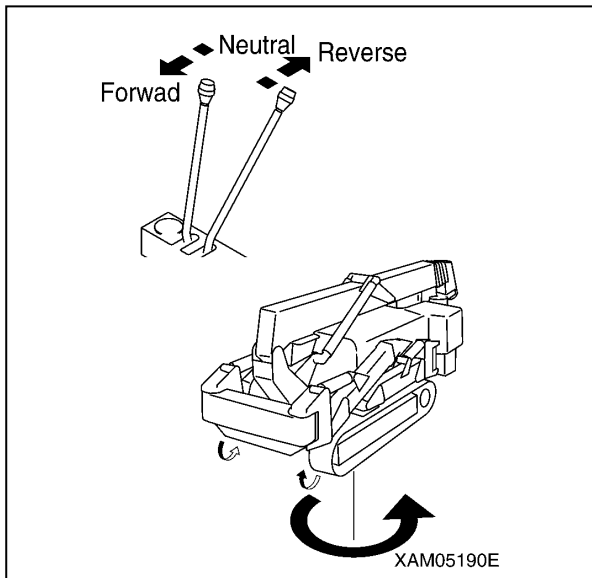


Fig. 4-70

Changing Path While Travelling Forward/Backward

Left Turn While Travelling Forward

While tilting the right travelling lever forward, return only the left travelling lever to the "Neutral" position.

Left Turn While Travelling Backward

While tilting the right travelling lever toward you, return only the left travelling lever to the "Neutral" position.

Right Turn While Travelling Forward

While tilting the left travelling lever forward, return only the right travelling lever to the "Neutral" position.

Right Turn While Travelling Backward

While tilting the left travelling lever toward you, return only the right travelling lever to the "Neutral" position.

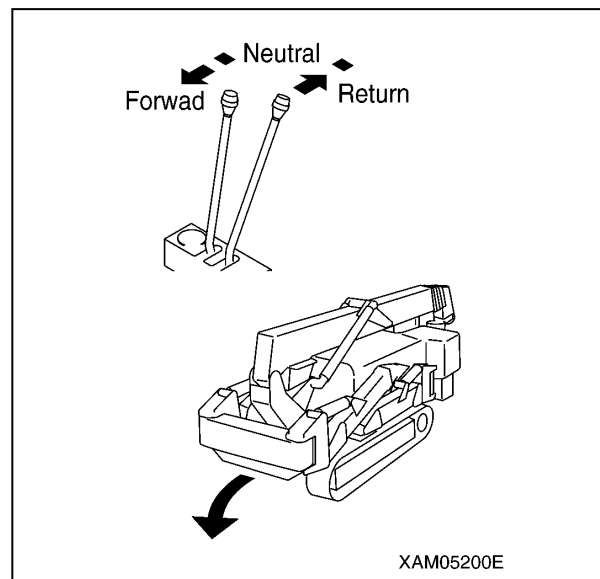


Fig. 4-71

STOPPING/PARKING MACHINE

WARNING!

- Avoid sudden stop and try to stop with margin whenever possible.
- Choose levelled and solid location for parking the machine.
If you park on the slope by necessity, provide some break so that the machine will not move.

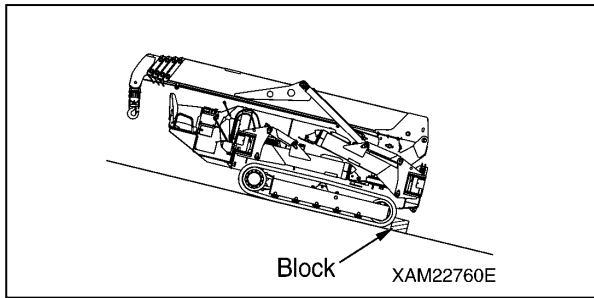


Fig. 4-72

- Careless contact with the travelling lever(s) during the engine operation may result in sudden movement of the machine, leading to serious accidents.
- Always set the travelling lock lever to the "LOCK" position when parking the machine.
- Stop the engine and always remove the key for the starter switch. Bring the key with you when you leave the machine.

1. Operate the left and right travelling levers to the "Neutral" position at the same time. This automatically brakes the machine and the machine stops.

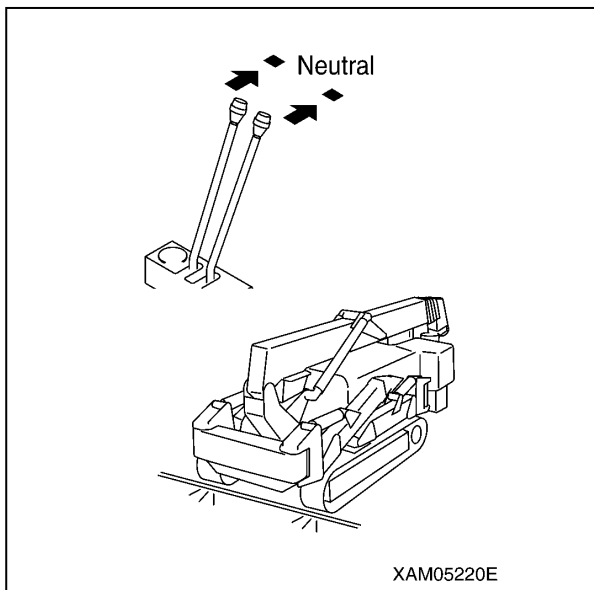


Fig. 4-73

2. Knock down the travelling lock lever (8) to the "LOCK" position.

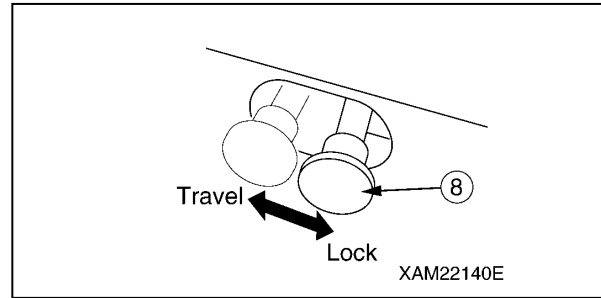


Fig. 4-74

DESCRIPTION ON OUTRIGGER AND CRANE SAFETY DEVICES

Outrigger Safety Devices

Functions of Outrigger Safety Devices

The outrigger safety devices have the interlock functions shown in the table below.

	Interlock Function	Description of Interlock Function
1	Outrigger Interlock	<p>The outrigger is not enabled if the position pin is not inserted properly by rotating the outrigger rotary to extension side (outward) with the boom being stowed (boom lowered to maximum, slewed and stored).</p> <ul style="list-style-type: none"> • Whether the boom is lowered to the maximum is verified by the detection switch located to the post. • Install a protrusion on the post at the boom slew and stow position and a detector switch on the travelling dolly in order to detect whether the boom has stopped at the slew and stow position.
2	Crane Interlock	<p>The crane operation (telescoping, raising/lowering hook, derricking, and slewing) is enabled only when all the four outriggers are extended and set (overhung and grounded). The outrigger extension status is detected as follows.</p> <ul style="list-style-type: none"> • Install a detection switch at the position pin section of the outrigger rotary to detect the insertion of the position pin into the extension position. • Install a detection switch inside the outrigger inner box to detect if the tray is seated properly through the detection pin installed between the tip of the inner box and the tray.

CAUTION:

- **Set the outriggers in the extension status and operate the work selector switch in the outrigger operation panel to the "Crane" position to enable the crane operation.**
When the detection condition for setting one of the four outriggers (see the item 2 in the table above) is no more fulfilled, the working status lamp (red) rotates and lights up, and outrigger un-set warning lamp (red) flashes.
If this state remains for 3 seconds or more, the crane interlock function is activated and the crane operation will be disabled.
- **Stow the crane and operate the work selector switch on the outrigger operation panel to the "Outrigger" position to enable the outrigger setting and extension operations.**
Please contact us or our sales service agency.
- **If the crane operation is not enabled after operating the work selector switch on the outrigger operation panel to the "Crane" position even after the outrigger is being extended and set, there may be faulty adjustment or failure in the outrigger safety device.**
Please contact us or our sales service agency.

WARNING! Understand well the operation sequence below, warning display from the safety devices under the corresponding machine conditions, and the details of operation stop. Keep these in mind for safe operations.

The table below shows what kind of "display and warning" will be issued and the resulting action of the safety devices when this machine is used in the standard condition.

The standard operation sequence shown here is as follows.

Check before setting outriggers => Outrigger setting operation => Crane operation => Crane stowing operation => Outrigger stowing operation => Machine travelling operation

The columns of the table below are described below.

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
This field shows the standard operation sequence and the operation position of operation levers and switches, and machine status.	This field shows the "display" and "warning" issued as a result of the operation.	This field shows the name of the safety device that prevents the resulted error and its action.

Check Before Setting Outriggers

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
<ul style="list-style-type: none"> Start the engine Travelling lock lever at "LOCK" position 	/	/
Check if the machine is in the posture of stowing the boom <ul style="list-style-type: none"> Fully retract the boom Boom horizontal stowing position Boom slewing stowing position 	<ul style="list-style-type: none"> Boom stowing lamp on display panel ON [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON] 	Outrigger interlock device <ul style="list-style-type: none"> All the outrigger operations stop if the boom stowing lamp does not light up.

Outrigger Setting Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Set the outriggers. <ol style="list-style-type: none"> Extend the outriggers. <ul style="list-style-type: none"> Rotate the outrigger rotary and secure them at the specified position with the position pin Work selector switch "Outrigger" Outrigger extension switches "OUT" 	<ul style="list-style-type: none"> Extension lamps on display panel ON [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON] 	Outrigger interlock device <ul style="list-style-type: none"> All the outrigger operations stop if one of the four extension lamps does not light up.
<ol style="list-style-type: none"> Set the outriggers. <ul style="list-style-type: none"> Outrigger grounding switch "OUT" Check the level with the level. 	<ul style="list-style-type: none"> Setting lamps on display panel ON [Outrigger un-set warning lamp OFF] [Working status lamp (red) OFF] 	
When the machine tilts for 3 degrees or more during outrigger setting operation	<ul style="list-style-type: none"> Warning buzzer sounds continuously 	Crane inclination alarm device is activated

Crane Operations

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Perform crane operations. <ul style="list-style-type: none"> • Work selector switch "Crane" • Crane operation with levers 	<ul style="list-style-type: none"> • Boom stowing lamp on display panel OFF • Actual work and the rated total load are compared, and the working status lamp lights up according to the load factor. • Load factor for illuminating working status lamp • Load factor less than 90 %: Working status lamp (green) ON • Load factor 90 to less than 100 %: Working status lamp (yellow) ON, alarm sounds. • Load factor 100 % or more: Working status lamp (red) ON, alarm sounds continuously. 	Moment limiter <ul style="list-style-type: none"> • When the load factor reaches 100 % or more (overloaded), hook raising, boom extending, and boom lowering operation stop.
When one of the outriggers go up in the air during crane operation	<ul style="list-style-type: none"> • Setting lamps (red) on display panel flash 	Crane interlock device <ul style="list-style-type: none"> • If any of the extension lamps and setting lamps (total of eight) goes off, hook raising, boom extending, and boom lowering operation stop.
When the hook was raised excessively	<ul style="list-style-type: none"> • Alarm buzzer sounds continuously 	Over winding detector is activated. Hook raising operation stops.
When the hook was lowered excessively	<ul style="list-style-type: none"> • Alarm buzzer sounds continuously 	Winch over un-winding detector is activated. Hook lowering operation stops.
When the machine tilts for 3 degrees or more during crane operation	<ul style="list-style-type: none"> • Alarm buzzer sounds continuously 	Crane inclination alarm device is activated

Crane Stowing Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Operate the machine to take the boom stowing posture. <ul style="list-style-type: none"> • Fully retract the boom • Boom horizontal stowing position • Boom slew and stow position 	<ul style="list-style-type: none"> • Boom stowing lamp on display panel ON 	Outrigger interlock device <ul style="list-style-type: none"> • If the boom stowing lamp (green) does not light up, all the outrigger operations stop.

Outrigger Stowing Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Stow the outriggers. 1. Set and stow the outriggers. • Work selector switch "Outrigger" • Outrigger grounding switch "ON"	• Setting lamps (red) on display panel flash [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON]	Crane interlock device • If any of the extension lamps and setting lamps (total of eight) goes off, all the crane operations stop.
2. Extend and stow the outriggers. • Outrigger extension switch "ON" • Rotate (Stow) the outrigger rotary and secure at the specified position with position pin. • Stop the engine.	• Extension lamps (red) on display panel flash [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON]	
When the machine tilts for 3 degrees or more during outrigger stowing operation	• Warning buzzer sounds continuously	Crane inclination alarm device is activated

Machine Travelling Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Travel the machine. • Travelling lock lever at "Travel" position • Start the engine. • Operate the travelling levers.		
When the machine tilts for 15 degrees or more during travelling operation	• Warning buzzer sounds continuously	Crane inclination alarm device is activated

Description of Pick & Carry Safety Devices

DANGER! Understand well the operation sequence below, warning display from the safety devices under the corresponding machine conditions, and the details of operation stop. Keep these in mind for safe operations.

The table below shows what kind of "display and warning" will be issued and the resulting action of the safety devices when this machine is used in the standard condition.

The standard operation sequence shown here is as follows.

Check before setting outriggers => Outrigger setting operation => Operation to take Pick & Carry posture => Pick & Carry operation => Outrigger setting operation => Crane stowing operation => Outrigger stowing operation => Machine travelling operation

The columns of the table below are described below.

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
This field shows the standard operation sequence and the operation position of operation levers and switches, and machine status.	This field shows the "display" and "warning" issued as a result of the operation.	This field shows the name of the safety device that prevents the resulted error and its action.

Check Before Setting Outriggers

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
<ul style="list-style-type: none"> Start the engine Travelling lock lever at "LOCK" position 	/	/
Check if the machine is in the posture of stowing the boom <ul style="list-style-type: none"> Fully retract the boom Boom horizontal stowing position Boom slewing stowing position 	<ul style="list-style-type: none"> Boom stowing lamp on display panel ON [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON] 	Outrigger interlock device <ul style="list-style-type: none"> All the outrigger operations stop if the boom stowing lamp does not light up.

Outrigger Setting Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Set the outriggers. <ol style="list-style-type: none"> Extend the outriggers. <ul style="list-style-type: none"> Rotate the outrigger rotary and secure at the specified position with the position pin Work selector switch: "Outrigger" Outrigger extension switch "OUT" 	<ul style="list-style-type: none"> Extension lamps on display panel ON [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON] 	Outrigger interlock device <ul style="list-style-type: none"> All the outrigger operations stop if one of the four extension lamps does not light up.
<ol style="list-style-type: none"> Set the outriggers. <ul style="list-style-type: none"> Outrigger grounding switch: "OUT" Check the level with the level. 	<ul style="list-style-type: none"> Setting lamps on display panel ON [Outrigger un-set warning lamp OFF] [Working status lamp (red) OFF] 	
When the machine tilts for 3 degrees or more during outrigger setting operation	<ul style="list-style-type: none"> Warning buzzer sounds continuously 	Crane inclination alarm device is activated

Crane Operations

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Take Pick & Carry posture. <ul style="list-style-type: none"> • Raise the boom to about 65 degrees • Slew the boom to the front centre • Pick & Carry switch: "ON" • Stow the outriggers • Travelling lock lever at "Travel" position 	<ul style="list-style-type: none"> • Boom stowing lamp on display panel ON 	Moment limiter <ul style="list-style-type: none"> • Restricts the boom slewing, angle, and telescoping
If the machine is not in Pick & Carry posture	<ul style="list-style-type: none"> • Boom stowing lamp on display panel (red) flashes • Alarm buzzer sounds continuously • Working status lamp (red) ON • Display panel indicates "E-P" 	
When the machine tilts for 3 degrees or more	<ul style="list-style-type: none"> • Warning buzzer sounds continuously 	Crane inclination alarm device is activated

Pick & Carry Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Perform crane operations. <ul style="list-style-type: none"> • Work selector switch: "Crane" • Operate crane operation levers 	<ul style="list-style-type: none"> • Boom stowing lamp on display panel ON • Actual work is compared to the rated total load, and the working status lamp lights up according to the load factor • Working status lamp lights up by load factor • Load factor less than 90 %: Working status lamp (green) ON • Load factor 90 to less than 100 %: Working status lamp (yellow) ON, alarm sounds • Load factor 100 % or more: Working status lamp (red) ON, alarm sounds continuously 	Moment limiter <ul style="list-style-type: none"> • Restricts the boom slewing, angle, and telescoping. • Stops hook raising, boom extending, and boom lowering operations if the load factor reaches 100 % or more (overloaded)
When winching excessively	<ul style="list-style-type: none"> • Alarm buzzer sounds continuously 	Over winding detector is activated Winch winding operation stops
When the machine tilts for 3 degrees or more during crane operation	<ul style="list-style-type: none"> • Warning buzzer sounds continuously 	Crane inclination alarm device is activated

Outrigger Setting Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Set the outriggers. 1. Verify that there is no load on the hook 2. Travelling lock lever at "LOCK" position		
3. Extend the outriggers. • Rotate the outrigger rotary and secure at the specified position with position pin. • Work selector switch: "Outrigger" • Outrigger extension switch: "OUT"	• Extension lamps on display panel ON [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON]	Outrigger interlock device • All the outrigger operations stop if any of the four extension lamps does not light up
4. Set the outriggers • Outrigger grounding switch: "OUT" • Check the level with the level	• Setting lamps on display panel ON [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON]	
5. Pick & Carry switch: "OFF"		
When the machine tilts for 3 degrees or more during outrigger setting operation	• Warning buzzer sounds continuously	Crane inclination alarm device is activated

Crane Stowing Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Operate the machine to take the boom stowing posture. • Fully retract the boom • Boom horizontal stowing position • Boom slewing stowing position	• Boom stowing lamp on display panel ON	Outrigger interlock device • All the outrigger operations stop if the boom stowing lamp does not light up

Outrigger Stowing Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Stow the outriggers. 1. Set and stow the outriggers. • Work selector switch: "Outrigger" • Outrigger grounding switch: "ON"	• Setting lamps (red) on display panel flash [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON]	Crane interlock device • All the crane operations stop if any of the extension lamps and setting lamps (green) (total of eight) does not light up
2. Extend and stow the outriggers. • Outrigger extension switch] "ON" • Rotate (Stow) the outrigger rotary and secure at the specified position with position pin. • Stop the engine.	• Extension lamps (red) on display panel flash [Outrigger un-set warning lamp flashes] [Working status lamp (red) ON]	
When the machine tilts for 3 degrees or more during outrigger stowing operation	• Warning buzzer sounds continuously	Crane inclination alarm device is activated

Machine Travelling Operation

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Travel the machine. <ul style="list-style-type: none">• Travelling lock lever at "TRAVEL" position• Start the engine.• Operate the travelling levers.		
When the machine tilts for 15 degrees or more during travelling operation	<ul style="list-style-type: none">• Warning buzzer sounds continuously	Crane inclination alarm device is activated

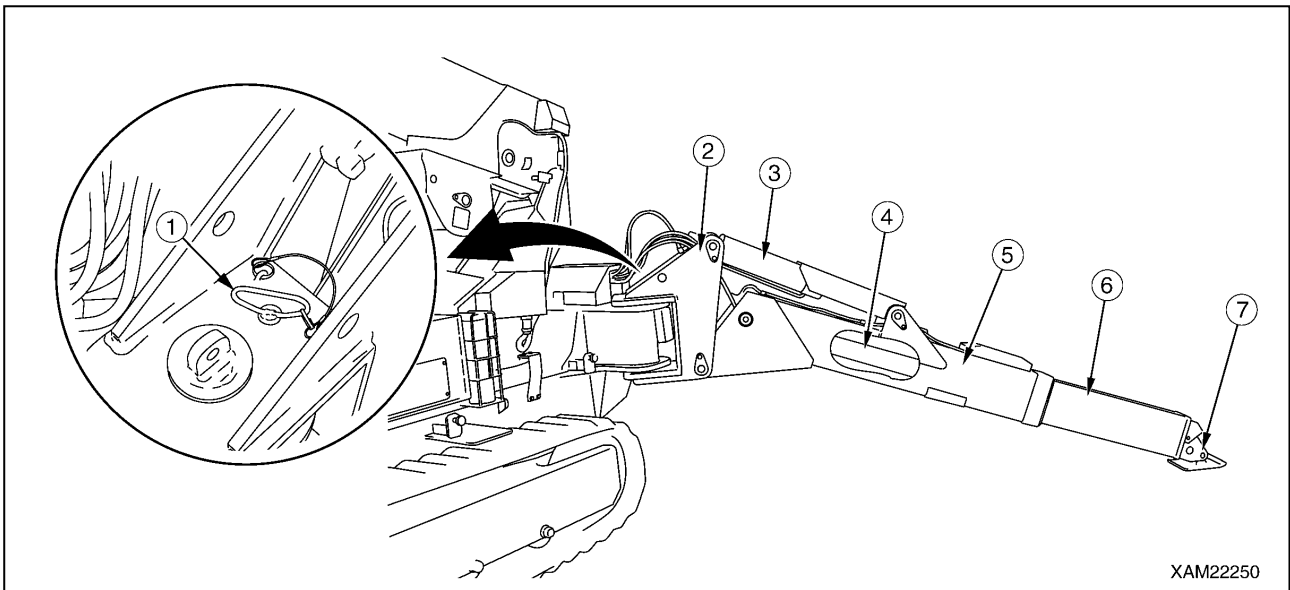
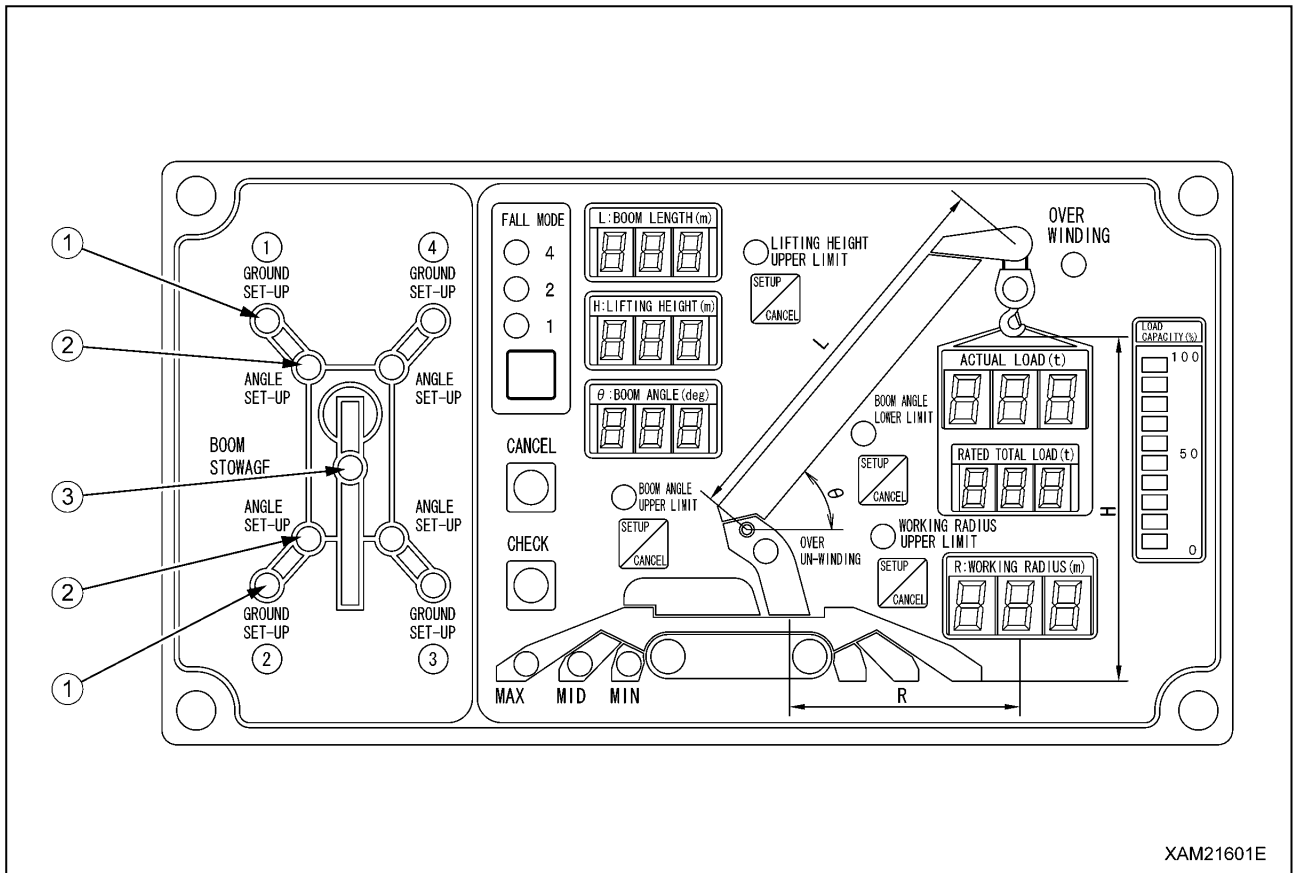
OUTRIGGER COMPONENTS

Fig. 4-75

- | | |
|----------------------------------|------------------------------|
| 1 - Position pin | 5 - Outer box |
| 2 - Rotary | 6 - Inner box |
| 3 - Outrigger setting cylinder | 7 - Outrigger adapter (Tray) |
| 4 - Outrigger extension cylinder | |

OUTRIGGER DISPLAY



XAM21601E

Fig. 4-76

- 1 - Outrigger grounding lamp
- 2 - Outrigger extension lamp

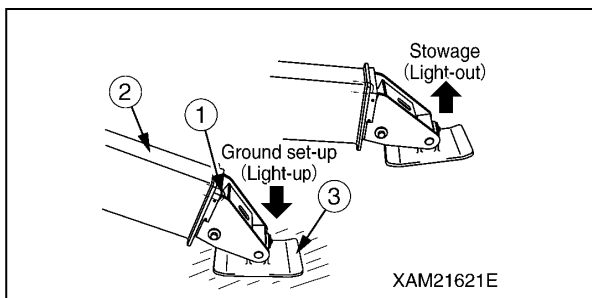
- 3 - Boom stowing lamp

Outrigger Grounding Lamps

The lamp turns on to indicate that the outrigger is set.

Turns on when the outrigger tray (3) is set, and turns off when the tray (3) floats (stow).

The conditions of the outrigger tray (3) are detected by the detection pin (1) at the tip of the inner box (2) and by the detection switch inside the inner box.



XAM21621E

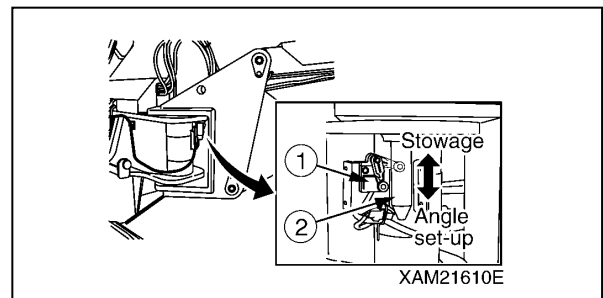
Fig. 4-77

Outrigger Extension Lamps

The lamp turns on to indicate that the outrigger is extended.

Turns on when the position pin (2) is inserted (extension), and turns off when extracted (stow).

The extraction/insertion of the position pin (2) is detected by the detection switch (1) of the outrigger rotary.



XAM21610E

Fig. 4-78

Boom Stowing Lamp

This lamp turns on and indicates that the boom is stowed.

The boom stowing lamp turns on and off in accordance to the following two types of detection switches. (When both of the detection switches detect.)

Boom Stowing Detection in Slewing Direction

The lamp turns on when the boom stops at the slew and stow position, and turns off when the boom leaves the slew and stop position.

Boom movements are detected by the projection (2) (slew) on the post and the detection switch (1) (fix) on the travelling dolly.

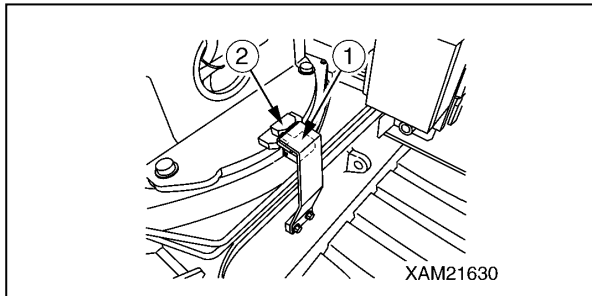


Fig. 4-79

Boom Stowing Detection in Horizontal Direction

The lamp turns on when the boom stops at the horizontal stowing position, and turns off when the boom leaves the horizontal stowing position.

Boom movements are detected by the projection (4) (movable) at the side of the boom rear edge and the detection switch (3) (fixed) at the boom connection.

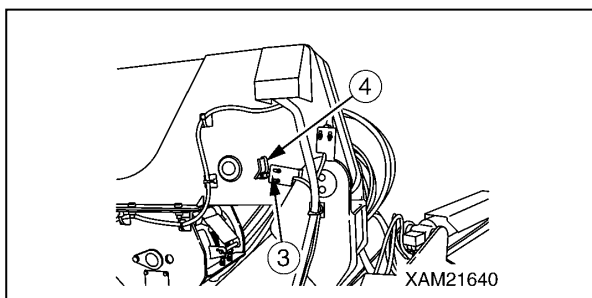


Fig. 4-80

OUTRIGGER UN-SET WARNING LAMP (YELLOW)

This lamp flashes to indicate that one or more of the four outriggers are not properly set.

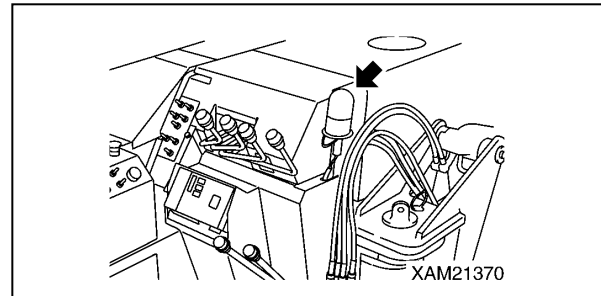


Fig. 4-81

NOTICE:

- The outrigger un-set warning lamp flashes if extension or setting of any of the four outriggers cannot be detected.
- The outrigger un-set warning lamp is interlocked with the working status lamp (red) for moment limiter. As soon as the outrigger un-set warning lamp flashes, the working status lamp (red) also rotates and lights up.

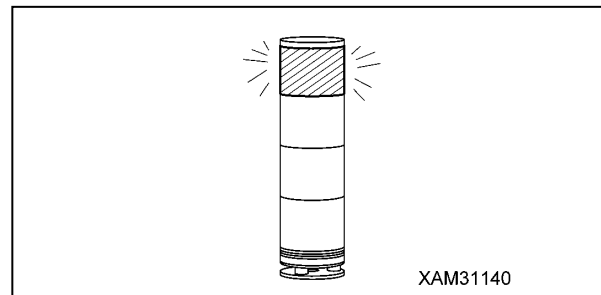


Fig. 4-82

OUTRIGGER OPERATION PANEL

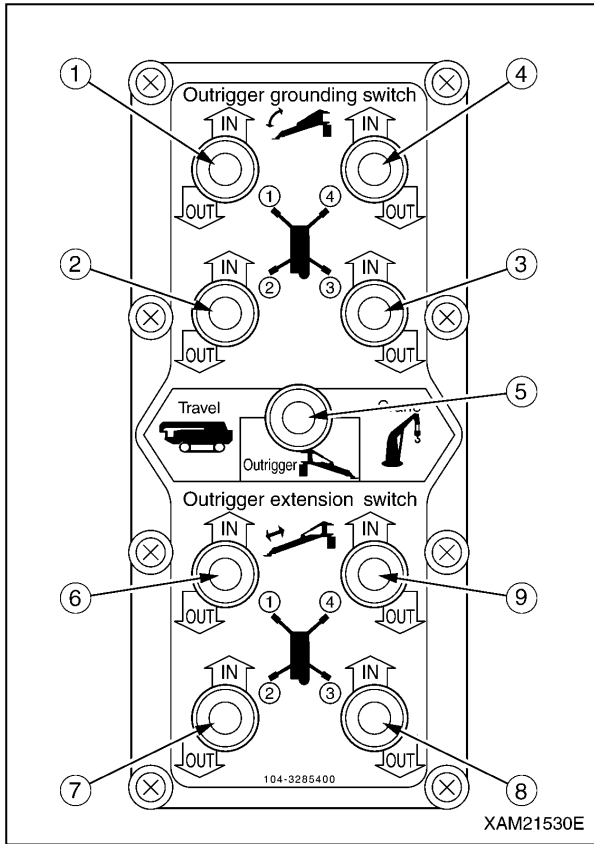


Fig. 4-83

- 1 - Outrigger [1] grounding switch
- 2 - Outrigger [2] grounding switch
- 3 - Outrigger [3] grounding switch
- 4 - Outrigger [4] grounding switch
- 5 - Work selector switch (Travel, Outrigger, Crane)
- 6 - Outrigger [1] extension switch
- 7 - Outrigger [2] extension switch
- 8 - Outrigger [3] extension switch
- 9 - Outrigger [4] extension switch

Work Selector Switch (Travel, Outrigger, Crane)

WARNING!

- When operating the work selector switch to the "Travel" position, be sure to stow the crane and put the machine in the "travelling posture". Operating the machine not in the "travelling posture" can overturn the machine, resulting in serious accidents.

- Be sure to operate the travelling lock lever to the "LOCK" position before outrigger or crane operation.
Note that if the travelling lock lever is not at the "LOCK" position, you can still travel the machine even if the work selector switch is operated to the "Outrigger" or "Crane" position. Be careful not to let your hand or body touch the travelling levers. The machine may move, causing serious accidents.
- Be sure to set all the outriggers when turning the work selector switch to the "Crane" position to perform the crane operation. Inappropriate setting of outriggers will prevent the crane operation because of the outrigger safety device function.
- Always stow the boom when performing the outrigger operation with the work selector switch set to the "Outrigger" position. If the boom is not stowed properly, the outrigger safety device function prevents the outrigger operation from being performed.

Use this switch to switch the work state of the machine (Travel, Outrigger, Crane).

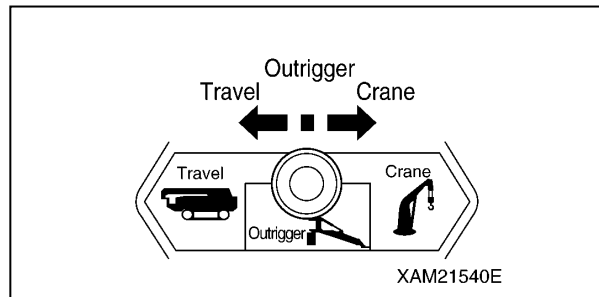


Fig. 4-84

- Travel: Push down the switch to the left. Now you can travel the machine.
- Outrigger: Push down the switch to the centre position. Now you can perform the outrigger operation.
- Crane: Push down the switch to the right. Now you can perform the crane operation.

NOTICE: The table below shows the relation between the operation position of the work selector switch and permitted operations.

- Only the travelling operation is active when the work selector switch is at the "Travel" position.
- When the work selector switch is at the "Outrigger" position, all the devices in the table below are active.

Be sure to set the travelling lock lever to the "LOCK" position and stow the crane when operating the outriggers. Be careful not to touch the operation levers of the crane.

- When the work selector switch is at the "Crane" position, all the devices except for outrigger operation in the table below are active. Be sure to set the travelling lock lever to the "LOCK" position and set all the outriggers when operating the crane.

Work Selector Switch Operation Position	Crane System (A: Active N: Not active)				
	Travelling Operation	Outrigger Operation	Crane Operation	Remote control system Crane	Moment Limiters
Travel	A	N	N	N	N
Outrigger	N (Note 1)	A	N	N	A
Crane	N (Note 1)	N	A	A	A (Note 2)

Note 1: Operating the travelling lock lever to the "LOCK" side restricts the travelling operation.

If the lever is not operated to the "LOCK" side, the machine travels when a travelling lever is operated.

Note 2: The outrigger operation is enabled only when the Transmitter of the remote control system is in the "OUTRIGGER mode".

Outrigger Grounding Switches

Use these switches to set or stow the outriggers. There are four outriggers ([1] to [4]). Each outrigger can be operated independently or all together.

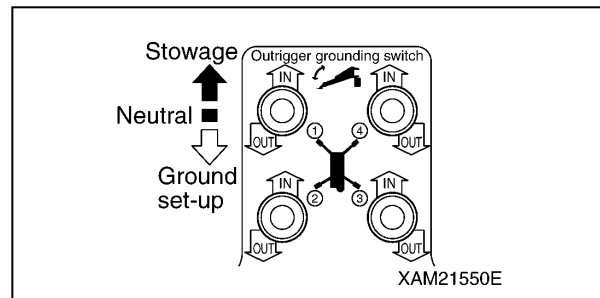


Fig. 4-85

- IN: Push down the switch upward. The outrigger setting cylinder retracts and you can stow the outrigger.
- Neutral: Release your finger from the switch. The switch returns to the "Neutral" position and the outrigger setting cylinder stops telescoping.
- OUT: Push down the switch downward. The outrigger setting cylinder extends and you can set the outrigger.

Outrigger Extension Switch

Use these switches to extend or stow the outriggers.

There are four outriggers ([1] to [4]). Each outrigger can be operated independently or all together.

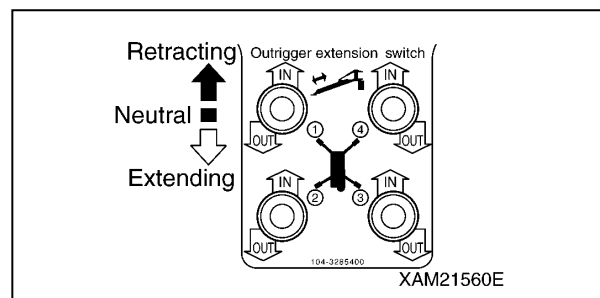


Fig. 4-86

- IN: Push down the switch upward. The outrigger extension cylinder retracts and you can stow the outrigger inner box.
- Neutral: Release your finger from the switch. The switch returns to the "Neutral" position and the outrigger extension cylinder stops telescoping.
- OUT: Push down the switch downward. The outrigger extension cylinder extends and you can extend the outrigger.

OUTRIGGER SETTING

WARNING! For more information on precautions when setting up outriggers, thoroughly check the items related to the outriggers in "WORKING WITH CRANE" on page 4-53.

CAUTION:

- Always keep the boom at the "fully retracted, lowest position and slew and store position" when operating the outriggers. The outriggers cannot be operated if the boom is not stowed completely. (Verify that the boom stowing lamp (green) on the outrigger display is ON.)
- After extending the outriggers, verify that the outriggers are securely set. If all the outriggers are not securely set, the crane operations will not be enabled. (Verify that all of the extension lamps and setting lamps (green) of the outrigger display are lit.)

Outrigger Setting Precautions

Protecting Ground

Setting the outriggers on the soft ground as given below will cause the tray of the outriggers to sink in the ground, leading to the overturning of the machine.

- Road surface with low-cost pavement (low-cost asphalt or thin concrete)
- Surface with paving stones
- Area reclaimed after excavation work
- Landfill
- Road shoulders or area close to hole such as excavation work
- Deteriorated pavement surface
- Areas where under the pavement surface is hollow due to water erosion and the top soil appears to be hard but soft in the ground
- Slope
- Place a sole plate of sufficient size with sufficient strength under the tray of all the outriggers on the soft ground to protect the ground.
- If you have to set the outriggers near the road shoulder by necessity, take secure action to prevent the collapse of the road shoulder.
- When working on the slope, level the tray of all the outriggers and the ground under the rubber tracks before setting the outriggers. Setting the outriggers with the tilted ground surface without levelling the ground surface will cause the outriggers to slip or overturn, causing serious accidents.

- If the ground is not protected or if the outriggers may sink even after protecting the ground, do not perform the crane operations.

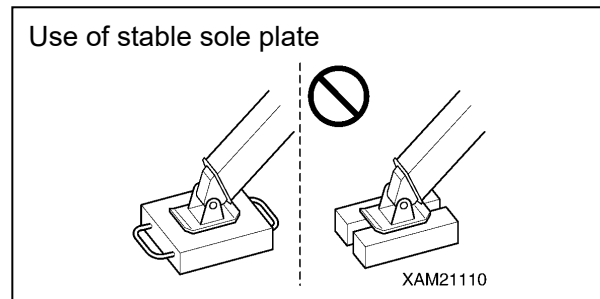


Fig. 4-87

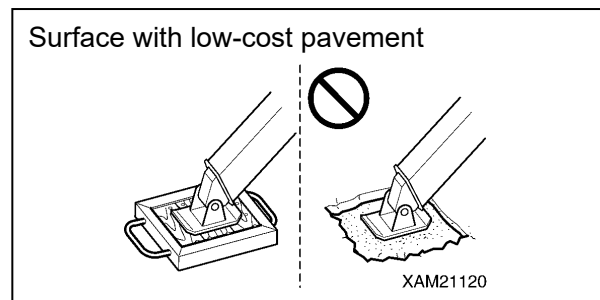


Fig. 4-88

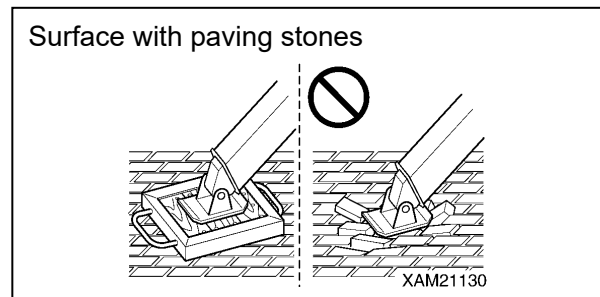


Fig. 4-89

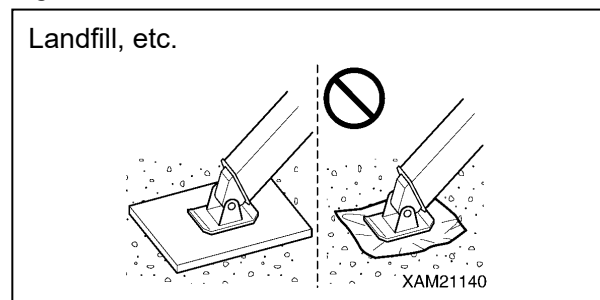


Fig. 4-90

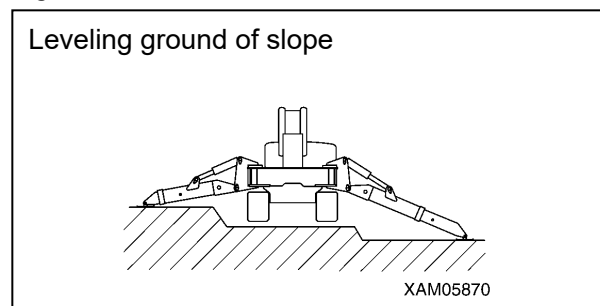


Fig. 4-91

Cautions When Placing Outrigger

Always observe followings to prevent serious injuries and death accidents when placing the outriggers.

- Do not let people approach nearby when placing the outriggers. Otherwise, serious accidents for instance the outrigger support catching a foot may occur.



Fig. 4-92

- Verify that the Moment Limiter Override Switch is at the "OFF" position.

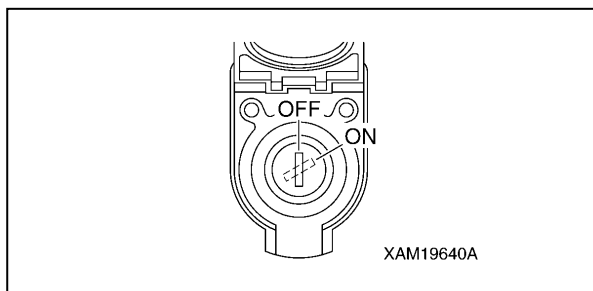


Fig. 4-93

- When extending the outriggers and bringing them in contact with the ground, be sure to set the outrigger rotaries to the extended position and to insert each position pin all the way in. Do not bring the outriggers into contact with the ground when the outrigger rotaries are stowed.
- When placing the outriggers, always keep the machine sternly level while looking at the level gauge. Occasionally view the level gauge and make sure to keep the machine level during the crane works as well.

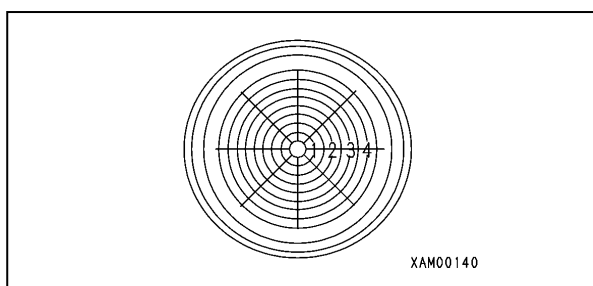


Fig. 4-94

- Place the outriggers at a maximum extension condition as the basic rule. If it is not possible to extend the outriggers to their maximum positions for some reason, operate the crane using the values given in the "Outrigger medium extension rated total load chart" or "Outrigger minimum extension rated total load chart" columns of the rated total load chart.

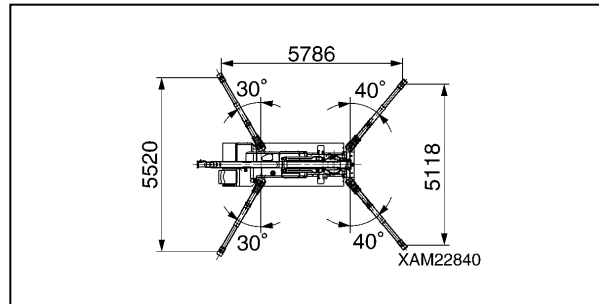


Fig. 4-95

- Place the outriggers in a style that the rubber tracks are approximately 50 mm above the ground.

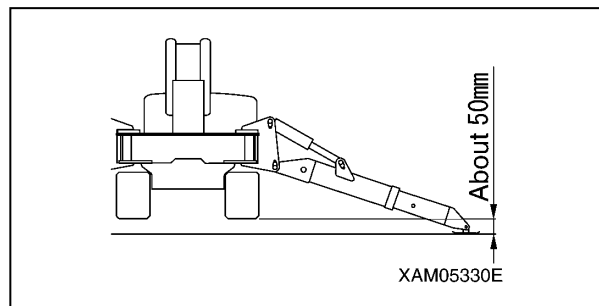


Fig. 4-96

- Make sure all of the outrigger position pins are securely fixed.

WARNING!

- **Make sure all the outriggers are placed properly before performing crane operation. This machine features a safety-interlock system that prevents crane operation unless all the lamps, other than the boom stowing lamp on the outrigger monitor, are on.**
- **Always place the machine in a horizontal position with the use of the level when extending the outriggers. A warning buzzer sounds when the machine is inclined 3° or more and stops when the machine is placed in a horizontal position.**

- When the crane is used with the outriggers extended other than at the maximum, crane operation should proceed with respect to the values specified in the rated total load chart corresponding to "When the crane is used with the outriggers extended at the minimum/medium". Failure to perform crane operation with proper values may cause the machine to topple over. Exercise caution when performing operation.
- Despite the maximum extension of all the outriggers, the width of extended outriggers decreases due to an ungraded ground even when clearance "a" in the figure is 50 mm.

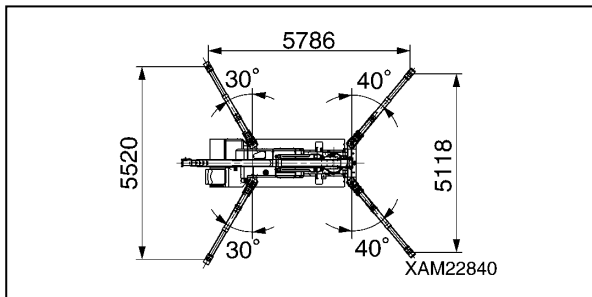


Fig. 4-97

Crane operation should proceed with respect to the values specified in "When the crane is used with the outriggers extended at the medium" in the rated total load chart.

- Despite the medium extension of all the outriggers, the width of extended outriggers decreases due to an ungraded ground even when clearance "a" in the figure is 50 mm.

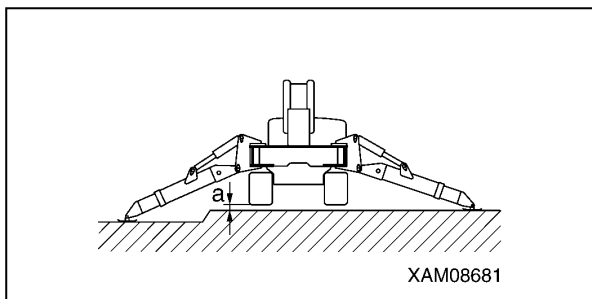


Fig. 4-98

Crane operation should proceed with respect to the values specified in "When the crane is used with the outriggers extended at the minimum" in the rated total load chart.

- Crane operation with the outriggers extended at the minimum is permitted only if the outriggers are placed on a level surface. 50mm of dimension between the outrigger bottom and crawler bottom should be obtained.
- On ungraded ground or similar, the width of extended outriggers decreases even when clearance "a" in the figure is 50 mm.

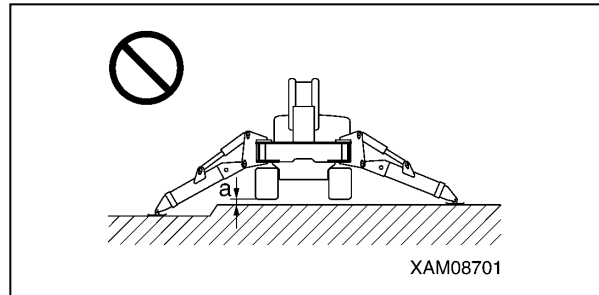


Fig. 4-99

Do not perform crane operation under such extension condition. Potential overturning of the machine may occur that leads to serious personal injury if disregarded.

- The machine becomes unsteady at some point if it undergoes a 360-degree slewing with an object hoisted. Irrespective of the rated total load, ensure operation in a short working radius and at low speed.

Tasks to Be Performed upon Engine Stop

There are four outriggers installed to the machine.

Although the setting method is described for just one outrigger (outrigger [4]), set the other three outriggers in the same way.

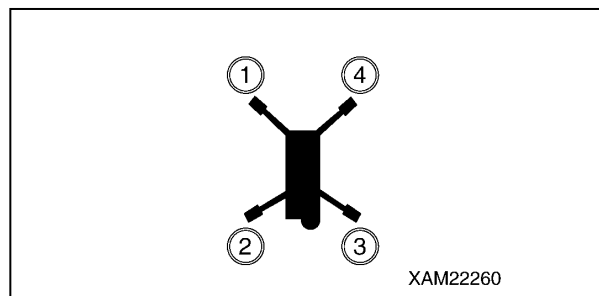


Fig. 4-100

1. Operate the travelling lock lever (8) to the "LOCK" position.

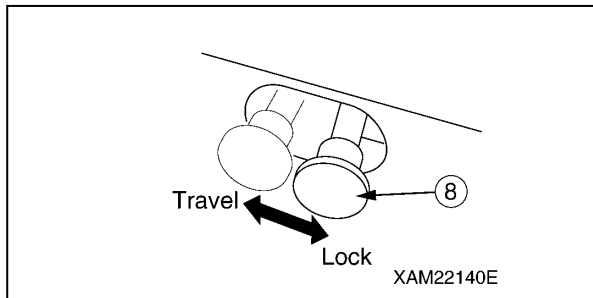


Fig. 4-101

2. Turn the starter switch to the "ON" position.

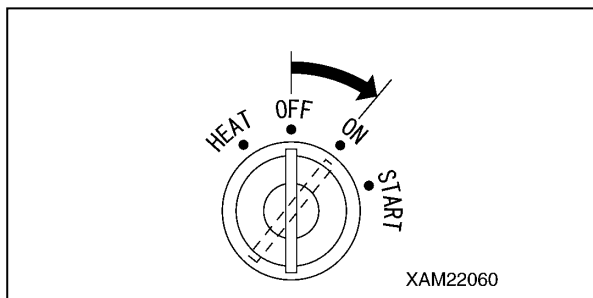


Fig. 4-102

3. Operate the work selector switch on the outrigger operation panel to the "Outrigger" position.

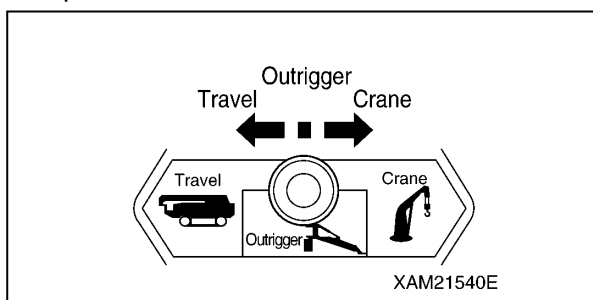


Fig. 4-103

4. Verify that the boom stowing lamp (1) (green) on the outrigger display is ON.

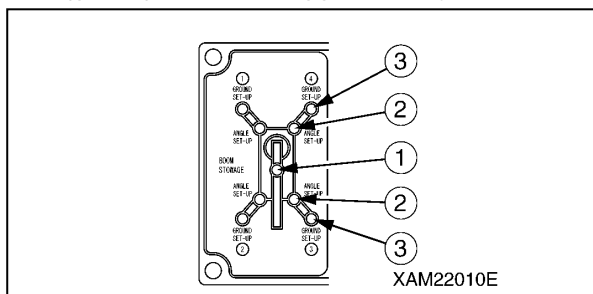


Fig. 4-104

5. Pull the position pin (1) out of the rotary (2) and rotate the rotary outward.

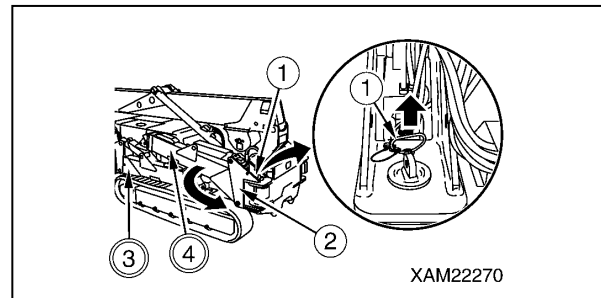


Fig. 4-105

6. Insert the position pin (1) to the end at the position where the pin holes are aligned after rotating the rotary (2) outward.

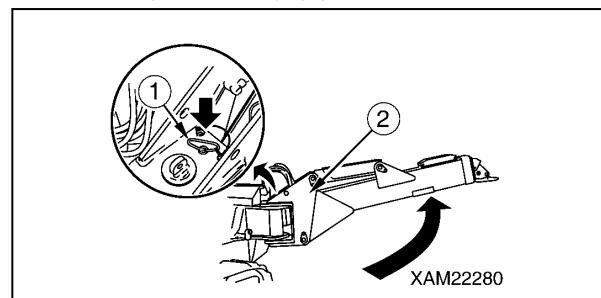


Fig. 4-106

NOTICE: The position pin (1) has a wire to prevent the loss of the pin.

7. Perform the same preparatory task to the other three outriggers.

NOTICE: After completing the preparatory task, verify that the position pin (1) is securely inserted.

8. Verify that the four outrigger extension lamps (2) (green) on the outrigger display are ON.

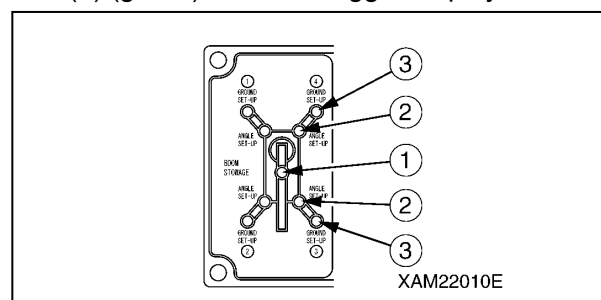


Fig. 4-107

NOTICE: The boom stowing lamp (1) and four outrigger extension lamps (2) on the outrigger display are ON.

Tasks to Be Performed after Starting Engine

WARNING!

- There are four outriggers. Be careful to operate the eight individual outrigger switches correctly. Check the position on the "number plate" affixed to each outrigger against the number indicated on the "operation plate" on the switch unit. Operating the wrong outrigger may result in serious accidents.
- Set the engine speed to low speed when operating the outrigger switches. If the engine speed is set to high speed, the outriggers may operate suddenly, resulting in machine toppling or other serious accidents.
- The overturning alarm buzzer sounds if the machine tilts for "3 degrees" or more when setting the outriggers. Operate the outrigger switches and adjust the machine to be levelled in which state the alarm buzzer will not sound.

1. See "STARTING ENGINE" on page 4-18 and start the engine.
2. Release your foot from the acceleration pedal (6) and change the engine speed to idling.

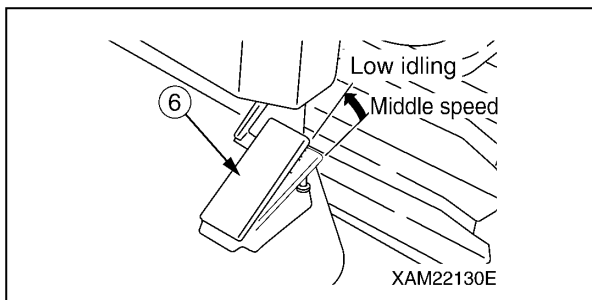


Fig. 4-108

3. Check the number on the operation plate at the switches on the outrigger operation panel to determine which outrigger to be operated.

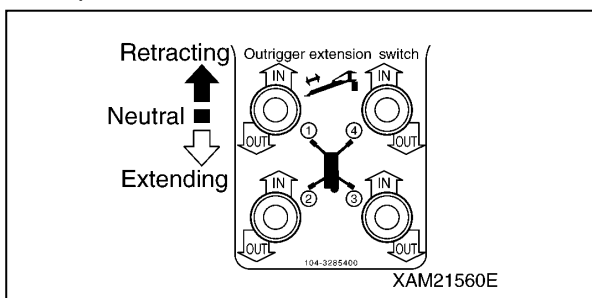


Fig. 4-109

4. Push down an outrigger extension switch or two of them at the same time to the "OUT" side.

When the outrigger extension cylinder extends and the inner box extends to the desired position, set the switch to the "Neutral" position.

Operate the remaining switches in the same way and extend the inner box of the four outriggers to the desired position. Set the switch to the "Neutral" position.

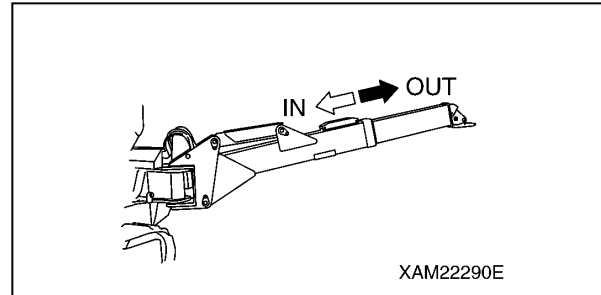


Fig. 4-110

5. Push down an outrigger grounding switch or two of them at the same time to the "OUT" (downward) side.

When the setting cylinder extends and the tray is set, set the switch to the "Neutral" position.

Operate the remaining switches in the same way and set the tray of all the four outriggers. Set the switch to the "Neutral" position.

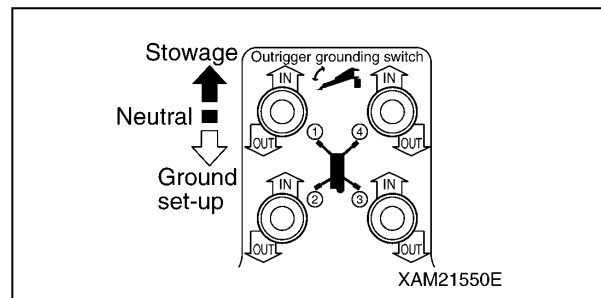


Fig. 4-111

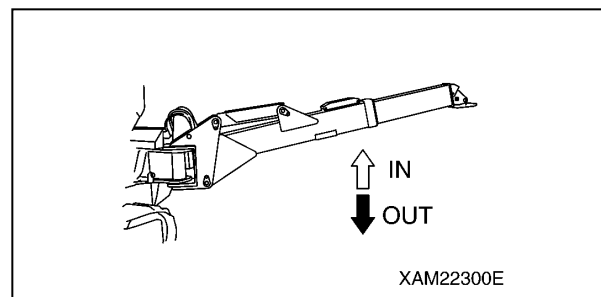


Fig. 4-112

WARNING!

- To lift the machine, use the four outrigger grounding switches to evenly lift each of the four outriggers little by little.
- When operating two outrigger grounding switches at the same time, choose two front switches (outrigger [1] and [4]) or two rear switches (outrigger [2] and [3]). Operating two left or right switches at the same time will suddenly raise two outriggers on one side, causing overturning of the machine.
- Do not attempt to extend the outriggers when they are in contact with the ground. This will subject the outriggers to excessive force and possibly damage them.

6. After all the trays were set, push down an outrigger grounding switch or two of them at the same time to the "OUT" (downward) position.

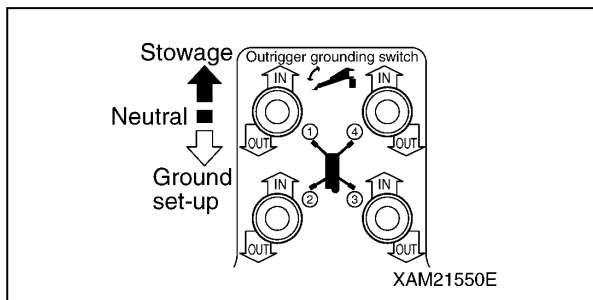


Fig. 4-113

When the setting cylinder extends and the machine is slightly raised, set the switch to the "Neutral" position. Operate the remaining switches in the same way so that the four outriggers are raised to the same height. Set the switch to the "Neutral" position. Repeat this operation to gradually raise the machine until the rubber tracks will be at the height of about 50 mm above the ground.

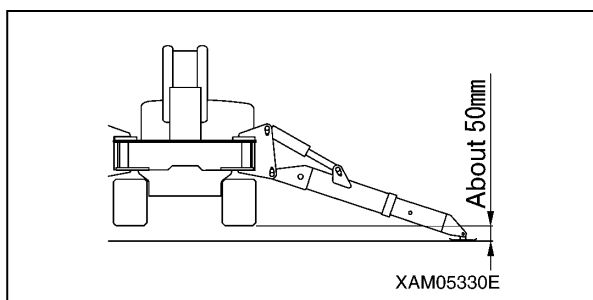


Fig. 4-114

7. When the machine was raised to about 50 mm above the ground, operate the outrigger operation switches while checking the position of the bubble in the level to adjust the machine to be levelled.

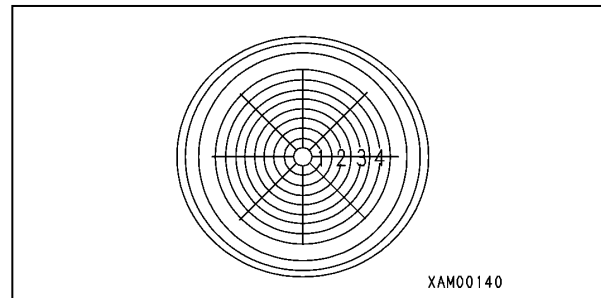


Fig. 4-115

8. After setting the outriggers, operate all the outrigger operation switches to the "Neutral" position.
9. Verify that the four outrigger grounding lamps (3) (green) on the outrigger display are ON.

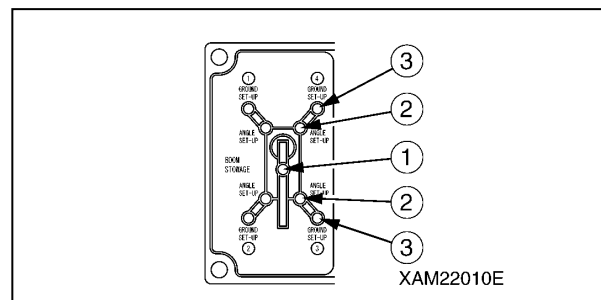


Fig. 4-116

NOTICE: On the outrigger display, all the boom stowing lamp (1), four outrigger extension lamps (2), and four outrigger grounding lamps (3) are illuminated in green.

CAUTION: If any of the setting lamps (3) is flashing in red, remove the cover (7) of the outrigger tray (6) and check if there is any foreign object pinched in the bending section.

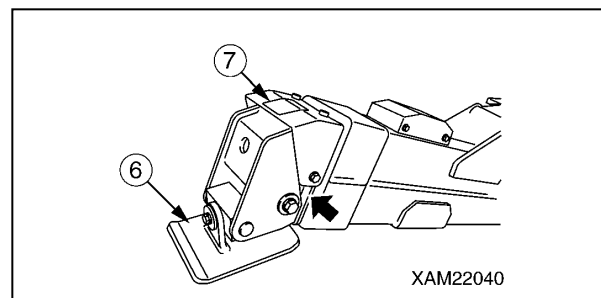


Fig. 4-117

Outrigger Extension Modes

Outrigger Maximum Extension

The figure represents the condition "When the crane is used with the outriggers extended at the maximum" in the rated total load chart.

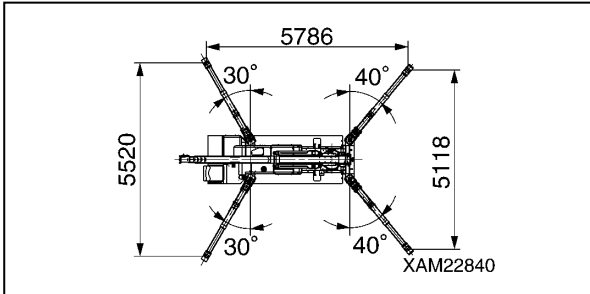


Fig. 4-118

Ensure that all the lamps, other than the boom stowing lamp on the outrigger monitor, are on. If the inner box is retracted even if only slightly, crane operation should proceed with respect to the values specified in the rated total load chart corresponding to "When the crane is used with the outriggers extended at the minimum/medium".

For more information on proper setting of the outriggers, see "OUTRIGGER SETTING" on page 4-42.

NOTICE: Outrigger maximum extension is defined as that:

1. The outrigger is set at the positioning pin position (40° front, 30° back).
2. The inner box of all the outriggers is extended fully.
3. All the outriggers are placed on a level surface.
4. Approx. 50mm is assured for clearance "a" (between the outrigger bottom and crawler bottom) in the figure.

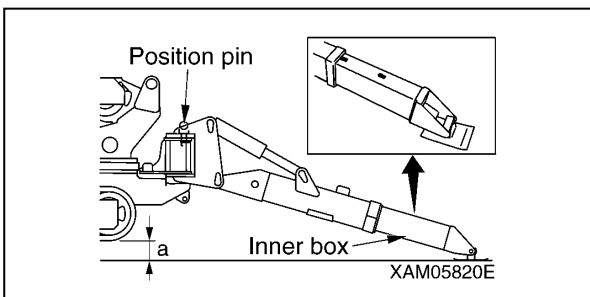


Fig. 4-119

Outrigger Medium Extension

The figure shown represents the condition "When the crane is used with the outriggers extended at the medium" in the rated total load chart.

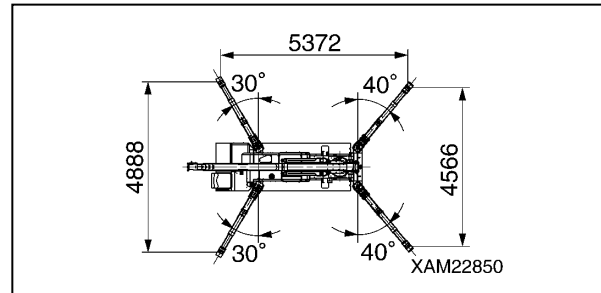


Fig. 4-120

NOTICE: Outrigger medium extension is defined as that:

1. The outrigger is set at the positioning pin position (40° front, 30° back).
2. The inner box of all the outriggers is extended at the medium.
3. All the outriggers are placed on a level surface.
4. Approx. 50mm is assured for clearance "a" (between the outrigger bottom and crawler bottom) in the figure.

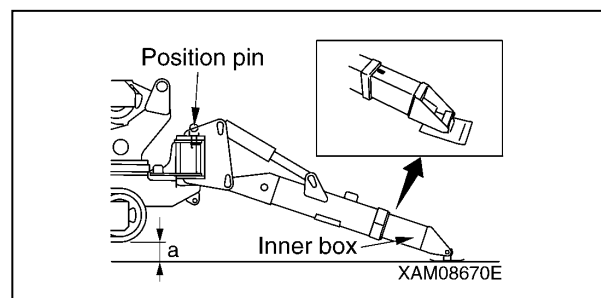


Fig. 4-121

NOTICE: If even a group of outriggers is retracted to a medium point, all the outriggers are deemed to be extended at the medium.

Outrigger Minimum Extension

The figure represents the condition "When the crane is used with the outriggers extended at the minimum" in the rated total load chart.

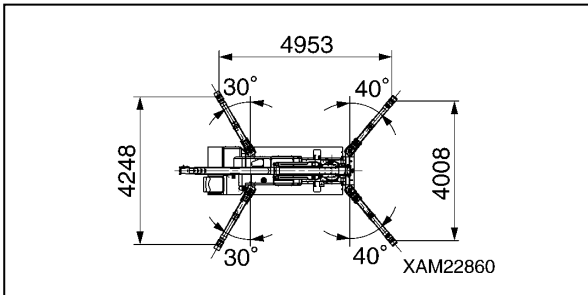


Fig. 4-122

NOTICE: Outrigger minimum extension is defined as that:

1. The outrigger is set at the positioning pin position (40° front, 30° back).
2. The inner box of all the outriggers is minimised.
3. All the outriggers are placed on a level surface.
4. Approx. 50mm is assured for clearance "a" (between the outrigger bottom and crawler bottom) in the figure.

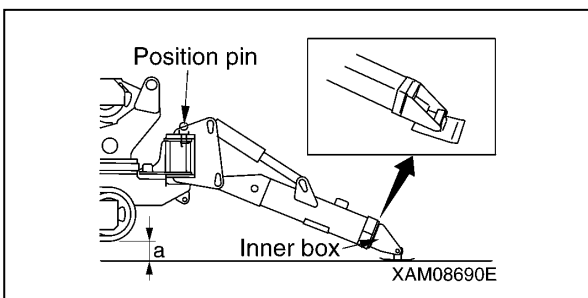


Fig. 4-123

NOTICE: If even a group of outriggers is retracted to the minimum point, all the outriggers are deemed to be extended at the minimum.

OUTRIGGER STOWING

WARNING!

- Do not let people approach toward the machine when stowing the outriggers. Staying around the machine may result in serious accidents such as getting caught between an outrigger and the main unit of the machine.
- Verify that there is nothing under the rubber tracks when stowing the outriggers. If there is any object under the rubber tracks, the machine may overturn and serious accidents may occur when stowing the outriggers.
- Stop the engine for operation except for extending/setting the outrigger cylinders. The third person touching an outrigger may result in sudden movement of the outrigger cylinder, which may lead to serious accidents.
- When the position pin is removed, the outrigger loses the support and rotates. Always hold the outrigger with one hand when removing the position pin.
- Do not put your hands or fingers around the gaps of movable areas when stowing the outriggers. Your hands or fingers may get caught, and it may lead to serious accidents.
- Insert the position pin to the end when stowing the outriggers.
- When lowering the raised machine, operate the eight outrigger switches so that the four outriggers are lowered little by little. Suddenly retracting two outriggers just on the right side or left side will cause instability in the machine and it can overturn the machine.
- Do not perform the outrigger extending operation after they are set on the ground. Doing so applies unreasonable force on the outriggers, resulting in the outrigger breakage.
- Always set the travelling lock lever to the "LOCK" position when operating the outriggers.

CAUTION:

- Always keep the boom at the "lowest position and slew and stow position" when operating the outriggers. The outriggers cannot be operated if the boom is not stowed completely. (Verify that the boom stowing lamp (green) on the outrigger display is ON.)
- Operate the work selector switch on the outrigger operation panel to the "Outrigger" position.

Tasks to Be Performed after Starting Engine

Although the stowing method is described for just one outrigger (outrigger [4]), stow the other three outriggers in the same way.

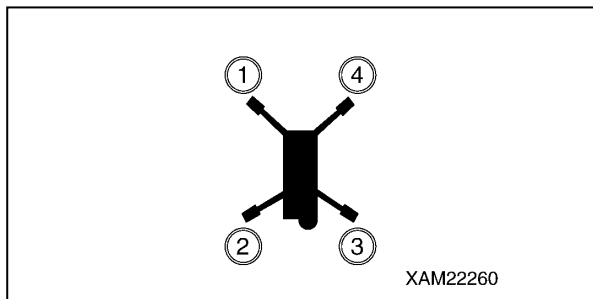


Fig. 4-124

1. Operate the travelling lock lever (8) to the "LOCK" position.

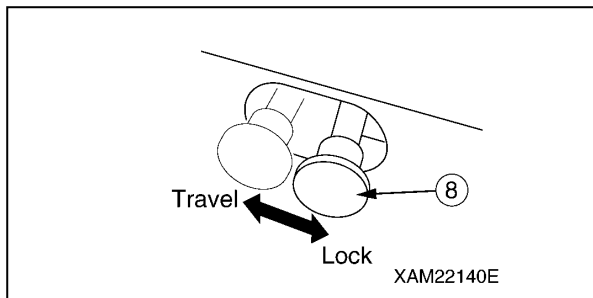


Fig. 4-125

2. See "STARTING ENGINE" on page 4-18 and start the engine.

3. Release your foot from the acceleration pedal (6) and change the engine speed to idling.

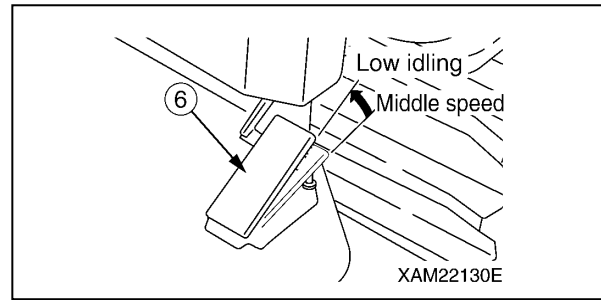


Fig. 4-126

4. Operate the work selector switch on the outrigger operation panel to the "Outrigger" position.

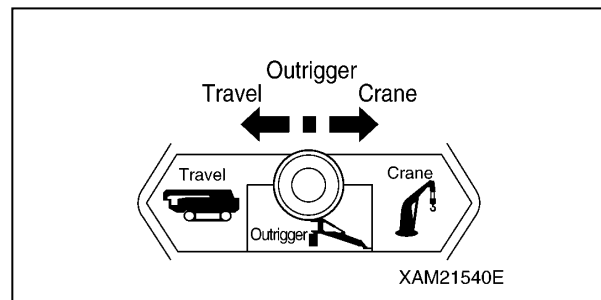


Fig. 4-127

5. Verify that the boom stowing lamp (1) (green) on the outrigger display is illuminated.

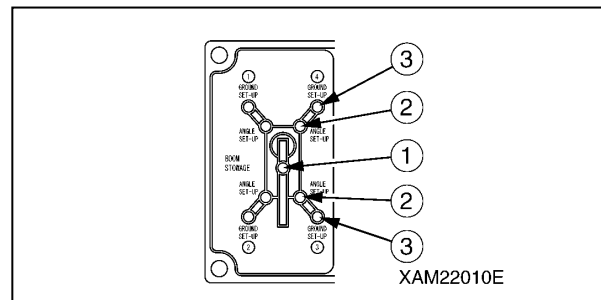


Fig. 4-128

WARNING! When operating two outrigger grounding switches at the same time, choose two front switches (outrigger [1] and [4]) or two rear switches (outrigger [2] and [3]). Operating two left or right switches at the same time will suddenly raise two outriggers on one side, causing overturning of the machine.

6. Check the number on the operation plate at the switch section on the outrigger operation panel to determine which outrigger to be operated.
7. Push down an outrigger grounding switch or two of them at the same time to the "ON" (upward) side.
When the outrigger setting cylinder retracts and the machine starts to go down, return the switch to the "Neutral" position.
Operate the remaining switches in the same way and lower all the four outriggers to the same height. Return the switch to the "Neutral" position.
Repeat this operation to gradually lower the machine until the rubber tracks go down completely on the ground.

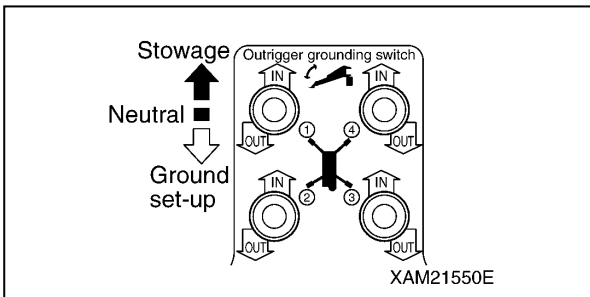


Fig. 4-129

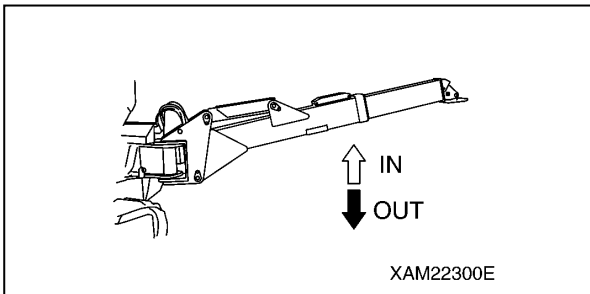


Fig. 4-130

8. When the left and right rubber tracks are completely set on the ground, push down again an outrigger grounding switch or two of them at the same time to the "IN" (upward) side.
When the setting cylinder completely retracts and the top box goes up to the upper limit, release your finger from the outrigger grounding switch.

9. Verify that the four outrigger grounding lamps (3) on the outrigger display are flashing in red.

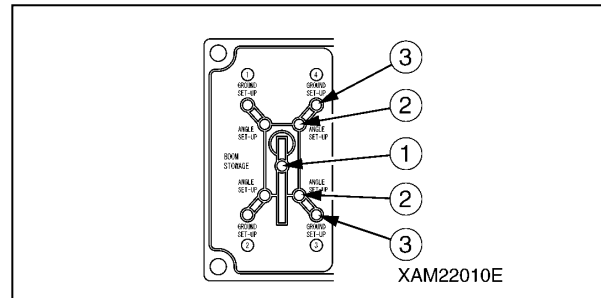


Fig. 4-131

NOTICE: On the outrigger display, the boom stowing lamp (1) (green) is illuminated and four outrigger extension lamps (2) and four outrigger grounding lamps (3) are flashing in red.

10. Push down an outrigger extension switch or two of them at the same time to the "IN" (upward) side.
When the extension cylinder fully retracts and the inner box is at its shortest, return the switch to the "Neutral" position.
Operate the remaining switches in the same way and make the inner box of the four outriggers to their shortest. Return the switch to the "Neutral" position.

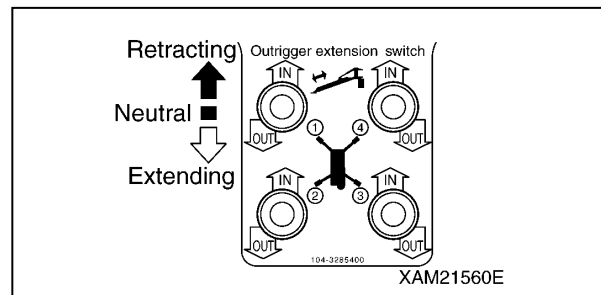


Fig. 4-132

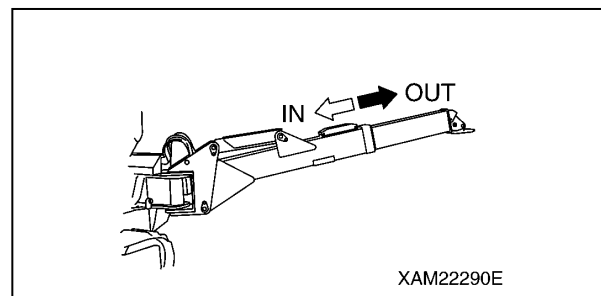


Fig. 4-133

- Turn the starter switch to the "OFF" position.
The engine stops.

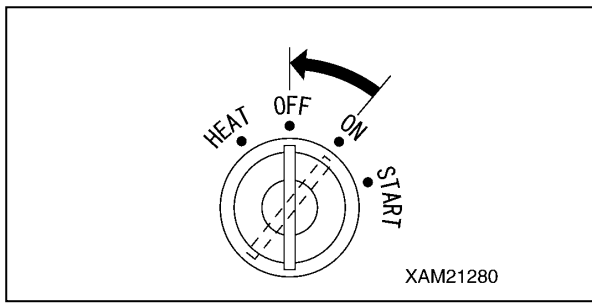


Fig. 4-134

Tasks to Be Performed upon Engine Stop

- Pull the position pin (1) out of the rotary (2) and rotate the rotary inward.

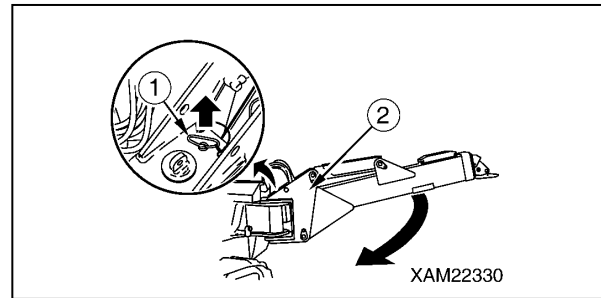


Fig. 4-135

- Insert the position pin (1) to the end at the position where the pin holes are aligned after rotating the rotary (2) inward.

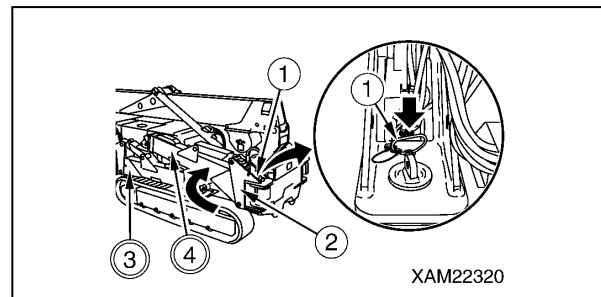


Fig. 4-136

NOTICE: The position pin (1) has a wire to prevent the loss of the pin.

- Stow the other three outriggers in the same way.

NOTICE: After stowing the outriggers, verify that the position pin (1) is securely inserted.

- Verify that the four outrigger extension lamps (2) on the outrigger display went off.

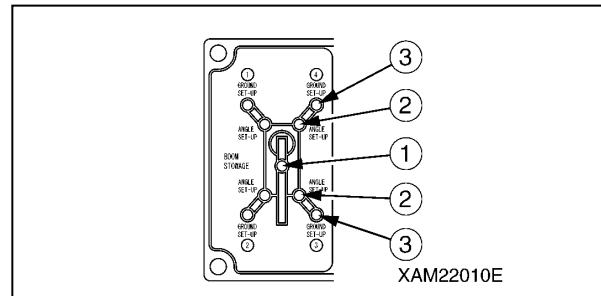


Fig. 4-137

NOTICE: On the outrigger display, the boom stowing lamp (1) (green) is illuminated and four outrigger extension lamps (2) and four outrigger grounding lamps (3) are flashing in red.

WORKING WITH CRANE

Inspection Before Starting Work

Check that the safety devices and crane operate properly.

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

Cautions When Handling Moment Limiter

- Use/store the moment limiter under the following ranges of ambient temperature.
 - ★ Temperature of use: 10 to 50 °C Storage temperature: -20 to 60 °C
- Avoid direct sunlight so that the temperature of the moment limiter body does not exceed the above range.
- Avoid locations with strong acid or alkaline atmosphere as much as possible. Otherwise, unexpected failures may occur.
- Do not apply impact to the moment limiter body for instance by colliding with an object. Such attempt may damage the case and may result in failures and improper operations.
- Do not push the panel sheet of the moment limiter body by a force more than necessary or push with sharp object such as a tip of a screwdriver. Such act may damage the panel sheet and may result in failures and improper operations.
- Do not remove the case cover or panel sheet from, or disassemble the moment limiter body. Such act may damage case and/or panel sheet and may result in failures and improper operations.

Cautions When Setting Up Moment Limiter

- The moment limiter calculates the moments assuming the machine is level. If you work with the crane when the machine is not level, warnings and alarms are not issued even when the rated total load is near. Always set the outrigger horizontally to the ground while looking at the level gauge.

- Before using the crane, check that the boom angle display, boom length display and real load display of the moment limiter are displayed correctly following the crane movements. Attempt to use without correct display results in failure to obtain correct measurement result and may result in serious bodily accidents caused by reasons such as an improper operation and/or breakage of nearby equipment.
- Always make sure the wire strand setting of the moment limiter matches with the wire strand of the crane. If the wire strands do not match, always let the wire strands match by changing the wire strand setting of the moment limiter or by changing the wire strand of the crane. Attempt to use with unmatched wire strands results in failure to obtain correct measurement result and may result in serious bodily accidents caused by reasons such as an improper operation and/or breakage of nearby equipment.
- Do not carelessly change the setting when measuring with the moment limiter. Such attempt results in failure to obtain correct measurement result and may result in serious bodily accidents caused by reasons such as an improper operation and/or breakage of nearby equipment.

Cautions High Temperature Oil When Working With Crane

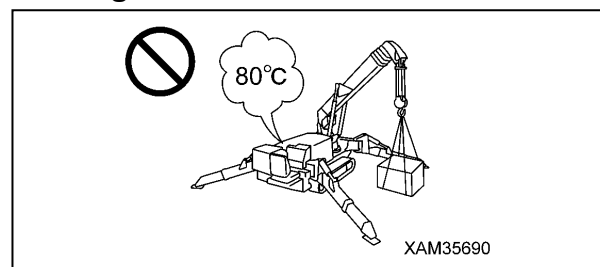


Fig. 4-138

When hydraulic oil temperature exceeds 80°C, high pressure hoses and seals can be damaged by heat, and it may cause burn by spouted oil. If temperature of hydraulic oil becomes over 80°C, stop operation and wait until the oil cools down.

Continuous hook raising / lowering operation at high working lifting height and a long time accelerated operation are easier to raise oil temperature. Especially be careful for these operations.

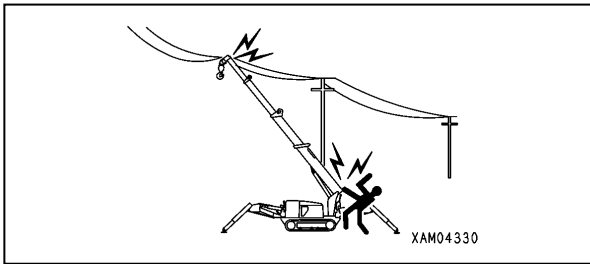
Beware of Electrical Cable Above

Fig. 4-139

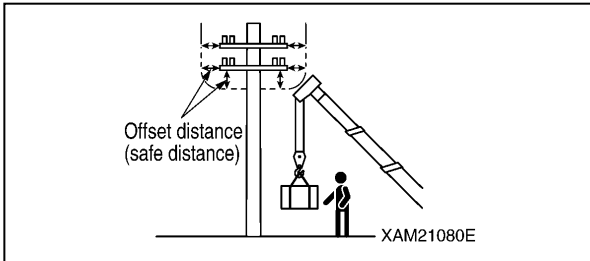


Fig. 4-140

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

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

Measures When Charge Accident Occurs

When an electrical charge accident occurred, do not panic but calm down, and apply solution by the following sequence.

1. Report
Immediately report to the electricity company or related management company, and receive instructions for the power transmission stop, emergency procedures and related.
2. Evacuation of related personnel from vicinity of machine
Let the related personnel including the workers from vicinity of the machine to prevent secondary disasters.
Personnel who suffered electrical shock by holding a sling rope, guide rope or other conductor when the machine was charged should evacuate by his/her own effort. Do not try to help such person. Otherwise, secondary electrical shock accident occurs.
3. Emergency procedure
Take the solution by following sequence in case of urgency where personnel received electrical shock because the machine was charged.
 - (1) If the machine can be operated, immediately operate the machine to move the machine constructions away from the contact and out of the range of the cause of the charge. Be careful not to snip the distribution power cable.
 - (2) Evacuate the machine completely away from the cause of the charge, make sure the machine is not charged, rescue the electrically shocked personnel and immediately carry to the hospital.

4. Measure after accident
After accident, do not reuse as is. Such attempt may cause unexpected accidents and enhances failures.
Ask us or our sales service agency for repair.

Cautions When Working with Crane in Location with High Output Microwave Emission

Working with crane near a high output microwave emission equipment such as a radar or TV/radio broadcast antenna causes the crane construction to be exposed to the microwave and generates induced current, therefore is very dangerous. In addition, the mechatronics may become haywire. Establish grounding between the machine frame and the ground when working in such location. In addition, slingers are requested to wear rubber boots and rubber gloves since risk of electrical shock by contacting parts such as the hook or wire exists.

Pay Attention to Weather Information

- In case of thunderstorm, risk of lightning exists, so abort working with crane, immediately lower the load and contain the boom.
- Exposing the hoisted load to wind causes the load to waggle and causes the machine to be unstable, thus is dangerous. Immediately lower the load and contain the boom when the wind is causing the load to waggle.
- If the maximum instantaneous wind speed is 10 m/s or greater, abort working with crane, immediately lower the load and contain the boom.
- Even when the maximum instantaneous wind speed is below 10 m/s, bigger the hoisted load, higher the hoisted load position, and longer the boom, the wind effect increases accordingly. Be fully careful during work.
- When a load such as a steel plate that has a large area exposed to wind is being hoisted, the wind arriving from front/rear/side of the boom may cause the machine to trip or damage the boom. Be fully careful when working.
- When an earthquake occurs, abort working and wait until the earthquake is over.

The following table indicates approximate relation between the wind speed and wind effect. The wind speed mentioned in the weathercast is mean wind velocity (m/s) during 10 minutes at 10 m above the ground.

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

Cautions When Slings

- Check the following before hoisting a load. Attempt to hoist the load without checking may result in serious bodily accidents by a drop of the load or tripping.
 - Observe the values in the rated total load chart.
 - Hoist from the centre of gravity of the load.
 - Check that the wire ropes of the hook block are perpendicular to the ground.
 - When the load leaves the ground, stop winding up the load once and check whether the load is stable.
- Before hoisting a slung load, always check whether the sling wire rope "retainer device" of the hook block is hung for sure. If the "retainer device" is not hung, the wire rope may leave the hook block and cause the load to fall and results in a serious accident.
- Larger wire rope angle when hoisting the load increases force that applies to the wire rope even when the load weight is unchanged, thus may cause the wire rope to snap. Pay enough consideration well when slinging to prevent excessive force from applying to the wire rope.
- Do not hoist more than loads at once. Such attempt may cause the hoist bracket to hit and damage the other hoisted load, the loads to move and lose balance and cause trip, or other cause of serious accidents. Do not hoist more than one load even if the total is within the rated total load.
- Hoisting of lengthy load causes the load to lose balance and is dangerous.
- In case of such load, hoist vertically by using a clamp, or achieve balance of the hoisted load by applying a rope to both ends of the load.

Cautions When Working with Crane

- Be sure to verify that the moment limiter override switch is at OFF position before operating the crane. Do not attempt the crane operation when the moment limiter override switch is at ON position. The moment limiter override switch is permitted to be at ON position only during the inspection or maintenance works.
- Crane works are not possible when the outriggers are placed in extension condition. Also, the crane work becomes halted when an outrigger support leaves the ground during the crane work. Securely place the crane in the extension condition, and avoid operations and works that may cause the machine to vibrate when working with the crane.
- Attempt to work beyond the capacity of the machine may cause serious accidents and failures caused by for instance tripping or fluctuation. Observe the rated total load chart when working with the crane.
- Do not travel with a load being hoisted under any circumstance. Such attempt may cause the crane to trip and may result in serious bodily accidents.
- Be slow when operating the crane. Sudden lever or accelerator operations may cause risks such as wagging or fall of the load and collision with the surrounding. Be especially careful to be slow during the slewing operations.
- Do not let people approach the work radius or below the load, since risks such as fall of the load and contact with the load exist. Such attempt may result in serious bodily accidents. Also, during the work, consider the fact that the working radius increases when the load is hoisted and the boom is deflected thus.
- Attempt to work with the crane even when the view is bad due to location or weather is dangerous. Ensure brightness by posting a work lamp or other illumination facility in dark places. When the view is bad because of bad weather (rain, fog, and snow), abort working and wait until the weather recovers.
- Do not use for other purpose, for instance raising a person using a crane, other than the true purpose.

- If the overwinding detector alarm buzzer is heard, immediately leave your hand from the winch lever. The hook block winding stops. Then, operate the winch lever to Down (push forward) to wind down the hook block. In addition, the hook block is wound up when the boom is extended, so be sure to ensure extra clearance between the boom and the hook block during work.
- When the boom extends, the hook block is wound up. Operate the winch lever to Down (push forward) to wind down the hook block while you extend the boom.
- Whenever an overload occurs during work, lower the load by winding down the winch by setting the winch lever to Down (push forward). Do not raise or lower the boom acutely. Such attempt may cause serious accidents by tripping.
- The volume of the hydraulic oil in each of the cylinders changes depending on the temperature.
By leaving idle with a load being hoisted, as the time passes by the oil temperature drops and the hydraulic oil volume decreases, and changes such as the boom derrick angle decrease and boom length decrease may occur.
In that case, execute boom derricking operations and boom extension operations appropriately to correct.
- Do not leave the operation position when a load is hoisted.
Lower the load before leaving the machine.
- Keep the hook block wound up when not in use.
Otherwise, person near the load may collide the hook block without load.
- The operator must always ensure that no one is ever underneath a hoisted load.
To ensure safety, any lifting carried out over the operator's seat must be operated by remote control.

Cautions When Operating Winch

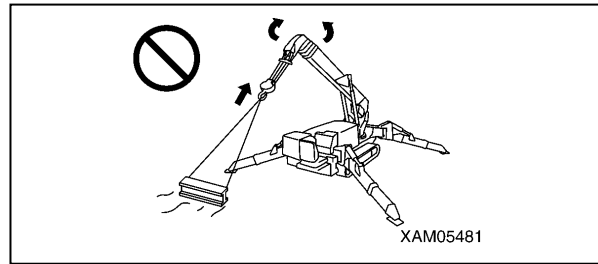


Fig. 4-141

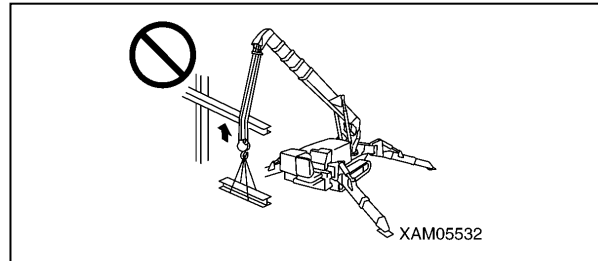


Fig. 4-142

- Do not let persons enter below the hoisted load.
- When hoisting a load, always stop once at the "takeoff" position where the hoisted load leaves the ground. Check subjects such as load stability and load force, then hoist up the load.
- Do not pull laterally, pull toward you or hoist diagonally. Such attempt may cause the crane to trip or suffer damage.
- Overwinding of the hook block may result in collision with the boom, snipping the wire ropes and causes the hook block and load to fall and cause serious accidents. Be fully careful to prevent overwinding the hook block.
- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steel when hoisting a load.
- If caught by an obstacle, do not forcibly wind up the hoist load, but untangle the caught part before winding up.
- Do not use the winch drum wire rope in random condition. If random, not only the wire rope suffers damage and shortens the lifetime, but the wire rope may snip and causes serious accidents.
Observe following precautions to avoid wire rope from becoming random.
 - Do not let the hook block hit the ground.
 - Before leaving the hook block lowered for a long time for instance when working with underground, leave at least three loops of wire rope in the winch drum.

- If the wire rope is twisted and causes the hook block to turn, fully eliminate the twist before work.

For more information, see "Winch Wire Rope - Correcting Twisted Rope" on page 5-67.

Cautions When Operating Boom

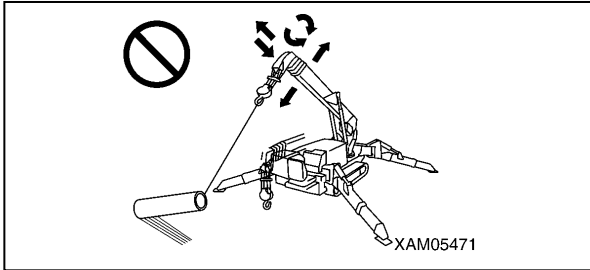


Fig. 4-143

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

Cautions During Slewing Operation

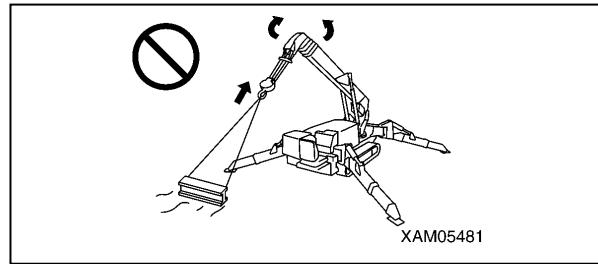


Fig. 4-144

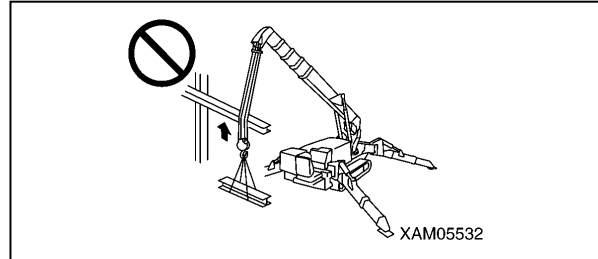


Fig. 4-145

- Check the safety in the vicinity and blow the horn before slewing.
- If the boom operator angle is small, be careful to prevent the boom from hitting the operator or the machine.
- Be slow as much as possible when operating the slewing lever. Make sure to start smoothly, slew slow, and stop quietly. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to wobble and cause the machine to lose balance, and thus may damage the crane or trip the machine.
- Attempts to pull to bring forth the load or let the load stand up by slewing operation are prohibited. Do not attempt under any circumstance.
- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steel when hoisting a load or when slewing. If caught by an obstacle, do not forcibly wind up the hoist load, but untangle the caught part before winding up.
- Certain outrigger extension condition may cause the boom to hit an outrigger and cause the crane to be damaged or the machine to trip. Be careful to prevent the boom from hitting outriggers during slewing operation.

Cooperation Hoisting Is Prohibited as the Rule

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

The cooperation hoisting work is a highly hazardous work that may cause for instance a trip of the machine due to uneven centre of gravity, fall of the hoisted load or boom damage.

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

And, observe the following cautions as well.

- Use the cranes of same model.
- Choose the machine model that can handle sufficiently larger load than the load to be hoisted.
- Make sure only one person gives signs.
- Limit the crane operations to single operations as the rule, and do not attempt any slewing operation.
- Appoint one responsible slinger who is most experienced.

Working at the Site with Underground Lifting

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

Place Crane on Level and Hard Soil

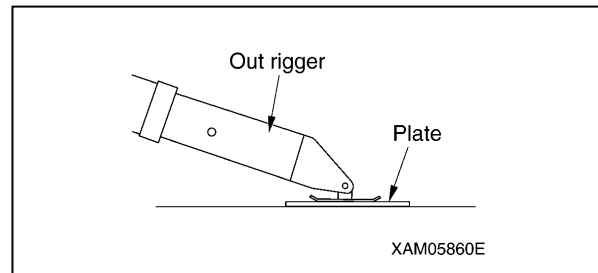


Fig. 4-146

- Always place the outriggers on a level, stable and solid ground. Attempt to work with crane without outriggers firmly contacting the ground may cause the Machine to trip.
 - Always place all outriggers before working with crane.
 - Do not set any outrigger near the location that may collapse, for instance a soft ground, roadside or drilled hole.
- In case the outriggers need to be placed on a soft ground for unavoidable reason, always reinforce the ground by laying a sufficiently large and strong base plate below each of all outrigger supports.

CRANE OPERATION

Dos and Don'ts During Crane Operations

WARNING!

- Always set the outriggers on the levelled solid ground when performing the crane operations.
- Never perform Pick & Carry or the crane operations without setting the outriggers. The machine will be unstable and overturn, leading to serious accidents.
- See the cautions given in "Section 2 SAFETY" besides the dos and don'ts in this section.

Do Not Operate with Slewing Force

Drawing in or lifting the load with slewing operation is prohibited.

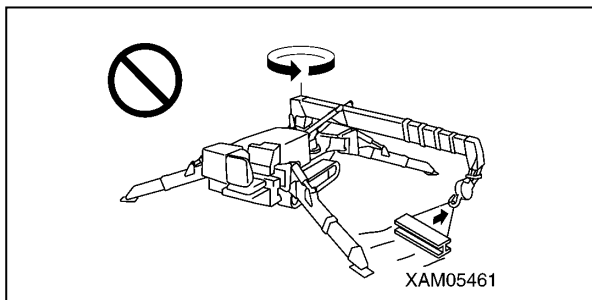


Fig. 4-147

Do Not Operate with Derricking Force

Drawing in or lifting the load with boom derricking operation is prohibited.

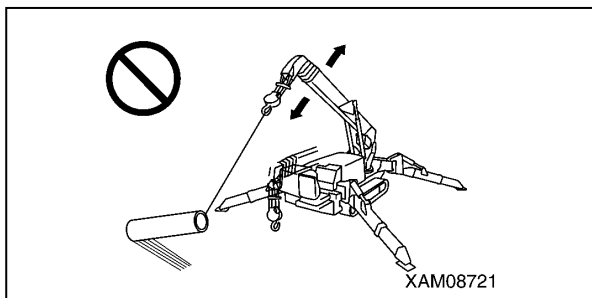


Fig. 4-148

Do Not Pull Sideward, Draw in, and Hoist Diagonally

Pulling sideward, drawing in, or hoisting diagonally applies unreasonable force on the machine. It not only damages the machine body, but also is dangerous. Never operate in these ways.

The hook must come right above the centre of gravity of the load hoisted.

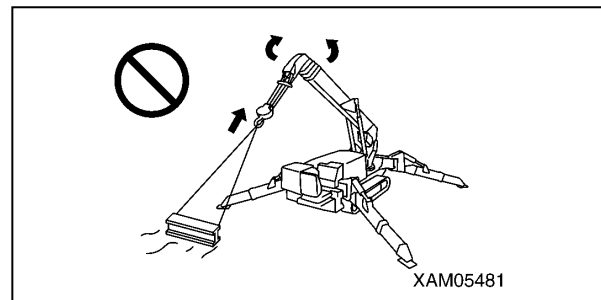


Fig. 4-149

Do Not Operate Violently

Do not operate the lever suddenly. Especially, the "slewing", "boom lowering", and "hook lowering" must be operated at low speed.

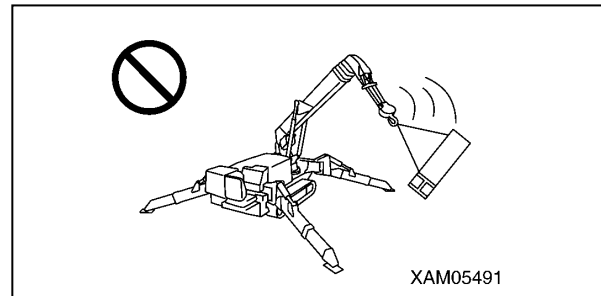


Fig. 4-150

Do Not Access into Working Radius

Do not let people access into the working radius such as permitting an operator to go under the hoisted load.

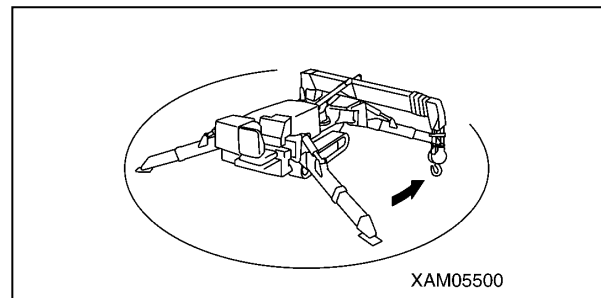


Fig. 4-151

Do Not Use for Other than Main Applications

Do not move people up/down with the crane.

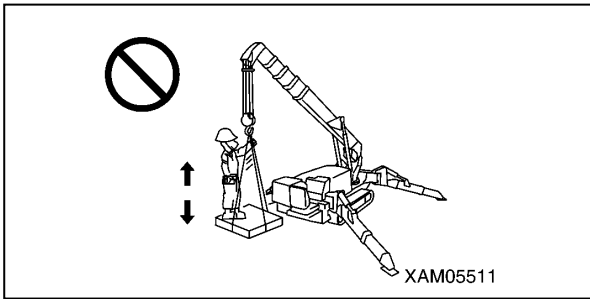


Fig. 4-152

Do Not Perform Unreasonable Operations

Operations requiring more than the machine performance can cause accidents.

Particularly, the crane operations must be carried out according to the rated total load chart.

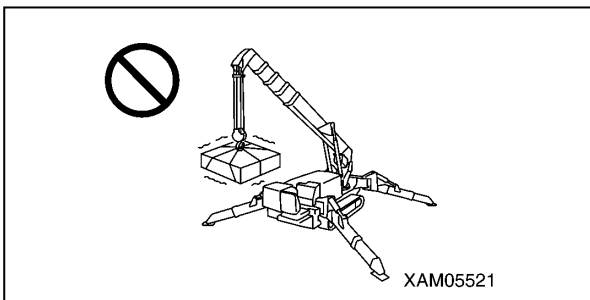


Fig. 4-153

Do Not Wind by Force

Be careful not to hook the wire rope over a tree or steel beam while working.

If it gets stuck with something, do not force to wind the wire. Untangle and then wind the wire.

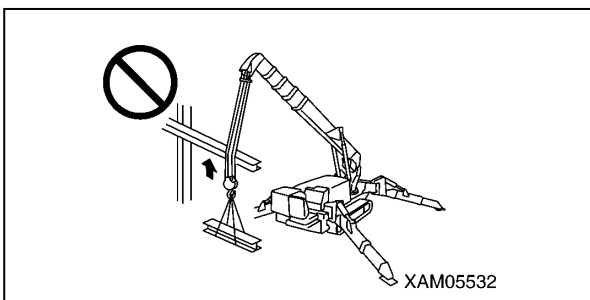


Fig. 4-154

Do Not Operate During Pick & Carry

The load may slew or the machine may overturn during the Pick & Carry.

Do not perform slewing operation or crane operations.

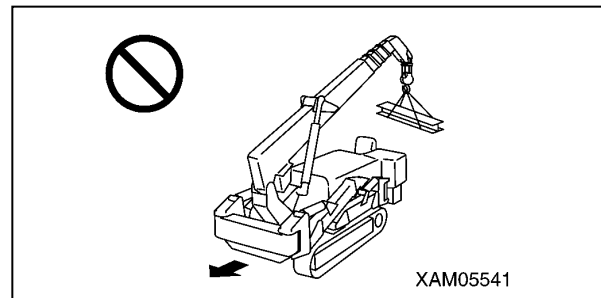


Fig. 4-155

Before Crane Operations

CAUTION:

- Verify that all the lamps on the outrigger display are illuminated in green before performing the crane operation. The crane cannot be operated if any of the four outrigger extension lamps and four outrigger grounding lamps is flashing in red.
- Set the travelling lock lever to the "LOCK" position when operating the operation levers of the crane system and outrigger switches.
- When loosening the stowing of the hook block, be careful not to topple the entire hook block sideways on the ground by loosening the wire rope too much. This will cause irregular winding on the winch drum.
- When loosening the stowing of the hook block, the hook block may slew and interfere with the peripheral devices, resulting breakage of the devices. Pay sufficient attention around the hook block.

Perform the following operations before crane operation.

1. Confirm that the moment limiter override switch is set to the "OFF" position.
The safety device operation will not stop if the switch is at the "ON" position.

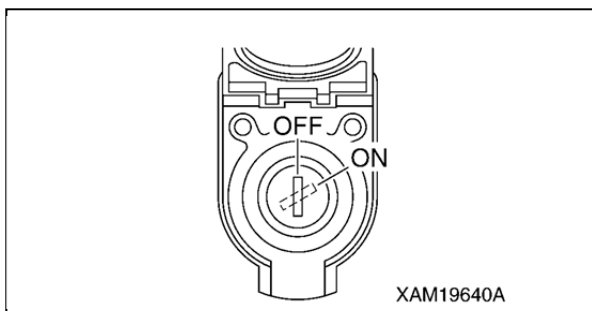


Fig. 4-156

NOTICE: If the moment limiter override switch is set to the "ON" position, the working status lamp will flash in red, and the warning buzzer will sound.

2. Operate the travelling lock lever (8) to the "LOCK" position.

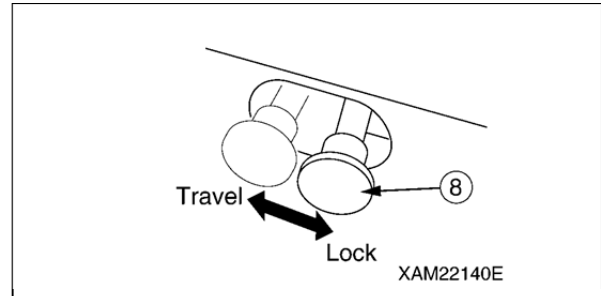


Fig. 4-157

3. Operate the work selector switch on the outrigger operation panel to the "Crane" position.

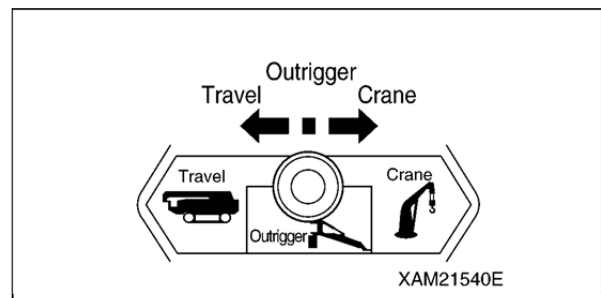


Fig. 4-158

4. Operate the winch lever (3) to the "DOWN" (push forward) side to loosen the hook block from the stowing position.

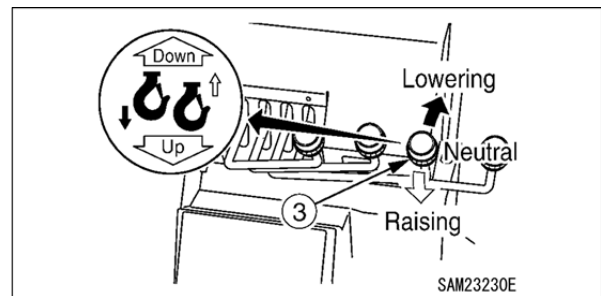


Fig. 4-159

Crane Operation Posture

Take the crane operation posture by following the procedure below when switching to the operation from the state described in "Before Crane Operations" on page 4-62.

1. Operate the winch lever (3) to the "DOWN" (push forward) side and lower the hook but not to let the hook block touch the ground.

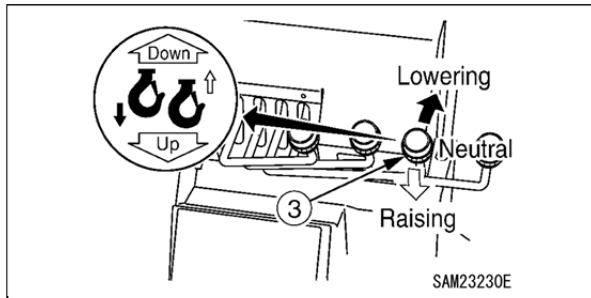


Fig. 4-160

2. Operate the boom derricking lever (4) to the "RAISE" (pull toward you) side and raise the boom to the angle where the hook block is not over wound and not touching the ground.

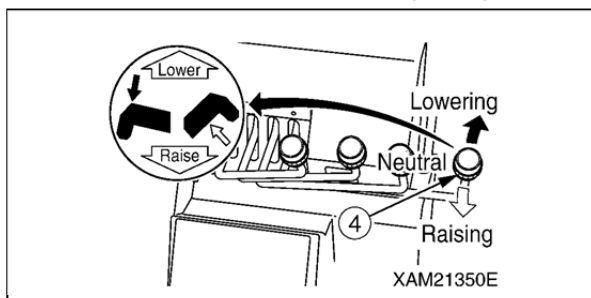


Fig. 4-161

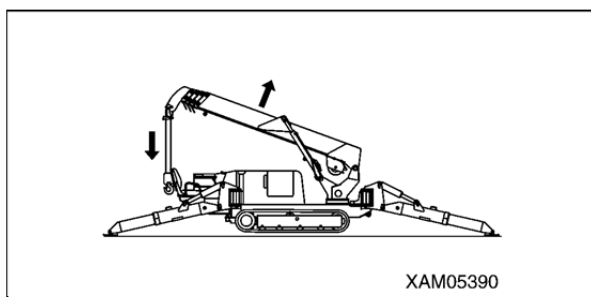


Fig. 4-162

Hook Raising/Lowering Operation

WARNING!

- With the boom deflection, the hoisted load slightly shifts forward. Notify the workers around such as slinging operators.
- If the hook block was hoisted too much, over winding will be detected. The alarm buzzer sounds and the audible message saying "Hook over hoisted" will be heard. When the alarm buzzer and audible voice were heard, operate the winch lever immediately to the "Neutral" position and stop raising the hook.
- When lowering the hook for long distance for underground works, be sure to leave more than three turns of the wire rope on the winch drum.

CAUTION: Do not let the hook block touch the ground.

The winch drum will wind irregularly, damaging the wire rope.

Operate the winch lever (3) as follows;

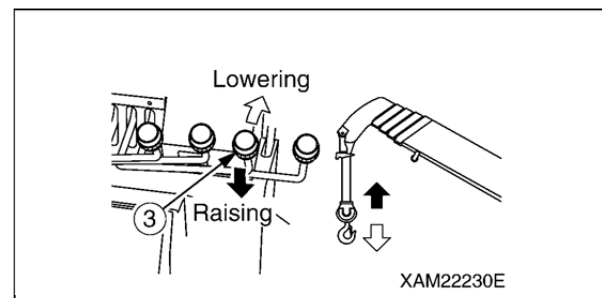


Fig. 4-163

- Lower: Push the lever forward "DOWN".
- Neutral: Release your hand from the lever. The lever will return to the "Neutral" position and the raising/lowering of the hook block stops.
- Raise: Pull the lever to the "UP" side toward you.

NOTICE: Adjust the winch raising/lowering speed with the winch lever and stroke of the acceleration pedal.

Boom Derricking Operation

WARNING!

- Operate the boom derricking lever as slowly as possible.
Sudden lever operation especially while hoisting a load will cause the load to slew, giving a great impact to the machine, and thus may break the crane or overturn the machine.
- Lowering the boom increases the working radius and the rated total load that can be hoisted decreases. Be extremely careful so that the load weight will not be overloaded with the boom most lowered when working by derricking the boom.

Operate the boom derricking lever (4) as follows.

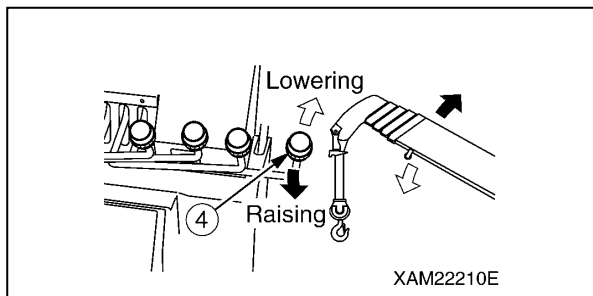


Fig. 4-164

- Lower: Push the lever forward to the "LOWER" side.
- Neutral: Release your hand from the lever. The lever goes back to the "Neutral" position and the boom derricking stops.
- Raise: Pull the lever toward you to the "RAISE" side.

NOTICE: Adjust the boom derricking speed with the boom derricking lever and the stroke of the acceleration pedal.

Boom Telescoping Operation

WARNING!

- Operate the boom telescoping lever as slowly as possible.
Sudden lever operation especially while hoisting a load will cause the load to slew, giving a great impact to the machine, and thus may break the crane or overturn the machine.
- Do not pull the load horizontally or pull in the load by telescoping the boom.

- Extending the boom increases the working radius and the rated total load that can be hoisted decreases. Be extremely careful so that the load weight will not be overloaded with the boom most extended when working by telescoping the boom.
- When the boom is extended, the hook block is raised.
If the alarm buzzer of the over winding detector and the audible message of "Hook Over Hoisted" are heard during the boom extending operation, return the boom telescoping lever immediately to the "Neutral" position and stop the boom extending operation.

CAUTION:

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

Perform the boom telescoping lever (2) as follows.

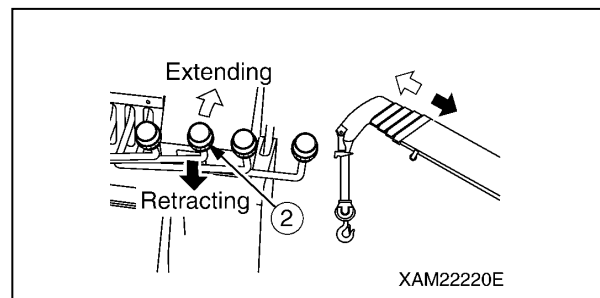


Fig. 4-165

- Extend: Push the lever forward to the "EXTEND" side.
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the boom telescoping stops.
- Retract: Pull the lever toward you to the "RETRACT" side.

NOTICE: Adjust the boom telescoping speed with the boom telescoping lever and the stroke of the acceleration pedal.

Slewing Operation

WARNING!

- Check the safety around and honk the horn before slewing.
- Operate the slewing lever as slowly as possible.
Start smoothly, slew at low speed, and stop gently.
Sudden lever operation especially while hoisting a load will cause the load to slew, causing the loss of stability in the machine, and thus may break the crane or overturn the machine.
- Even if the outriggers are set normally, some directions have lower stability when slewed for 360 degrees. Be extremely careful when slewing while hoisting a load.
- Depending on how outriggers are extended, the hoisted load may hit an outrigger during the slewing operation, breaking the crane or overturning the machine. Be careful not to let the hoisted load hit an outrigger.

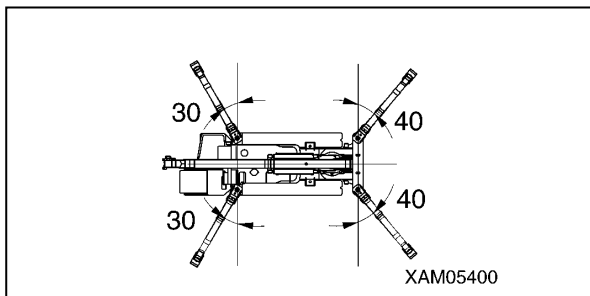


Fig. 4-166

Operate the slewing lever (1) as follows.

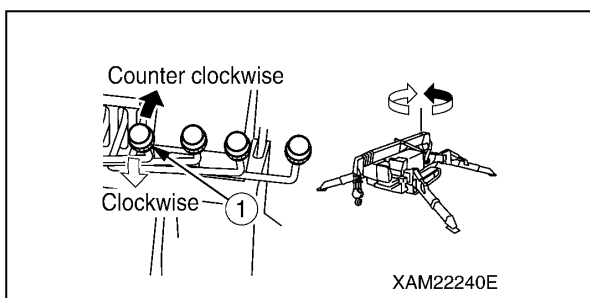


Fig. 4-167

- Slew counterclockwise (left): Push the lever forward to the "LEFT" side.
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the slewing stops.
- Slew clockwise (right): Pull the lever toward you to the "RIGHT" side.

NOTICE: Adjust the crane slewing speed with the slewing lever and the stroke of the acceleration pedal.

Acceleration Operation

WARNING! Accelerating the operation speed of the crane units more than is necessary is dangerous.

CAUTION: Decrease the speed in the beginning or near the end of an operation. Change the speed to low speed or high speed according to the load.

Operate the acceleration pedal (6) as follows.

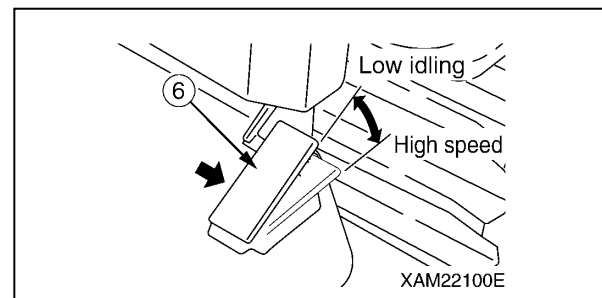


Fig. 4-168

- Low idling: Release your foot from the pedal. The engine speed decreases and the operation speed of the crane units slows down.
- Full speed: Fully step on the pedal. The engine speed increases, and the operation speed of the crane units accelerates.

NOTICE: Step on the pedal to the position of the engine speed necessary for the task.

Crane Stowing Operation

CAUTION: The hook stowing switch cancels the auto stop function of the over winding detector.

Operate the winch lever carefully not to let the hook block hit the boom when stowing the hook block.

CAUTION:

- Stop the slew of the hook block before stowing the hook block.
- When stowing the hook block, do not topple the entire hook block sideways on the ground by loosening the wire rope too much. This will cause the irregular winding on the winch drum.
- The boom "retracting" operation will lower the hook block. The hook block also lowers with the boom "lowering" operation. Raise the hook at the same time so that the hook block will not touch the ground or interfere with the machine.
- Stow the boom securely into the stowing position. After stowing the boom, verify that the boom stowing lamp on the outrigger display lights up in green. If the boom stowing lamp does not light up, the outriggers cannot be stowed. If the boom stowing lamp does not light up, lower the boom to the maximum or slew the boom to verify that the boom stowing lamp lights up.

1. Operate the boom telescoping lever (2) to the "RETRACT" (pull toward you) side to fully retract the boom.

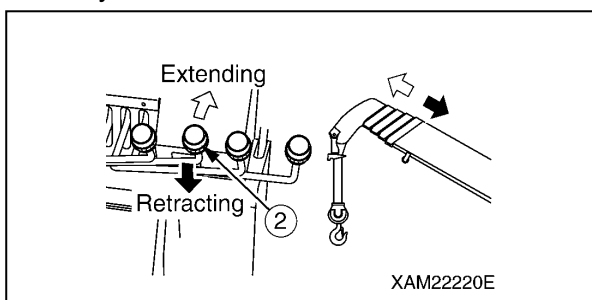


Fig. 4-169

2. Operate the slewing lever (1) to the "LEFT" or "RIGHT" side so that the boom slews to the centre of the machine.

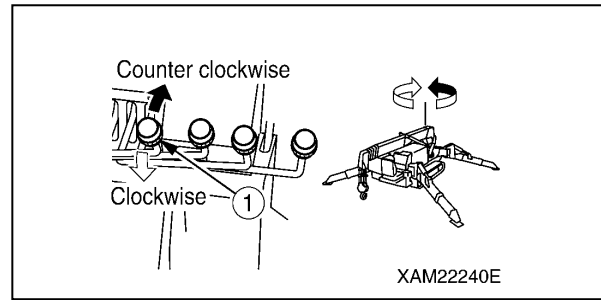


Fig. 4-170

3. Operate the boom derricking lever (4) to the "LOWER" (push forward) side and lower the boom until it automatically stops.

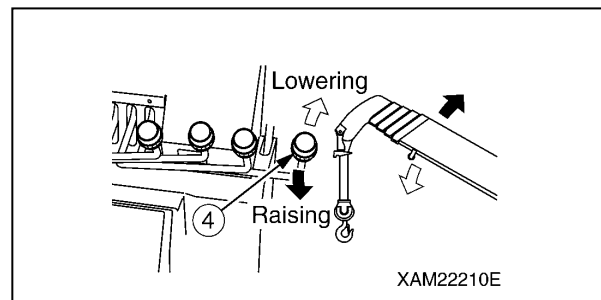


Fig. 4-171

4. With the boom stowing switch knocked to the "ON" position, operate the boom derricking lever (4) again to the "LOWER" (push forward) side to stow the boom.

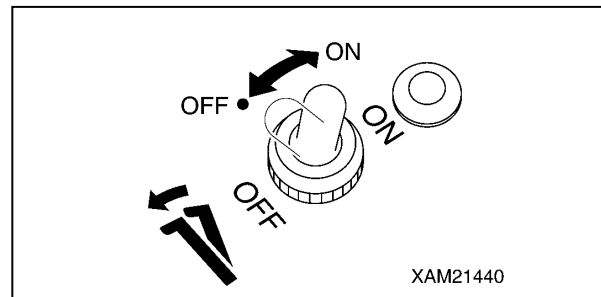


Fig. 4-172

NOTICE: When the boom stowing switch is at the "ON" position, the pilot lamp at the switch section lights up.

- Operate the winch lever (3) to the "UP" (pull toward you) side and winch until the hook block automatically stops (over winding).

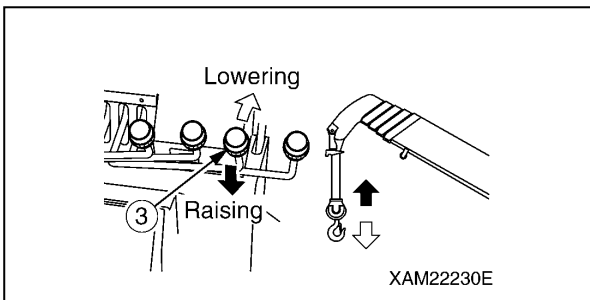


Fig. 4-173

NOTICE: Hoisting the hook block too much will result in the detection of over winding. Then the alarm buzzer and audible message of "Hook Over Hoist" are heard and the hook raising operation automatically stops.

- With the hook stowing switch at the "ON" position, operate the winch lever (3) to the "UP" (pull toward you) side again and slowly raise the hook block (4) to stow the block at the bottom of the boom end.

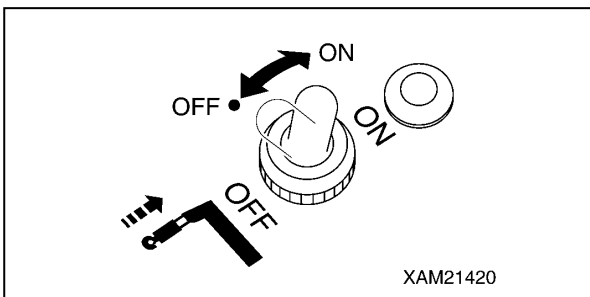


Fig. 4-174

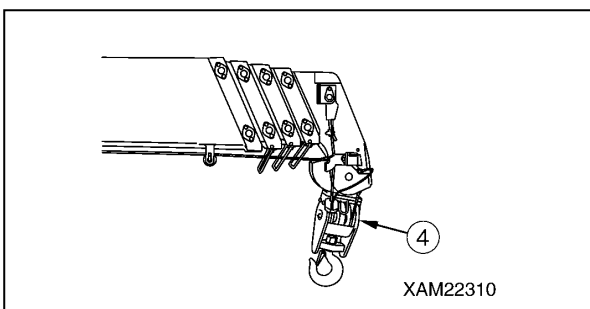


Fig. 4-175

NOTICE: Operating the hook stowing switch to the "ON" position turns on the pilot lamp at the switch section.

- Verify that the boom stowing lamp (1) (green) on the outrigger display lights up.

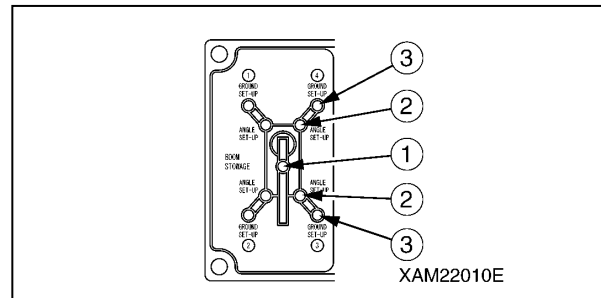
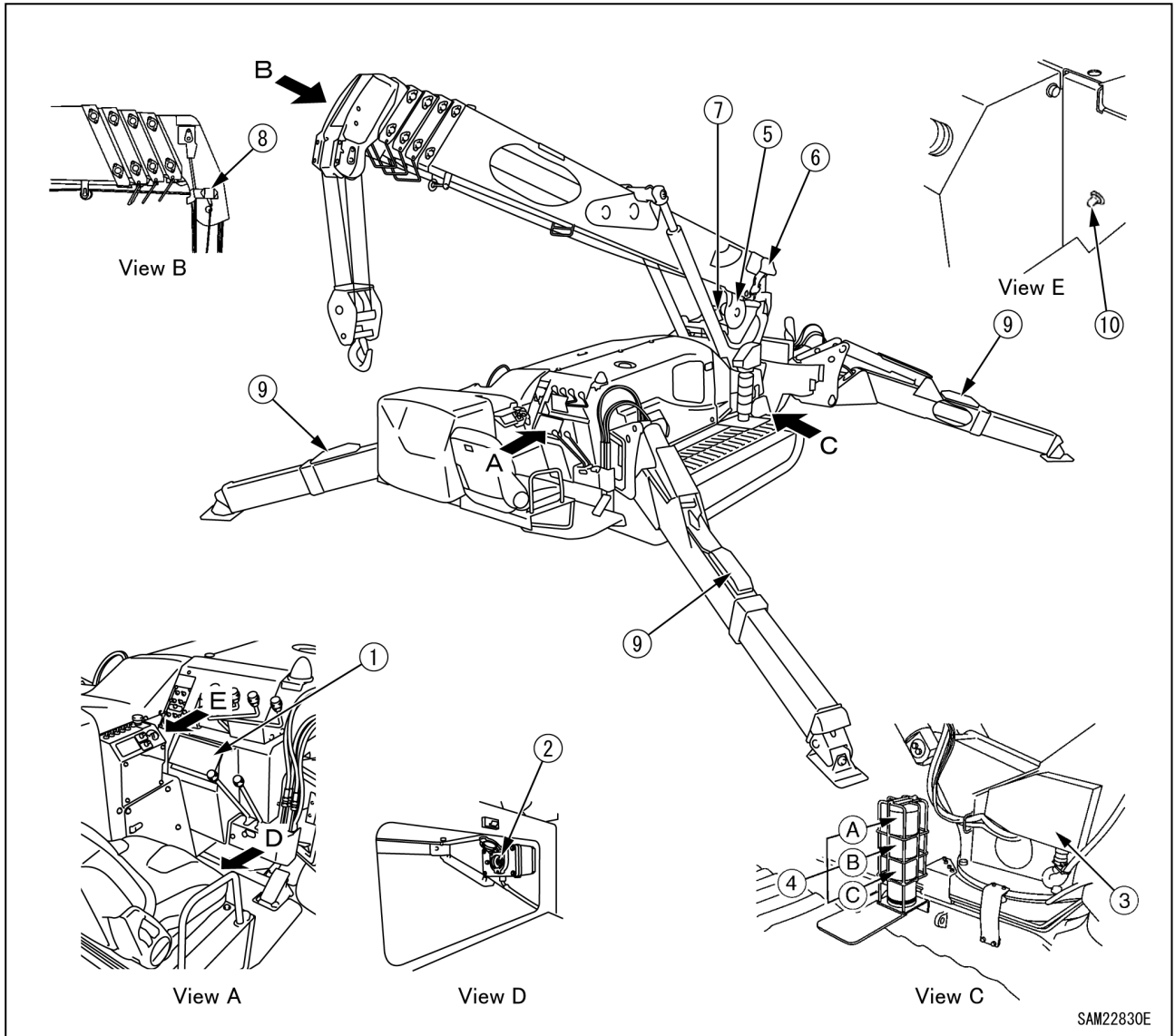


Fig. 4-176

NOTICE: If the boom stowing lamp (1) (green) on the outrigger display does not light up, repeat the boom lowering operation to the lowest position and slewing operation.

MOMENT LIMITER (OVERLOAD DETECTOR)

Moment Limiter Features



SAM22830E

Fig. 4-177

- 1 - Moment limiter display unit
 - 2 - Moment limiter override switch
 - 3 - Moment limiter converter
 - 4 - Working status lamp
 - 5 - Boom length gauge (inside boom)
 - 6 - Boom angle gauge (side of boom rear edge)
 - 7 - Pressure sensor (derrick cylinder) (two)
 - 8 - Overwind alarm detector (side of boom tip)
 - 9 - Outrigger position detection switch
 - 10 - Boom lift bypass switch
- A - Red working status lamp (Warning lamp for load factor of 100 % or more)
- B - Yellow working status lamp (Pre-warning lamp for load factor of 90 to 100 %)
- C - Green working status lamp (Working lamp for load factor of less than 90 %)

Function of Moment Limiter

WARNING!

- Do not remove, disassemble, or repair detectors. Do not move the detectors to another location from original position.
- Should an object hit a detector or you find any damage on a detector, be sure to verify the actuation status of the auto stop. If you find any abnormality with the actuation of the auto stop, do not fail to fix it.
- Do not turn ON the moment limiter override switch unless you find an error or check/perform maintenance on detectors. Setting the moment limiter override switch to the "ON" position disables the moment limiter function for three minutes. Overloading can cause the hoisted load to fall, boom breakage, or overturning of this machine that can lead to serious accidents resulting in death or serious injury. Note that if the moment limiter override switch is set to the "ON" position and the moment limiter function is disabled, the working status lamp will light up in red and the warning buzzer will sound.
- The machine will not stop automatically even if the crane is overloaded during the crane slewing operation. Do not slew the crane when being overloaded.
- When the boom approaches the stop position during the operation, be sure to change the operation speed of the boom to low speed. With high-speed boom operation, the boom may overrun the specified stop position, causing serious accidents such as overturning of the machine resulting in death or serious injury.

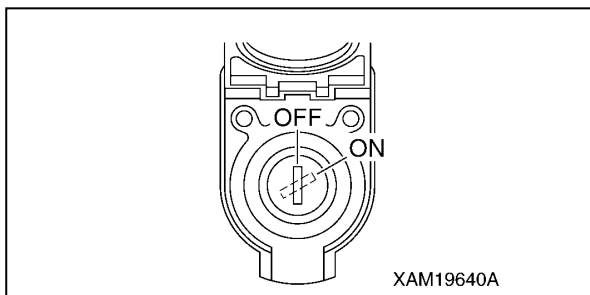


Fig. 4-178

The moment limiter is a device installed to prevent the hoisted load from falling, the boom from breaking, or the machine from overturning due to overloading.

Always check the operation of the moment limiter before crane operation to verify no abnormality.

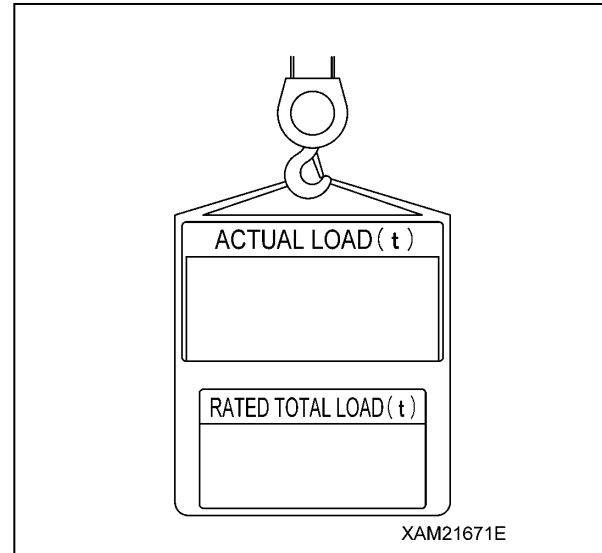


Fig. 4-179

Mechanism of Moment Limiter

The moment limiter calculates current "rated total load" by knowing the current boom posture by the boom angle gauge and the boom length gauge, by knowing the outrigger extension condition by the outrigger position switch, and by knowing the number of wire falls (entered by the operator).

Then by actually hoisting a load, the "read load" (hoist load) is sent from the pressure sensor of the derrick cylinder to the moment limiter.

The moment limiter comparatively calculates between the "rated total load" computed out of the current posture and the "real load" (hoisted load), and issues an alarm if the result indicates the real load/rated total load=90 to 100%.

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

Display of Moment Limiter Error Messages

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

The result is displayed on the "Rated total load Display" of the moment limiter display unit by an error code to notify the operator of the error. Immediately stop the use of the crane when an error code is displayed.

See "Moment Limiter Error Causes and Actions to Be Taken" on page 5-94.

Moment Limiter Operations

The moment limiter is a device for unexpected events. Operations relying on the device will rather incur danger.

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

Prohibited Actions After Auto Stop

DANGER! The following crane operations are prohibited after the crane has stopped automatically due to overloading. These operations may cause overturning of the machine or breakage of the boom and are very dangerous.

- Boom lowering operation
- Boom raising operation
- Boom extending operation
- Hook raising operation
- Crane slewing operation

Recovery Operation After Auto Stop

DANGER! Be sure to switch the engine speed to low speed and perform crane operation carefully if the moment limiter load factor is 90 % or higher.

Performing crane operation at high engine speed will slew the hoisted load and is very dangerous, causing overloading and it may break the boom.

1. With load factor of "less than 90 %"

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

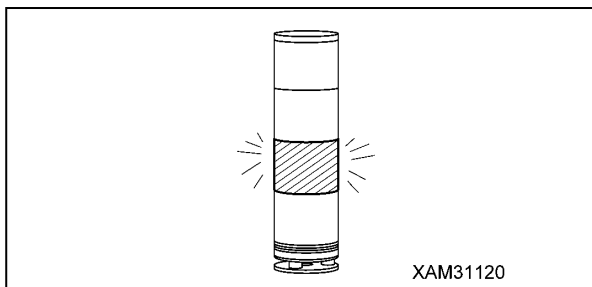


Fig. 4-180

2. With load factor of "90 to less than 100 %"

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

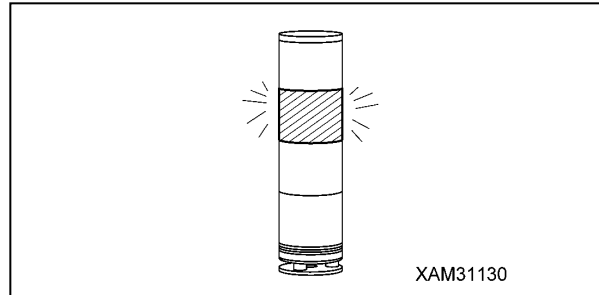


Fig. 4-181

3. With load factor of "100 % or higher"

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

- Hook raising operation
- Boom extending operation
- Boom lowering operation
- Boom raising operation

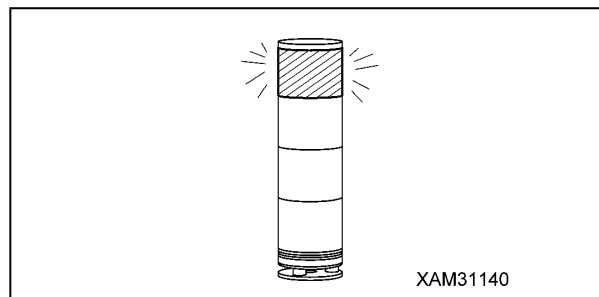


Fig. 4-182

4. Recovery Operation from Auto Stop

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

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

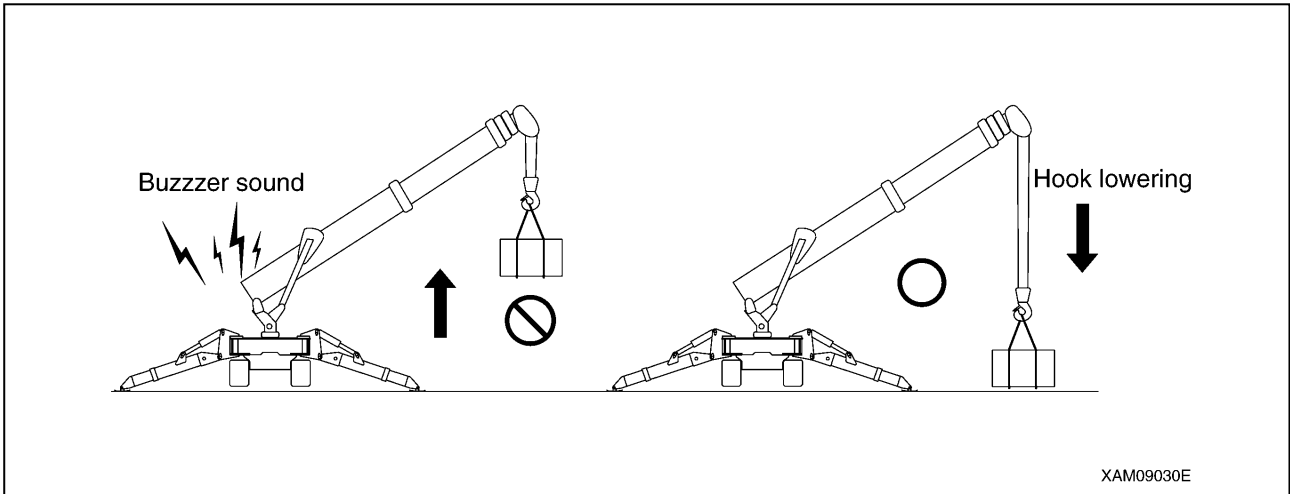


Fig. 4-183

- (2) Retract the boom.

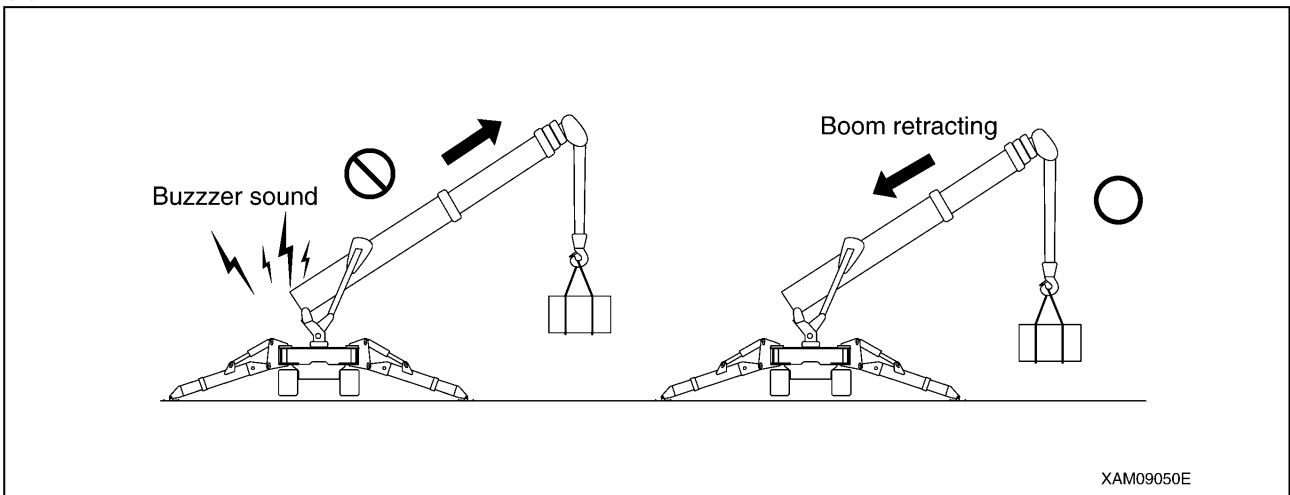


Fig. 4-184

5. When recovering by boom raising operation

In the case of an automatic stop, when raising of the boom is unavoidable, the boom raising operation is possible only while keeping the boom lift bypass switch in the "ON" position. To return to the "OFF" position, also return the boom raising lever.

DANGER! Only use this switch when an automatic stop has occurred through entry into the overload region while lowering or extending the boom. Do not use under normal conditions or when lifting clear from the ground. If you use this switch when lifting from the ground, there is a risk of serious accidents such as the machine being damaged or overturning.

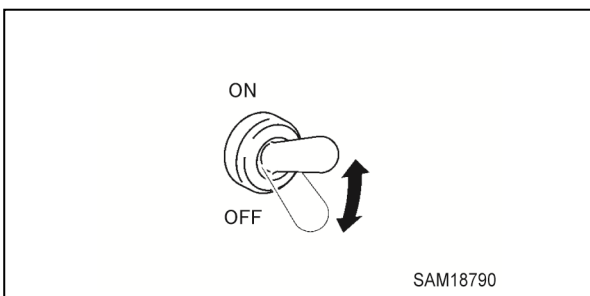


Fig. 4-185

Moment Limiter Display

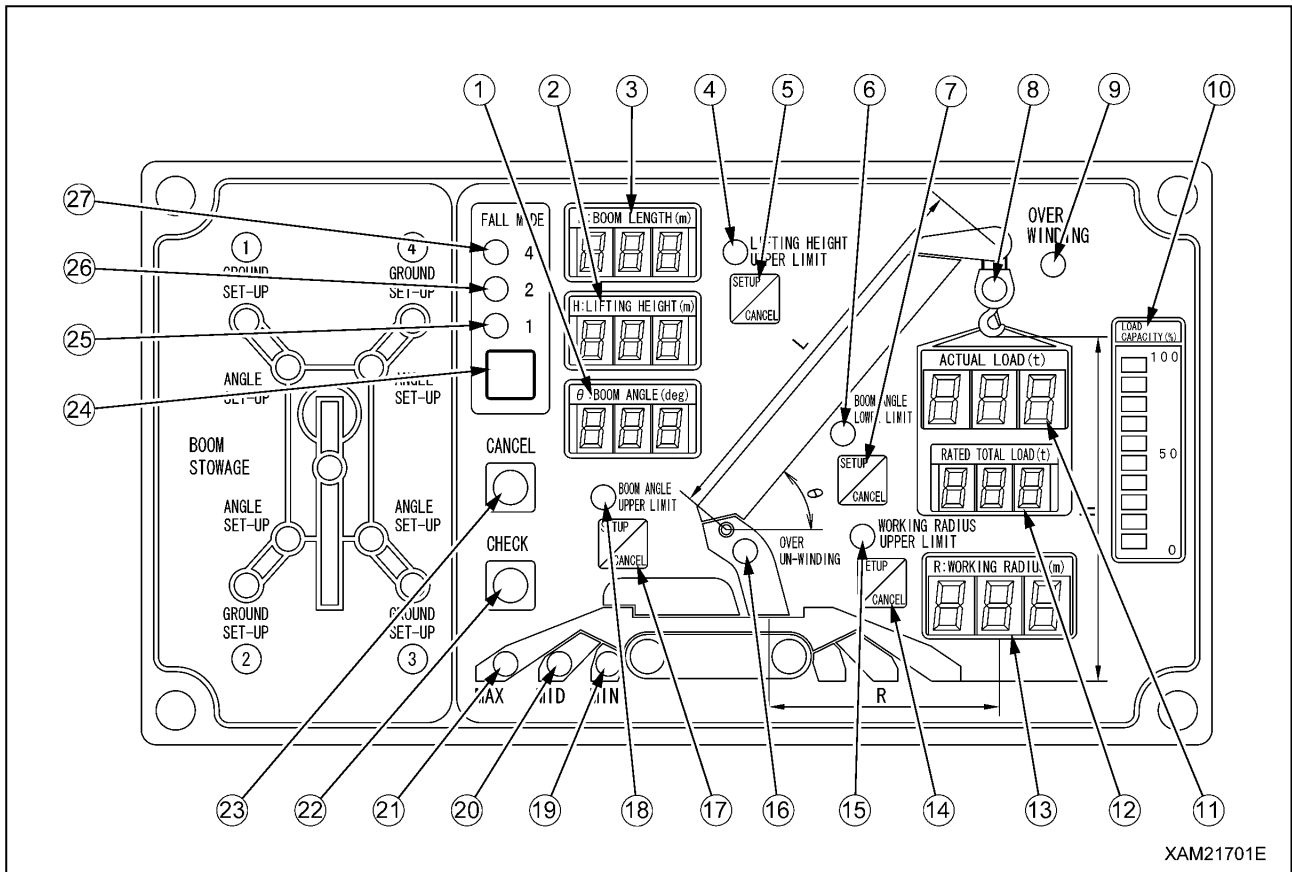


Fig. 4-186

- | | |
|--|--|
| 1 - Boom angle display | 14 - Working radius upper limit switch |
| 2 - Lifting height display | 15 - Working radius upper limit LED (Orange) |
| 3 - Boom length display | 16 - Over un-winding LED (Orange) |
| 4 - Boom lifting height upper limit LED (Orange) | 17 - Boom angle upper limit switch |
| 5 - Boom lifting height upper limit switch | 18 - Boom angle upper limit LED (Orange) |
| 6 - Boom angle lower limit LED (Orange) | 19 - Outrigger MIN. extension LED (Blue) |
| 7 - Boom angle lower limit switch | 20 - Outrigger MID. extension LED (Blue) |
| 8 - Load factor LED
(Changes to green, yellow, and red) | 21 - Outrigger MAX. extension LED (Blue) |
| 9 - Over winding LED (Red) | 22 - Check switch |
| 10 - Load capacity display (Yellow) | 23 - Cancel switch |
| 11 - Actual load display | 24 - Fall mode selector switch |
| 12 - Rated total load display | 25 - 1-fall LED (Blue) |
| 13 - Working radius display | 26 - 2-falls LED (Blue) |
| | 27 - 4-falls LED (Blue) |

Descriptions of Switches on Moment Limiter Display

Wire Falls Selector Switch and Wire Falls Display LED (Blue)

DANGER! When entering the number of wire falls, verify the actually used number of wire falls and make sure to set up correctly. Entering incorrect number of wire falls may prevent issuance of the pre-warnings and boom auto-stop even when the overload is near happening, and thus may result in crane damage or machine trip that may result in serious accidents.

Use this switch to change the number of wire falls.

Keep pressing the switch for 2 seconds or more.

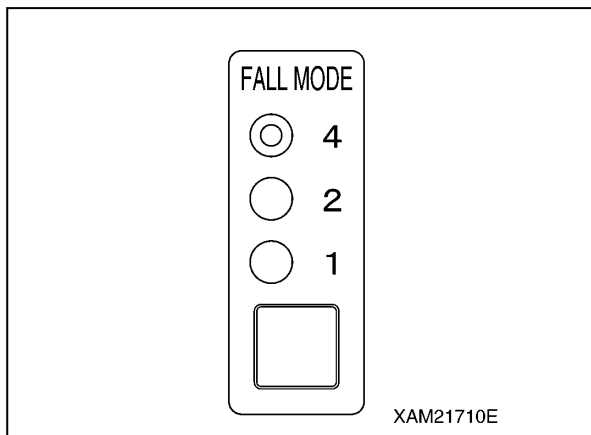


Fig. 4-187

Operation mode of wire falls will change as shown below by pressing the switch for 2 seconds or more each time.

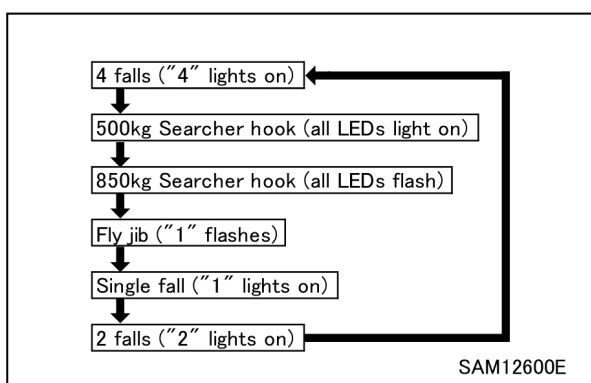


Fig. 4-188

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

Boom Angle Upper Limit Switch and LED (Orange)

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

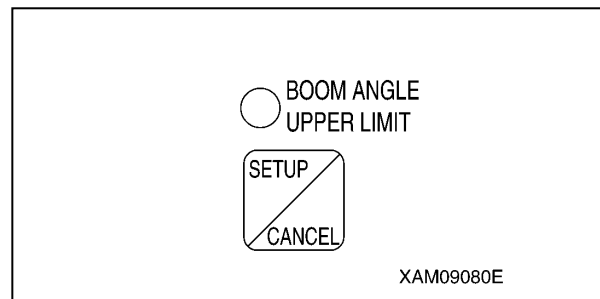


Fig. 4-189

Setup

With no upper limit value being set, set the boom to the angle you would like, and press the switch for 2 seconds.

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

At the same time, the LED lights up indicating that the upper limit value was set.

To enable this setting, turn the key switch to the "ON" position again after turning it to the "OFF" position, or lower the boom by "10 degrees" or more from the set boom angle to get out of the pre-warning zone while the engine is being started.

NOTICE: Be sure to verify that the boom automatically stops at the set angle before performing the actual operation. If the boom does not stop automatically, re-set the boom angle using the procedure above.

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

Cancel

With the upper limit value being set (LED ON), press the switch for 5 seconds.

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

NOTICE: The setting and cancelling will not repeat even if you keep the switch pressed for more than 2 seconds. Let your hand go off the switch and press the switch again.

Boom Angle Lower Limit Switch and LED (Orange)

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

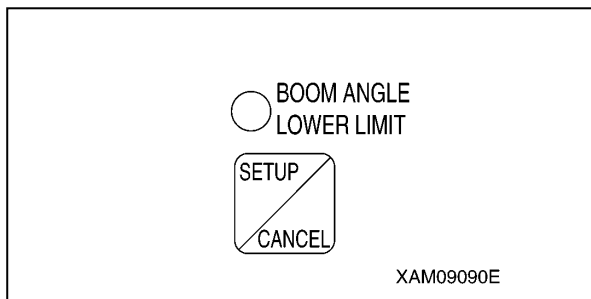


Fig. 4-190

Setup

With no lower limit value being set, set the boom to the angle you would like, and press the switch for 2 seconds.

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

At the same time, the LED lights up indicating that the lower limit value was set.

To enable this setting, turn the key switch to the "ON" position again after turning it to the "OFF" position, or raise the boom by "7 degrees" or more from the set boom angle to get out of the pre-warning zone while the engine is being started.

NOTICE: Be sure to verify that the boom automatically stops at the set angle before performing the actual operation. If the boom does not stop automatically, re-set the boom angle using the procedure above.

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

Cancel

With the lower limit value being set (LED ON), press the switch for 5 seconds.

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

NOTICE: The setting and cancelling will not repeat even if you keep the switch pressed for more than 2 seconds. Let your hand go off the switch and press the switch again.

Working Radius Upper Limit Switch and LED (Orange)

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

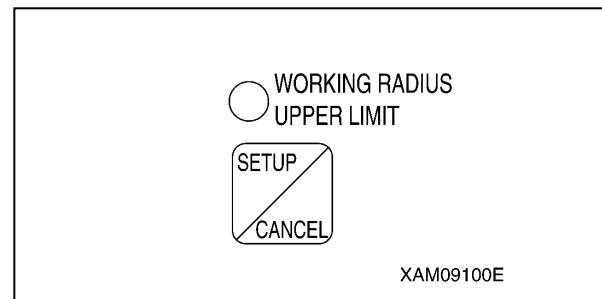


Fig. 4-191

Setup

With no upper limit value being set, set the boom to the working radius you would like, and press the switch for 2 seconds.

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

At the same time, the LED lights up indicating that the upper limit value was set.

To enable this setting, turn the key switch to the "ON" position again after turning it to the "OFF" position, or reduce the working radius by "1.3 m" or more from the set working radius to get out of the pre-warning zone while the engine is being started.

NOTICE: Be sure to verify that the boom automatically stops at the set working radius before performing the actual operation. If the boom does not stop automatically, re-set the working radius using the procedure above.

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

Cancel

With the upper limit value being set (LED ON), press the switch for 5 seconds.

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

NOTICE: The setting and cancelling will not repeat even if you keep the switch pressed for more than 2 seconds. Let your hand go off the switch and press the switch again.

Lifting Height Upper Limit Switch and LED (Orange)

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

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

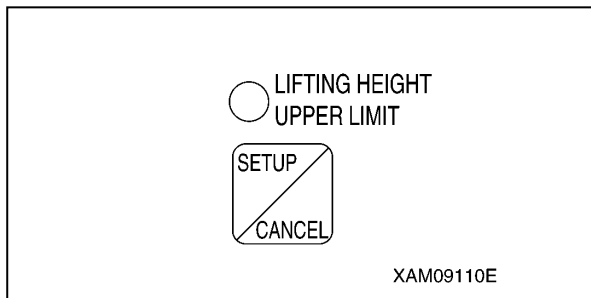


Fig. 4-192

Setup

With no upper limit value being set, set the boom to the lifting height you would like, and press the switch for 2 seconds.

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

At the same time, the LED lights up indicating that the upper limit value was set.

To enable this setting, turn the key switch to the "ON" position again after turning it to the "OFF" position, or reduce the lifting height by "1.3 m" or more from the set lifting height to get out of the pre-warning zone while the engine is being started.

NOTICE: Be sure to verify that the boom automatically stops at the set lifting height before performing the actual operation. If the boom does not stop automatically, re-set the lifting height using the procedure above.

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

Cancel

With the upper limit value being set (LED ON), press the switch for 5 seconds.

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

NOTICE: The setting and cancelling will not repeat even if you keep the switch pressed for more than 2 seconds. Let your hand go off the switch and press the switch again.

Cancel Switch

Use this switch to cancel the all setting sets in the section 2 to 5 above.

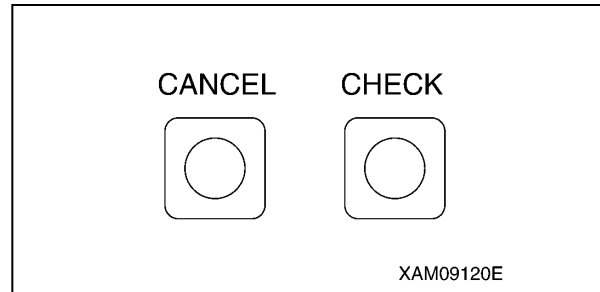


Fig. 4-193

- Press this switch and "CHECK" switch at the same time for 5 seconds or more.
The all value sets in the section 2 to 5 above will be cancelled.

Check Switch

Use this switch to verify the values set in the section 2 to 5 above.

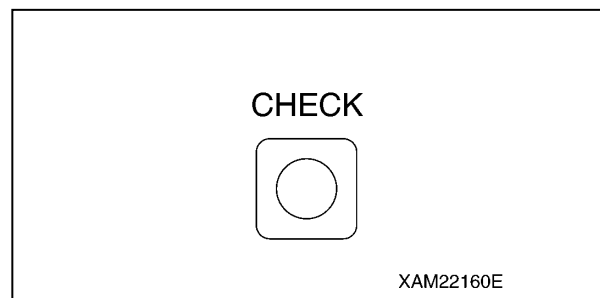


Fig. 4-194

- Press this switch. Every time the switch is pressed, the set value will be displayed in the following order.

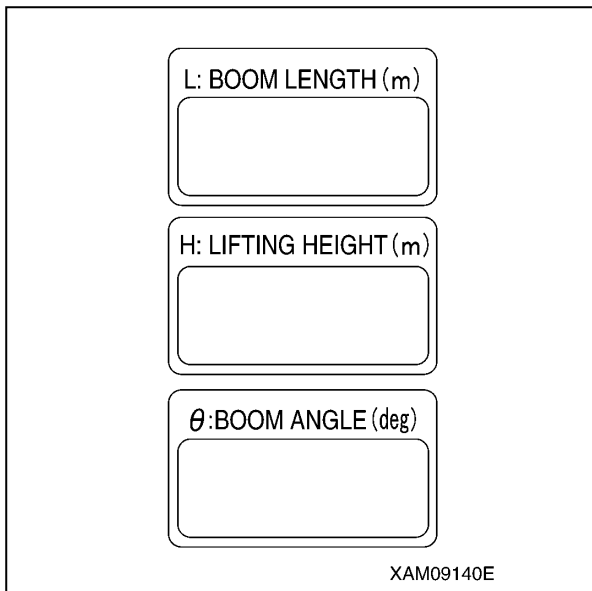


Fig. 4-195

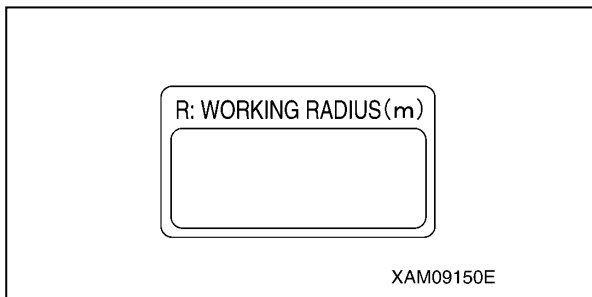


Fig. 4-196

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

NOTICE:

- When a set value is displayed, the LED for its setting switch section flashes at the same time.
- If no switch was pressed for 5 seconds or another switch was pressed with a set value being displayed, the display goes back to the original display.
- The display will be a blank for the item to which no value is set.
- The display sections other than for the corresponding items will be blank.

Descriptions of Moment Limiter Display

For LEDs not described in this section, see "Moment Limiter Display" on page 4-72.

Actual Load Display Section

This section constantly displays the actual load of the hoisted load during the crane operation.

The actual load indicates the total weight of the hoisted load including rigging and the hook block. If "0.0" to "0.1" is displayed when nothing is being hoisted, the system is normal.

If the value displayed is out of this range, contact us or our sales service agency.

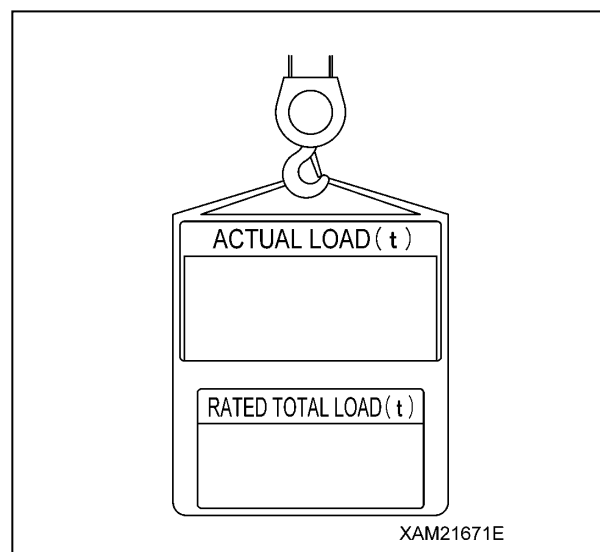


Fig. 4-197

Rated Total Load Display Section

This section displays the number of wire falls on the hook, working radius, currently hoistable rated total load (hook weight + rigging weight + load to be hoisted) computed out of the conditions such as the degree of outrigger extension.

Working Radius Display Section

This section constantly displays the current working radius during the crane operation.

The working radius is the horizontal distance from the crane slewing centre to the centre of the hook.

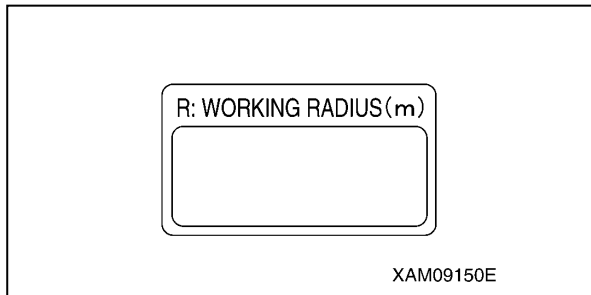


Fig. 4-198

Boom Length Display Section

This section constantly displays the current boom length during the crane operation.

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

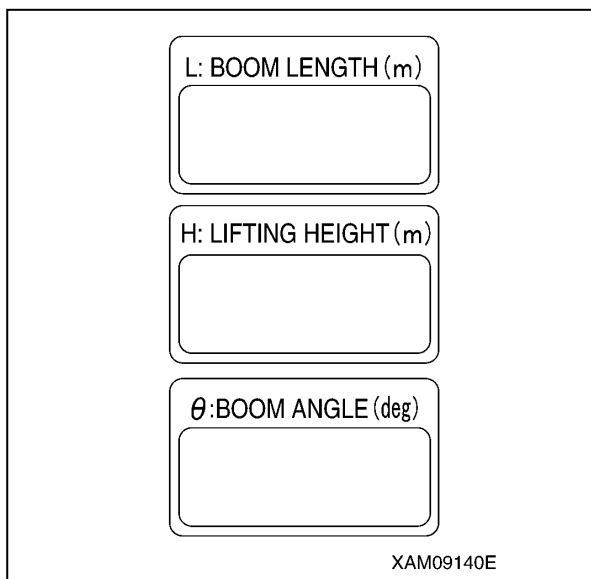


Fig. 4-199

Lifting Height Display Section

This section constantly displays the current lifting height during the crane operation.

The lifting height is the vertical distance from the ground to the bottom of the hook.

Boom Angle Display Section

This section constantly displays the current boom angle during the crane operation.

The boom angle is the angle the boom and the horizontal line form.

Over Winding LED (Red)

This LED flashes up when the hook is overwound, and issues overwinding warning and causes an automatic stop.

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

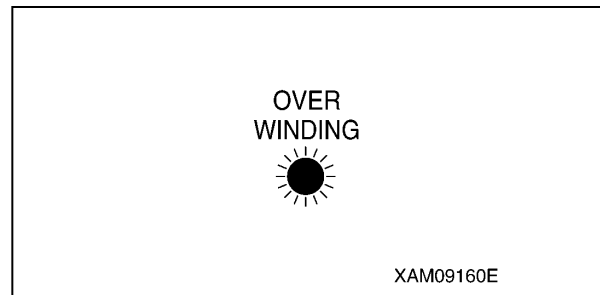


Fig. 4-200

Outrigger Extension LED (Blue)

The LED lights up to indicate the outrigger extension status.

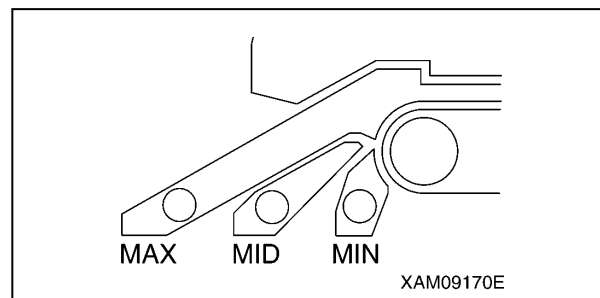


Fig. 4-201

- If any of the four outriggers has not properly reached the middle extension position, the "MIN" LED lights up.
- If all the four outriggers properly reach the middle extension position, the "MID" LED lights up.
- If all the four outriggers reach the maximum extension position, the "MAX" LED lights up. Even if you thought you had set the outriggers at the maximum extension position, the "MID" LED lights up if any of the outriggers did not properly reach the maximum extension position.

Load Factor LED (Changes to Green/Yellow/Red)

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

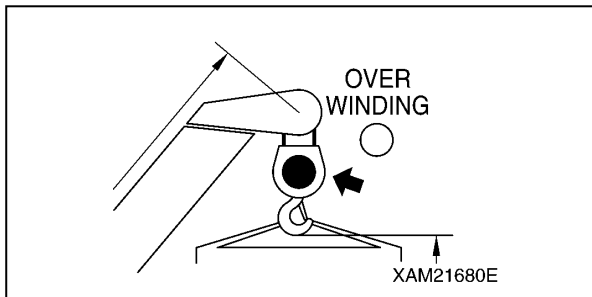


Fig. 4-202

- The LED lights up in green if the load factor is less than 90 %.
- The LED lights up in yellow if the load factor is 90 to less than 100 %.
- The LED lights up in red if the load factor is 100 % or higher.

Load Factor Display (Yellow)

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

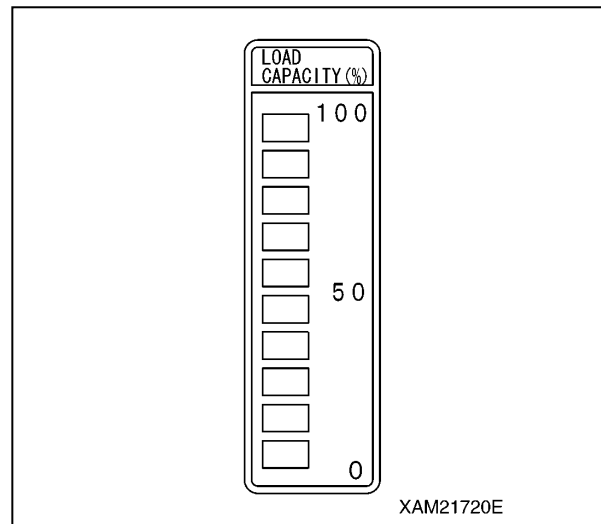


Fig. 4-203

- The load factor is indicated by ON/OFF of the "bar" according to the changes of the load factor.
- All the "bars" will be ON when the load factor reaches 100 % or higher.

NOTICE: When the load factor is about 50 %, all the "bars" around the number "50" on the right and below are ON.

All the "bars" around the number "50" and above are OFF.

Moment Limiter Functions

Overload Warning

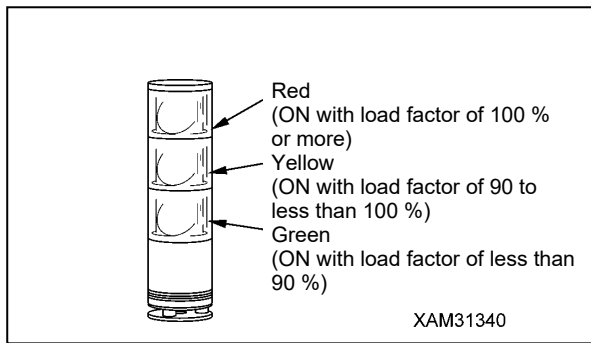


Fig. 4-204

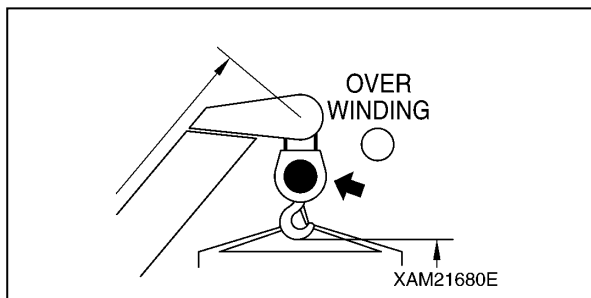


Fig. 4-205

- 1. Safety Zone** ("Actual load" is less than 90 % of the "rated total load")
 - Green of the working status lamp lights up.
 - The LED lights up in green if the load factor is less than 90 %.
- 2. Pre-Warning** ("Actual load" is 90 to less than 100 % of the "rated total load")
 - Yellow of the working status lamp lights up.
 - The LED lights up in yellow if the load factor is 90 to less than 100 %.
 - The alarm bleeps.
- 3. Limit Warning** ("Actual load" is 100 % or higher than the "rated total load")
 - Red of the working status lamp lights up.
 - The LED lights up in red if the load factor is 100 % or higher.
 - The alarm bleeps continuously.
 - The hazardous operation of the boom stops automatically.
 - Voice message of "Overloading" is heard.
 - "Load factor 100 % or more" LED (yellow) lights up.

4. Clearing Limit Warning Auto Stop

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

For more information on recovery operations, see "Recovery Operation After Auto Stop" on page 4-70.

Working Envelope Restriction Warning

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

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

NOTICE: For more information on how to set the value for working envelope restriction, see "Descriptions of Switches on Moment Limiter Display" on page 4-73.

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

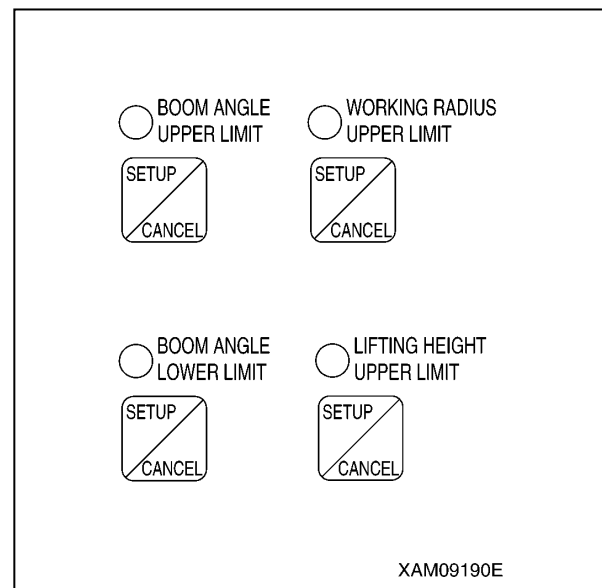


Fig. 4-206

1. Safety Zone

- The appropriate working envelope restriction LED (orange) lights up.
- Green of the working status lamp lights up.

2. Pre-Warning

- The appropriate working envelope restriction LED (orange) lights up.
- The alarm bleeps.

3. Limit Warning

- The appropriate working envelope restriction LED (orange) lights up.
- Red of the working status lamp lights up.
- The alarm bleeps continuously.
- The hazardous operation of the boom stops automatically.

Over Winding Detector

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

Extending the boom also raises the hook. Always check the hook height when extending the boom.

When you over-wind the hook when raising the hook or extending the boom,

- The "Over-winding" LED (red) flashes.
- The alarm bleeps continuously.
- The hook raising and boom extending operation stop automatically.
- The voice saying "hook is overwinded" is heard.

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

Perform hook lowering and boom retracting operations as recovery operations.

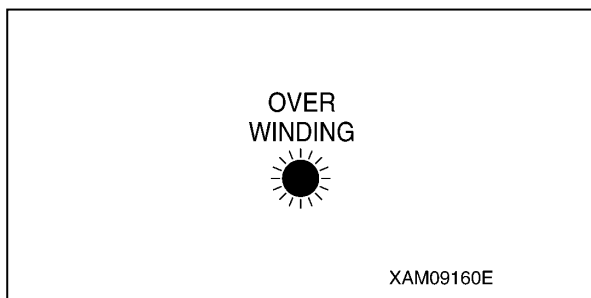


Fig. 4-207

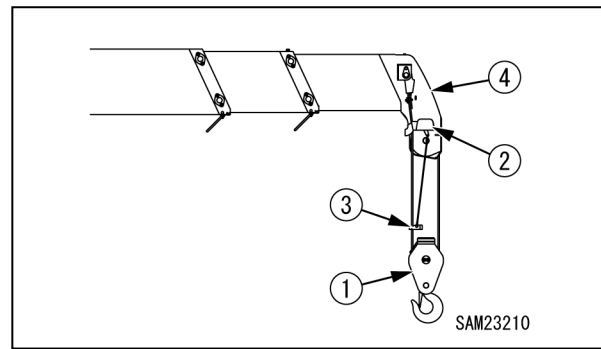


Fig. 4-208

- 1 - Hook block
- 2 - Over winding detector
- 3 - Weight
- 4 - Boom

When the hook block (1) was raised or the boom (4) was extended, the over winding detector activates the buzzer to warn the operator of overwinding if the hook block (1) approached the end of the boom (4) and pushed up the weight (3).

At the same time, the raising of the hook block (1) and the extension of the boom (4) stop automatically.

When a warning buzzer sounds, operate the winch lever immediately to the "LOWER" side or operate the boom telescoping lever to the "RETRACT" side to lower the hook block (1).

Number of Wires Selector Switch

WARNING!

- Stop the crane operation when changing the number of wires hooked using the number of wires selector switch. Changing the number of wires during the crane operation can cause unexpected accidents.
- Perform the crane operation always after matching the number of wires display on the moment limiter and the actual number of wires. Mistaking the number of wires cause serious accidents.

The wire rope has the safe load per rope determined.

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

The actual number of wires hooked and the number of wires display on the moment limiter must match.

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

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

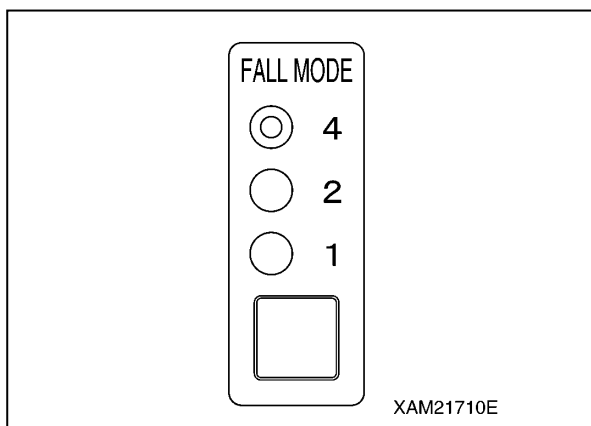


Fig. 4-209

Boom Upper Limit Detection

When the boom is raised and the boom angle reaches "about 77 degrees", the boom raising operation stops automatically.

Boom Lower Limit Detection

When the boom is lowered and the boom angle reaches "about 3 degrees", the boom lowering operation stops automatically.

Outrigger Extension Detection

The outrigger extension status is detected with the limit switch mounted to each of four outriggers, lighting the appropriate LED (blue) of the "MIN", "MID", or "MAX" and changing the rated total load.

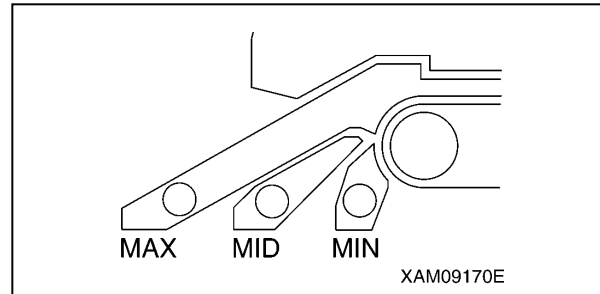


Fig. 4-210

Moment Limiter Starting Status

The moment limiter checks its function for 2 seconds when the starter switch is turned to the ON position.

Meanwhile,

- The red of the working status lamp lights up.
- All the LEDs light up.
- The horn sounds momentarily.

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

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

Moment Limiter Working Envelope Setting

WARNING!

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

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

Setting Working Envelope

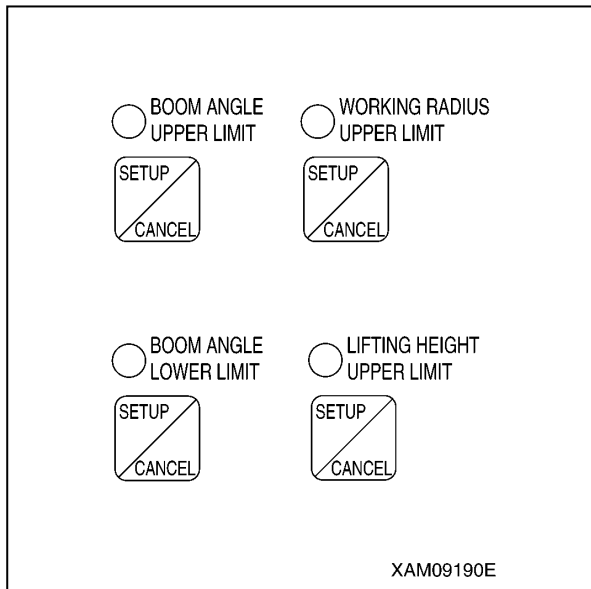


Fig. 4-211

Operate the boom to the limit of the working envelope you would like to restrict, and press the appropriate SETUP/CANCEL switch for 2 seconds.

You can set that limit value.

At the same time, the LED above the appropriate switch lights up.

Then, return the boom to the following setting to enable the restriction control.

"Set value – 10 degrees or more" for boom upper limit.

"Set value + 7 degrees or more" for boom lower limit.

"Set value – 1.3 m or less" for working radius upper limit

"Set value – 1.3 m or less" for lifting height (With [Lower] or [Retract] operation of the boom)

Or, turn the starter switch to the "OFF" position and then turn again to the "ON" position to enable the restriction.

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

Cancelling Working Envelope Setting

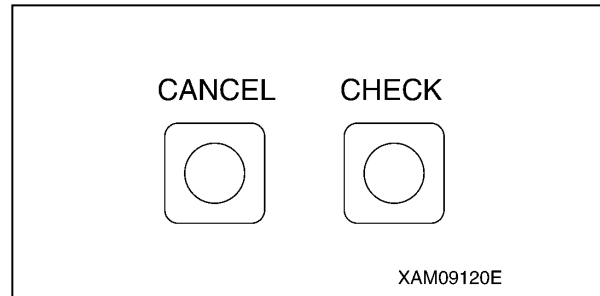


Fig. 4-212

- Press and hold the CANCEL switch and CHECK switch at the same time for 5 seconds or more.
All the set working envelope restrictions are cancelled.
At the same time, the LED above all the working envelope limit switches go off to complete the cancellation of the settings.
- Press the SETUP/CANCEL switch of the item which restriction you would like to cancel for 5 seconds.
The set value of only the item can be cancelled.
At the same time, the LED above the switch goes off to complete the cancellation of the setting.

NOTICE: For more information on how to set limit on the working envelope, see "Descriptions of Switches on Moment Limiter Display" on page 4-73.

Moment Limiter Override Switch

DANGER!:

The moment limiter override switch disables **ALL** safety features, **ALL** limits and **ALL** automatic stops of the Moment Limiter Digital Load Safety System.

When this switch is turned to the "ON" position (OVERRIDE), all the Moment Limiter's interlocked automatic safety/ stop /limit features become **INACTIVE & DISABLED**. All crane operations in this situation are unprotected by the Moment Limiter system.

The risk of a crane accident increases greatly without the use of the Moment Limiter system. The Moment Limiter system is a safety aid to the operator, not a tool or excuse for poor and dangerous crane operation.

With or without the protection of the Moment limiter system, crane operation outside of the parameters of the Rated Total Load Chart(s), unsafe operations beyond accepted safe crane practices and proper crane operation technics may result in dropping of a hoisted load, breakage of crane components or the machine tipping over. A serious accident resulting in death or serious injury may occur.

Use this switch only in the case of an emergency due to failure of the Moment Limiter system, and or machine maintenance / service when any crane travel, lifting operations are not being performed. Do not store the override key permanently in the moment limiter override switch box.

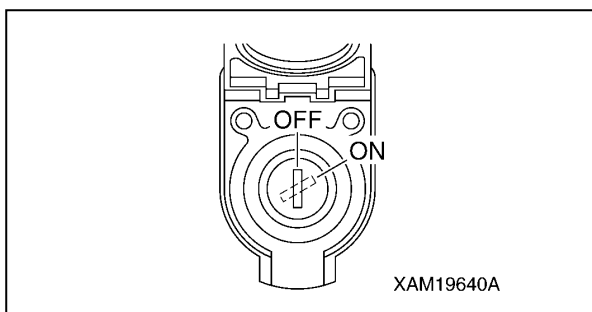


Fig. 4-213

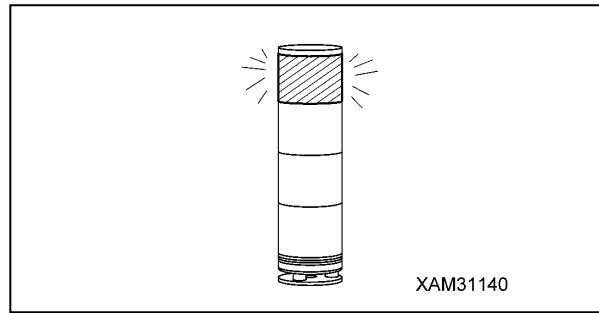


Fig. 4-214

To Override the Moment Limiter System:

- The moment limiter override switch box is located inside the door under the operation seat.
- KEY TO "ON" POSITION = OVERRIDE Insert the OVERRIDE KEY into the moment limiter override switch box. Turn the key clockwise (right) to "ON" position. (The spring-loaded switch automatically returns to the "OFF" position when you release the key). Now the system is in OVERRIDE. ALL safety features, ALL limits and ALL automatic stops of the Moment Limiter system are INACTIVE & DISABLED for a total of 3 minutes.
- The moment limiter override switch box LED light will illuminate solid for 2-1/2 minutes, then it will flash for the last 30 seconds of OVERRIDE.
- The Working status light will flash RED during OVERRIDE.
- The Moment Limiter warning buzzer /alarm will sound continuously for 3 minutes.
- Crane functions boom extend, and boom lowering will be limited in speed to 20% of normal speed during OVERRIDE.
- To discontinue OVERRIDE, at any time under 3 minutes, turn the engine starter ignition key to OFF shutting down the machine. Restart the machine as normal, and the Moment Limiter system will commence with normal start up sequence.

Pick & Carry Operation

Cautions During Pick & Carry Operation

DANGER! Pick & Carry makes the machine very unstable and involves danger, and is principally prohibited.

If you have to perform Pick & Carry by necessity, the load must be within the values shown in the "Pick & Carry rated total load chart" and Pick & Carry posture must be strictly respected.

Not observing these cautions on Pick & Carry can cause serious accidents.

Rated Total Load and Working Range

Caution During Pick & Carry

ALWAYS observe the rated total load in the following table and the working range in the figure during Pick & Carry.

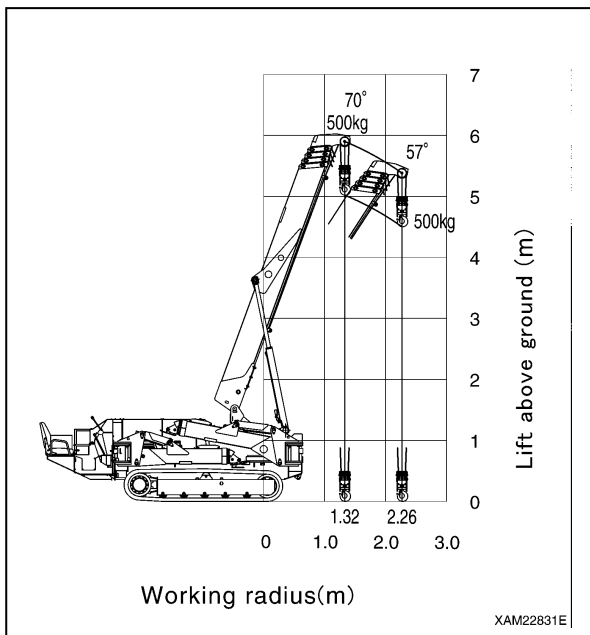


Fig. 4-215

Item	Abstract
Boom position	180 degrees slewing
Boom length	Most retracted, One
Boom angle range	57 to 70 deg
Rated total load	Within 500 kg (including 50 kg the hook mass)

Cautions on Worksite

The following ground and location present the machine overturning hazard. Do not approach those locations or perform Pick & Carry at those locations.

Check the condition of the road surface and ground in advance and place someone to guide you at the hazardous location or the location with poor sight.

- Slope, soft ground such as swamps, ground with many obstacles, ground with distinct irregularity such as river beds
- Near deep gullies and road shoulders
- Under water, shallow water, snowy area, frozen road

Cautions on Operations

The following travelling operations involve the danger of overturning the machine. Never perform these operations.

Always be seated to the operation seat and carefully perform the Pick & Carry operation.

- Do not perform the crane operation while travelling. Keep Pick & Carry posture.
- Do not hold the load high. Hold the load near the ground so that the load does not slew.
- Do not perform sudden starting, sudden stop, or sudden steering. The load will slew and will be dangerous. Keep the engine at low speed and travel slowly.
- Do not go over an obstacle. The machine will topple over easily. Always travel on the path avoiding the obstacles.

Pick & Carry Posture

DANGER!

- Take the "Pick & Carry posture" described below when performing Pick & Carry with this machine.
 - Fully retract the boom
 - Raise the boom to "about 65 degrees"
 - Slew the boom to the centre front
 - Stow the outriggers
- Do not perform any operation that will change the posture described above during Pick & Carry operation.
 The machine may topple over, leading to serious injury accidents.

Take the Pick & Carry posture shown in the figure when performing Pick & Carry operation.

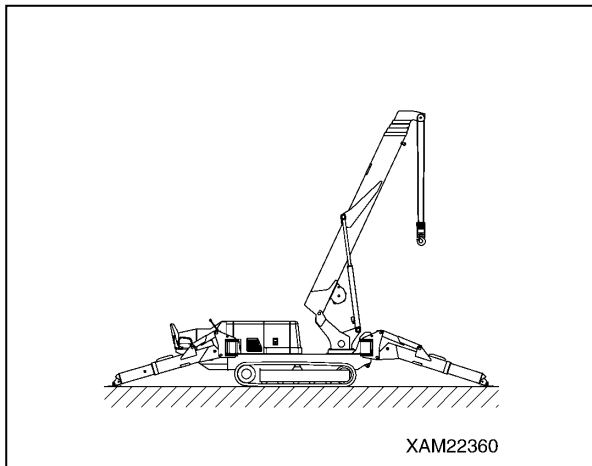


Fig. 4-216

1. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers.
2. See "Boom Derricking Operation" on page 4-64 to raise the boom to "about 65 degrees".
3. See "Slewing Operation" on page 4-65 to slew the boom to the centre position in front.

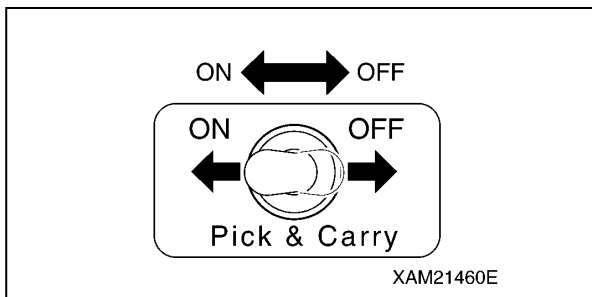


Fig. 4-217

4. Operate the Pick & Carry switch to the "ON" position.

NOTICE: If the machine is not taking the proper Pick & Carry posture when the switch is operated to the "ON" position, the following alarms and display will be given.

- The alarm buzzer sounds continuously
- The red of the working status lamp turns on
- An error code "E-P" is given on the moment limiter display.

Operate the Pick & Carry switch to the "OFF" position and perform the boom derricking operation or slewing operation to correct the Pick & Carry posture, and then operate the switch to the "ON" position again.

5. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers.
6. Operate the travelling lock lever (8) to the "TRAVEL" position.

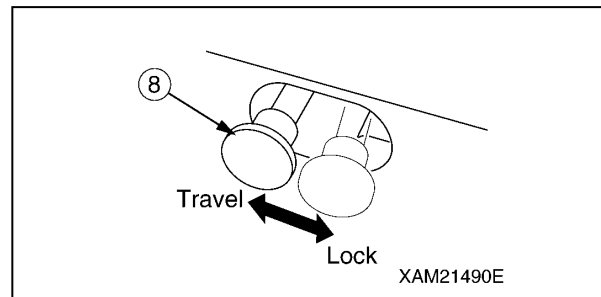


Fig. 4-218

7. Verify that the moment limiter override switch is at the "OFF" position.

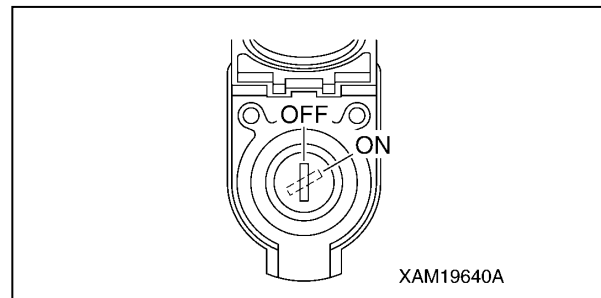


Fig. 4-219

Pick & Carry Operations

DANGER!

- Read the items described in "Cautions During Pick & Carry Operation" on page 4-84 when performing Pick & Carry operation for safe operation.
- Do not perform crane operations during Pick & Carry. The machine may topple over.
- Be always seated to the operation seat and carefully perform Pick & Carry operation.
- Verify the safety around the machine and honk the horn before starting travelling the machine.
- Verify the safety around the machine and honk the horn before switching travelling forward/backward or steering.
- Keep the engine speed at low speed during travelling and travel slowly and carefully. Keep the safe distance so that the hoisted load or machine does not hit other machine or structures.
- When the machine tilts forward/backward/left/right during the crane operation and travelling, the overturning alarm buzzer sounds. When the overturning alarm buzzer sounds, stop the work immediately. The machine may topple over. Strictly observe the values in the "Hoisted load rated total load" during the crane operation. Avoid slope and obstacles while travelling.

1. Operate the work selector switch on the outrigger operation panel to the "Crane" position.

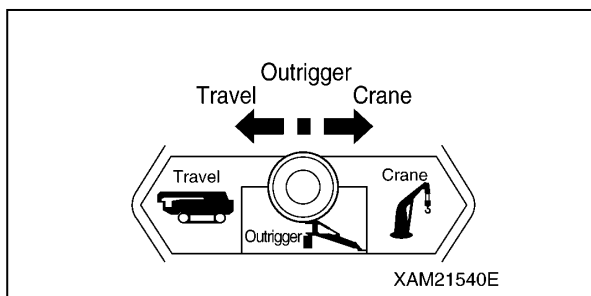


Fig. 4-220

2. See "STARTING TRAVELLING MACHINE" on page 4-25, "DIRECTIONAL CONTROLS" on page 4-26, and "STOPPING/PARKING MACHINE" on page 4-28 to TRAVEL the machine.

3. See "Hook Raising/Lowering Operation" on page 4-63 and "Boom Derricking Operation" on page 4-64 to perform the crane operation. Keep the hoisted load near the ground so that the load will not slew.

NOTICE:

- When the moment limiter is activated, the alarm buzzer and the audible message of "Overloaded" are heard. At the same time, hazardous boom and winch operations stop automatically.
- If the moment limiter was activated, see the items in "Recovery Operation After Auto Stop" on page 4-70.

Cancelling Pick & Carry Operation Posture

1. Set the travelling lock lever (8) to the "LOCK" position.

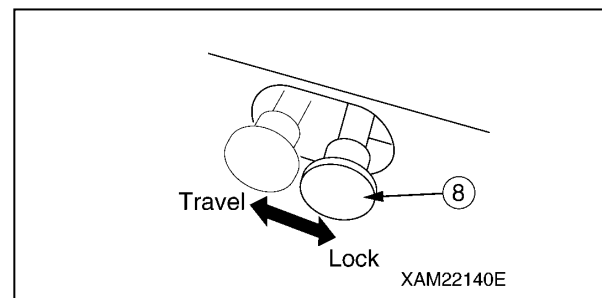


Fig. 4-221

2. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers.
3. Set the Pick & Carry switch to the "OFF" position.

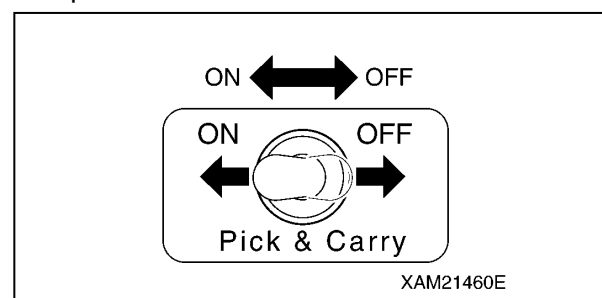


Fig. 4-222

4. See "TRAVELLING POSITION" on page 4-23 to put the machine in the travelling posture.

REMOTE CONTROL SYSTEM INTRODUCTION

This section describes the remote control operating procedures. Before you perform any remote control operating procedures, read "Section 2 SAFETY."

General

No Modification

- Do not attempt to modify or disassemble the Transmitter and Receiver, or the accessories, which may cause an electrical shock or a fire.

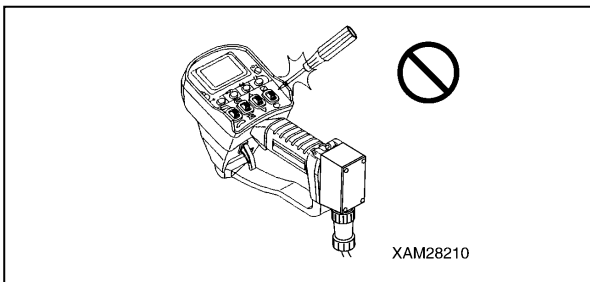


Fig. 4-223

Holding the Transmitter

- The Transmitter is designed for one hand controls in general. Refer to the figure below for basic usage of the Transmitter. Levers and buttons can be manipulated by the thumb, while the Accelerator lever can be triggered by the forefinger. Other fingers should grab the grip to hold the Transmitter.

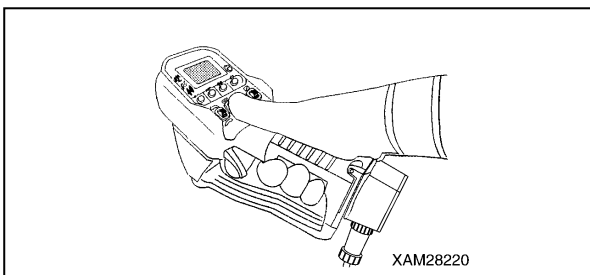


Fig. 4-224

- Always manipulate levers and switches by fingers. Do not attempt to pick them by a sharp edge or such for manipulation. It may make an opening in the Transmitter which allows water to enter inside and brings its troubles or failures and cause a serious hazard.

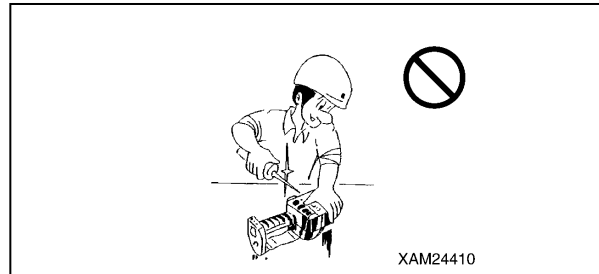


Fig. 4-225

No Water Washing

- Always keep the Transmitter unsoiled, and clean it when necessary. Oil or mud on surface may cause miss-operation by slipping hands, which may result a serious hazard.
- Do not attempt water-wash the Transmitter, in any event. It allows water to enter inside and brings its troubles or failures and cause a serious hazard.



Fig. 4-226

- Scrub the Transmitter and Receiver with a wet cloth from water or diluted detergent to remove the dirt. Avoid alkaline or alcoholic cleaners or sprayer cleaners which deteriorate plastics and produce cracks.

No Shock to the Transmitter

- During the Transmitter operations, always use a hook belt (1) to prevent the unexpected drop of it.

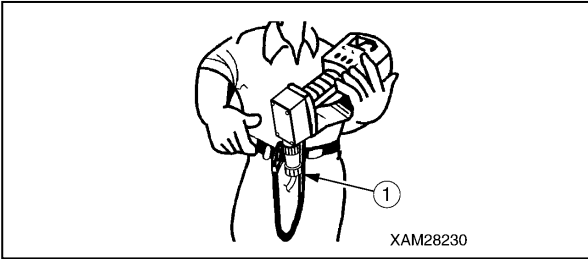


Fig. 4-227

- Always avoid an impact on the Transmitter, such as hitting it to any object. It may result a damage to the enclosure or internal components which may cause a failure or malfunction and brings electrical shock or other serious hazard.

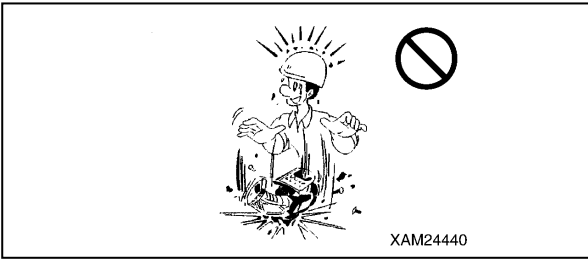


Fig. 4-228

- In the event of such damages, send us or to our agents for services. Use of such a damaged Transmitter will result in miss-operation and extend to electrical shock or other serious hazard.

Precaution for Operations in Cold Seasons

- Avoid the use of the Transmitter in a condition where the ambient temperature makes sudden change or becomes extremely low (-10°C or below) or cold air directly blows. Sudden change in temperature may cause dew formation inside the Transmitter and which causes failure or malfunction and leads to a serious hazard.



Fig. 4-229

- In the winter times, allow sufficient idling prior to starting crane operations. In the winter, due to the low temperature, hydraulic fluid has higher viscosity. Such condition may result in a delay of functions in crane operations.
- Keep the Transmitter away from conditions as below for its storage, where the Transmitter enclosure may deform or discolour, or internal components may be damaged to bring malfunctions and a serious hazard:
- Extremely low temperature (-20°C or below) or direct cold air blow.
- Direct sun ray.

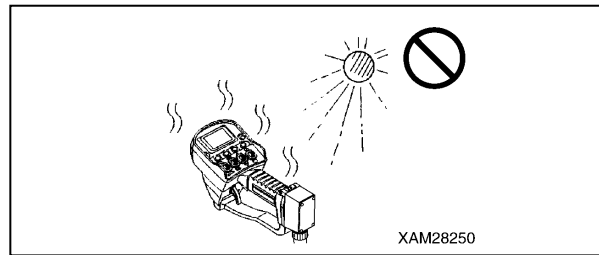


Fig. 4-230

- Adjacent to warm air outlets of vehicles.
- Adjacent to housing heating system.
- High humidity.

Precautions for Handling of Connection Cable

Do not attempt to hang the Transmitter by the connection cable and fling it around, or bend the cable or thread on it. Such poor handling will damage the internal wires or produce other failures.

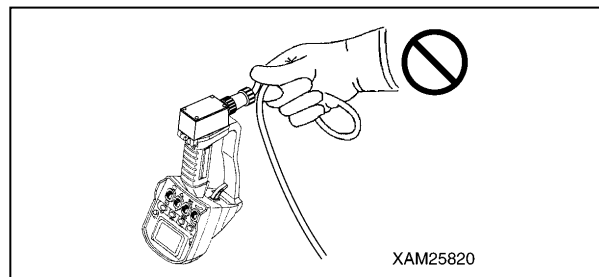


Fig. 4-231

Precautions for Crane Operation - before Starting Engine

Inspection Prior to Starting Engine

At the beginning of the day's operation, perform the opening inspection as specified for this machine, prior to starting the engine.

Serious injury or death may arise when these inspections are neglected.

Any failure detected at the inspection must be properly corrected.

Safety Measures for Starting Engine

- Ensure that nobody is around the Crane, or no obstacles, at starting the engine.
- Toot the horn for notice just before turning the ignition key.
- Never attempt to short the starter circuit for the purpose of the engine start, which may cause fire.

Inspection Prior to Turn On the Transmitter

- Check for any dirt, damage or cracks in the enclosure, control levers, operation buttons, or LCD screen.
- Ensure that the Transmitter's control levers, operation buttons and the Accelerator lever move smoothly and properly.
- Check the connection cable for damage or crack when the Transmitter is in use.

Inspection after Turning On the Transmitter

Ensure that LCD screen of the Transmitter provides correct indications.

- Switch to each operation mode, i.e. CRANE MODE and OUTRIGGER MODE, then check that LCD screen displays proper indications when each lever and button is manipulated. Further, verify the each applicable value of load in the Transmitter is identical to that of the Moment limiter display.

Inspection Prior to Turn On the Receiver

- Check for any dirt, damage or cracks in the Receiver's Control box, Main switch, Monitor display, Antenna and such.
- Ensure that the Receiver's Main switch moves smoothly and properly.

Precautions for Crane Operation - after Starting Engine

Function Check of Outrigger Mode by the Transmitter, and Notices for Operation

- Switch the operation mode to the "OUTRIGGER MODE" and confirm that the mode is switched correctly.
- Activate "Start/Reset button" to assure that the engine correctly starts.
- Activate "Stop/EMO button" to assure the engine correctly stops.
- Operate the outrigger control switches to assure that the corresponding outrigger works correctly.
- Check that the position pins for outriggers and retainers are securely fixed.

Function Check of Crane Mode by the Transmitter and Notices for Operation

- Before switching the operation mode to "CRANE MODE" always make all the outriggers extended and securely contacted on the ground.
- Switch the operation mode to the "CRANE MODE" and confirm that the mode is switched correctly.
- Activate levers for crane operations and assure that the Crane functions correctly.
- Always refer to the portable rated total load chart and avoid over-loaded operations.
- Activate the control levers and Accelerator lever of the Transmitter slowly in any time.

Precautions for Crane Operation - Terminating the Operation

Precautions for Terminating the Operation by the Transmitter

- Before stowing the boom, switch the operation mode to "CRANE MODE" and confirm that the mode is switched correctly.
- Before stowing the outriggers, ensure that the boom and the hook is stowed in the correct positions.
- Before stowing the outriggers, switch the operation mode to "OUTRIGGER MODE" and confirm that the mode is switched correctly.
- When all the operation by the Transmitter is complete, always turn OFF the power of both the Transmitter and Receiver.
- On no condition, Transmitter will be ON unless the Crane is in operation, otherwise, unexpected touch or contact of operation levers or buttons of the Transmitter to any other object may cause un-desired motion of the Crane and a serious accident such as tipping or collision may occur.
- Where it is required to turn ON the Transmitter for the purpose of inspecting it or such, always keep the Receiver OFF and stop the engine, as well.

REMOTE CONTROL SYSTEM FEATURES

This system is designed principally for the following purposes:

This Interactive Remote Control System includes both Transmitter and Receiver which facilitate remote control of the Crane which is purchased with this device.

This Interactive Remote Control System provides an operation of the Crane at the most convenient place away from it within a range of the length of the connection cable. In addition, its LCD screen indicates "Rated total load", "Actual Load" and "Load factor (by a bar chart)", which ensures proper operation based on these information.

CAUTION: The remote control system provides following safety functions:

- **Abnormal Signal Detector Circuit**
When the Main switch of the Receiver is turned ON this circuit checks the dispatch of Crane operation signals for 3 to 4 seconds. Thus, the Crane will not be immediately ready for operations. When dispatch of any crane operation signals are noticed, power will be automatically OFF and the Crane stops. For resume, push the Reset button of the Transmitter.
- **Automatic Power OFF Circuit**
Power of the Transmitter will be automatically OFF when the remote control of crane operations is discontinued for the specific time. For resume, push the Power switch of the Transmitter to turn ON.
- **Voltage Drop Limiter (for the Receiver)**
The Receiver will be automatically shut down in the event where the voltage of the battery drops below DC 7 volts. This prevents malfunctions of the Crane due to voltage drop and the operation will resume automatically when the voltage is restored to DC 7 volts or higher.

Transmitter

The Transmitter is equipped with LCD screen (1), Six control buttons (2), Four operation levers (3), Accelerator lever (4), Grip (5) and Connection cable (6).

The Transmitter sends signals for crane operations to the Receiver through the connection cable so that remote operation of the Crane can be carried out. In addition, the Transmitter collects the load data from the Moment limiter of the Crane through the cable, which are displayed in the LCD screen as "Rated total load", "Actual load" and "Load factor (by a bar chart)".

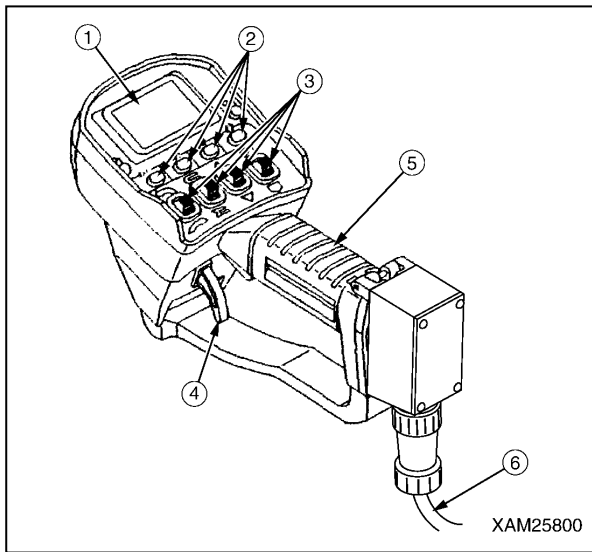


Fig. 4-232

Receiver

The Receiver which is installed in the Crane equips with Control box (1), Main switch (2), Monitor display (3), and Receptacle (4), etc.

The Receiver receives operation signals from the Transmitter through the connection cable which control the Crane.

Further, the load data from the Moment limiter of the Crane are delivered to the Transmitter through the cable.

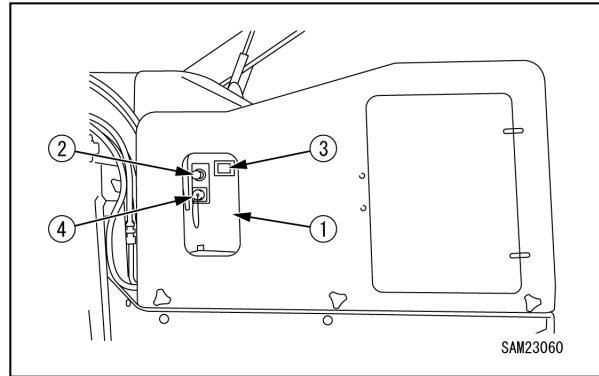


Fig. 4-233

Functions of Remote Control System

- The Transmitter allows one hand operation, which enables craning works, such as holding the load by the other hand or slinging, by one person.
- The Accelerator lever facilitates the control of the Crane operation speed from stand-by condition to the maximum speed.
- The LCD screen of the Transmitter indicates operation status, such as "Rated total load", "Actual load", "Load factor (by a bar chart)", "Speed control", "Outrigger setting" and so on, to provide easy confirmation. In addition, the LCD screen of the Transmitter shows error messages in the event where the Transmitter has a failure, so that the detection and correction of the failure is promptly accomplished. Still more, the voice messages will notify the Transmitter conditions or warning alerts.
- Depend on the operation requirement, manual operation on the console of the Crane is also available, in addition to handling by the Transmitter.
- The connection by the cable between the Transmitter and Receiver allows secure communication between both.

REMOTE CONTROL SYSTEM COMPONENTS

Transmitter

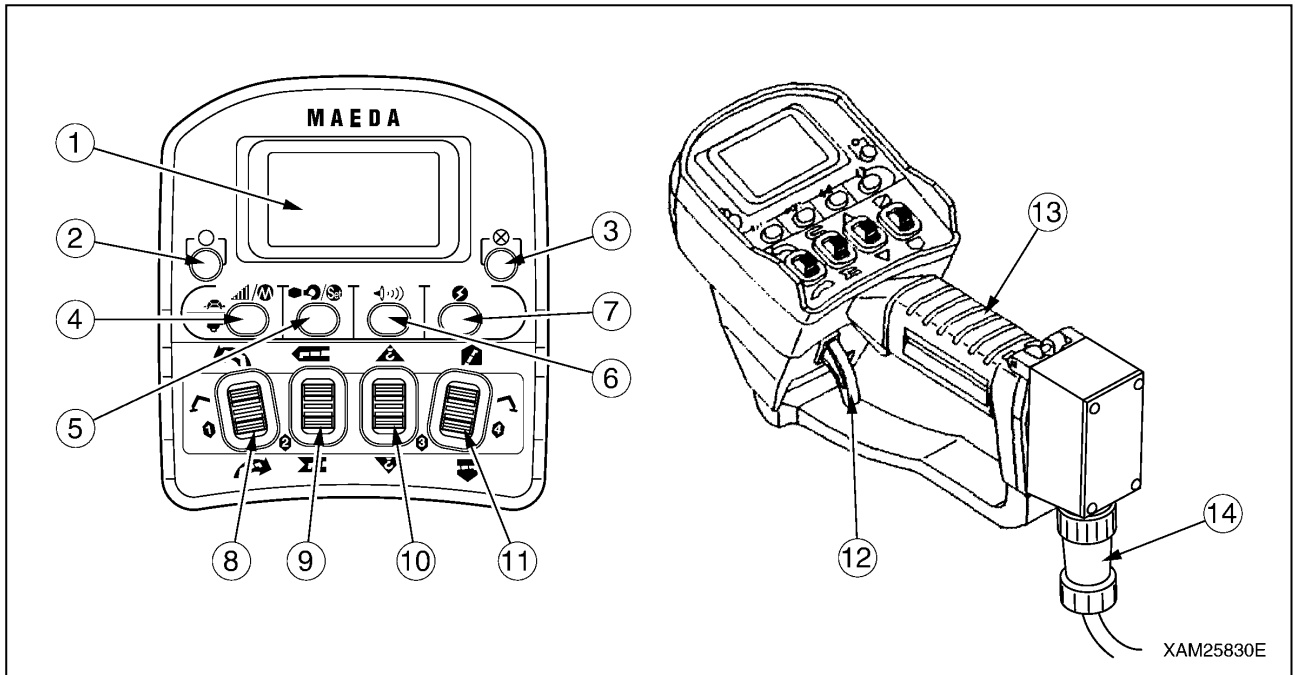


Fig. 4-234

- 1 - LCD Screen
- 2 - Start/Reset Button
- 3 - Stop/EMO Button
- 4 - Speed/Mode Button
- 5 - Hook Stow/Setting Button
- 6 - Horn Button
- 7 - Power Switch
- 8 - Slewing/No.1 Outrigger Operation Lever
- 9 - Boom Telescoping/No.2 Outrigger Operation Lever
- 10 - Hook Raising and Lowering/No.3 Outrigger Operation Lever
- 11 - Boom derricking/No.4 Outrigger Operation Lever
- 12 - Accelerator Lever
- 13 - Grip
- 14 - Connection Cable

LCD Screen

The LCD screen displays the status of the Transmitter in operation, the established values for each mode, or error messages by symbols, comments or signs.

Start/Reset Button

This button has two usages as below:

- To push this button starts the engine.
- This button resets the "Emergency Stop" and "Abnormal Signal Detect" conditions.

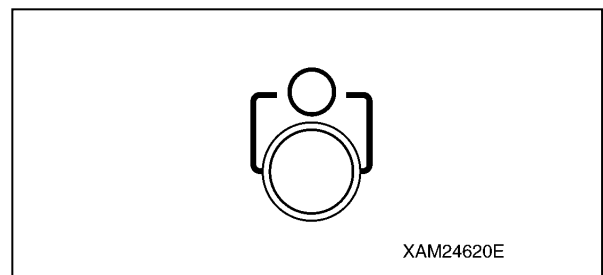


Fig. 4-235

Stop/EMO Button

This button also has two usages as below:

- To push this button stops the engine.
- In an emergency event where the Crane does not stop by normal operations, or such, this button provides the forced stop function.

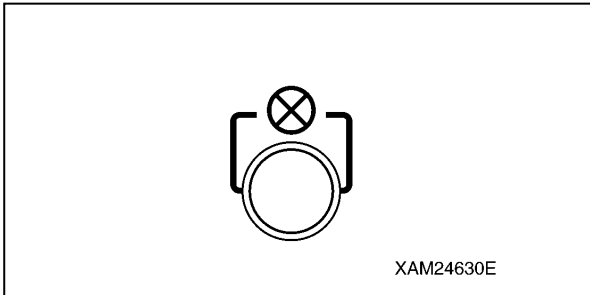


Fig. 4-236

Speed/Mode Button

This button also provides two usages as below:

- During crane operations, to push this button decelerates the operation speed.
- During the crane operation is in a pause, this button provides the selection of the Transmitter operation modes.

The current active mode will be displayed in the LCD screen.

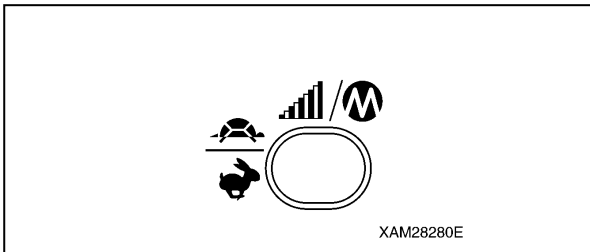


Fig. 4-237

Hook Stow/Setting Button

This button also serves two usages as below:

- To push this button automatically stows the hook.
- For each of the setting of the modes, use this button to fix to one of the choice from the menu in the LCD screen.

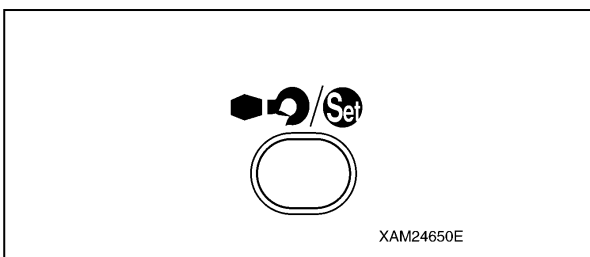


Fig. 4-238

Horn Button

Push this button to toot the horn.

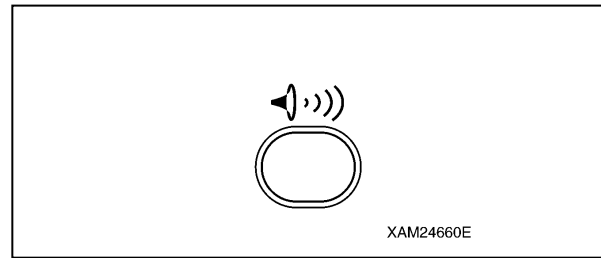


Fig. 4-239

Power Switch

To push this button switches ON and OFF the power of the Transmitter. Each push will turn ON or OFF alternately.

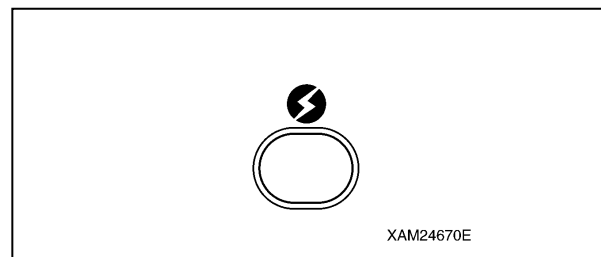


Fig. 4-240

Slewing/No.1 Outrigger Operation Lever

This operation lever functions in two ways as below:

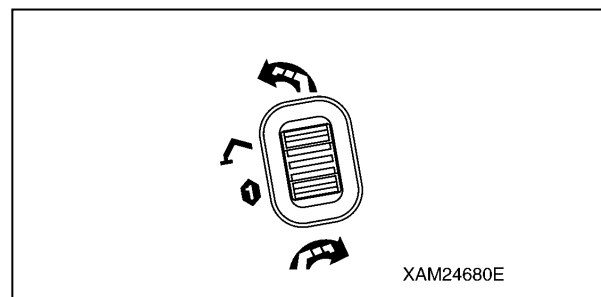


Fig. 4-241

1. In the CRANE MODE, this lever controls slew of the Crane structure:
 - Counterclockwise (left): Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Clockwise (right): Push the lower end of the lever.

2. In the OUTRIGGER MODE, this lever controls extension (setting) and retraction (stowing) of either only No.1 or all of the outriggers at once:
 - Retraction (stowing): Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lower end of the lever.

Boom Telescoping/No.2 Outrigger Operation Lever

This operation lever functions in two ways as below:

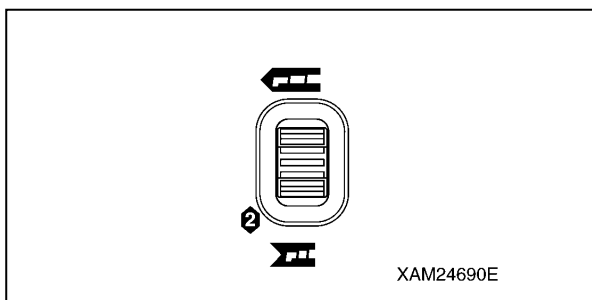


Fig. 4-242

1. In the CRANE MODE, this lever controls the telescopic boom length:
 - Boom extension: Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Boom retraction: Push the lower end of the lever.
2. In the OUTRIGGER MODE, this lever controls extension (setting) and retraction (stowing) of either only No.2 or all of the outriggers at once:
 - Retraction (stowing): Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lower end of the lever.

Hook Raising and Lowering/No.3 Outrigger Operation Lever

This operation lever functions in three ways as below:

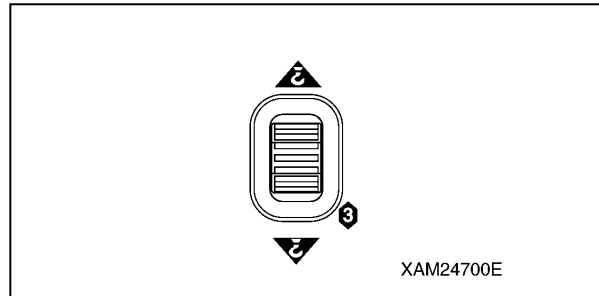


Fig. 4-243

1. In the CRANE MODE, this lever controls raising and lowering the hook:
 - Hook raising: Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Hook Lowering: Push the lower end of the lever.
2. In the OUTRIGGER MODE, this lever controls extension (setting) and retraction (stowing) of either only No.3 or all of the outriggers at once:
 - Retraction (Stowing): Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lower end of the lever.
3. In the A MODE, this lever is used as a cursor key by "▲ and ▼".

Boom Derricking/No.4 Outrigger Operation Lever

This operation lever functions in two ways as below:

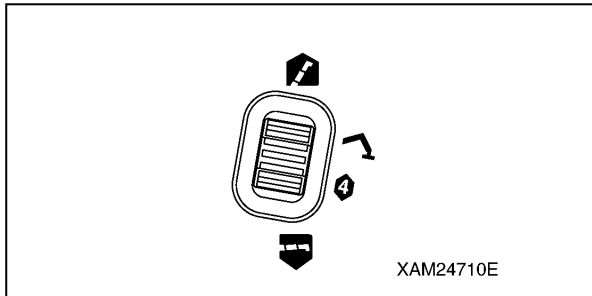


Fig. 4-244

1. In the CRANE MODE, this lever controls the boom derricking angle:
 - Boom raising: Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Boom lowering: Push the lower end of the lever.
2. In the OUTRIGGER MODE, this lever controls extension (setting) and retraction (stowing) of either only No.4 or all of the outriggers at once:
 - Retraction (stowing): Push the upper end of the lever.
 - Neutral: Release your finger from the lever.
 - Extension (setting): Push the lower end of the lever.

Accelerator Lever

The Accelerator lever controls the flow rate of the control valves and the engine speed or output.

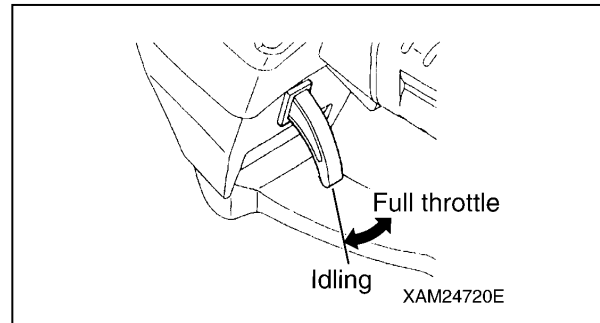


Fig. 4-245

- Low idling: Release your finger from the Accelerator lever.
- Full throttle: Squeeze the accelerator lever to the full.

NOTICE:

- *The Accelerator lever itself cannot control either flow rate of the control valves or the engine speed when it is manipulated alone. In the condition that any of the other operation levers are also used, the Accelerator lever launches specified operation of the Crane in the idling state of the engine, when it is manipulated, then, the engine speeds up by further manipulation of it; the crane operation turns to be faster, accordingly.*
- *The Accelerator lever does not control outriggers.*
- *The acceleration rate is always indicated in the right part of the LCD screen during crane operations.*

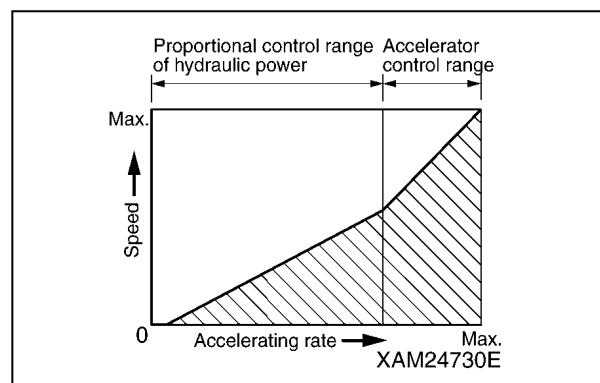


Fig. 4-246

Grip

The Transmitter is designed for one hand controls in general. Levers and buttons can be manipulated by your thumb, while the accelerator lever can be triggered by your forefinger. Other fingers should grab the grip to hold the Transmitter.

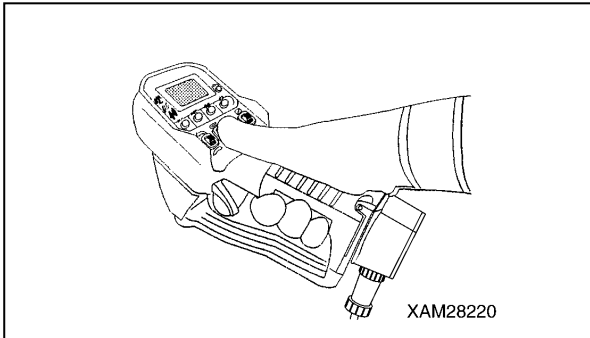


Fig. 4-247

Hook Belt

During the operation, this belt prevents the Transmitter from falling down to the ground, when the operator drops it by mistake.

Hook one end of the hook belt (16) to the Transmitter and attach another end to the operator's waist belt, or such.

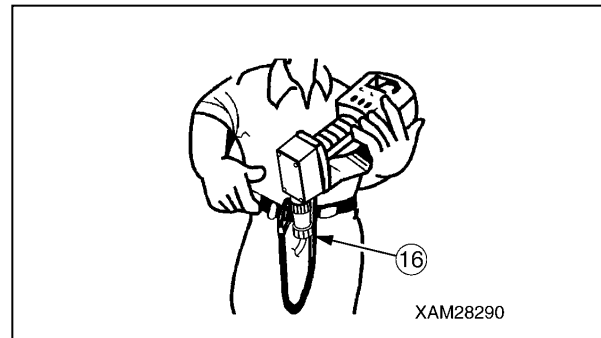


Fig. 4-250

Connection Cable

The connection cable is a cable between the Transmitter and Receiver.

Before and after the operation, always check this connection cable for any crack or damage, or bent. In addition, check the receptacle for any damage.

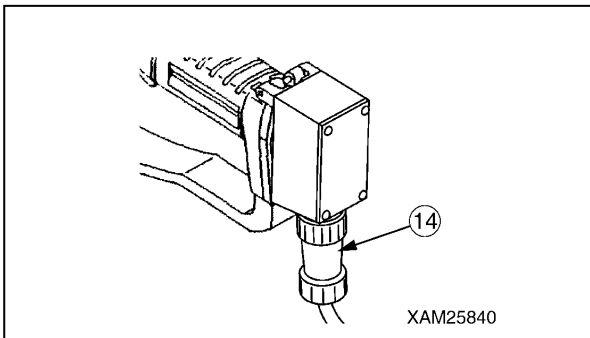


Fig. 4-248

Storage Case

The Storage case is a compact bag for protection of the Transmitter.

Before putting it into this case, ensure that the power of the Transmitter is OFF.

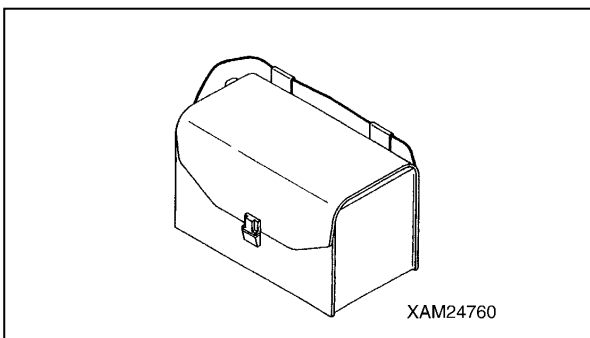


Fig. 4-249

Receiver Components

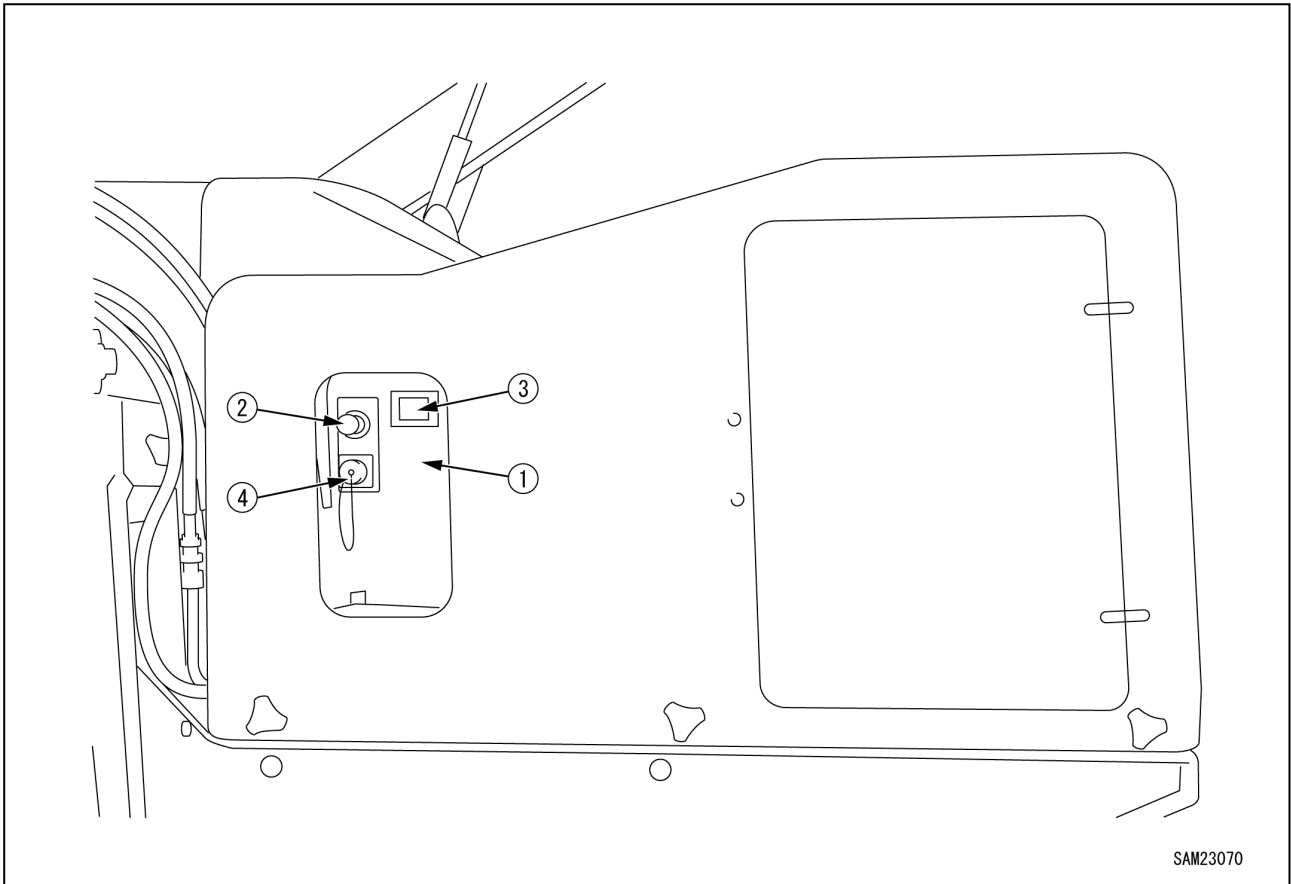


Fig. 4-251

- 1 - Control Box
- 2 - Main Switch

- 3 - Monitor Display
- 4 - Receptacle

Control Box

The Control box contains the Receiver devices and control devices.

Never attempt to dismantle this Control box.

Main Switch

The Main switch is a toggle switch to power ON or OFF the Receiver

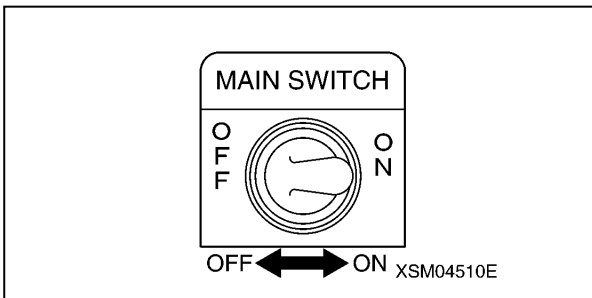


Fig. 4-252

- ON: Turn the toggle to ON to start the Receiver.
- OFF: Turn the toggle to OFF to terminate the Receiver.

CAUTION:

- **Before starting the engine, always turn this Main switch of the Receiver to OFF.**
- **Where the remote control is not in use, always turn the main switch of the Receiver to OFF.**

Monitor Display

In the event that the abnormal signal detector of the controller serves, the Monitor display indicates error codes.

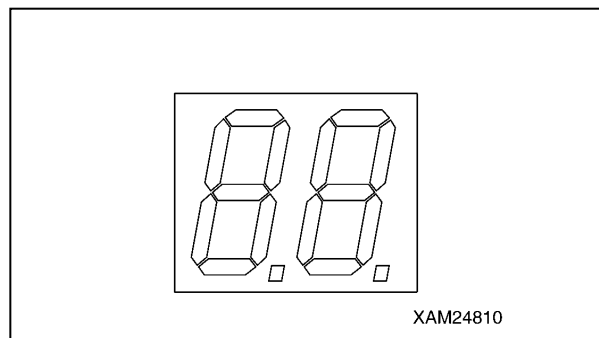


Fig. 4-253

CAUTION: In the event that the monitor display (3) indicates an error code, settle the error as follows:

1. Push the Reset button of the Transmitter.
2. When the practice as above 1. results another error code, once turn the Receiver OFF, then start it again.
3. When the practice as above 2. results further error code, it is suspected that the Transmitter or Receiver has faults; contact us or our sales service agency.

For more information on error codes, see "TROUBLESHOOTING" on page 5-89.

Receptacle

Connect the connection cable from the Transmitter, here.

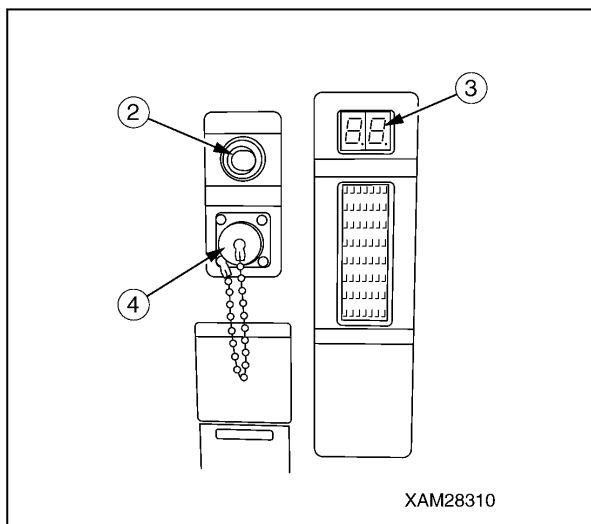


Fig. 4-254

CAUTION:

- Before attaching the connection cable to the receptacle (4), always confirm that the Main switch (2) is in the OFF position. After the insertion, secure the plug by the screw.
- Always apply the water proof cap while the remote control is not in use.
- In the condition where the remote control is not provided, this receptacle (4) is incompetent. Always keep the water proof cap attached.

Fuse in the Receiver

CAUTION:

- For any tests or replacement of a fuse, always turn OFF the Main switch of the Control box, before removing it.
- The fuse must be replaced with the same type of glass tube fuses, and of the same rating.

CAUTION: A fuse is inserted in the (+) line of the main power supply of the Receiver as a protective circuit of internal devices and prevents circuits from burnt.

- A glass tube fuse is employed. In the event where the fuse is corroded and shows white rust, or when a loose condition is recognised, always replace it with a new one.
- When the fuse is blown, never fail to examine the circuit for the cause and repair it before replace the fuse.
- The fuse must be replaced with the same type of glass tube fuses, and of the same rating.

The fuse is placed inside the Receiver.

Test and replacement of the fuse shall be practiced as follows:

- Use the following hand tools:
- A screw driver (Philips)
- Jewelers screw driver set (Slotted)
- General hand tools, used to detach the cover of the control box.

Removal of the Fuse

1. Remove the rear cover as described in "Removing Rear Cover" on page 5-19.

- Unfasten eight of screws (4) and take away the cover of the Receiver (3).

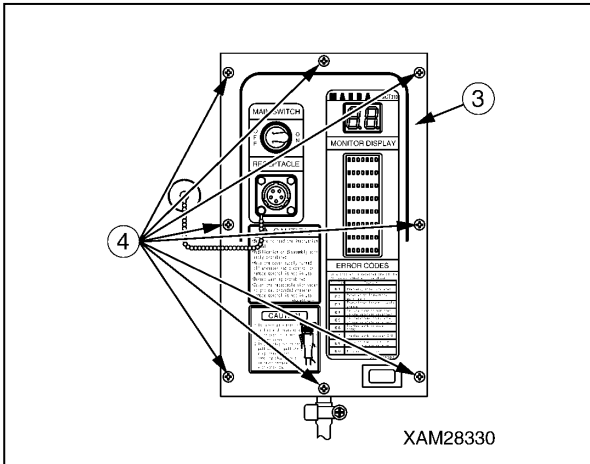


Fig. 4-255

- Extract three of connectors (6) in the first PCB (5).
- Unfasten six of screws (7) and remove the first PCB (5).

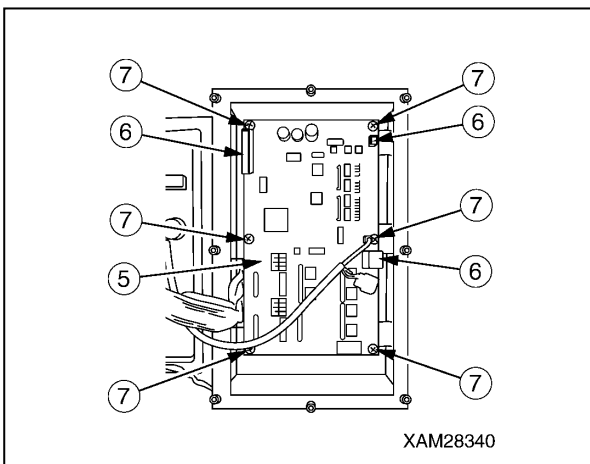


Fig. 4-256

- With a jeweler's driver (A) to pull out the fuse (8) from its clips, then examine it.

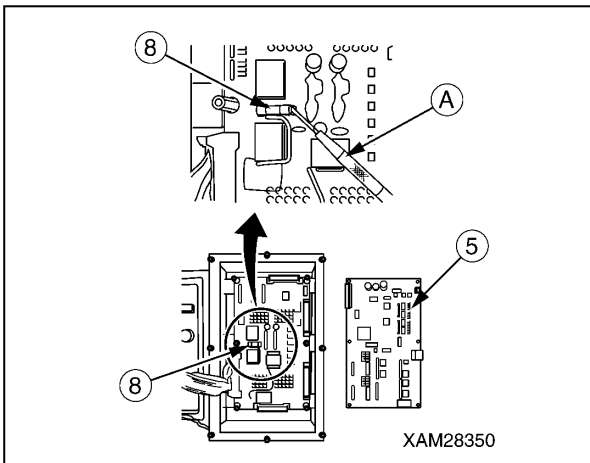


Fig. 4-257

- Insert a new fuse or the examined fuse to where the one was.

Insertion of a Fuse

After the fuse is examined or replaced, restore the Receiver in the reverse practice of the removal.

CAUTION:

- When the three connectors (6) of the first PCB (5) is inserted again, secure them and avoid any loose conditions.
- Care should be exercised so that the cover (3) of the Receiver will not catch wires when it is attached back.

[Fuse class]

Type: Grass tube fuse

Rating: 15A

MODE SETTING OF THE TRANSMITTER

This device provides the "A MODE" in which the initial values of the Transmitter are established, the "OUTRIGGER MODE" in which the outriggers are set or stowed, and the "CRANE MODE" where the Crane is operated. This device is designed to switch to the applicable mode for the operation by the Transmitter.

A Mode

WARNING!

- Before entering into A MODE, always turn the main switch of the Receiver to the OFF position.
- Before the setting of values for A MODE, ensure that "A MODE" is correctly indicated in the LCD screen. Otherwise, un-expected motion of the Crane may result a serious accident, due to entry of values in the other mode, by mistake.

Opening A Mode Screen

Push the Speed/Mode button and Power switch jointly for 2 seconds. A message as "A MODE" appears in the LCD screen for 2 seconds.

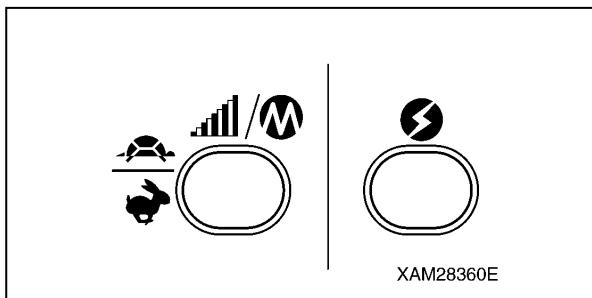


Fig. 4-258

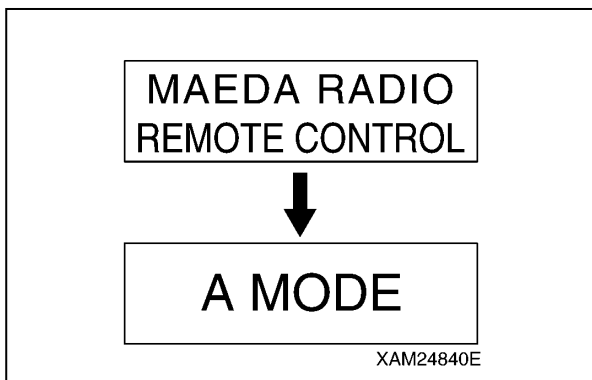


Fig. 4-259

Messages in the A Mode Screen

Refer to the figure below for the A MODE screen:

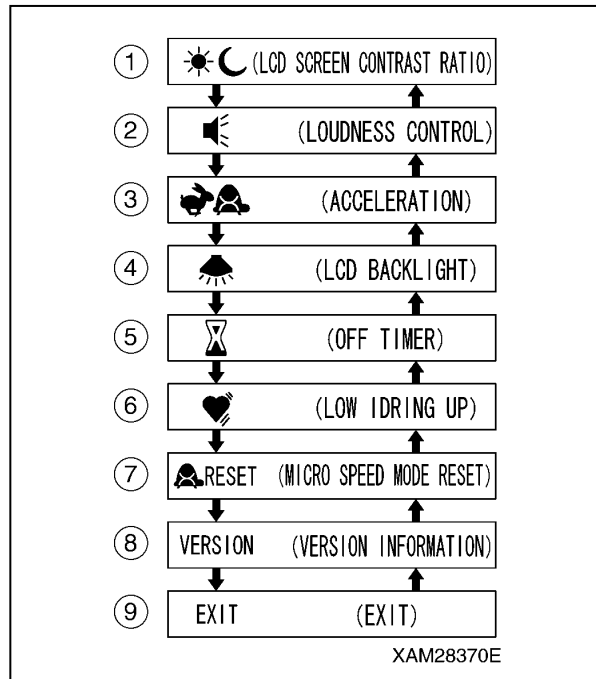


Fig. 4-260

It contains eight function items ((1) to (8)) and the Exit command ((9)).

NOTICE: In the A MODE, following applicable items are adjustable, as required:

- (1) "Contrast ratio" of LCD screen
- (2) "Loudness control"
- (3) The "Engine speed limit", controllable by the Accelerator lever.
- (4) LCD backlight, "Time for lighting, until the auto-cut".
- (5) "Auto Shut-OFF time" of the Transmitter power.
- (6) "Low idling rate" of the engine. (Idling only while the crane operation levers are manipulated.)
- (7) Reset of "user values" by the speed set-up mode.
- (8) Version information of the Transmitter firmware.

To switch the function item to another, or to change the setting value of the function, use the Hook raising and lowering lever.

Then, to fix the value in the function, push the hook Stow/Setting button.

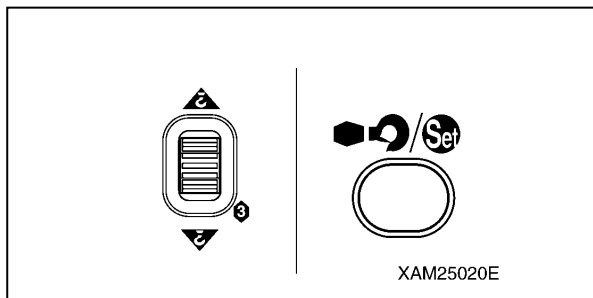


Fig. 4-261

LCD Screen Contrast Ratio

CAUTION: The LCD screen may be illegible when it is set too light or too dark, which may prevent correct operations. Adjust its contrast adequately for comfortable read.

Adjust the contrast ratio of the LCD screen:

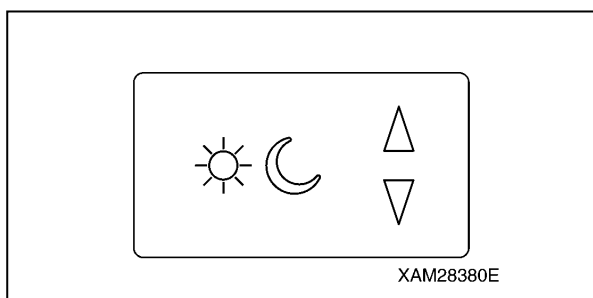


Fig. 4-262

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever.
 - To darken: Push the upper end of the Hook raising and lowering lever.
 - To lighten: Push the lower end of the Hook raising and lowering lever.
- When the desired contrast is obtained, push the Hook stow/Setting button. The condition obtained in above 1. will be fixed and the display returns to the A MODE screen.

Loudness Control (Available Only for Units with Optional Voice Message)

Adjust the volume of voice messages:

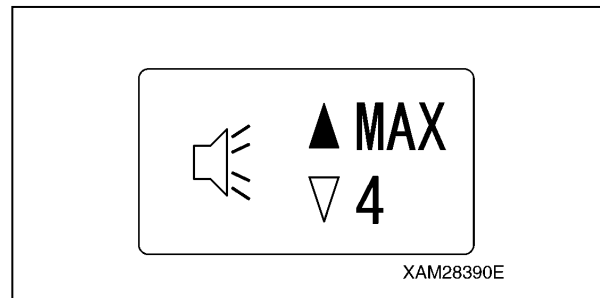


Fig. 4-263

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever and select the appropriate rate. The volume adjust is by 6 steps, OFF, 1, 2, 3, 4, or ON. The factory setting for this function is "MAX".
- When the desired volume is obtained, push the Hook stow/Setting button. The condition obtained in above 1. will be fixed and the display returns to the A MODE screen.

Acceleration

Adjust the engine speed limit, controllable by the Accelerator lever:

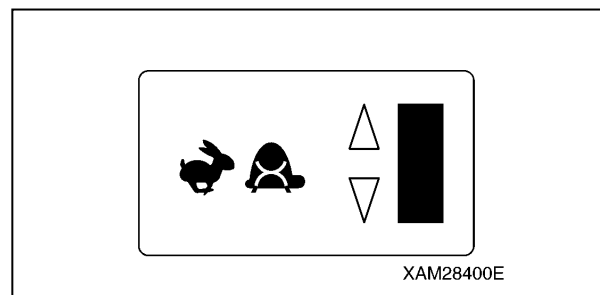


Fig. 4-264

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever. When all the bars lights, the speed limit is in maximum, otherwise, when the all are OFF, it is in minimum.
- When the suitable rev limit is obtained, push the Hook stow/Setting button. The value obtained in above 1. will be fixed and the display returns to the A MODE screen.

LCD Backlight

Adjust the time to the auto-cut of the LCD backlight, after your finger is released from each of the lever.

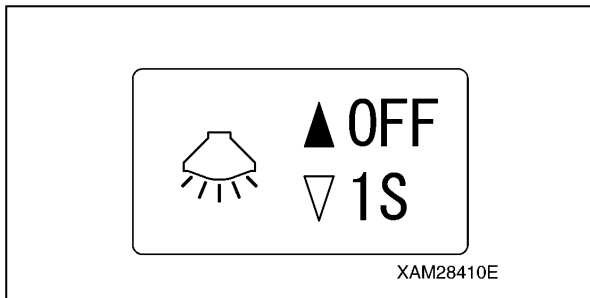


Fig. 4-265

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever and select the preferred time.
The elapse time adjust is by 4 steps, OFF, 1 sec., 3 sec., or 4 sec.
The factory setting for this function is "1 second".
- When the desired time is obtained, push the Hook stow/Setting button. The elapse time in above 1. will be fixed and the display returns to the A MODE screen.

Off Timer

Adjust the Auto shut-OFF time of the Transmitter power.

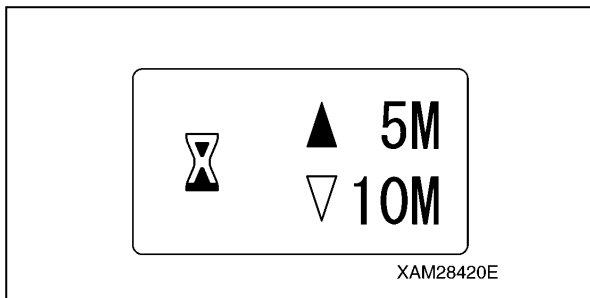


Fig. 4-266

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever and select the preferred time.
The Auto shut-OFF adjust is by 3 steps, 5 min., 10 min., or 15min.
The factory setting for this function is "5 minutes".
- When the desired time is obtained, push the Hook stow/Setting button. The time in above 1. will be fixed and the display returns to the A MODE screen.

Low Idling Up

CAUTION: The low idling rate regulated by this idling-up function is valid only during crane operation levers are manipulated. Once the lever is released, the low idling rate is reset to the normal rate.

Adjust the engine's low idling rate to higher than the normal rate, during the crane operation levers are manipulated.

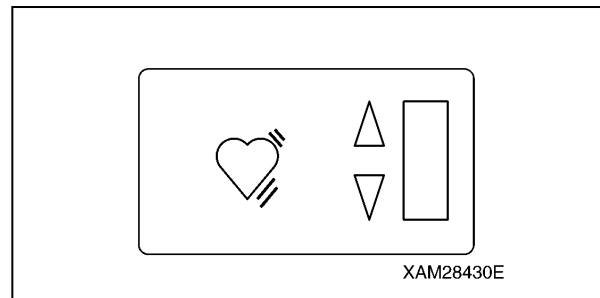


Fig. 4-267

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever. When all the bars light, the idling up is in the maximum, otherwise, when the all are OFF, the idling up is cancelled.
- When the suitable idling up rate is obtained, push the Hook stow/Setting button. The value obtained in above 1. will be fixed and the display returns to the A MODE screen.

Micro Speed Mode Reset

Select either to reset or preserve the value at the micro speed mode.

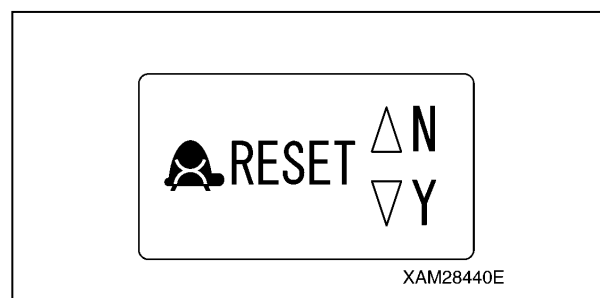


Fig. 4-268

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever and select "N" or "Y".
To reset, select "Y", otherwise, select "N" to preserve.
- Whether reset or not is fixed, push the Hook stow/Setting button. The status in above 1. will be fixed and the display returns to the A MODE screen.

Version Information

Push the Hook stow/Setting button, so that version information of the Transmitter firmware is displayed. Another push of the same button makes the display returns to the A MODE screen.

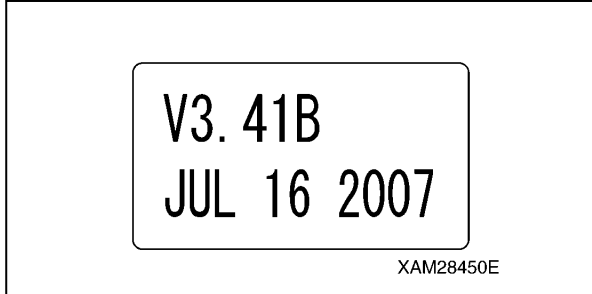


Fig. 4-269

Exit

CAUTION: Once setting-up the desired function items of all is completed, do not forget to practice the termination procedure, below. Otherwise, when this process is not correctly terminated, the latest setting will not become valid.

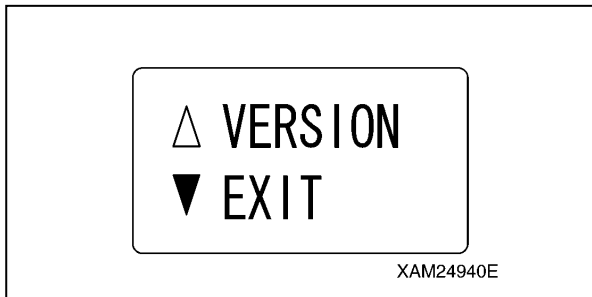


Fig. 4-270

1. Once setting-up the desired function items of all is completed, ensure that the display has returned to the A MODE screen.
2. Shift the cursor (▲ or ▼) using the Hook raising and lowering lever and select "EXIT".
3. Push the Hook stow/Setting button, which will terminate the "A MODE" and turn the mode to the "CRANE MODE".

An Example for Setting in the A Mode

Hereunder is a procedure to change the time of the "OFF timer", from "5 minutes" of the factory setting, to 10 minutes:

1. Use the Hook raising and lowering lever and shift the cursor (▲ or ▼) to the side of the function item to change.

2. When the cursor comes to the side of the "OFF timer", push the Hook stow/Setting button. Now, the "OFF timer" is selected and the cursor (▲) appears next to "5 minutes", as the current value.
3. Use the Hook raising and lowering lever so that the cursor (▼) comes to the side of "10 minutes", then push the Hook stow/Setting button. Now, the "OFF timer" setting is 10 minutes.

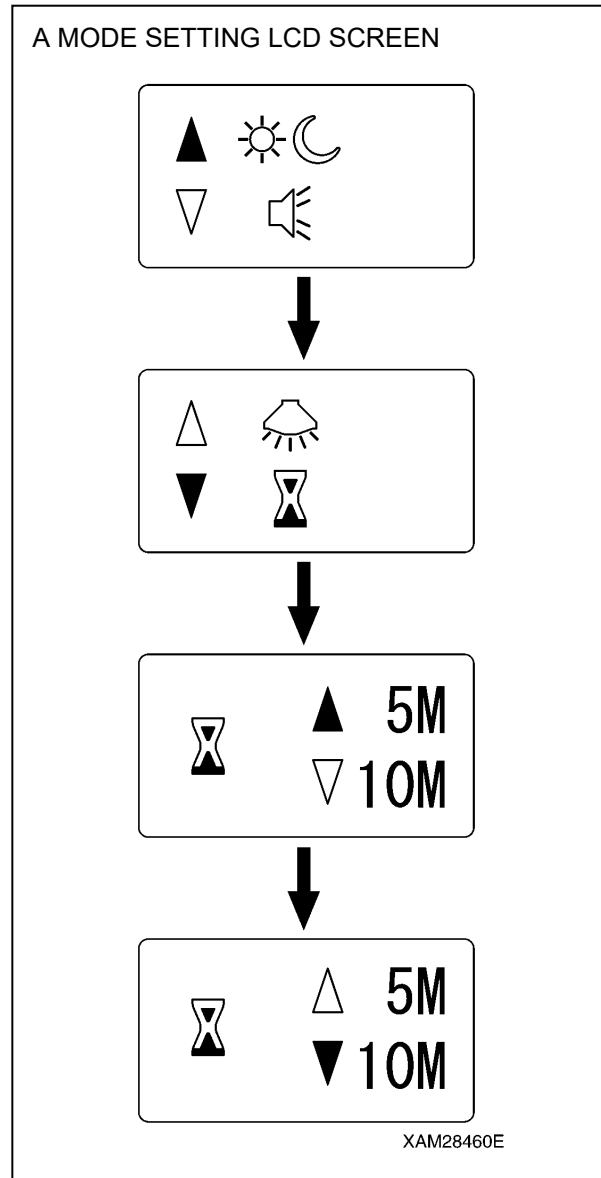


Fig. 4-271

- Shift the cursor (▲ or ▼) using the Hook raising and lowering lever and select "EXIT", then push the Hook stow/Setting button. Now the mode exits from the "A MODE" and is turned to the "CRANE MODE".

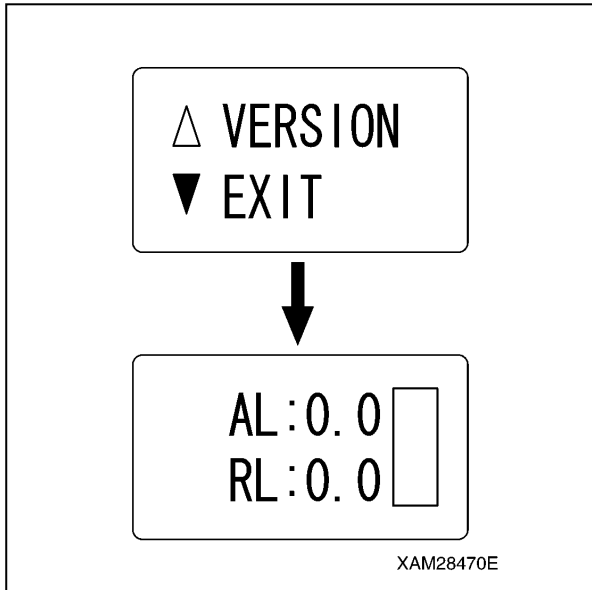


Fig. 4-272

CAUTION:

- Once setting-up the desired function item is completed, do not forget to practice the termination procedure, above. Otherwise, when this process is not correctly terminated, the latest setting will not be valid.
- Change of the other function item setting is available by the same procedure. In such event, correctly exit from the A MODE, without fail.

Procedure in the Operation Mode

CAUTION: When the Main switch of the Receiver is turned ON, its abnormal signal detector automatically starts, first. Please allow it for 3 to 4 seconds, without using any levers, buttons and the Accelerator lever.

NOTICE:

- For changes between the modes, always turn OFF the power, once, then push the Power button again to power ON.
- While using a mode other than the "CRANE MODE", when you turn OFF the power by the Power switch and turn it ON, again (i.e., you keep waiting for 2 seconds or more), the mode is automatically set to "CRANE MODE". When you want to continue the operation in the previous mode, call the appropriate mode, again.

Call Out Crane Mode

- Push the Power button to turn ON the Transmitter. The "Crane mark" is displayed in the LCD screen for 2 seconds or around.

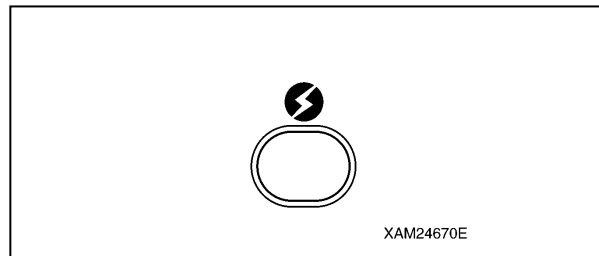


Fig. 4-273

NOTICE: In case that the power is already ON, once turn OFF, and then push the Power button again for power ON.

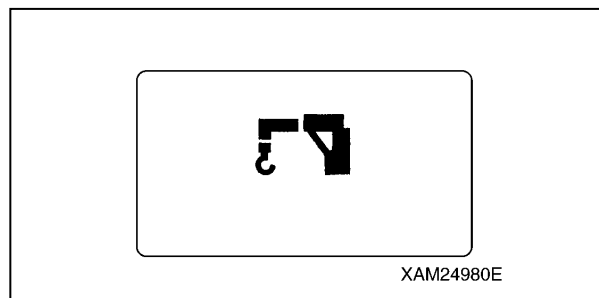


Fig. 4-274

- When the "Crane mark" in the LCD screen disappears in 2 seconds, the "CRANE MODE" is automatically called out.

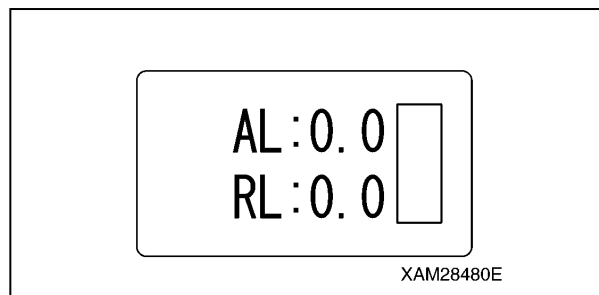


Fig. 4-275

Call Out Outrigger Mode

NOTICE: The OUTRIGGER MODE consists of "Extension mode" and "Ground setting mode". Use respective modes as shown below:

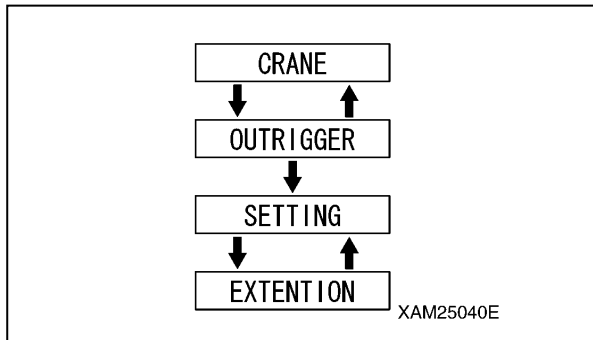


Fig. 4-276

1. Push the Power button to turn ON the Transmitter.
The "Crane mark" is displayed in the LCD screen for 2 seconds around.

NOTICE: In case that the power is already ON, once turn OFF, and then push the Power button again for power ON.

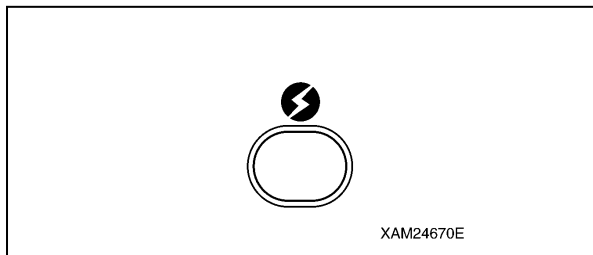


Fig. 4-277

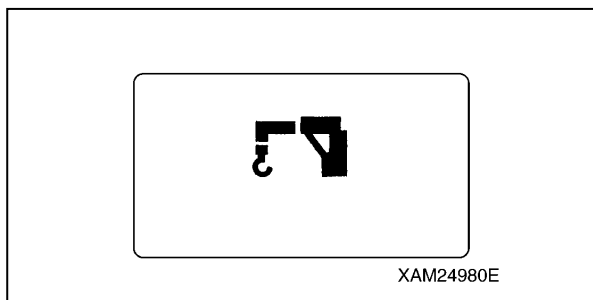


Fig. 4-278

2. While the "Crane mark" is shown in the LCD screen (for approx. 2 seconds), push the Speed/Mode button for 2 seconds.
The LCD provides the screen for selecting "CRANE MODE" or "OUTRIGGER MODE".

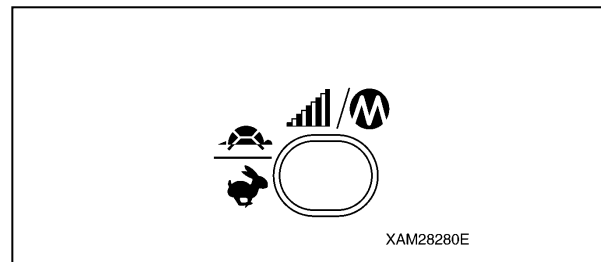


Fig. 4-279

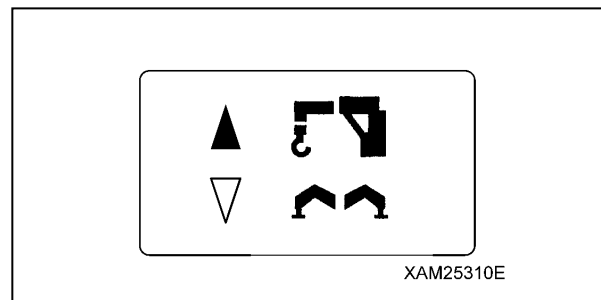


Fig. 4-280

3. Use the Hook raising and lowering Lever and shift the cursor (▲ or ▼), and push the Hook stow/Setting button when the cursor points out the "OUTRIGGER".

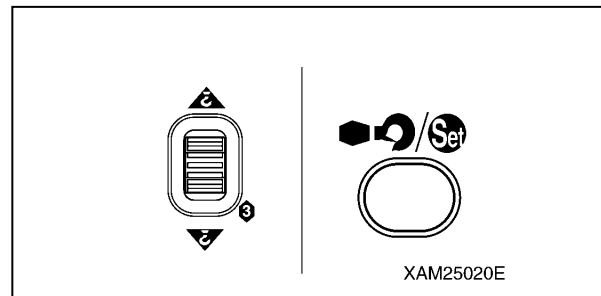


Fig. 4-281

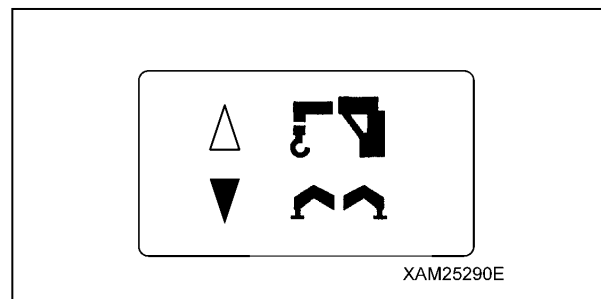


Fig. 4-282

4. The operation mode is already switched to the "OUTRIGGER MODE", thus the "Outrigger mark" is exhibited. Soon after, it enters into "Ground setting mode", then the mark turns to "Ground setting (↑↓)".

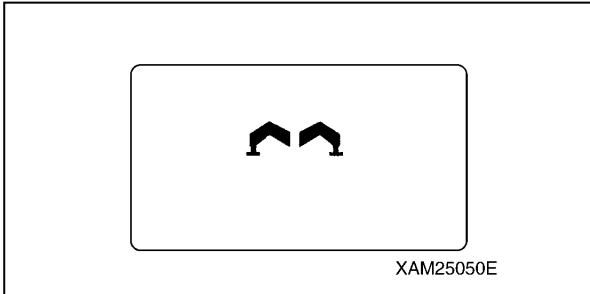


Fig. 4-283

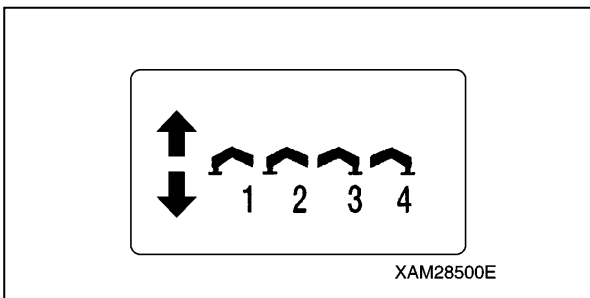


Fig. 4-284

5. To shift to "Extension mode", push the Speed/Mode button, while the LCD screen shows the "Ground setting mode". Then the mode is switched to "n"; the mark turns to "Extension (←→)".

NOTICE: Switching between "Outrigger Extension mode" and "Outrigger Ground setting mode" is alternately by each push of the Speed/Mode button.

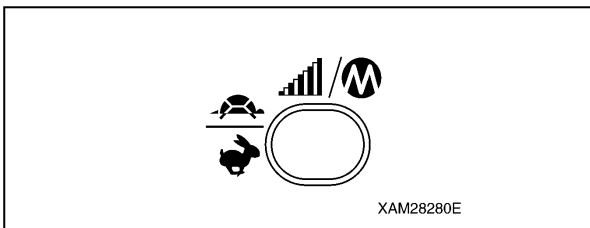


Fig. 4-285

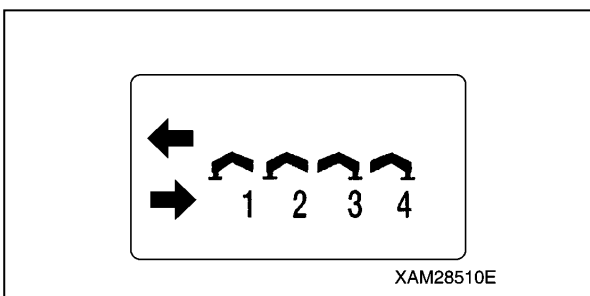


Fig. 4-286

REMOTE CONTROL SYSTEM VERIFICATIONS

Checking Before Starting Engine

WARNING! Precautions shown in this section must be practiced prior to the day's work, without fail.

Serious injury or death may arise when these checking are neglected.

Further, see "Pre-Start Visible Checks" on page 5-22 for the checking of the crane structure.

In the event where any failure is revealed in such checking, repair it, or contact us or our sales service agency.

Checking Before Turning on the Transmitter

WARNING! For the Checking before Turning ON the Transmitter, ensure that the engine starter key is in the OFF position, as well as the Receiver main switch is OFF.

Otherwise, the engine may un-expectedly starts and cause serious injury or death, while checking the Transmitter.

Perform the following inspections while the Transmitter power is OFF:

- Check the control levers, operation buttons, LCD screen, Accelerator lever and Grip for oily dirt or other soil. Scrub away the dirt with a clean cloth or such, when any.
- Check for foreign bodies such as particles of small stone or sand, caught into small openings in the vicinity of the control levers and/or Accelerator lever.

Remove such particles completely, when any. In the event where such particles are caught in the small openings in the vicinity of the control levers and/or acceleration lever, they may disturb correct operations and cause un-expected motion of the Crane which results a serious accident.

- Check for any cracks and/or damage to the Transmitter enclosure, or impairment to the rubber cover of the operation levers and control buttons. Repair such cracks or damage immediately, when any.

Such cracks or damage may allow water to enter inside and brings troubles or failures to the Transmitter and cause a serious hazard.

- Check the smooth and correct actions of each of the operation lever and control button, and the Accelerator lever, as well as they smoothly return to the each neutral position when the finger is released.

Repair the operation levers, Accelerator lever and/or control button without delay, when any of them show an incorrect action.

Any failure to the operation levers, Accelerator lever and/or control button brings troubles or failures and cause a serious hazard.

- Check the connection cable for any cracks, damages and/or bents, or loose connection or damage in the connector section.

Repair or replace to a new cable, where such cracks, damages, or loose connection is present.

Checking After Turning on the Transmitter

At the moment when the Transmitter is powered ON, make checks on following items:

Verification of the LCD Screen Sign at Power-On

Push the Power switch to turn ON the Transmitter.

At this moment, confirm the mark as shown below, in the LCD screen.

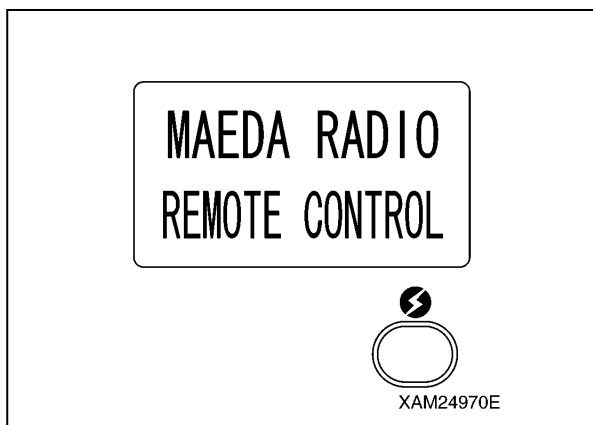


Fig. 4-287

NOTICE: In two seconds of this condition, it automatically enters into the "CRANE MODE".

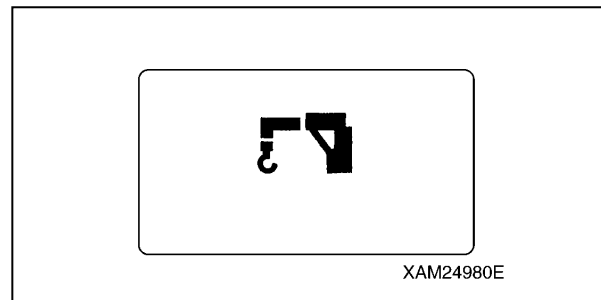


Fig. 4-288

Verification of the LCD Screen Sign at the "Crane Mode"

1. Compare the corresponding values in the Transmitter and Moment limiter, i.e. "AL" to "Actual Load", "RL" to "Rated Load", and the "bar chart (in the right)" to "Load Factor", to verify each is identical.

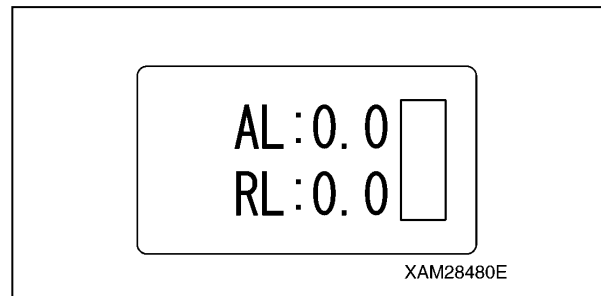


Fig. 4-289

2. Manipulate each control button and verify that each indication in the LCD screen is correct.
3. Verify that "START" is correctly displayed in the LCD screen when the Start/Reset button is pushed.

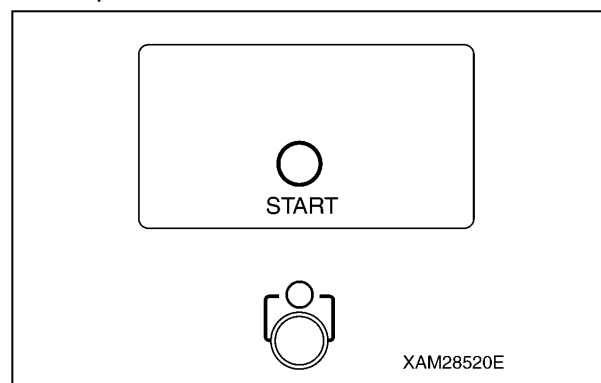


Fig. 4-290

- Also, verify that "STOP" is correctly displayed in the LCD screen when the Stop/EMO button is pushed.

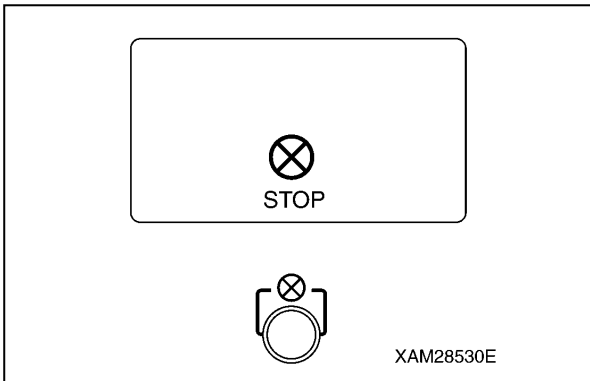


Fig. 4-291

Verification of the LCD Screen Sign at the "Outrigger Mode"

- Push the Power switch to once turn OFF the Transmitter.

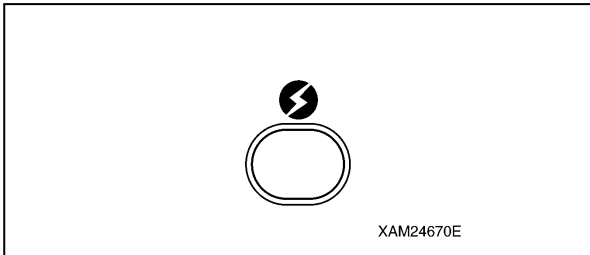


Fig. 4-292

- Push the Power switch again to turn ON the Transmitter. The "Crane mark" is displayed in the LCD screen for 2 seconds around.

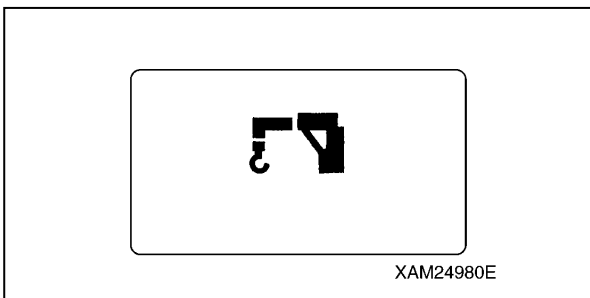


Fig. 4-293

- While the "Crane mark" is shown in the LCD screen (for approx. 2 seconds), push the Speed/Mode button for 2 seconds. The LCD provides the screen for selecting "CRANE MODE" or "OUTRIGGER MODE".

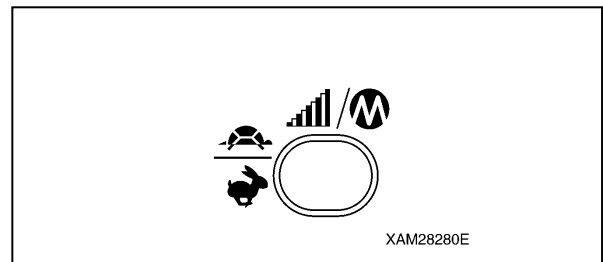


Fig. 4-294

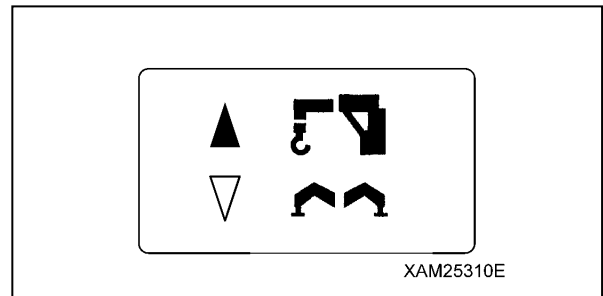


Fig. 4-295

- Use the Hook raising and lowering Lever and shift the cursor (▲ or ▼), and push the Setting button when the cursor points out the "OUTRIGGER".

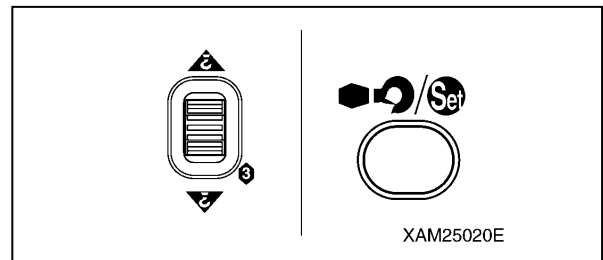


Fig. 4-296

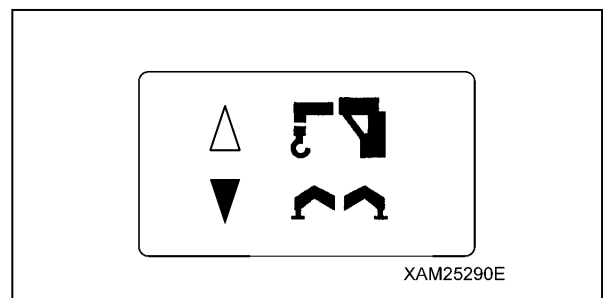


Fig. 4-297

Here, confirm that the "Outrigger mark" is exhibited, then it enters into the "Ground setting mode", soon after.

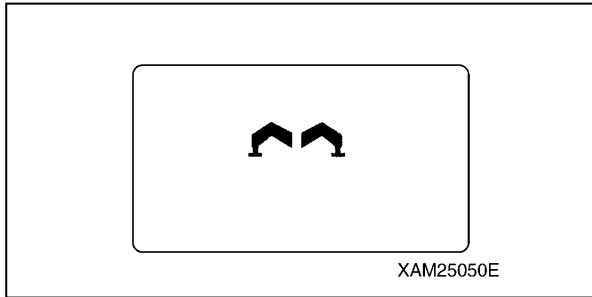


Fig. 4-298

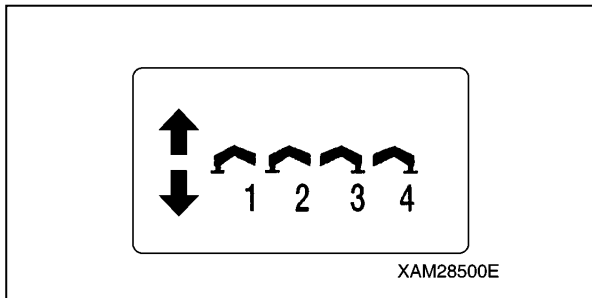


Fig. 4-299

5. Manipulate each operation lever and verify that each indication in the LCD screen is correct.

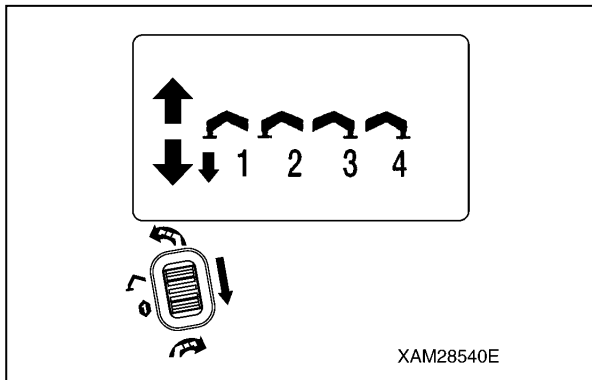


Fig. 4-300

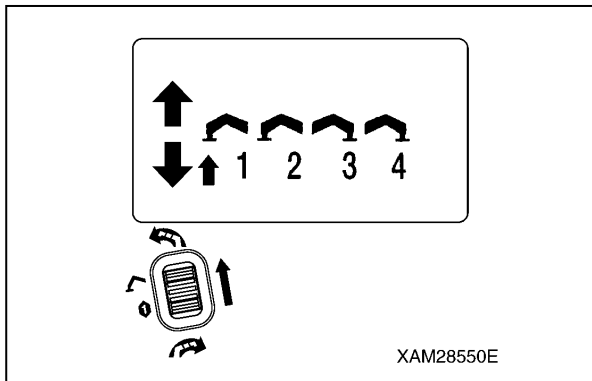


Fig. 4-301

6. To shift to "Extension mode", push the Speed/Mode button, while the LCD screen shows the "Ground setting mode".

Here, confirm that the "Outrigger Extension mode" is exhibited.

NOTICE: Switching between "Outrigger Extension mode" and "Outrigger Ground setting mode" is alternately by each push of the Speed/Mode button.

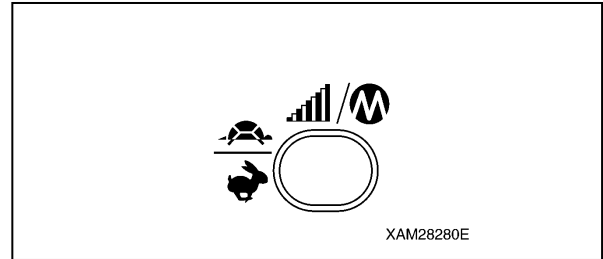


Fig. 4-302

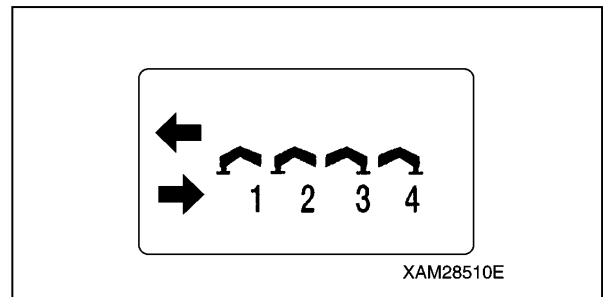


Fig. 4-303

7. Manipulate each operation lever and verify that each indication in the LCD screen is correct.

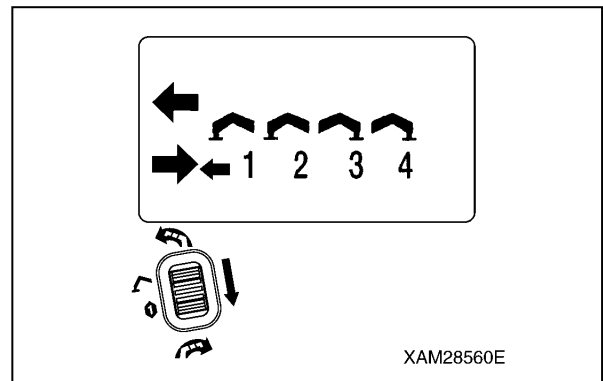


Fig. 4-304

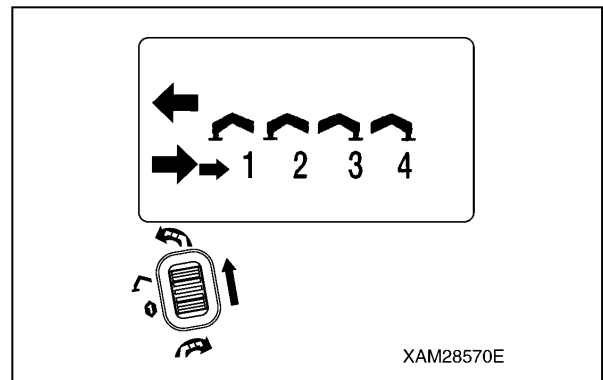


Fig. 4-305

Checking Receiver

Perform the following inspections:

- Check the Control Box (1), Main Switch (2), Monitor display (3), and Receptacle (4) for oily dirt or other soil. Scrub away the dirt with a clean cloth or such, when any.

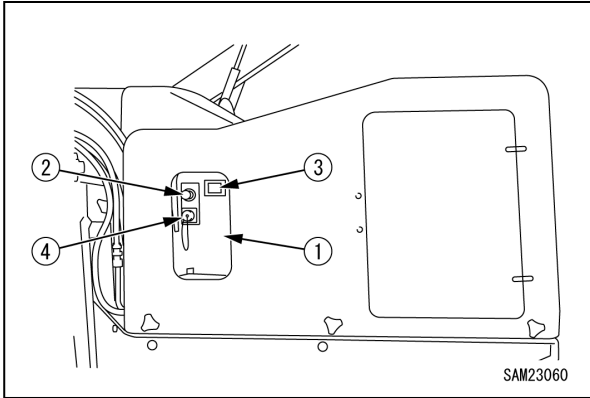


Fig. 4-306

- Check for any cracks and/or damages to the Control Box (1) or Monitor display (3). Repair such cracks or damage immediately, when any. Such cracks or damages may allow water to enter inside and brings troubles or failures to the Receiver, then cause a serious hazard.
- Check the Main switch (2) and Receptacle (4) for the loose conditions or damages. Repair immediately when such loose conditions or damages are found. Such loose conditions or damages may cause errors or faults of the Receiver, which results a serious hazard.
- Toggle the Main switch (2) to ON and OFF alternately to verify that power is correctly turned ON or OFF.

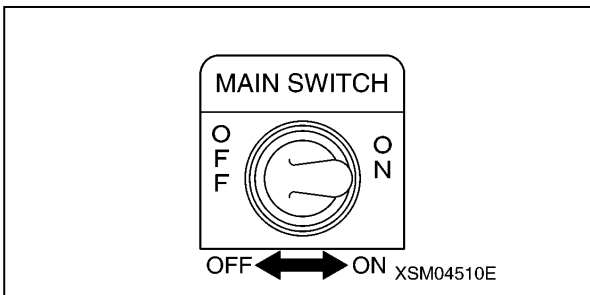


Fig. 4-307

- Turn ON the Transmitter, then toggle the Main switch (2) to ON, in addition, and confirm next that the two dots in the Monitor display as shown in the figure in the light blink.

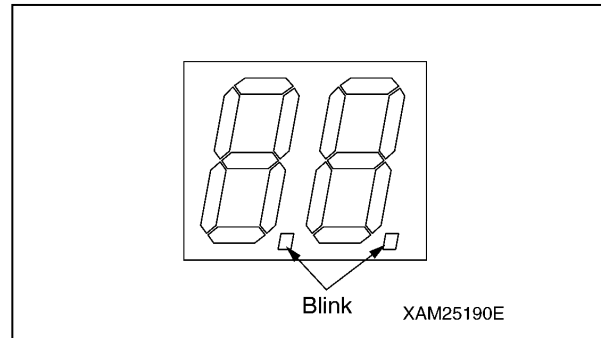


Fig. 4-308

NOTICE: In the condition that the Transmitter is not powered ON, or reception has an error, the Monitor display shows the error code, "E2", when the Receiver is turned ON.

Checking After Starting Engine

WARNING! Precautions shown in this section must be practiced prior to the day's work, without fail.

Serious injury or death may arise when these inspections are neglected.

Further, see "Pre-Start Visible Checks" on page 5-22 for the checking of the crane structure.

Whenever any failures are revealed in such inspections, repair them, or contact us or our sales service agency.

Verification for the Engine Start and Stop

WARNING!

- Ensure that the boom and outriggers are in the stow position, entirely . In case where they are not in those positions, manipulate applicable levers of the Crane to make them stowed. Otherwise, the Transmitter operation may cause damages to the Crane or tipping that results serious injury or death.
- The Crane is inoperable in such event where the LCD screen in the Transmitter shows an error message or the Monitor display in the Receiver shows an error code.

Without fail, examine the cause of the error and perform appropriate service when any fault is identified, or contact us or our sales service agency.

Checking Engine Start Operation

1. Position the Starter Switch of the Crane to ON.
2. Next, push the Power switch of the Transmitter, to power ON.
3. Then turn ON the Main switch of the Receiver.

4. Here, push the Horn button and confirm that the horn toots.

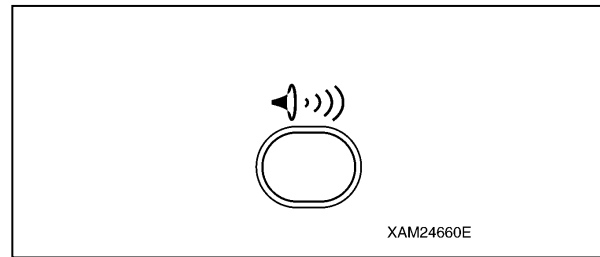


Fig. 4-309

5. Use the Start/Reset button to check that the engine starts properly.
6. Check whether the indication as "START" appears in the LCD screen, at that time.

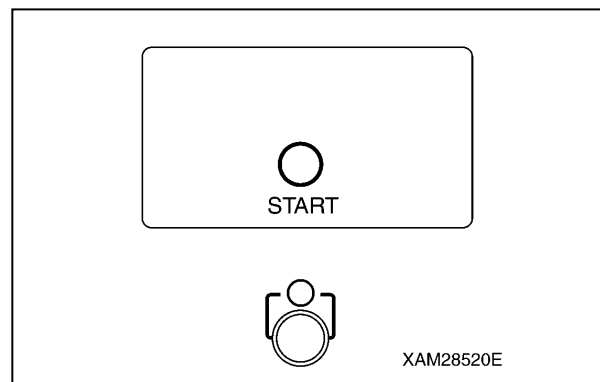


Fig. 4-310

Checking Engine Emergency Stop Operation

1. When the engine is started as in "Checking Engine Start Operation" on page 4-111, try the Stop/EMO button to confirm that the engine absolutely stops.
2. Here, check whether the indication as "STOP" appears in the LCD screen. Further, confirm that the Monitor display in the Receiver shows the error code, "E1", at that time.

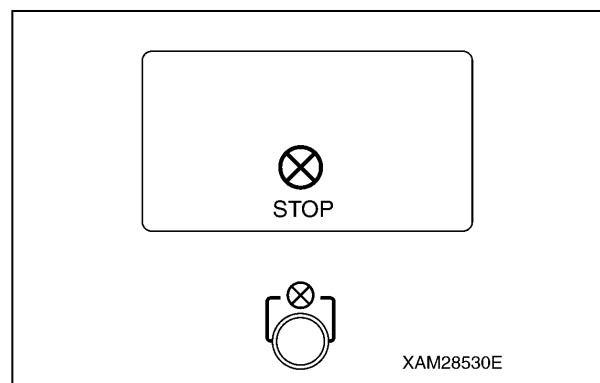


Fig. 4-311

Checking "Outrigger Mode" Operation

WARNING! The Crane is inoperable in such event where the LCD screen in the Transmitter shows an error message or the Monitor display in the Receiver shows an error code.

Without fail, examine the cause of the error and perform appropriate service when any fault is identified, or contact us or our sales service agency.

1. Position the Starter switch of the Crane to ON.
2. Push the Power switch of the Transmitter to power ON.
3. Turn ON the Main switch of the Receiver.
4. Switch the operation mode to the "OUTRIGGER MODE" and confirm that "Ground setting mode" is indicated in the LCD screen.

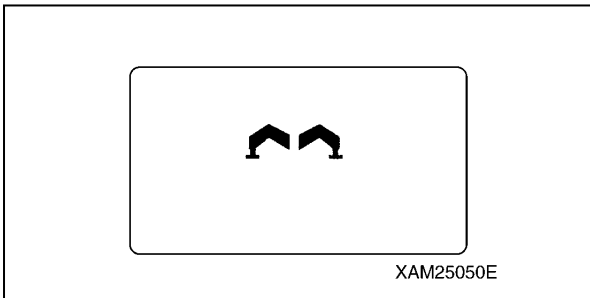


Fig. 4-312

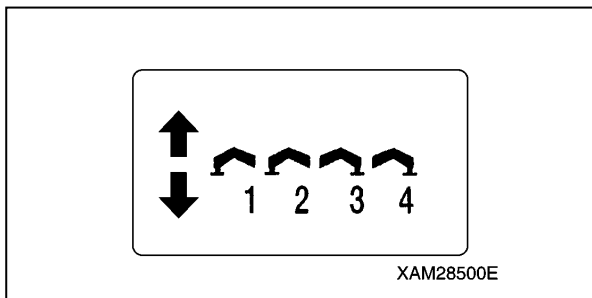


Fig. 4-313

5. Push the Speed/Mode button. Here, confirm that the "Outrigger Extension mode" is exhibited. Switching between "Outrigger Extension mode" and "Outrigger Ground setting mode" is alternately by each push of the Speed/Mode button.



Fig. 4-314

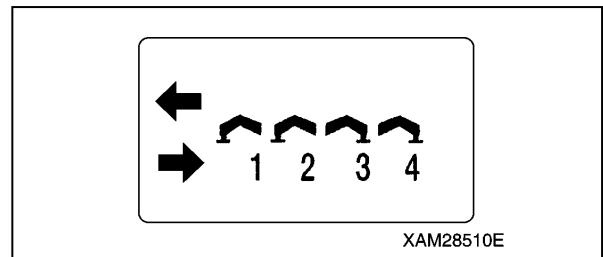


Fig. 4-315

6. Push the Start/Reset button and start the engine.
7. Use the Slewing/No.1 Outrigger operation lever, to the both "Extend (lower)" and "Retract (upper)" area, and check that the No. 1 outrigger follows the lever operation.

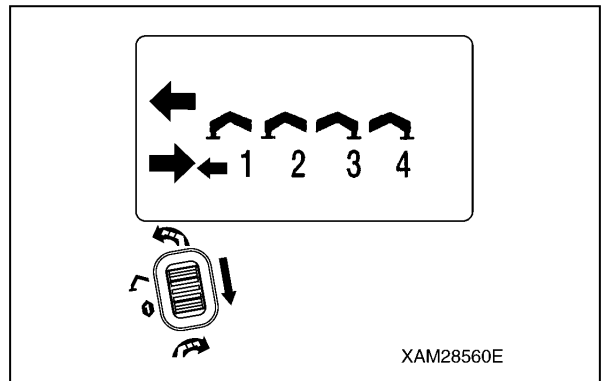


Fig. 4-316

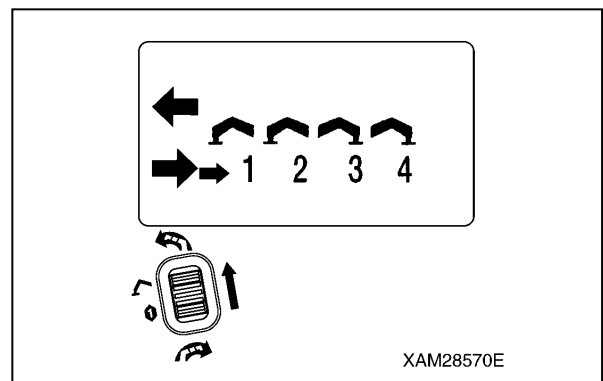


Fig. 4-317

8. During the control lever manipulation, slowly pull and release the Accelerator lever and confirm that the speed of outrigger action follows the acceleration ratio.

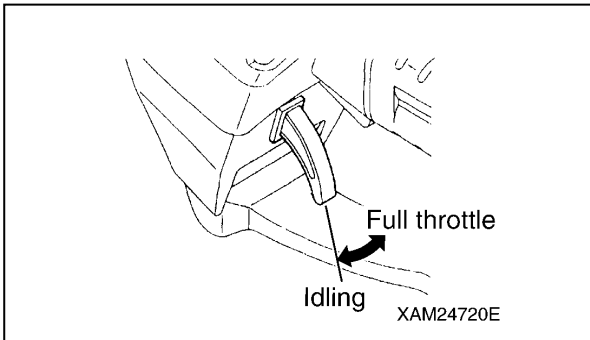


Fig. 4-318

9. Try other outriggers, No. 2 to 4 by the same manipulation and confirm that the outriggers correctly respond to the lever control. Lastly, manipulate all the outrigger operation levers to "Extend (lower)".
10. Use the Speed/Mode button to switch to the "Ground setting mode".



Fig. 4-319

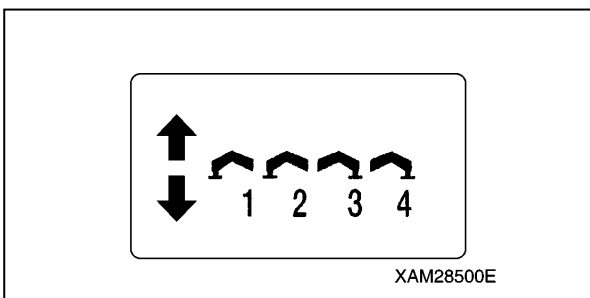


Fig. 4-320

11. Use the Slewing/No.1 Outrigger operation lever, to the both "Extend (lower)" and "Retract (upper)" area, and check that the No. 1 outrigger follows the lever operation.

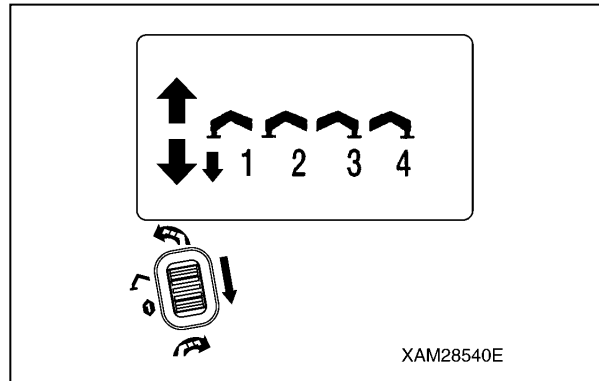


Fig. 4-321

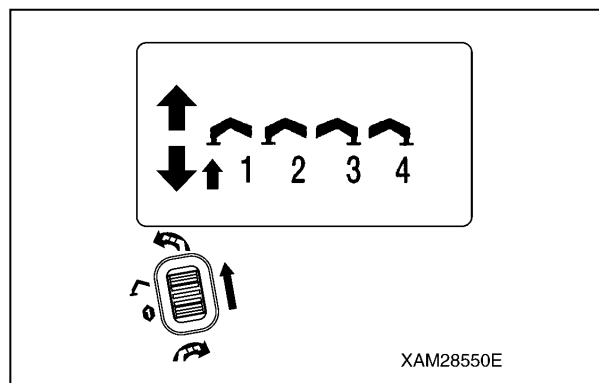


Fig. 4-322

12. During the control lever manipulation, slowly pull and release the Accelerator lever and confirm that the speed of outrigger action follows the acceleration ratio.

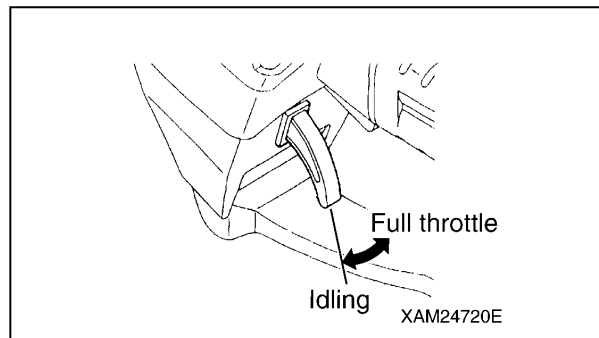


Fig. 4-323

13. Try other outriggers, No. 2 to 4 by the same manipulation and confirm that the outriggers correctly respond to the lever control.

Checking "Crane Mode" Operation

WARNING!

- Ensure that all the outriggers are securely settled, before starting crane operations. Any crane operations where outriggers are improperly used cause the tip of the Crane or other serious accidents.
- The Crane is inoperable in such event where the LCD screen in the Transmitter shows an error message or the Monitor display in the Receiver shows an error code.

Without fail, examine the cause of the error and perform appropriate service when any fault is identified, or contact us or our sales service agency.

1. Start the engine by the Starter switch of the Crane.
2. See "Before Crane Operations" on page 4-62 and "Crane Operation Posture" on page 4-63 to configure the Crane as shown in the figure.

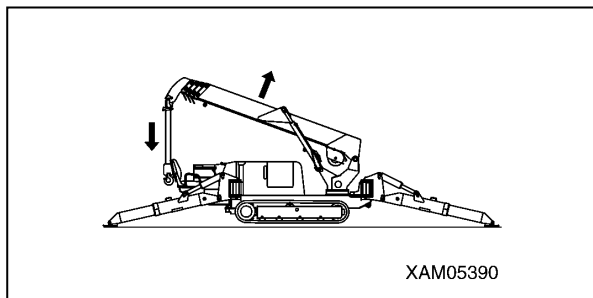


Fig. 4-324

3. Push the Power switch of the Transmitter to power ON.
4. Then turn ON the Main switch of the Receiver.
5. Enter into "CRANE MODE"; confirm that the indication as "CRANE MODE" is displayed in the LCD screen.

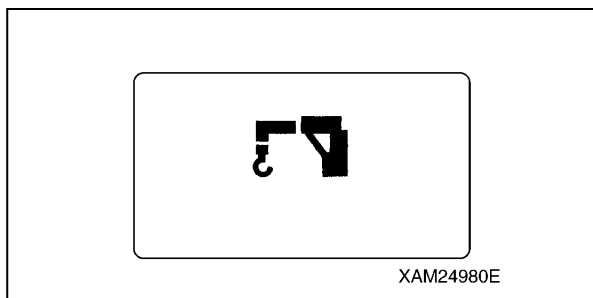


Fig. 4-325

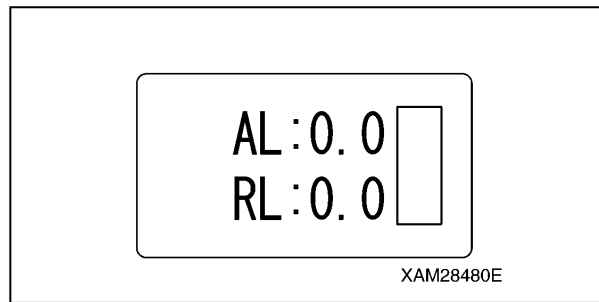


Fig. 4-326

6. Use the Boom derricking lever to the both "Raise (upper)" and "Lower (lower)" area, pull the Accelerator lever and check that the boom follows the lever operation.

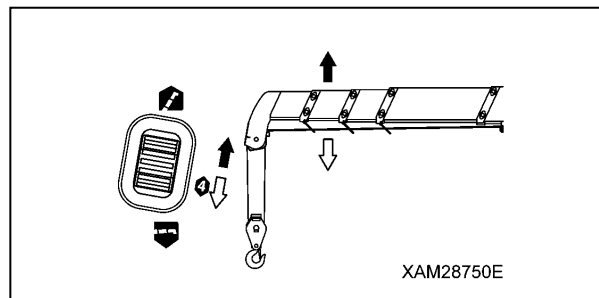


Fig. 4-327

7. Raise the boom to the sufficient angle (approximately 60 degree) by the Boom derricking lever, pushing to the "Raise (upper)" area.

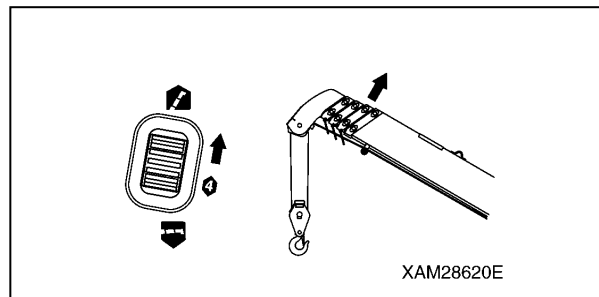


Fig. 4-328

8. During the Hook raising and lowering lever manipulation, to the "Raise (upper)" and "Lower (lower)" area respectively, pull the Accelerator lever and check that the hook follows the lever operation.

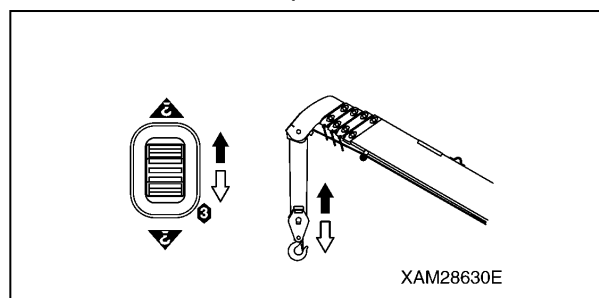


Fig. 4-329

- Using the Hook raising and lowering lever to the "Lower (lower)" area, lower the hook as much as possible.

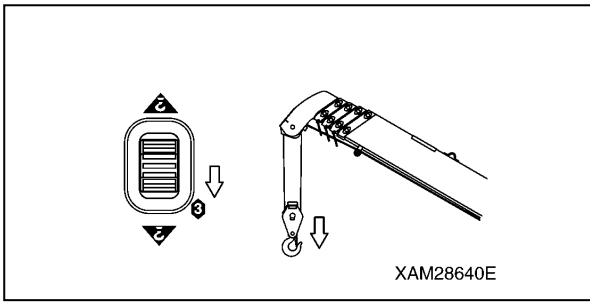


Fig. 4-330

- During the Boom telescoping lever manipulation, to the "Extend (upper)" and "Retract (lower)" area respectively, pull the Accelerator lever and check that the boom follows the lever operation.

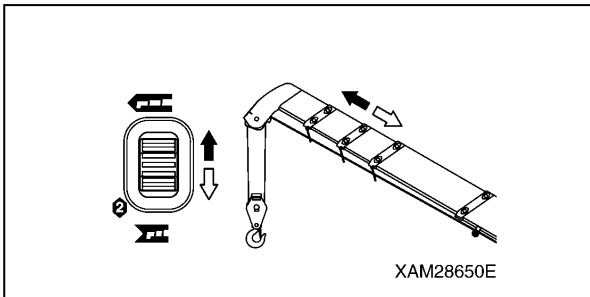


Fig. 4-331

- Using the Hook raising and lowering lever to the "Raise (upper)" area, hoist the hook.

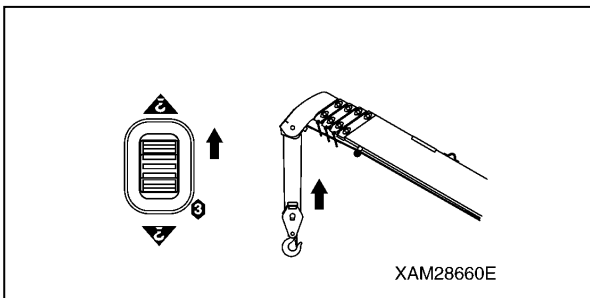


Fig. 4-332

- During the Slewing lever manipulation, to the "Counterclockwise (left) (upper)" and "Clockwise (right) (lower)" area respectively, pull the Accelerator lever and check that the Crane follows the lever operation. In addition, practice a slew around 360 degrees or more to check any abnormal conditions

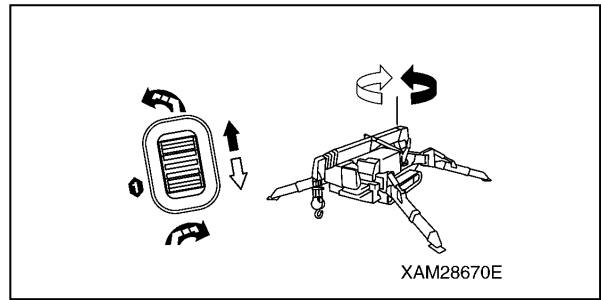


Fig. 4-333

- During each control lever manipulation of 6. through 12., above, slowly pull and release the Accelerator lever and confirm that the speed of each action follows the acceleration ratio.

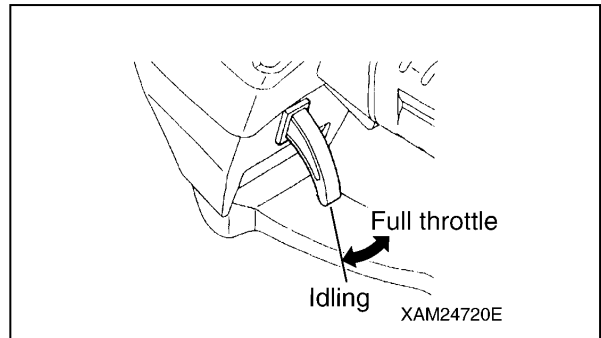


Fig. 4-334

- During each control lever manipulation of 6. through 12., above, push the Speed/Mode button, then try both "Micro speed command" and "Enhanced speed command" and confirm the speed of each operation corresponds to respective controls of "Micro speed command" and "Enhanced speed command".

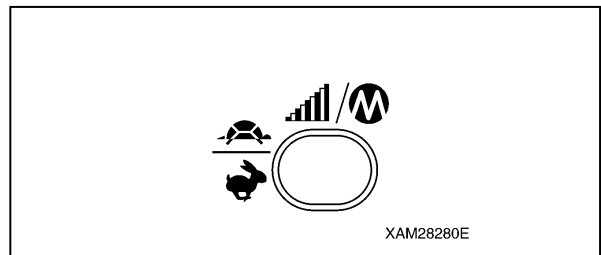


Fig. 4-335

- Keep pushing the Hook Stow/Setting button and pull the Accelerator lever to verify the hook is stowed properly.

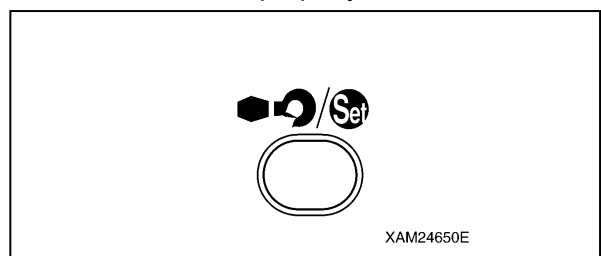


Fig. 4-336

REMOTE CONTROL OPERATION

WARNING!

- In no event, attempt to disassemble or modify the Transmitter or Receiver, which may cause an electrical shock or a fire.
- Avoid to make an impact to the Transmitter by dropping or hitting. A damaged part of the enclosure allows water to enter inside that brings its troubles or failures and cause a serious hazard, such as malfunction or electrical shock.

In such event of dropping and damage, send the Transmitter to us or our sales service agency.

- In no event, water-wash the Transmitter or Receiver; that allows water to enter inside and brings its troubles or failures and cause a serious hazard, such as malfunction or electrical shock.
- Both remote control operation and manual operation at a time are not allowed. That may cause the un-expected behavior of the Crane and results a serious hazard. The Crane must be operated by only in either method. (Manual operation is not available, when the remote control is active.)
- Prior to start the remote control operations, always conduct inspections of both the Transmitter and Receiver, in accordance with "REMOTE CONTROL SYSTEM VERIFICATIONS" on page 4-106.

Cautions Before Operation

1. So that dropping the Transmitter is prevented, hook one end of the hook belt (16) to the Transmitter and attach another end to the operator's waist belt, or such.

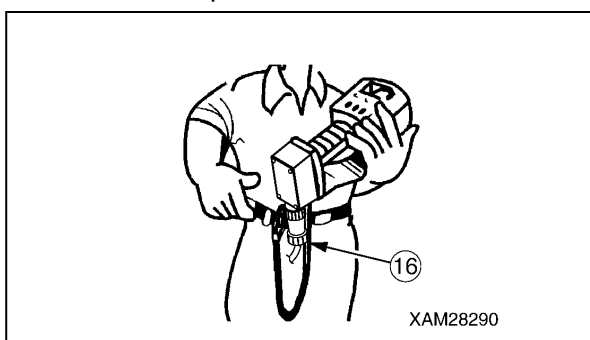


Fig. 4-337

2. Always conduct inspections of both the Transmitter and Receiver, in accordance with "REMOTE CONTROL SYSTEM VERIFICATIONS" on page 4-106.
3. Make sure that the receptacles (14) in the both ends of the connection cable are secured to both the Transmitter and Receiver, respectively.

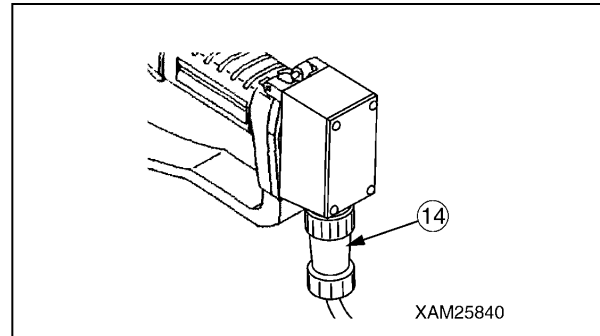


Fig. 4-338

NOTICE:

- When it is required to change the initial values of settings such as the contrast of the Transmitter LCD screen, the light, or the OFF timer, once switch to "A MODE" for adjustment.
- In the event that the remote control operation is discontinued for the length of the "Auto shut - OFF time" or more, during the crane operation, the Transmitter power will be automatically cut. To resume the remote control operation, turn ON the Transmitter and set each items for the operation mode, again.

Operation in Outrigger Mode

WARNING!

- Check smooth and correct actions of each operation lever of the Transmitter, and they smoothly return to each neutral position when the finger is released.
- Each operation lever of the Transmitter will be blocked by its stopper when it is moved full. When it is blocked, do not attempt to push more, otherwise it may damage the Transmitter to cause its fault and results a serious accident.

- To toggle each operation lever to the opposite side, or to use another lever, always release the Accelerator lever, each time. Also, to operate the outrigger, manipulate the operation lever first, then pull the Accelerator lever. To stop the actuation of outriggers, release your finger from the Accelerator lever, first, then discharge the operation lever.
- For the outrigger operations, always keep the engine speed in the low or middle range. Such operation in the high speed range makes outriggers actuate too quickly, which may tip the Crane and result in a serious hazard.
- For the outrigger operations, always configure the Crane to the stow position. In the condition that the boom is raised or any load is craned, it may cause a serious accident, such as tipping of the Crane.
- For the outrigger operations, always ensure that the position pin of each outrigger is securely inserted. In the event where the pins are missing, the Crane may be tipped and it results in a serious hazard.
- For the installation of outriggers, always extend them first in the "Extension mode", then switch the mode to "Ground setting mode". Lift each outrigger equally and gradually, until the Crane is properly elevated. For the stowing of Outriggers, lower each outrigger equally and gradually, until the Crane is grounded in the "Ground setting mode", then switch to the "Extension mode" to retract them. Unless otherwise this order is followed, that may cause to tip the Crane and bring a serious accident.

1. Ensure that the Main switch of the Receiver is in the OFF position.
2. Start the engine by the Starter switch of the Crane.
3. Push the Power switch of the Transmitter to power ON.
Confirm that the LCD screen shows the mark as the figure and the "CRANE MODE" is automatically provided.

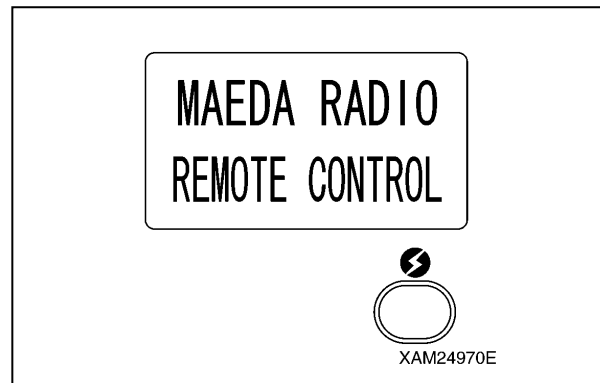


Fig. 4-339

4. Then turn ON the Main switch of the Receiver.

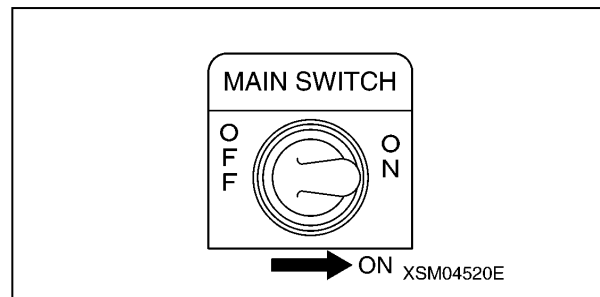


Fig. 4-340

The voice message will call you as "Remote control is ready".

NOTICE: When the Main switch of the Receiver is turned ON, the abnormal signal detector circuit works for 3 to 4 seconds. During this moment, the Crane is not ready for operations.

NOTICE: This Crane equips four sets of outriggers and number labels (1) to (4) are appended on each. These labels correspond to the number of each operation lever in the Transmitter.

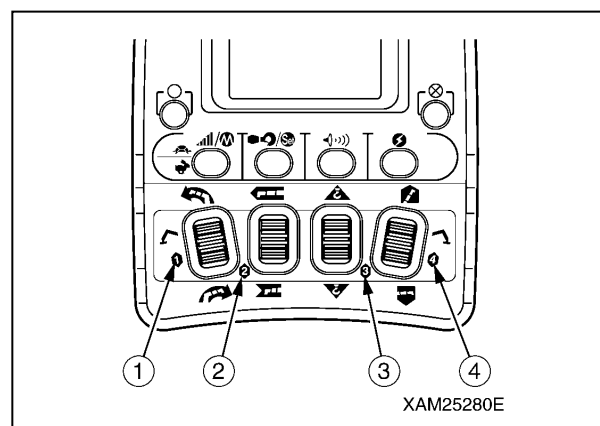


Fig. 4-341

Outrigger Setting

1. In accordance with "Procedure in the Operation Mode" on page 4-104, enter into the "OUTRIGGER MODE".

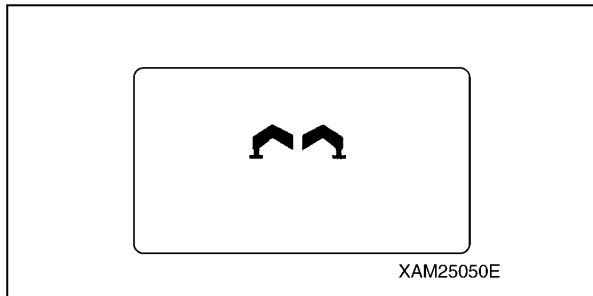


Fig. 4-342

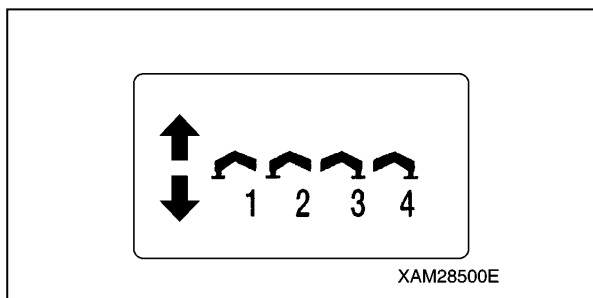


Fig. 4-343

2. Push Speed/Mode button in the mode condition of above 1.
The operation mode is switched to "Outrigger Extension mode".

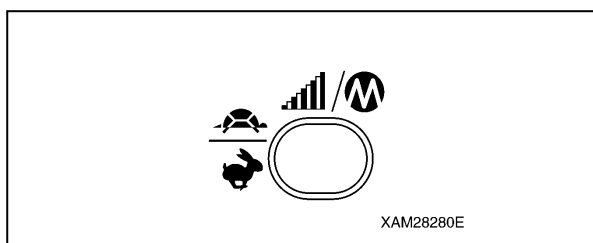


Fig. 4-344

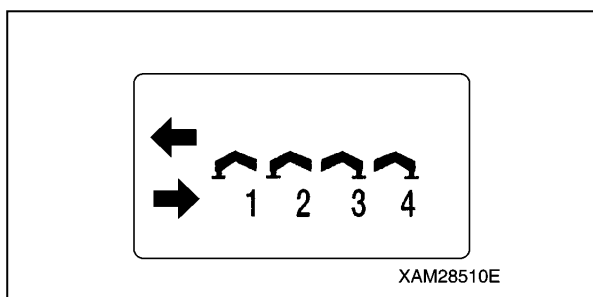


Fig. 4-345

3. Turn one of the outrigger operation levers to "Extend (lower)" and pull the Accelerator lever slowly.

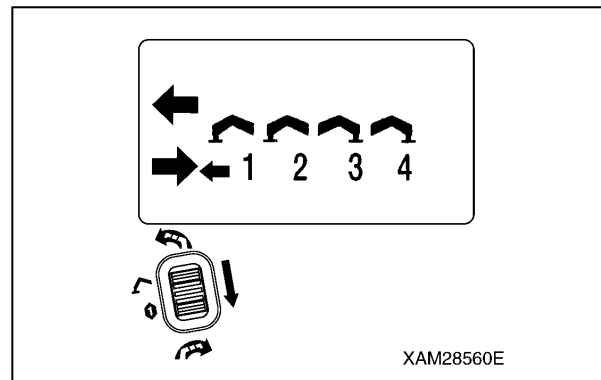


Fig. 4-346

4. When the outrigger is extended to the proper position, slowly release the accelerator lever, then release the outrigger operation lever to return to its neutral position.

NOTICE: Repeat the same process to the other three outriggers, so that all of the four outriggers are extended to the proper position.

5. Push Speed/Mode button in the mode condition of above 4.

The operation mode is switched to "Ground setting mode".

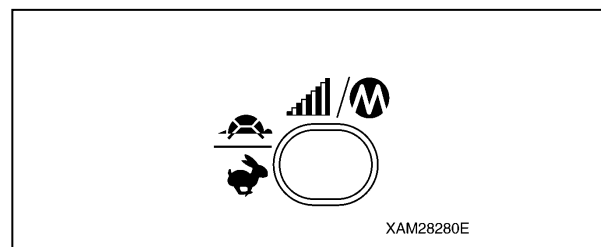


Fig. 4-347

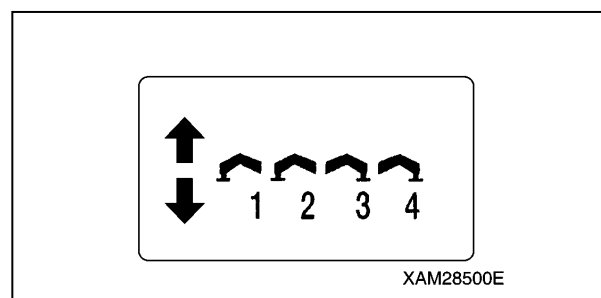


Fig. 4-348

- Turn one of the outrigger operation levers to "Extend (lower)" and pull the Accelerator lever slowly.

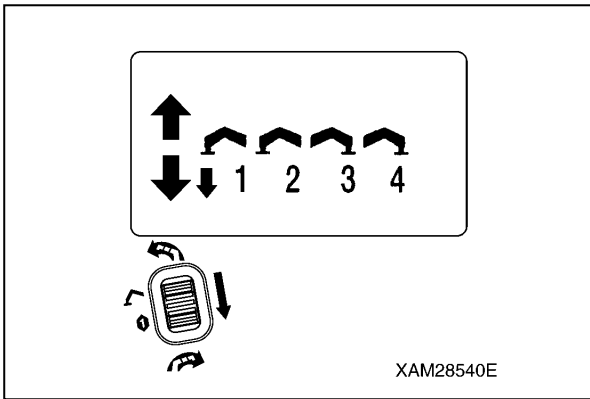


Fig. 4-349

NOTICE: Repeat the same process to the other three outriggers and lift all the four outriggers equally and gradually, so that the Crane is properly elevated.

- When the Crane is elevated "approximately 50mm", slowly release the Accelerator lever, then release the outrigger operation lever to return to the neutral position.

Outrigger Stowage

- In accordance with "Procedure in the Operation Mode" on page 4-104, enter into the "OUTRIGGER MODE".

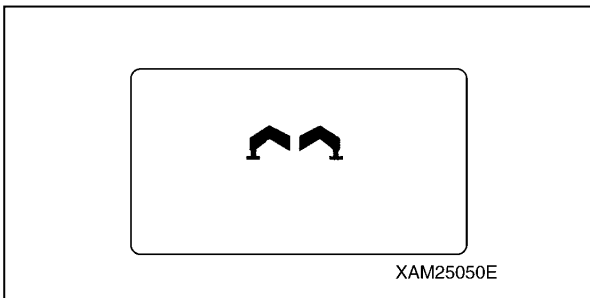


Fig. 4-350

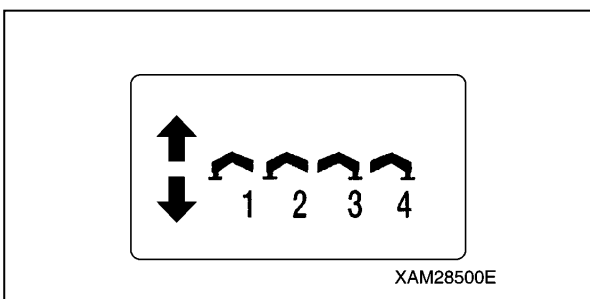


Fig. 4-351

- Turn one of the outrigger operation levers to "Retract (upper)" and pull the Accelerator lever slowly.

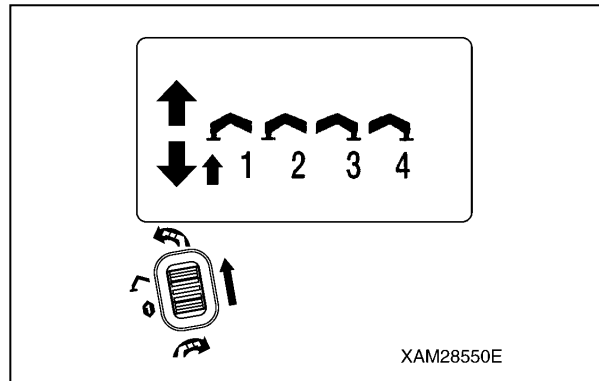


Fig. 4-352

- When the Crane touches the ground, slowly release the acceleration lever, then release the outrigger operation lever to return to its neutral position.

NOTICE:

- Repeat the same process to the other three outriggers and lower all the four outriggers equally and gradually, so that the Crane is grounded.
 - After the Crane is grounded, lower all the four outriggers completely.
- Push Speed/Mode button in the mode condition of above 3. The operation mode is switched to "Outrigger Extension mode".

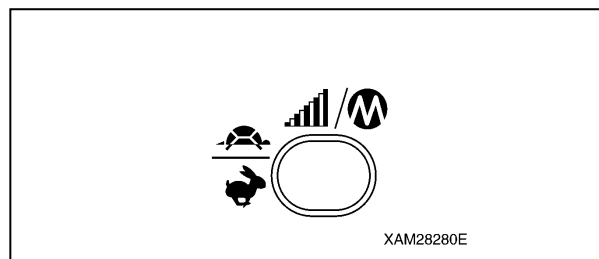


Fig. 4-353

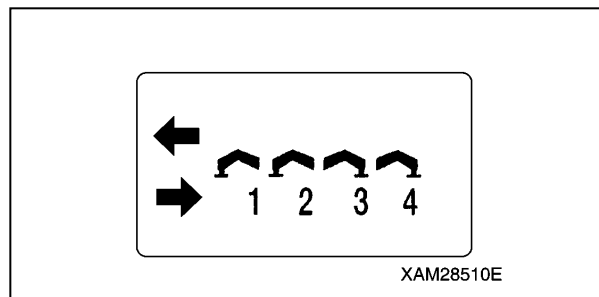


Fig. 4-354

5. Turn one of the outrigger operation levers to "Retract (upper)" and pull the Accelerator lever slowly.

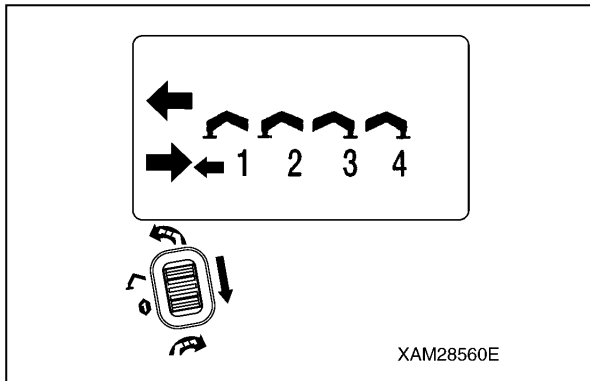


Fig. 4-355

6. When the outrigger is completely retracted, slowly release the Accelerator lever, then release the outrigger operation lever to return to its neutral position.

NOTICE: Repeat the same process to the other three outriggers to retract all the four outriggers completely and stow them to the proper position.

Operation in Crane Mode

WARNING!

- Ensure that all the outriggers are properly installed.
Where outriggers are improperly installed, it may result a serious hazard, such as a Crane tipping.
- During crane operations, always refer to the portable rated total load chart and avoid over-loaded operations. Operations in over-loaded conditions may damage or tip the Crane, which results a serious hazard.
- Check the smooth and correct actions of each operation lever of the Transmitter, and that they smoothly return to the each neutral position when the finger is released.
- Each operation lever of the Transmitter will be blocked by its stopper when it is moved full. When it is blocked, do not attempt to push more, otherwise it may damage the Transmitter and cause its fault; it may result a serious accident.

- To toggle each operation lever to the opposite side, or to use another lever, always release the Accelerator lever, each time. Also, to operate the Crane, manipulate the operation lever first, then pull the Acceleration lever, next. To stop the operation of the Crane, release your finger from the Accelerator lever, first, and next discharge the operation lever.
- Always actuate the Accelerator lever with caution to the acceleration rate. It must be properly controlled to keep the appropriate crane operation speed and avoid any abrupt motion. Such abrupt acceleration or deceleration especially while a load is hung will make a large impact to the Crane and may result a serious hazard such as Crane tipping or damage.
- During a load is hung, do not attempt to perform multiple operation at a time, the hook raising and the boom derricking, for instance. That may cause abrupt change of the load condition and cause a serious hazard such as the Crane tipping or damage.

1. Ensure that the main switch of the Receiver is in the OFF position.
2. Start the engine by the Starter switch of the Crane.
3. Push the Power switch of the Transmitter to power ON.
Confirm that the LCD screen shows the mark as the figure and the "CRANE MODE" is automatically provided.

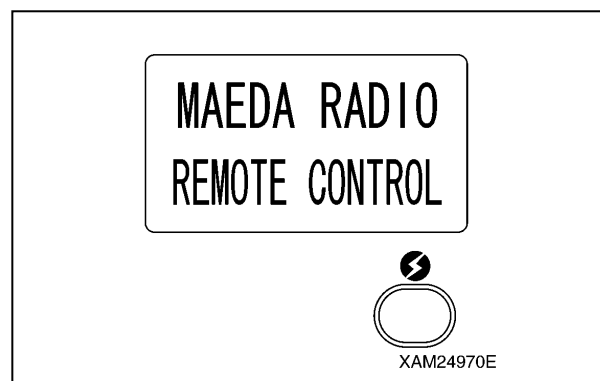


Fig. 4-356

4. Then turn ON the Main switch of the Receiver.
The voice message will call you as "Remote control is ready".

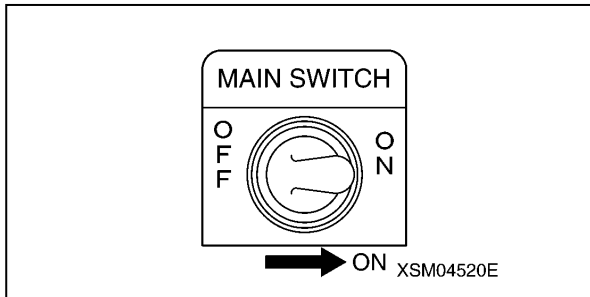


Fig. 4-357

NOTICE: When the main switch of the Receiver is turned ON, the abnormal signal detector circuit works for 3 to 4 seconds. During this moment, the Crane is not ready for operations.

NOTICE: Four of the Crane operation levers are provided. Each controls the following operation, respectively.

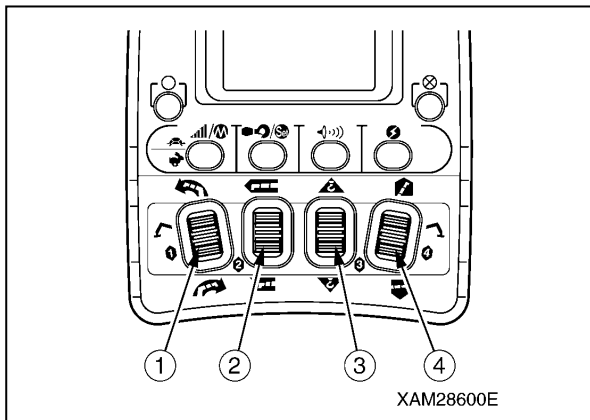


Fig. 4-358

- (1): Slewing (upper: counterclockwise (left), lower: clockwise (right))
 (2): Boom telescoping (upper: extend, lower: retract)
 (3): Hook raising and lowering (upper: raising, lower: lowering)
 (4): Boom derricking (upper: raising, lower: lowering)

Slewing Operation

WARNING! At the slewing operation, actuate the Accelerator lever carefully and always keep in low speed.

Also, actuate the Accelerator lever slowly and delicately to avoid abrupt slewing.

Such abrupt acceleration or deceleration especially while a load is hung will make a large impact to the Crane and may result a serious hazard such as Crane tipping or damage.

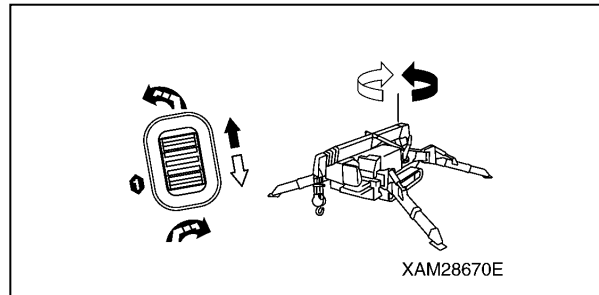


Fig. 4-359

Slew Clockwise (right)

Push the Slewing/No.1 outrigger operation lever to "Clockwise (right) (lower)", then pull the Accelerator lever slowly.

The boom slews clockwise (right), provided that you look down the Crane from the sky.

Slew Counterclockwise (left)

Push the Slewing/No.1 outrigger operation lever to "Counterclockwise (left) (upper)", then pull the Accelerator lever slowly.

The boom slews counterclockwise (left), provided that you look down the Crane from the sky.

Stop Slewing

Release the Accelerator lever slowly, then release the Slewing/No.1 outrigger operation lever to return it to its neutral position.

The boom stops slewing.

Boom Telescoping

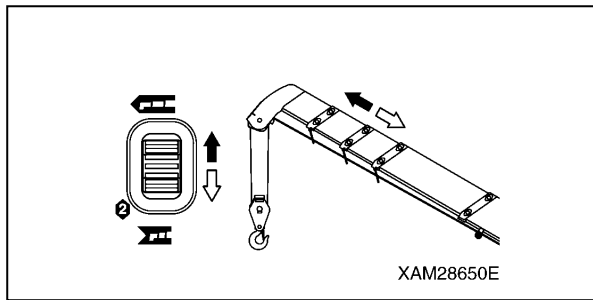


Fig. 4-360

Boom "Extending"

Push the Boom telescoping/No.2 outrigger operation lever to "Extend (upper)", then pull the Accelerator lever slowly.

The boom extends.

Boom "Retracting"

Push the Boom telescoping/No.2 outrigger operation lever to "Retract (lower)", then pull the Accelerator lever slowly.

The boom retracts.

Stop Telescoping

Release the Accelerator lever slowly, then next release the Boom telescoping/No.2 outrigger operation lever to return it to the neutral position.

The boom stops telescoping.

Hook Raising and Lowering Operation

WARNING!

- In the event of "Over-winding alarming" or "Automatic cut out" during the hook raising operation, immediately suspend winding. Otherwise, it may cause a damage to the Crane, or the wire-rope is broken which result dropping off the hook or load; a serious accident may happen.
- Continuing the hook lowering in the condition that the load already reached the ground, the random wind of the wire-rope will happen. This may damage the wire rope or shorten its life badly. Further, there is some risk that the wire-rope may bite itself which prevents any more winching. During the hook lowering, always take good care not to cause such random wind.
- The hook is raised or lowered by the boom telescoping or derricking, as well. The same attention must be paid as the hook raising and lowering by the winch operation.

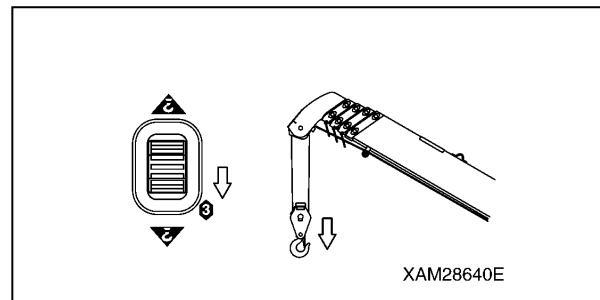


Fig. 4-361

Hook Raising

Push the Hook raising and lowering/No.2 outrigger operation lever to "Raise (upper)", then pull the Accelerator lever slowly.

The hook starts to be raised.

Hook Lowering

Push the Hook raising and lowering/No.2 outrigger operation lever to "Lower (lower)", then pull the Accelerator lever slowly.

The hook starts to be lowered.

Stop Raising or Lowering

Release the Accelerator lever slowly, then release Hook raising and lowering/No.2 outrigger operation lever to return it to the neutral position.

The hook stops raising or lowering.

Boom Derricking Operation

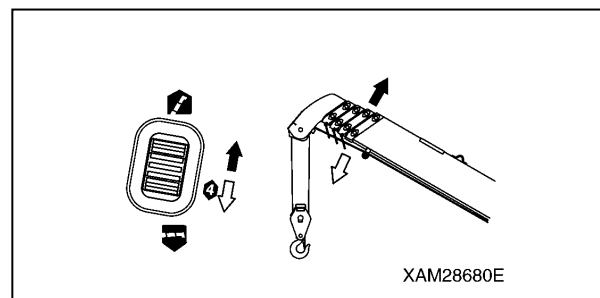


Fig. 4-362

Boom Raising

Push the Boom derricking/No.4 outrigger operation lever to "Raise (upper)", then pull the Accelerator lever slowly.

The boom is raised.

Boom Lowering

Push the Boom derricking/No.4 outrigger operation lever to "Lower (lower)", then pull the Accelerator lever slowly.

The boom is lowered.

Stop Boom Derricking

Release the Accelerator lever slowly, then release the Boom derricking/No.4 outrigger operation lever to return it to the neutral position.

The boom stops derricking.

Automatic Hook Stow Function

CAUTION: This automatic hook stow function is not available in the "Micro Speed mode" or "Enhanced Speed mode".

To stow the hook, always cancel either the "Micro Speed mode" or "Enhanced Speed mode".

For more information, see "Set-Up/Cancel Micro Speed and Enhanced Speed Mode" on page 4-124.

1. Configure the boom to the travelling condition and push the Hook raising and lowering/No.2 outrigger operation lever to "Raise (upper)", then pull the Accelerator lever.
Keep raising the hook until it touches to the over winding detector weight and automatically stops.

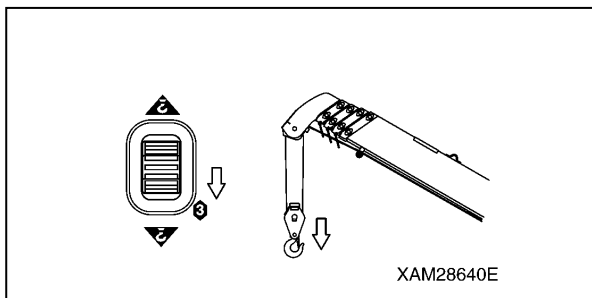


Fig. 4-363

NOTICE: At the time the hook automatically stops, the voice message will call out, "Danger rope over winding".

2. When the hook automatically stops, push the Hook stow/Setting button.
LCD screen in the Transmitter displays "HOOK 1".

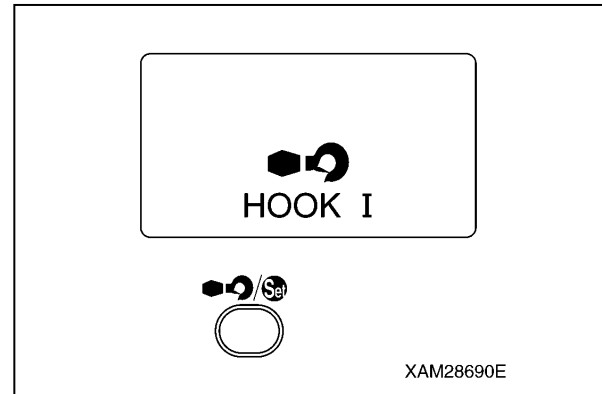


Fig. 4-364

NOTICE: When you push the Hook stow/Setting button, the voice message will instruct you "Do not store hook until boom is in travel mode".

3. Keep pushing the Hook stow/Setting button, pull the Accelerator lever slowly.
The hook (4) will be raised to the proper stow position.

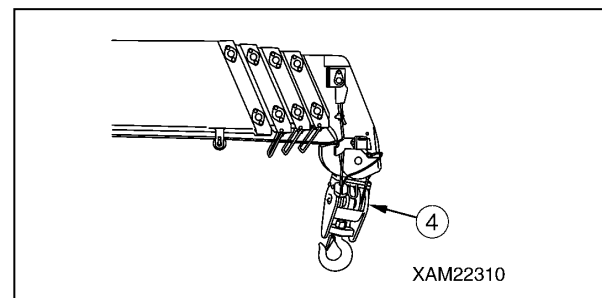


Fig. 4-365

NOTICE: This hook stowage operation is performed under the engine idling condition, regardless of the Accelerator lever rate.

4. When the hook (4) is settled to its position, release the Accelerator lever, then release your finger from the Hook stow/Setting button.

Set-Up/Cancel Micro Speed and Enhanced Speed Mode

When it is required to operate the Crane in low speed, use the Micro speed mode, which limits the maximum speed of the Crane and facilitates the smoother control in the low speed range. "MICRO SPEED MODE" is available by users' setting.

Contrary, when it is required to enhance the maximum speed of the Crane operation, the "ENHANCED SPEED MODE" is also available.

NOTICE: "MICRO SPEED MODE" is valid only in the "CRANE MODE".

Setting the Micro or Enhanced Speed Mode

Push the Speed/Mode button. Each push will forward the LCD screen indication as shown in the diagram, below: When the indicated mode fits your requirement, carry on the Crane operation in that condition.



Fig. 4-366

Cancel the Micro or Enhanced Speed Mode

Push the Speed/Mode button several times, until LCD screen indication attains the "Normal".

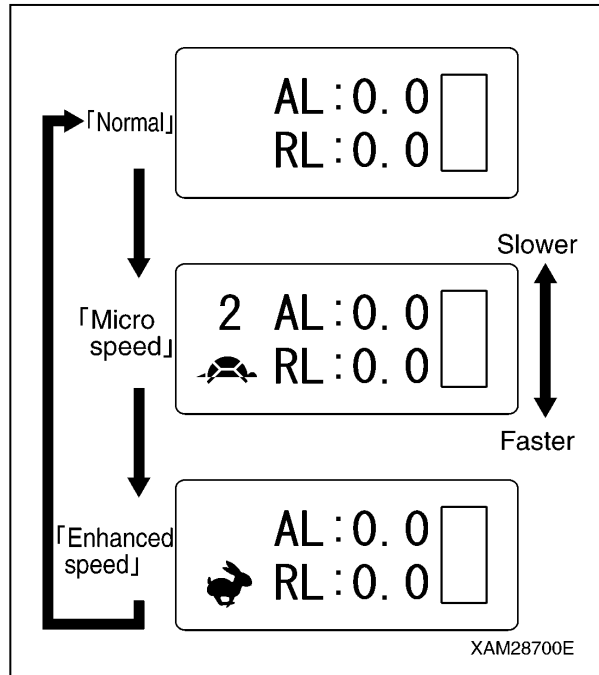


Fig. 4-367

Setting to the Micro Speed Mode

WARNING! Setting to the Micro speed mode requires actual crane operations with the engine running. Before starting the Micro speed mode setting, always ensure that nobody except on business is within the working area.

1. Push the Speed/Mode button several times so that the LCD screen indicates the "MICRO SPEED MODE".

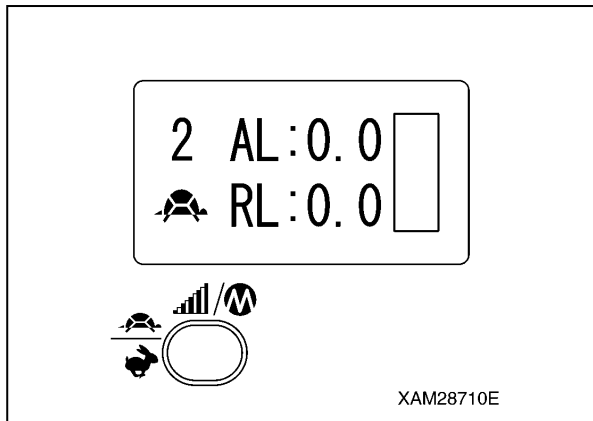


Fig. 4-368

2. Push the Hook stow/Setting button for at least 2 seconds. Indication of "2" in the LCD screen is high-lighted and it enters into the "MICRO SPEED MODE" setting screen.

NOTICE: The "MICRO SPEED MODE" setting is available while the "2" in the LCD screen is high-lighted.

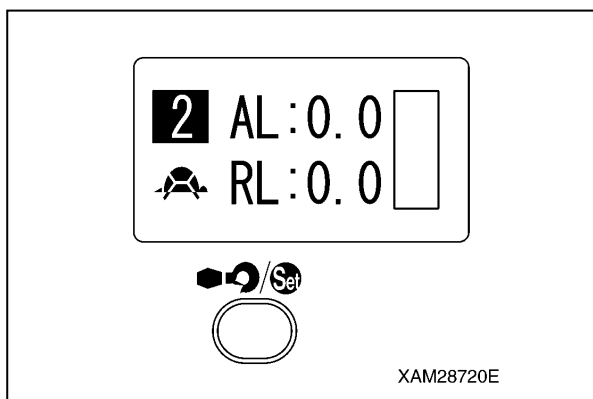


Fig. 4-369

3. Push the operation lever to be adjusted and pull the Accelerator lever slowly. When the operation speed reaches the desired maximum speed, push the Hook stow/Setting button.

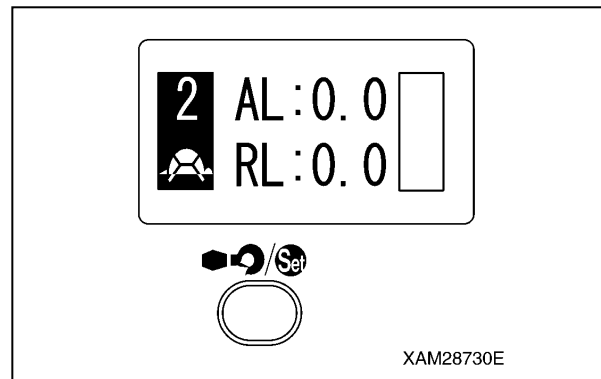


Fig. 4-370

NOTICE:

- Perform the same process to other operation levers, respectively.
 - In case that you operate two or more levers at the same time for this setting, note that the Micro speed rate is established to the ratio of the fastest operation of all.
- It is recommended that the Micro speed shall be set one by one of each operation lever*
- No operation lever provides the Micro speed unless otherwise set to the Micro speed mode, beforehand

4. When the settings for all the required operation levers are complete push the Speed/Mode button. Now the setting is established and the Micro speed mode is available.

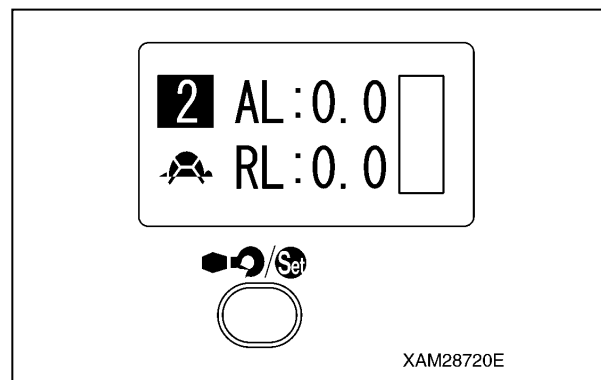


Fig. 4-371

Engine Stop and Emergency Stop Procedure

WARNING!

- For any abnormalities in crane operations, push immediately the Stop/EMO button to stop the engine. Such cases include that the crane operation does not stop though you release your fingers from any of the operation levers or Accelerator lever, or the Crane starts the operation despite that no operation lever is manipulated.
- In such event of the emergency stop of the engine, turn OFF the power of the Transmitter and check the cause of the emergency, after the engine stops, and repair the failure.
- The Stop/EMO button is also available to stop the engine in the normal conditions.

Push the Stop/EMO button to stop the engine from the Transmitter or in case of emergency. The engine stops.

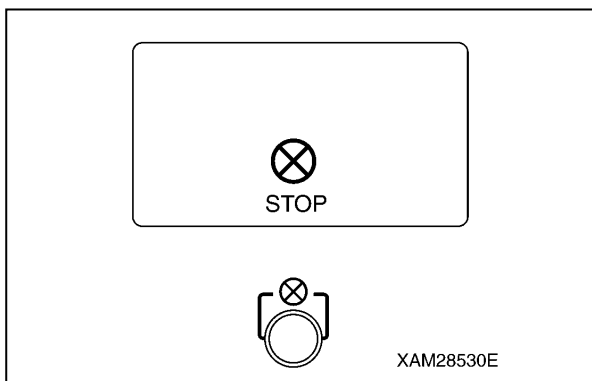


Fig. 4-372

Engine Start and Reset Procedure

Engine Start Procedure

CAUTION: For the practice of the engine start from the Transmitter Start/Reset button, the Starter switch of the Crane must be in the ON position. Otherwise, where the Starter switch is in OFF position, the engine will not start by that Start/Reset button.

When it is required to start the engine from the Transmitter, push the Start/Reset button. The engine starts.

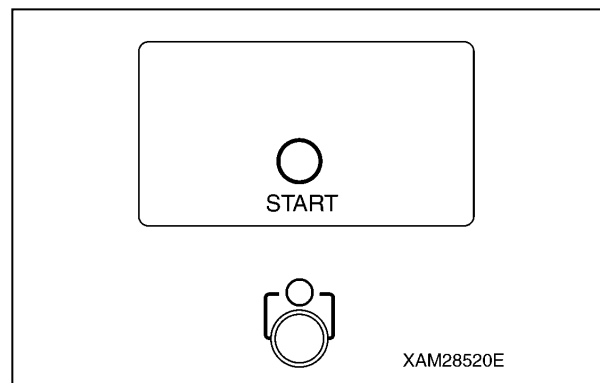


Fig. 4-373

Reset Procedure

To release the emergency stop equipment or abnormal signal detector, push the Start/Reset button.

Power of the Receiver will be reset.

NOTICE:

- While the engine runs, the engine starter will not work even though the Start/Reset button is used.
- When the Start/Reset button is used, push the Power switch of the Transmitter to turn ON it, beforehand.
- When the Start/Reset button is pushed, the abnormal signal detector circuit starts working. Wait for 3 to 4 seconds until it completes.

Checking After Crane Operation

WARNING!

- **When the operation of the Crane is finished, always turn OFF the Transmitter and Receiver power.**
- **In no occasions except the Crane operations, power of the Transmitter shall not be turned ON.**
That may cause an un-expected motion of the Crane and result a serious hazard, such that the Crane hit the other person or any object, or the Crane tips.
- **When it is required to turn ON the Transmitter for the purpose of inspection or such, ensure first that the engine is standstill, then shut down the Receiver by turning OFF its main switch.**

1. Enter into the "CRANE MODE" of the Transmitter operation mode.
2. Use the operation levers and retract the boom to its shortest condition and lower it to the base position, then stow the hook.
3. Enter into the "OUTRIGGER MODE" of the Transmitter operation mode.
4. Use the operation levers and stow all the outriggers so that the Crane is configured to the travelling mode.
5. Stop the engine and turn OFF the Transmitter power.
6. Shut down the power of the Receiver by turning its Main switch to the OFF position.
7. Maintain the Transmitter and Receiver as follows:
 - (1) Check operation levers and the Accelerator lever for any faults.
 - (2) Remove oil or other soil by a clean cloth, if any.
 - (3) Repair all the cracks or damages without fail, if any.
8. Put the Transmitter into the accessory storage case and keep it in the dry and cool place where the wind and rain or direct sun ray is sheltered.

ELECTRIC MOTOR (OPTION)

WARNING! The following precautions should always be observed when using the machine abiding by engine and electric motor specifications. Potential serious accident may occur if disregarded.

- Installation of this machine must comply with laws and regulations of your country. Contact us or our sales service agency if no laws and regulations are applied.
- Only personnel qualified according to laws and regulations of your country are allowed to establish power connection of power supply equipment, inspect and repair the electric system. Contact us or our sales service agency if no laws and regulations are applied.
- Operation and storage of this machine must satisfy the requirements listed below:
- Operating temperature: -10 to 40°C (no frost)
- Storage temperature: -20 to 60°C
- Operating humidity: Max. 90%RH (no condensation)
- Atmosphere: Outdoor environment free from explosive, flammable, and corrosive gases, moisture, and excessive dust particles
- Altitude: Max. 1000m
- Vibration: Max. 0.5G
- Turn OFF the power supply equipment breaker promptly in the event of an abnormal event in this machine during operation. Potential fire or electric shock may occur if disregarded.
- Turn OFF the power supply equipment breaker promptly in the event of a power failure during operation. This machine may go into action upon energisation.
- Always turn OFF the power supply equipment breaker before performing inspection and maintenance of the electric system. Potential electric shock may occur during work if disregarded. Before inspection and maintenance, inform all personnel to alert them of your action. Be sure to attach a warning tag, "Do Not Touch", to the power supply equipment breaker for the prevention of accidental breaker operation conducted by other personnel.

- Always turn OFF the power supply equipment breaker and wait for 10 minutes or longer before performing inspection and maintenance of the electric system. Ensure that no voltage is applied to the power supply box with a tester.
- All the parts will be at elevated temperatures immediately after machine operation. Perform inspection and maintenance of the electric system according to the procedure provided in this manual only after the parts drop in temperature for safety. Potential burn may occur if disregarded.
- Keep the power supply box and inverter board away from water. The machine goes out of order that causes malfunction if the electric system is wetted. Exercise due caution to handle the electric system.
- Contact us or our sales service agency to request repair of the inside of the inverter board, when necessary.

CAUTION: See "Section 2 SAFETY" for safety precautions that are not provided in this section.

The weight (mass) of a machine varies with machine types between a standard specification machine and a machine abiding by engine and electric motor specifications. See the following figure for the weight (mass) of the machine described in "Electric Motor (Option)" on 2-50 and loads imposed on one wire rope for machine hoisting with four wire ropes.

MC405C-3 MACHINE WEIGHT	
Component	Weight
Main Unit	5600 kg
Electric Unit	+150 kg
850kg Searcher Hook	+30 kg
Fly-Jib	+150 kg

104-4760600

Fig. 4-374

Load per single line of
4 parts hanging

1438kg

104-4552400

Fig. 4-375

Instrument Panel Sections

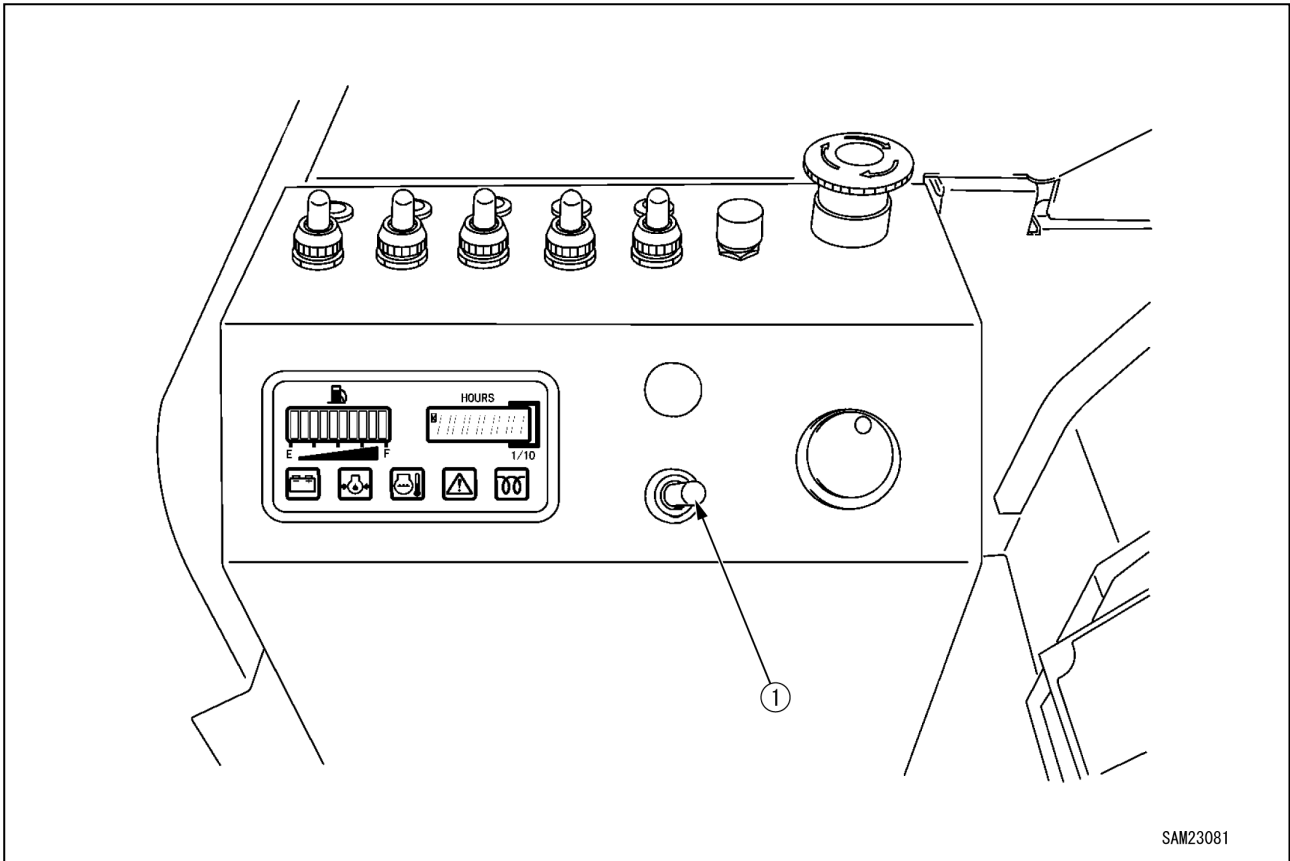


Fig. 4-376

1 - Engine and electric motor switch

CAUTION: This section describes only additional items related to the electric motor specification. For details other than those described here, see "INSTRUMENT PANEL SECTIONS" on page 4-7.

- The hour meter value will continue to increment whether the electric motor or engine is selected to power the machine.
- Following monitors (five) are not active when the electrical motor is the output source: Fuel gauge, pre-heat monitor, engine water temperature monitor, engine oil pressure monitor, battery charge monitor

Engine and Electric Motor Switch

CAUTION: Ensure that the Inverter unit power lamp is ON when switching the engine and electric motor switch to "Electric Motor". Electric operation is permitted only when the power lamp is ON.

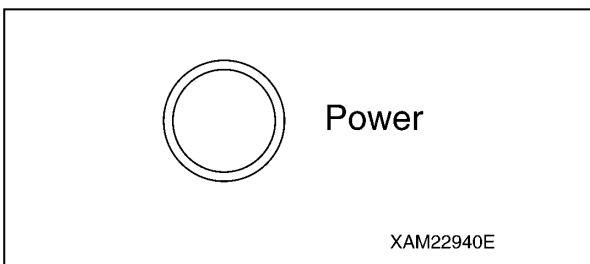


Fig. 4-377

Use this switch to switch the power output source of the machine.

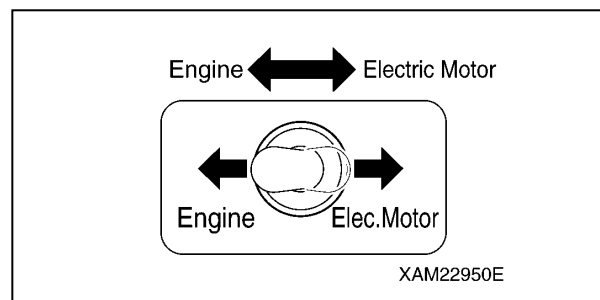


Fig. 4-378

- Engine: Push down the switch to the left. The engine is designated as a power output source.
- Electric motor: Push down the switch to the right. The electric motor is designated as a power output source.

Power Unit

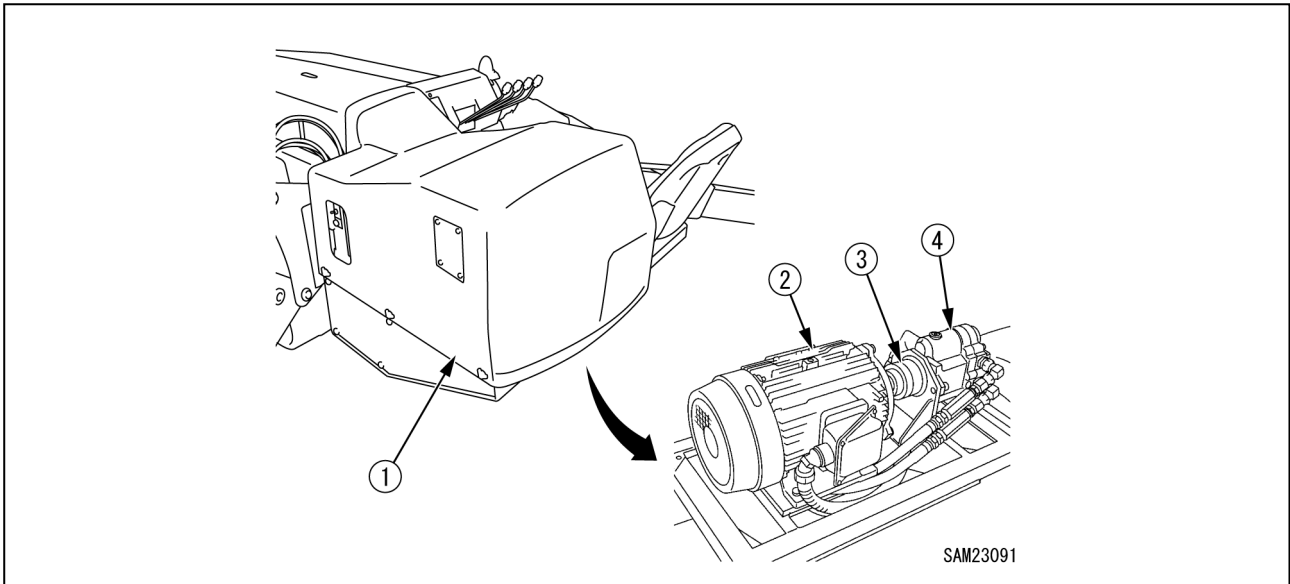


Fig. 4-379

- 1 - Rear cover
- 2 - Electric motor

- 3 - Coupling
- 4 - Hydraulic pump

Power Supply Box

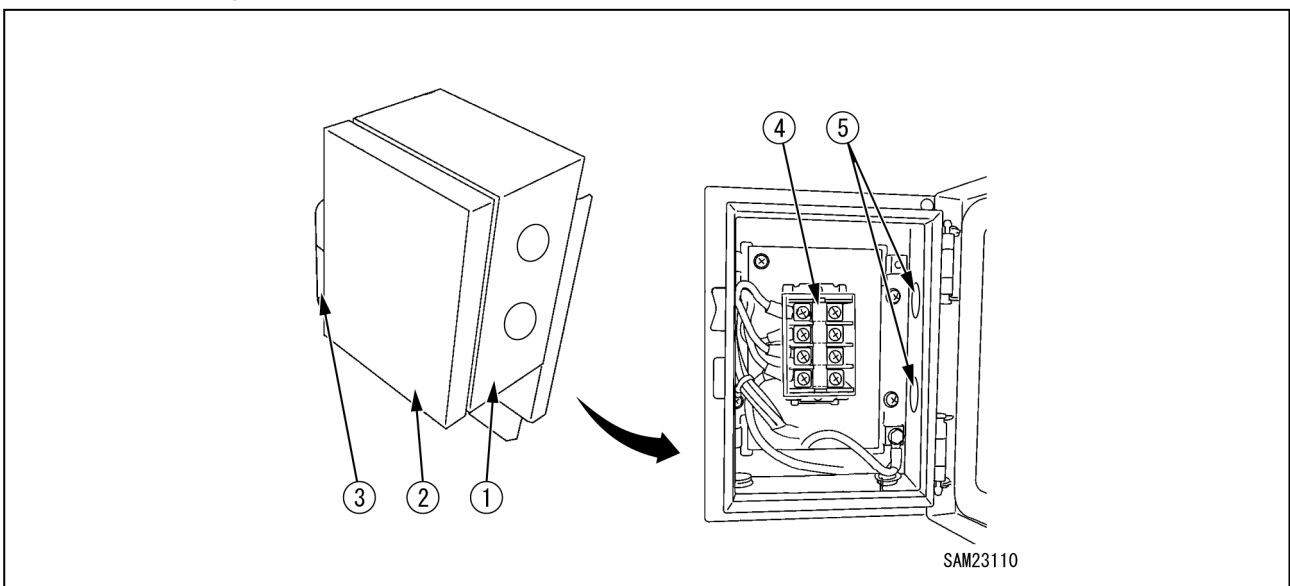


Fig. 4-380

- 1 - Power supply box
- 2 - Power supply box door
- 3 - Door handle

- 4 - Terminal block
- 5 - Cable inserting hole

Inverter Unit

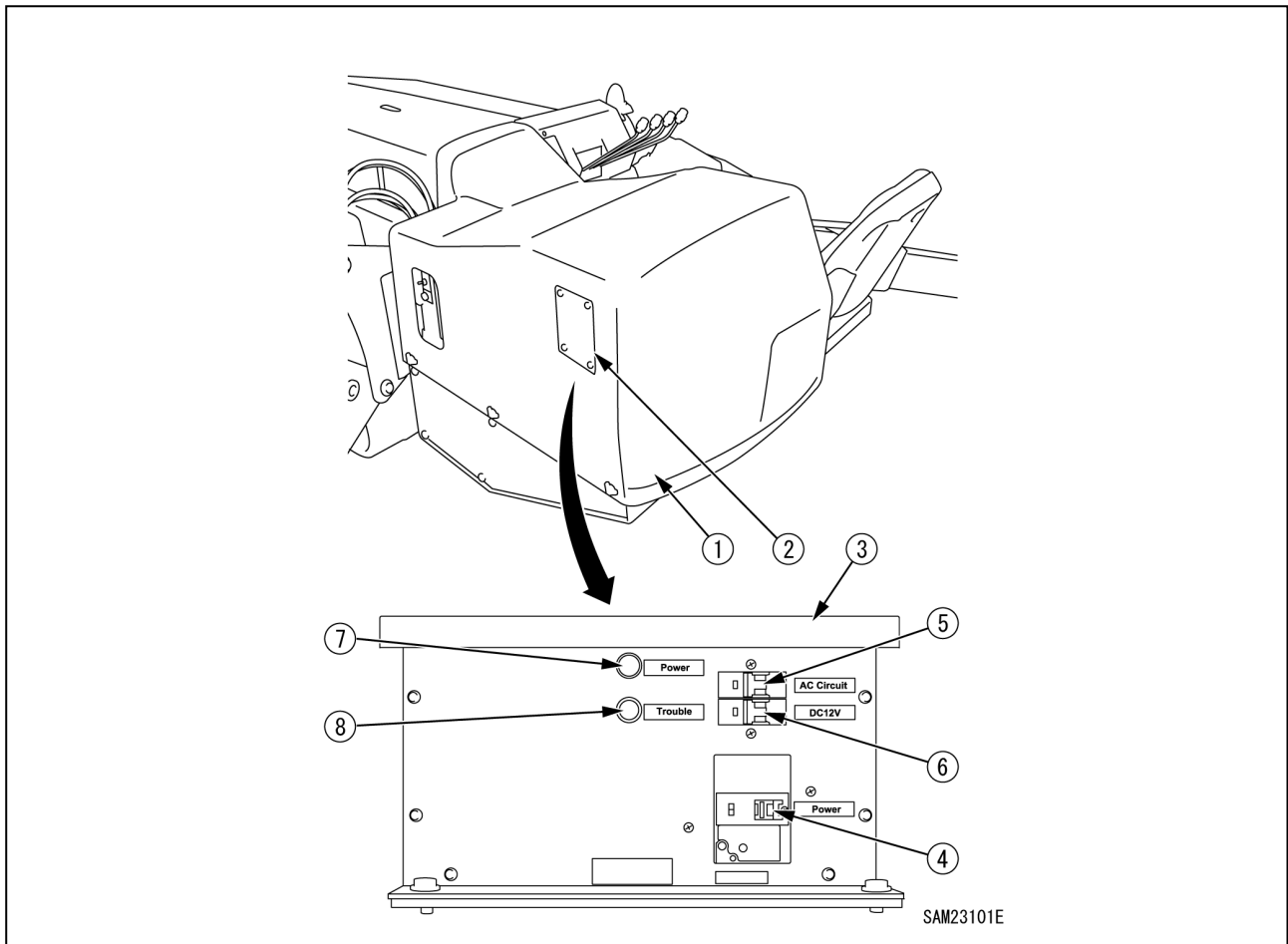


Fig. 4-381

- | | |
|---|-----------------------------|
| 1 - Rear cover | 5 - DC12V power switch |
| 2 - Protective cover | 6 - AC circuit power switch |
| 3 - Inverter unit | 7 - Power lamp (white) |
| 4 - Main breaker (with a leak detector) | 8 - Trouble lamp (red) |

Main Breaker (with a Leak Detector)

WARNING!

- Make sure the breaker is OFF when this machine derives no power from power supply equipment and when work is completed.
- Abnormal conditions are encountered around the Inverter unit, electric motor, or electric wiring when the breaker is automatically turned OFF during operation. Be sure to locate failures and check for burnt smell and parts. Promptly contact us or our sales service agency.
- Inspection and repair must be completed before turning ON the breaker to re-supply power. **Potential fire or machine failure may occur if disregarded.**

The main breaker is equipped with the parts shown in the figure.

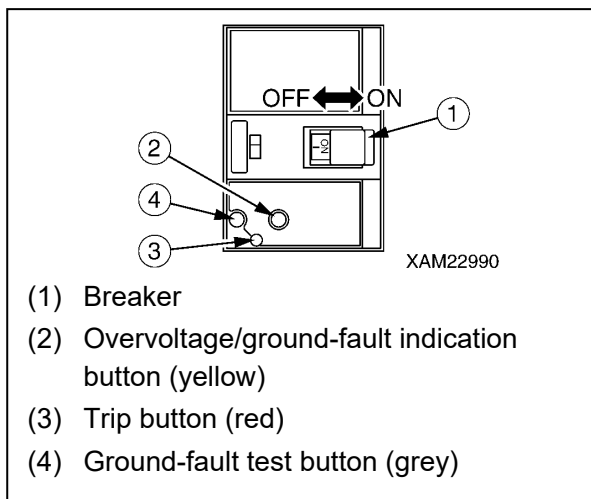


Fig. 4-382

- The breaker (1) is designed to provide automatic shutoff of the power that is supplied from the Inverter unit to the electric motor in the event of an error including overcurrent and overvoltage, to prevent fire and machine failure. The breaker (1) also controls the supply of power to the electric motor and Inverter unit.
 - ON: Power is supplied.
 - OFF: No power is supplied.
- The overvoltage/ground-fault indication button (2) on the cover is designed to eject in the event of an overvoltage or ground fault. For reset, press the breaker to turn the ON.
- The trip button (3) is designed to mechanically trip the breaker as external control.

- The ground-fault test button (4) is used to test tripping in response to a ground fault. Proper tripping is assured if the overvoltage/ground-fault indication button (2) on the cover ejects.

CAUTION: Periodic (biannual) ground fault test is recommended.

The test button should be controlled at 10-second or longer intervals and not be pressed more than requires.

If an indication of a ground fault remains on after the overvoltage/ground-fault indication button (2) is reset, contact us or our sales service agency.

DC12V Power Switch

The DC12V power switch is used to switch the DC power output source for the crane operation system.

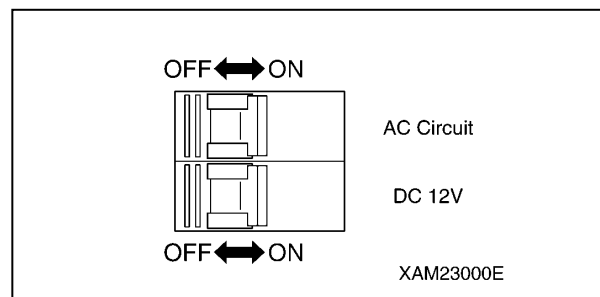


Fig. 4-383

- ON: Power is supplied to the crane operation system.
- OFF: No power is supplied to the crane operation system.

AC Circuit Power Switch

The AC circuit power switch is used to witch the AC power output source for the Inverter unit and inverter cooling fan.

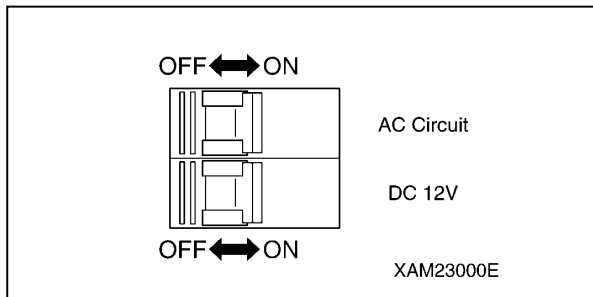


Fig. 4-384

- ON: Power is supplied to the Inverter unit and inverter cooling fan.
- OFF: No power is supplied to the Inverter unit and inverter cooling fan.

NOTICE:

- No safety hazard is posed even if the DC12V power switch and AC circuit power switch remain on.
- The AC circuit power switch is illustrated in the figure, and the DC12V power switch is illustrated in the lower figure.

Power Lamp (White)

The power lamp is designed to indicate the presence of energisation to this machine from power supply equipment.

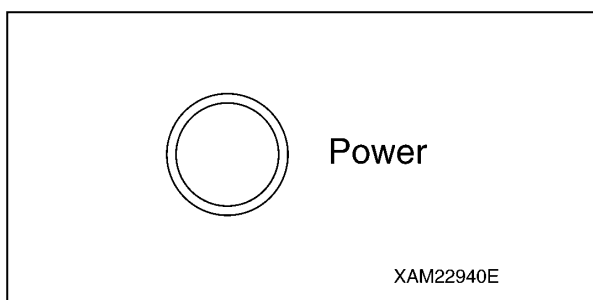


Fig. 4-385

- ON: This machine is deriving power from power supply equipment.
- OFF: This machine is deriving no power from power supply equipment.

NOTICE: If the power lamp remains off despite the power supply equipment breaker being turned ON with power supply assured between power supply equipment and this machine, check the power supply on power supply equipment.

Trouble Lamp (Red)

WARNING! An error occurs in the Inverter unit, which causes the trouble lamp to come ON.

Contact us or our sales service agency.

The trouble lamp is designed to indicate the presence of an error in the Inverter unit.

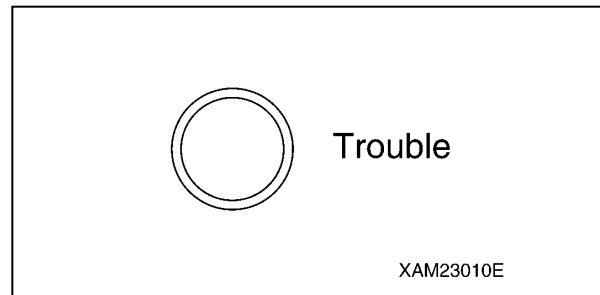


Fig. 4-386

- ON: An error is detected in the Inverter unit.
- OFF: The Inverter unit is in normal operation.

ELECTRIC MOTOR OPERATION

Pre-start Inspection

Pre-start Visible Checks

WARNING! For more information on checking before starting engine (visible checks), see "Pre-Start Visible Checks" on page 5-22. As to the machine abiding by engine and electric motor specifications, potential fire in the machine may occur if a heap of flammable materials and oil leak are present around the hot sections such as the Inverter unit, power supply box, and power unit. Carefully check around these areas. Should you find any abnormality, be sure to fix it or contact us or our sales service agency.

Checking Before Starting Electric Motor

For more information on inspections before starting the electric motor, see "Pre-Start Inspection - Before Starting Engine" on page 5-24. Perform the tasks other than those related to the engine.

Checking After Starting Electric Motor

For more information on checking after starting electric motor, see "Post-Start Inspection - After Starting Engine" on page 5-31.

Connecting Power Supply Cable

WARNING! The following precautions should always be observed. Potential serious accident may occur if disregarded.

- Be sure to supply the machine specifications-compliant power (AC 380, 400V) to this machine.

Power supply voltage (V)	Power current (A)	Power supply frequency (Hz)
380, 400	15	50

- A cabtyre cable must adhere to the specifications of this machine (AC 380, 400V).

Motor voltage (V)	Cable spec. (sq)	Cable length (m)
380, 400	3.5	20
	5.5	40

- Always use a dry cabtyre cable. Potential electric shock may occur if the cabtyre cable terminal is wet or power connection is performed with moisten hands.
- Always turn OFF the main breakers of power supply equipment and this machine before connecting the cabtyre cable to this machine.
- Keep the cabtyre cable free of flaws and bend. Be sure to replace a damaged cabtyre cable with a new one.
- Ensure that no sharp protrusion is present at an area where the cabtyre cable is routed. Failure to follow the above precaution may cause the cable to get snagged on the protrusion and damaged or broken.
- To connect the cabtyre cable to the terminal block in the power supply box, torque the screw to the specified value. Potential fire or electric shock may occur if the screw comes loose that could develop a short circuit.
- To connect the cabtyre cable to the terminal block in the power supply box, tighten the cable ground screw properly for the prevention of water entry and cable protection.
- The ground wire of the cabtyre cable must be properly connected to the "PE terminal" at the bottom of the terminal block in the power supply box.
- Always close the power supply box door completely after work, and attach the Inverter unit cover properly.

Use the following procedure for establishing power connection between power supply equipment and this machine.

1. Make sure the breakers of power supply equipment and Inverter unit are OFF.

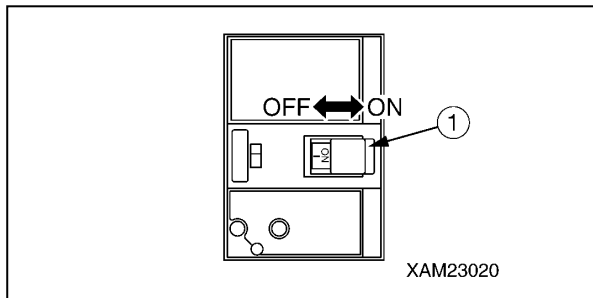


Fig. 4-387

2. Unlock the door (3) of the power supply box (2) by pulling the handle (4) toward you to open it.

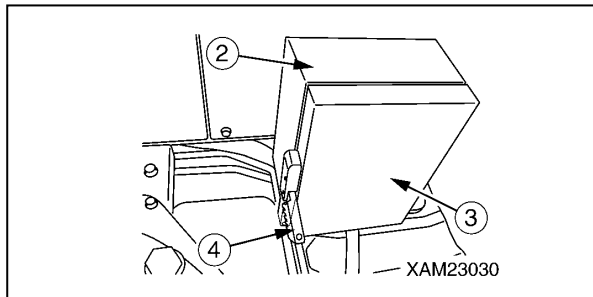


Fig. 4-388

3. Remove the cover (6) of the terminal block (5) in the power supply box, holding the top and bottom of the cover (6) with fingers and pulling it toward you.

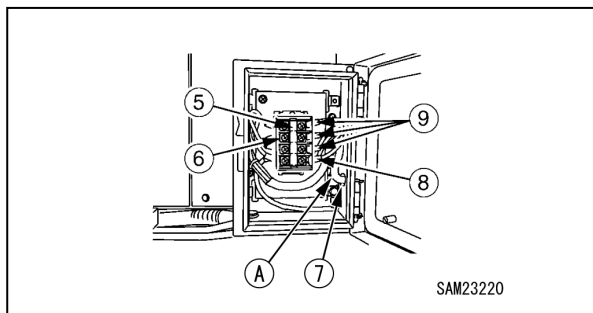


Fig. 4-389

4. Draw the machine specifications-compliant cabtyre cable (A) through a hole of the cable ground (7) at the bottom of the power supply box to connect it to the terminal block (5).

CAUTION: The ground cable (8) of the cabtyre cable must be properly connected to the "PE terminal" on the terminal block. Inverter-driven three cables (9) other than the ground cable are capable of being connected to any of "L1, L2, and L3 terminals".

5. Upon completion of connection of the power supply box cabtyre cable (A), replace the cover (6) of the terminal block (7) and close the door (3) of the power supply box (2).
6. Move and connect the cable terminal block to the power supply equipment breaker without undue strain on the cabtyre cable (A).
7. Turn ON the power supply equipment breaker.
8. Remove the four mounting screws (11) and remove the protective cover (10).

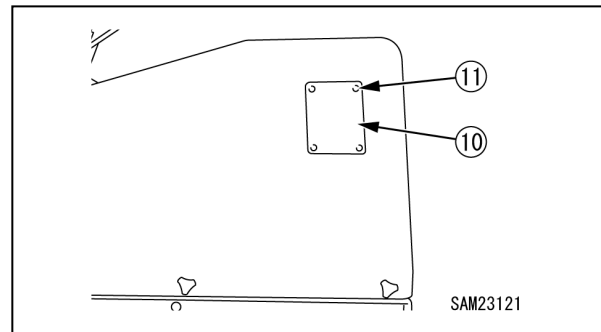


Fig. 4-390

9. Turn ON the breaker (1).

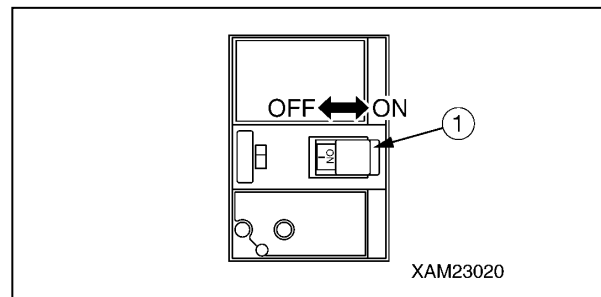


Fig. 4-391

10. Turn ON the AC circuit power switch (12) and DC12V power switch (13).

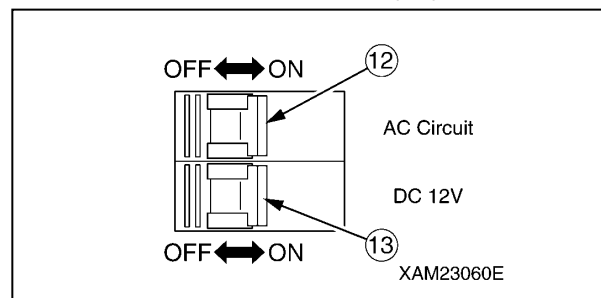


Fig. 4-392

NOTICE: No safety hazard is posed even if the AC circuit power switch (12) and DC12V power switch (13) remain ON.

11. Replace the protective cover (10) to the original position and securely tighten four mounting screws (11).

Operation and Checking After Power Connection

WARNING!

- Before starting the electric motor, make sure of no presence of personnel around and impediments, and sound a horn.
- Warm-up is required. The motor needs adequate warm-up especially in cold climates.
Failure to warm the motor may result in serious accident on account of low reactivity of the travelling gear and crane to the operating lever.
- Ensure that no abnormal noise, odour, or vibration is present in and around the Inverter unit and power unit during warm-up. If abnormal conditions are encountered, immediately turn the starter switch to the OFF position to bring the machine to a halt. Turn OFF the power supply equipment breaker accordingly to shut off the supply source.

Check the Inverter unit and electric motor, the peripheries, and electric wiring for burnt smell and parts. Promptly contact us or our sales service agency to request inspection and repair.

- Crane operational check is necessary after motor warm-up.
Keep the hook block away from the boom to avoid interference and collision.
- Exercise caution to keep the boom from contact with an operator and this machine when slewing it.
- If crane operational check detects an abnormal event, make an emergency stop promptly and repair a relevant part. Potential serious accident may occur if disregarded.
- Exercise caution not to travel on or entangle the cabtyre cable during crane travelling. Staff guide personnel as necessary, and follow the lead of them.
- Keep the Inverter unit cover away from flammable materials.
The inside of the Inverter unit will rise in temperature that may lead to fire, if disregarded.

CAUTION:

- Proper temperature of hydraulic oil: 50 to 80°C
The hydraulic oil should be at around 20°C regardless of operational environment such as low-temperature operation.

- Ensure that the main switch of the remote control box is turned OFF.

1. Set the engine and electric motor switch to the "Elec. Motor" position.

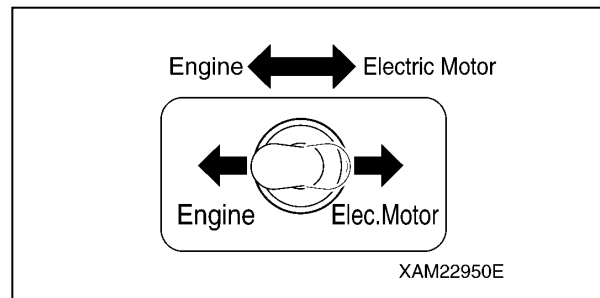


Fig. 4-393

2. Insert the key into the starter switch and turn the key to the "START" position.

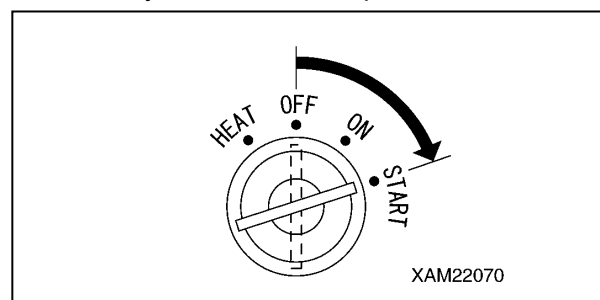


Fig. 4-394

3. Release your hand from the key once the electric motor has started.
The key will automatically return to the "ON" position.

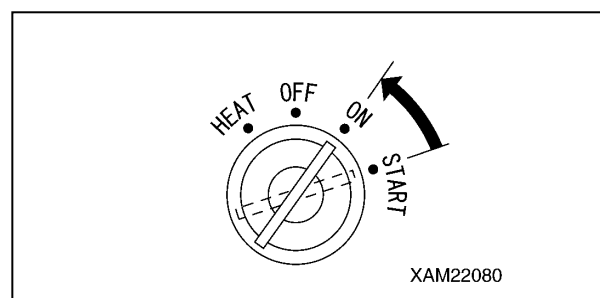


Fig. 4-395

- Conduct 5-minute warm-up after the electric motor is started.

NOTICE: This machine is structured to switch to the energy-saving mode if no lever operation is attempted within 5 minutes after the electric motor is started.

Once the energy-saving mode has been entered, the electric motor undergoes an extreme reduction in rotational speed. Operate any lever for recovery from the energy-saving mode. The electric motor comes to a stop if no lever operation is attempted within further 30 minutes after being started. Turn the starter switch to the "START" position again for recovery.

- Visually check through the access protective cover of the Inverter unit that the trouble lamp remains OFF.

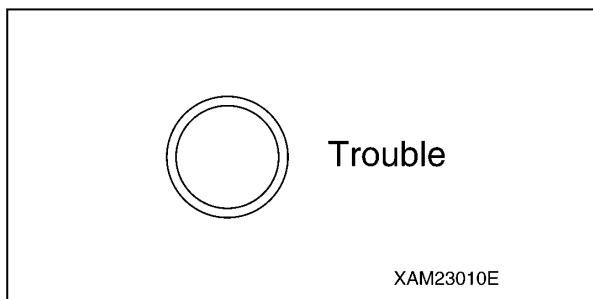


Fig. 4-396

CAUTION: An error occurs in the Inverter unit, which causes the trouble lamp to come ON in red. Contact us or our sales service agency.

- Use the following procedure for checking the power unit if an abnormal noise, odour, or vibration is present in and around the power unit.

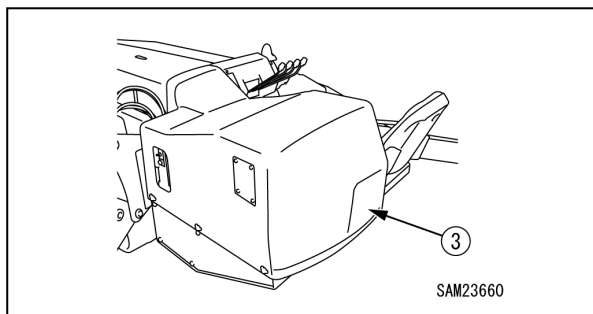


Fig. 4-397

- Turn the starter switch key to the "OFF" position.
The electric motor comes to a stop.
- Remove the rear cover (3) as described in "Removing Rear Cover" on page 5-19.

- Check the mounting bolts securing the electric motor (5) and hydraulic pump (6) for looseness and falling off, and check the coupling (7) for looseness. If check finds looseness, torque the bolts to the specified value to provide retightening.

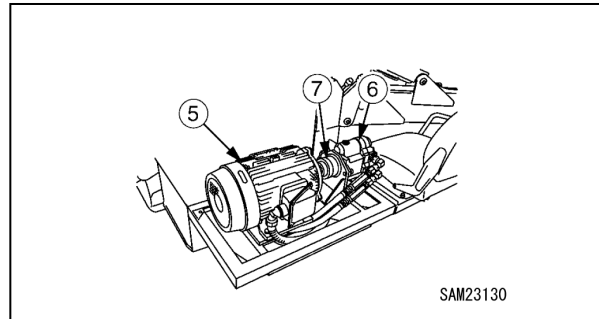


Fig. 4-398

- Keep the periphery of the power unit free of dead leaves, paper waste, and dust.
Eliminate dead leaves, paper waste, and dust if heaped or adhered.
- After inspecting or cleaning, reattach the rear cover (3) as described in "Installing Rear Cover" on page 5-19.

Machine Operation

CAUTION: For more information on individual crane operations, see the sections from "TRAVELLING POSITION" on page 4-23 to "Dos and Don'ts During Crane Operations" on page 4-60.

Machine Stop and Checks After Stopping Machine

1. Turn the starter switch key to the "OFF" position.
The electric motor comes to a stop.

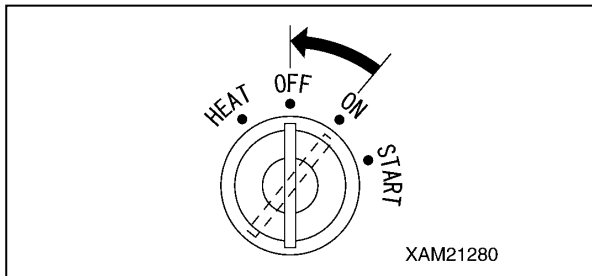


Fig. 4-399

2. Remove the starter switch key.
3. Visibly check for oil leakage, and check around the crawlers, crane, and exterior of the machine. If you find any leakage or abnormality, fix the problem.
4. Clean off the crawlers and outriggers, removing mud.
5. Keep the periphery of the inverter unit free of dead leaves and paper waste. Potential fire may occur if disregarded.

Disconnecting Power Supply Cable

1. Turn OFF the power supply equipment breaker.
2. Remove the four mounting screws (11) and remove the protective cover (10).

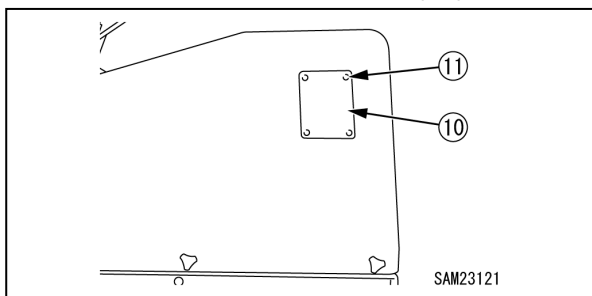


Fig. 4-400

3. Turn OFF the main breaker (1).

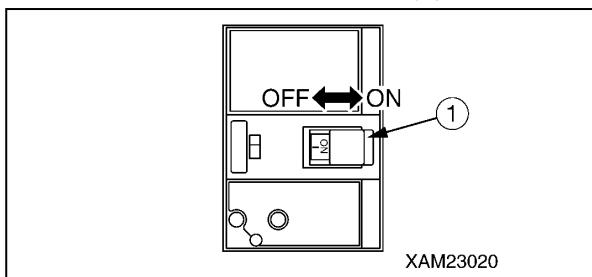


Fig. 4-401

4. Replace the protective cover (10) to the original position and securely tighten four mounting screws (11).
5. Unlock the door (3) of the power supply box (2) by pulling the handle (4) toward you to open it.

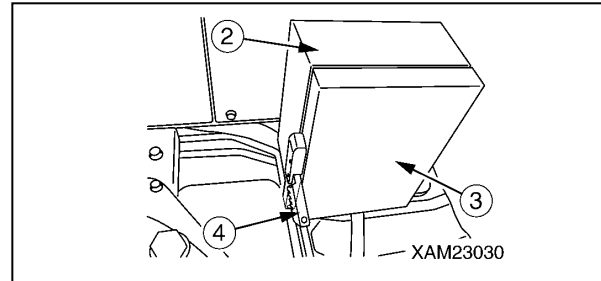


Fig. 4-402

6. Remove the cover (6) of the terminal block (5) in the power supply box, holding the top and bottom of the cover (6) with fingers and pulling it toward you.

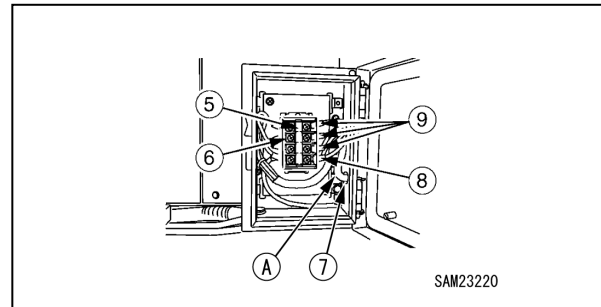


Fig. 4-403

7. Disconnect the cable (8) and three cables (9) of the cabtyre cable (A) from the terminal block (5).

CAUTION:

- Clean off the cabtyre cable and check it for damage or bend.
If check finds damage, replace the cable with a new one.
- Always return the cabtyre cable to a designated place after performing inspection and cleaning.

8. Replace the cover (6) of the terminal block (5) to the original position and close the door (3) of the power supply box (2).

SEARCHER HOOK SAFETY PRECAUTIONS

NOTICE: For more information on precautions not described here, see "Section 2 SAFETY."

Handling Precautions

Moment Limiter Settings Check

When using 850 kg searcher hook, confirm that the moment limiter is set to the following wire falls/option mode and searcher hook position: "850 kg searcher hook mode."

If the crane is operated in a mode other than 850 kg searcher hook mode, the moment limiter will not operate correctly, posing risk of machine damage, toppling, or other serious accidents.

Precautions When Attaching/Removing Main Unit or Altering Position

- Be sure to tighten the searcher hook mounting bolts using the specified torque to keep the searcher hook from falling when it is being attached.
- Keep fingers out of the pin holes at all times.
- The position pins must always be secured using lynch pins. Serious accidents may result if the position pins become detached during operations.

Operating Precautions

Precautions Using Boom Raising Enable Switch

Use the boom raising enable switch only in 850 kg searcher hook mode.

In contrast to regular crane operations, if the crane is overloaded in 850 kg searcher hook mode, the operation will stop automatically. Use the boom raising enable switch only when the boom has stopped automatically after entering the overload area while being lowered or extended. Do not use this switch in normal situations to lift loads off the ground.

Serious accidents such as machine damage or toppling may occur if you use the boom raising enable switch to lift loads off the ground.

850 kg SEARCHER HOOK COMPONENTS (OPTION)

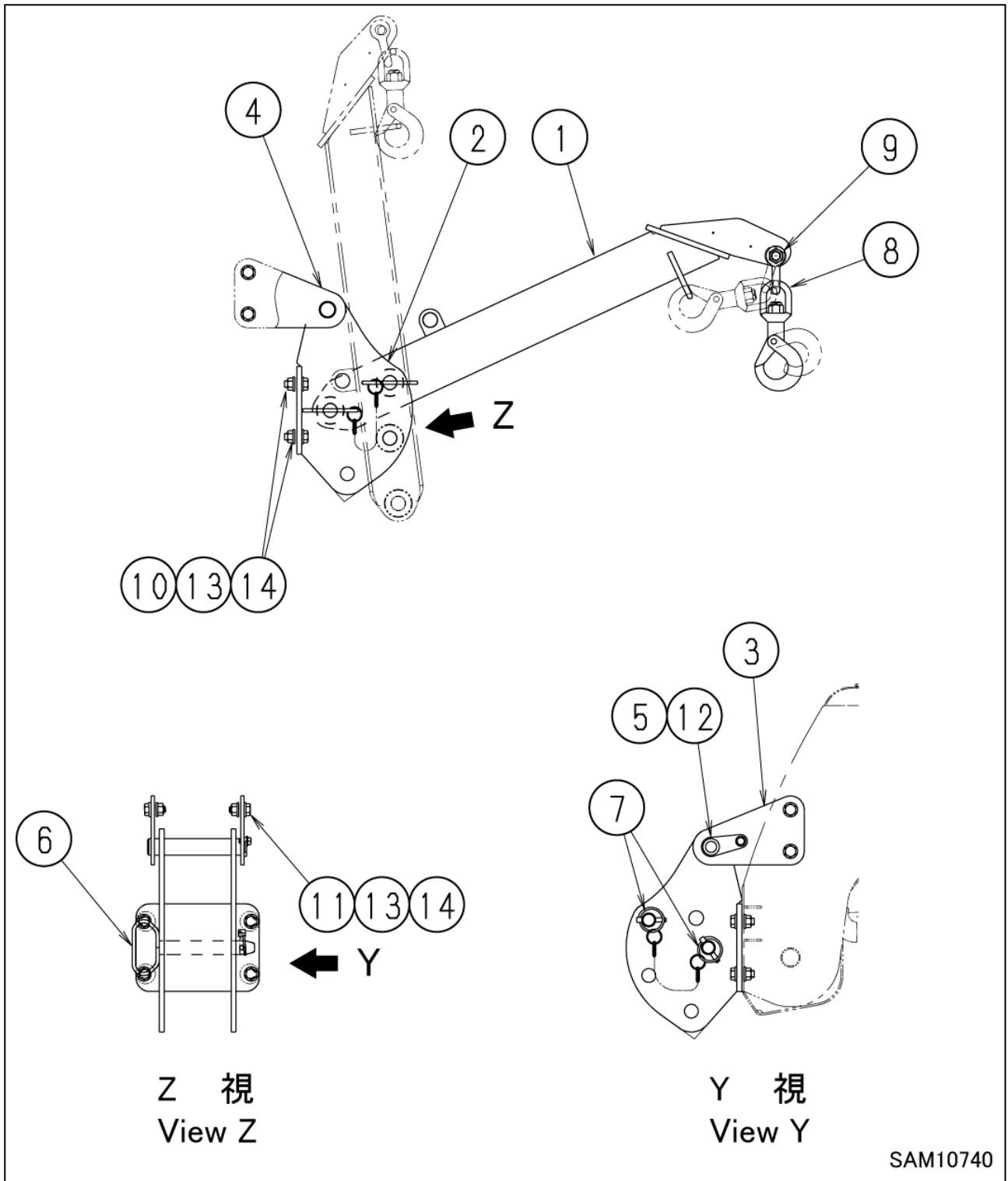


Fig. 4-404

- 1 - E-Boom
- 2 - Bracket
- 3 - Bracket 1
- 4 - Bracket 2
- 5 - Pin
- 6 - Position pin
- 7 - Lynch-pin

- 8 - Hook
- 9 - Shackle
- 10 - Hexagonal bolt with washer (strength 10.9)
- 11 - Hexagonal bolt with washer (strength 10.9)
- 12 - Hexagonal bolt with washer (strength 10.9)
- 13 - Nut (strength 10)
- 14 - High tension washer

850 kg SEARCHER HOOK MOMENT LIMITER DISPLAY

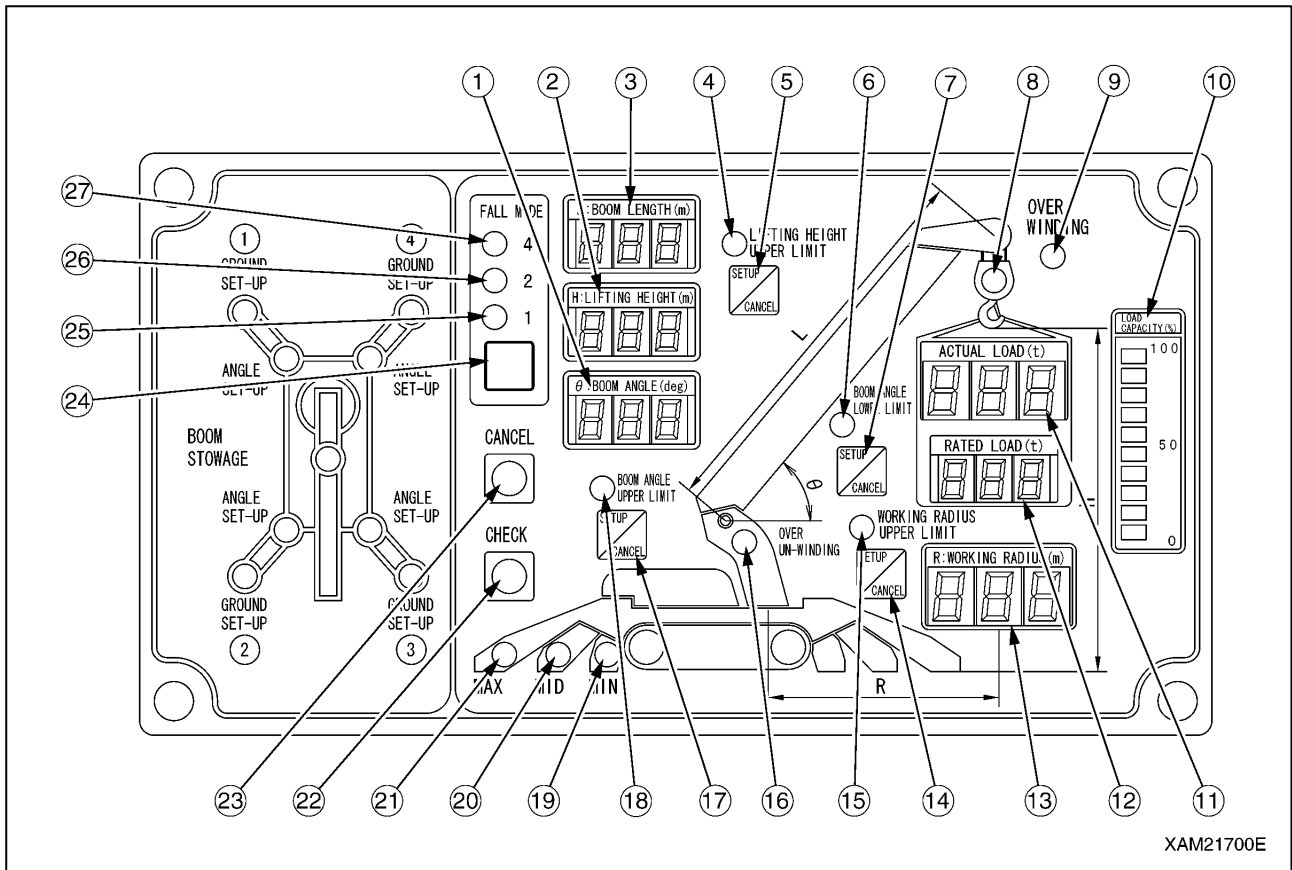


Fig. 4-405

- | | |
|---|---|
| 1 - Boom angle display | 14 - Working radius upper limit switch (Setup / cancel) |
| 2 - Lifting height display | 15 - Working radius upper limit LED (Orange) |
| 3 - Boom length display | 16 - Over un-winding LED (Orange) |
| 4 - Boom lifting height upper limit LED (Orange) | 17 - Boom angle upper limit switch (setup / cancel) |
| 5 - Boom lifting height upper limit switch (Setup / cancel) | 18 - Boom angle upper limit LED (Orange) |
| 6 - Boom angle lower limit LED (Orange) | 19 - Outrigger MIN. extension LED (Blue) |
| 7 - Boom angle lower limit switch (setup / cancel) | 20 - Outrigger MID. extension LED (Blue) |
| 8 - Load factor LED (Changes to green, yellow, and red) | 21 - Outrigger MAX. extension LED (Blue) |
| 9 - Over Winding LED (Red) | 22 - Check switch |
| 10 - Load capacity display (Yellow) | 23 - Cancel switch |
| 11 - Actual load display | 24 - Fall mode / Option selector switch |
| 12 - Rated total load display | 25 - 1-fall LED (Blue) |
| 13 - Working radius display | 26 - 2-fall LED (Blue) |
| | 27 - 4-fall LED (Blue) |

NOTICE: For information on the moment limiter not provided here, see "MOMENT LIMITER (OVERLOAD DETECTOR)" on page 4-68.

Wire Falls Selector Switch and Wire Falls Display LED (Blue)

DANGER! Fall mode/option mode and searcher hook must be set as "850 kg searcher hook mode".

Using 850 kg searcher hook other than in 850 kg searcher hook mode may prevent activation of the pre-warnings and boom auto-stop even when the approaching overload, and thus may result in crane damage or machine tipping and could cause a serious accident.

Use the wire falls selector switch to change the number of wire falls options.

Keep pressing the switch for 2 seconds or more.

Operation mode of wire falls will change as shown below by pressing the switch for 2 seconds or more each time.

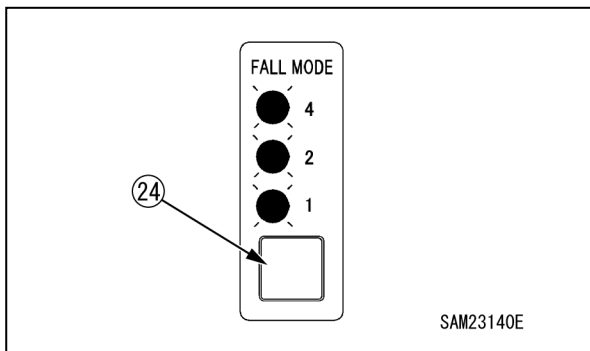


Fig. 4-406

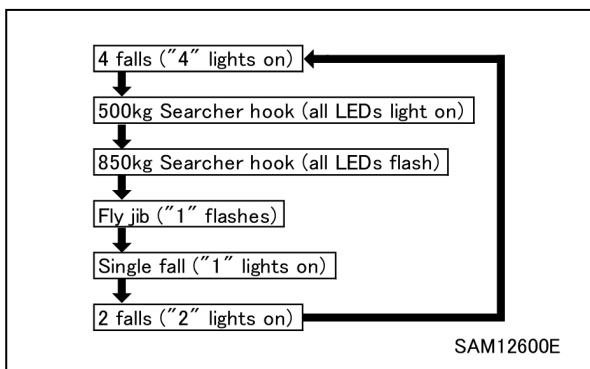


Fig. 4-407

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

Cancel Switch

DANGER! Do not use 850 kg searcher hook if actual searcher hook offset position and display of boom length windows do not match. Without setting moment limiter to the actual searcher hook offset position, moment limiter may not work properly and thus may result in crane damage or machine tipping and could cause a serious accident.

Use the cancel switch and fall mode/option selector switch to set searcher hook offset position shown in the boom length window.

- With fall mode set as 850 kg searcher hook mode, press fall mode/option selector switch (24) and cancel switch (23) at the same time for 2 seconds or more and shift to set actual searcher hook offset position.

For correct setting, see "Searcher Hook offset position and mode display in boom length window" on page 4-143.

Pressing fall mode/option selector switch (24) and cancel switch (23) at the same time for 2 seconds or more shifts boom length display in order of "SH1 → SH2 → SH3 → SH1 . . ."

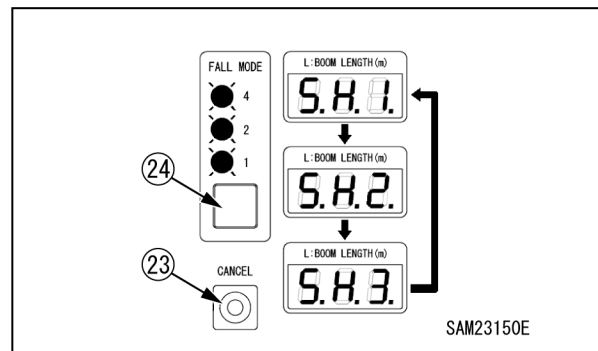
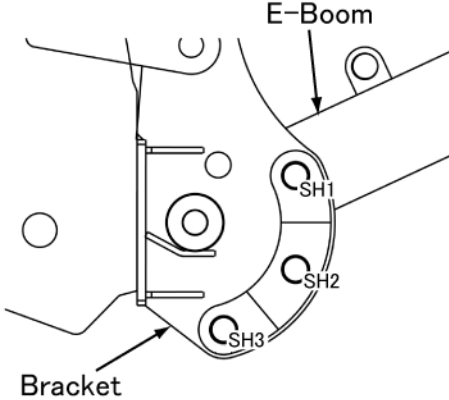
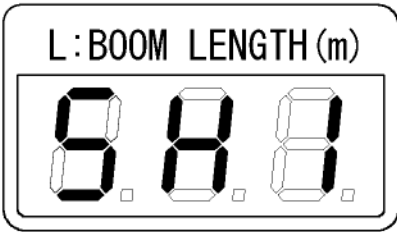
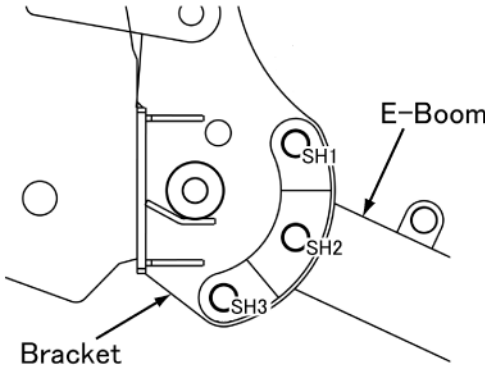
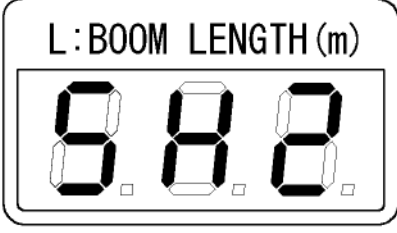
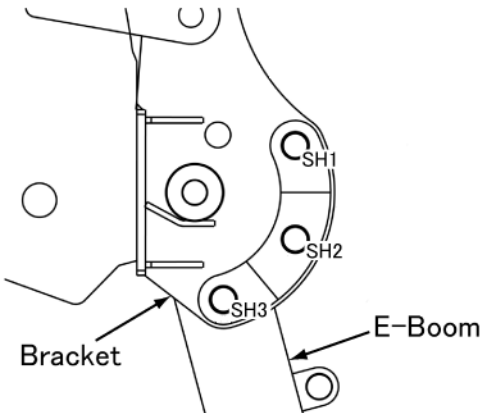
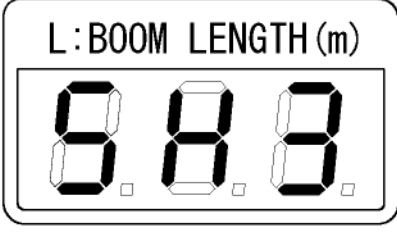


Fig. 4-408

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

When in 850 kg searcher hook mode, searcher hook position mode display and actual boom length value are shown alternately.

Searcher Hook offset position and mode display in boom length window

SEARCHER HOOK POSITION	MOMENT LIMITER BOOM LENGTH
 <p>When a E-Boom is set SH1</p>	
 <p>When a E-Boom is set SH2</p>	
 <p>When a E-Boom is set SH3</p>	

SAM10700

Fig. 4-409

SEARCHER HOOK OPERATION

1. See "OUTRIGGER SETTING" on page 4-42 and set the outrigger.

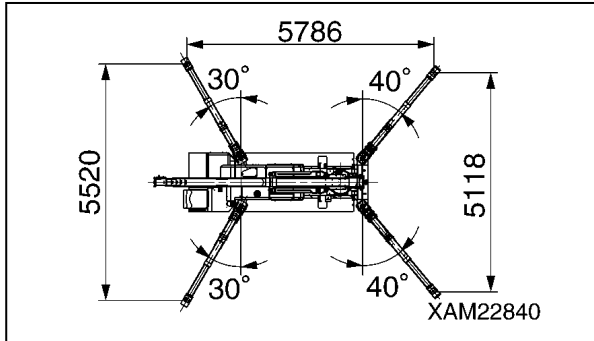


Fig. 4-410

2. Install bracket (1), (2), and (3) using M12 bolts with washers (strength 10.9), nuts, and washers to main boom. Using torque wrench, tighten bolts at $93N \cdot m$ ($\pm 14N \cdot m$). Then insert pin (4) into holes of bracket (1), (2), and (3) as shown in the drawing, and tighten M8 bolts with washers (strength 10.9) at torque $27N \cdot m$ ($\pm 8N \cdot m$).

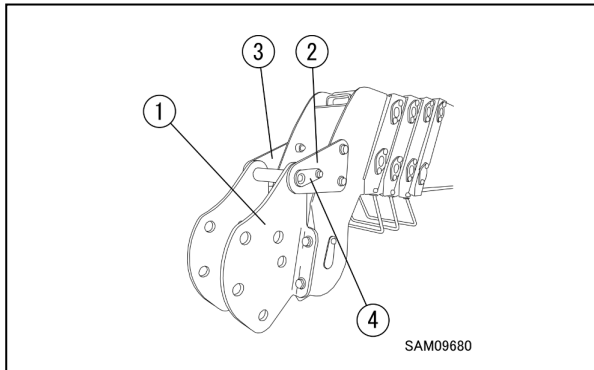


Fig. 4-411

DANGER! Crash Hazard. Make sure to torque searcher hook mounting plate bolts to the designated tightening torque. To install searcher hook, always use new genuine Maeda bolts, nuts, and washers.

3. Using fall mode/option selector switch (24), set moment limiter to 850 kg searcher hook mode (all LED flashes).

Also make sure the boom length display changes to either SH1, SH2, or SH3.

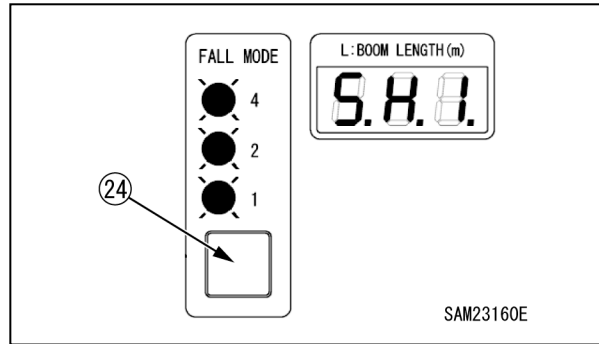


Fig. 4-412

DANGER! Do not operate 850 kg searcher hook without setting moment limiter at "850 kg searcher hook mode". Without setting in correct mode, moment limiter will not work properly, and thus may result in crane damage or a serious accident.

CAUTION: The last status of fall mode/option mode is memorised even after starter switch is turned to the OFF position

4. Remove the lynch-pin (6) from the end of position pin (5), and remove the position pin (5).

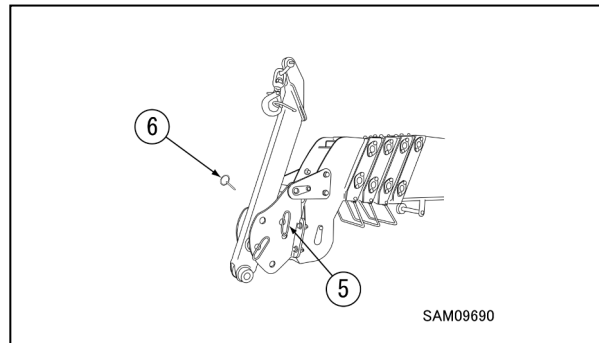


Fig. 4-413

- Line up the hole (8) in E-boom (7) tip and hole (9) in bracket.

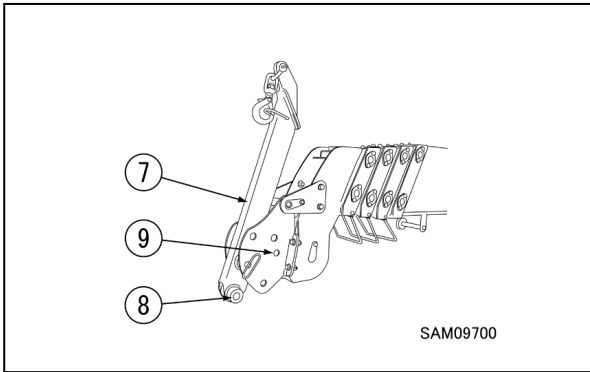


Fig. 4-414

- Insert the removed position pin (5) (in procedure 4.) through the hole of bracket (9), and secure with lynch pin (6) to the tip of position pin (5).

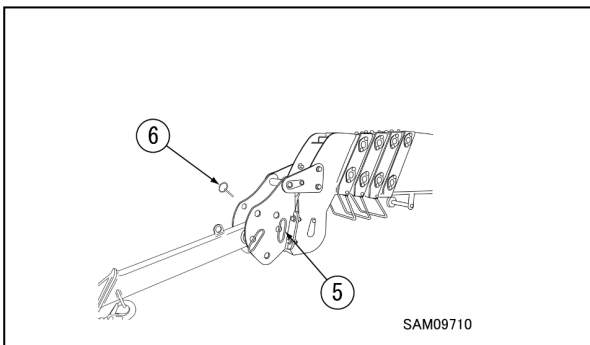


Fig. 4-415

DANGER! Always secure the position pin (5) with the lynch pin (6). If the position pin falls out during operations, serious injury or damage to the machine may result.

- Remove lynch pin (11) from the tip of position pin (10), and remove the position pin (10).

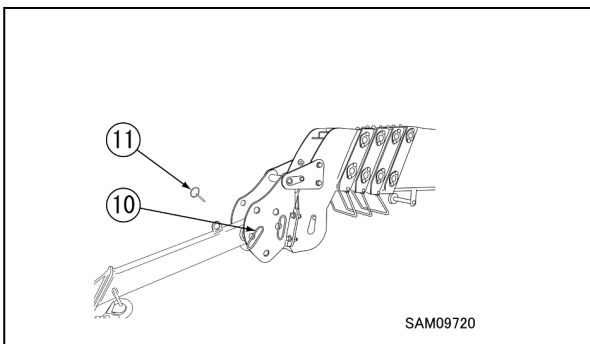


Fig. 4-416

- Move E-boom (7) to the required angle for the work, and line the holes (1) in the E-boom (7).

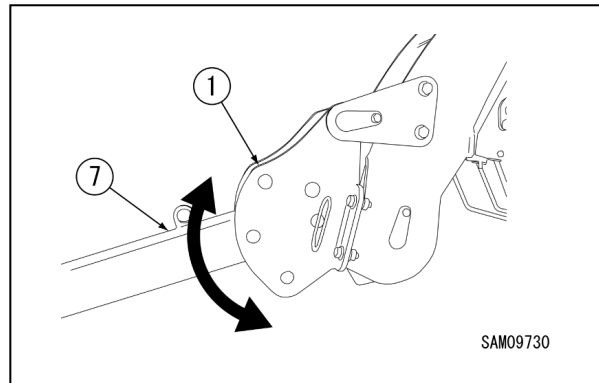


Fig. 4-417

DANGER! E-boom and hook may interfere with each other in RESTRICTED AREA on Rated Total Load chart, and it may cause a serious accident. Always adjust boom angle to proper position for the work.

- Insert the position pin (10) through the hole of bracket, and secure with lynch pin (11) to the tip of position pin (10).

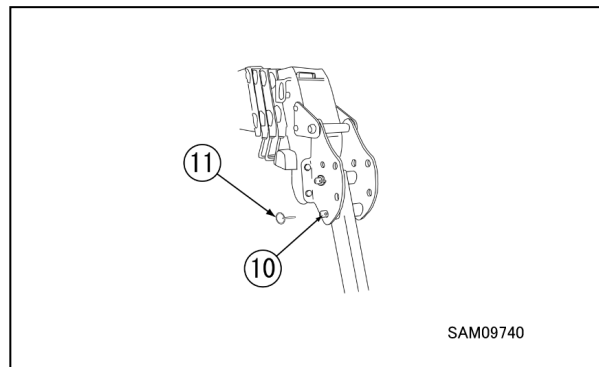


Fig. 4-418

DANGER! Always secure the position pin (10) with the lynch pin (11). If the position pin falls out during operations, serious injury or damage to the machine may result.

10. With fall mode set as 850 kg searcher hook mode, press fall mode/option selector switch (24) and cancel switch (23) at the same time for 2 seconds or more and shift to set actual searcher hook offset position. For correct setting, see "Searcher Hook offset position and mode display in boom length window" on page 4-143. Pressing fall mode/option selector switch (24) and cancel switch (23) at the same time for 2 seconds or more shifts boom length display in order of "SH1 → SH2 → SH3 → SH1 ..."

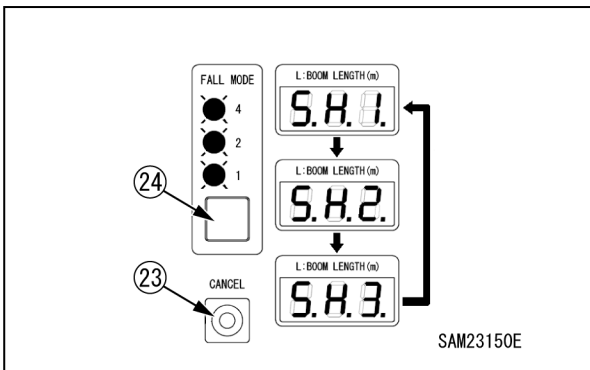


Fig. 4-419

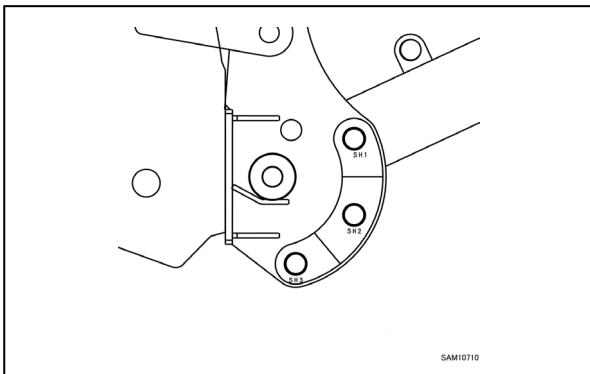


Fig. 4-420

DANGER! Do not use 850 kg searcher hook if actual searcher hook offset position and display of boom length window do not match. Without setting moment limiter to the actual searcher hook offset position, moment limiter may not work properly and thus may result in crane damage or machine tipping and could cause a serious accident.

11. Attach the load securely to the hook (12) and start operations.

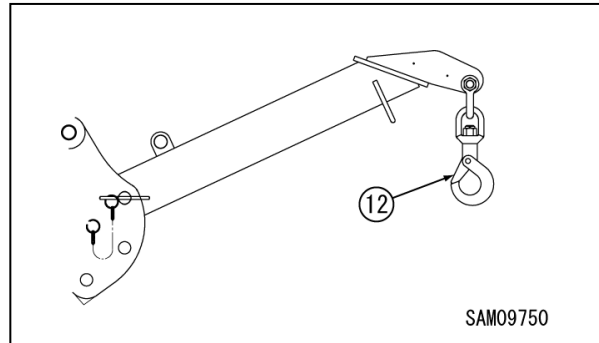


Fig. 4-421

DANGER! When hoisting a load in 850 kg searcher hook mode, raise boom to hoist the load off the ground, and stop for a while to check if the load is safe to hoist.

NOTICE: Characteristic of moment limiter display

- At certain working conditions, moment limiter may display bigger load value than actual load.
- Sudden lever operation increases error in reading load. When operating boom derricking lever, move the lever slowly.

12. When operation is auto-stopped by reaching overload during boom lowering or extending operation, first retract boom to recover into safe load range, and then lower boom to ground the load.

If boom lift must be operated due to the situation, use boom lift bypass switch (11) to enable the boom lift function.

To operate boom lifting using this boom lift bypass switch (13), keep pressing the switch to upper side and operate boom lift at the same time.

After the work, release the switch and it automatically turns off.

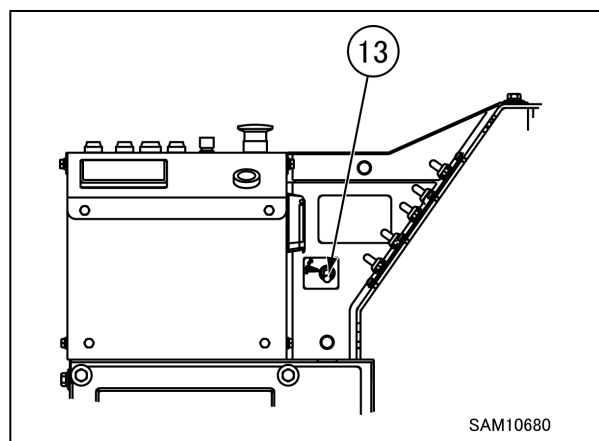


Fig. 4-422

DANGER! The boom lift bypass switch is to be used only when in 850 kg searcher hook mode.

The boom lift function is stopped automatically when overloaded.

Never use this for normal lifting of loads clear of ground. Hoisting a load off ground by using this switch may cause damage to the machine and serious accident.

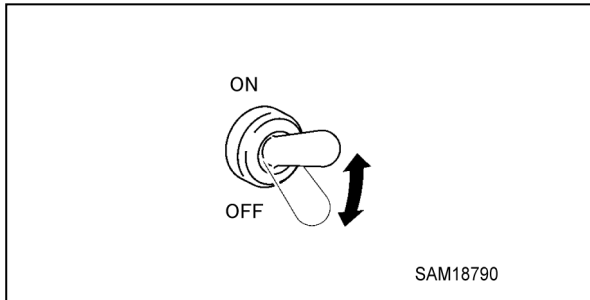


Fig. 4-423

NOTICE: In case machine is automatically stopped by entering overload area by boom lowering or boom extending operation, recover from the overload area by retracting boom, or lifting boom by keeping the boom lift bypass switch to ON side.

NOTICE: When working envelope is set, and operation automatically stops at the boom upper angle limit or hook height upper limit, boom can be lifted beyond the limit by using this boom lift bypass switch. The boom lift bypass switch is to be used only when in 850 kg searcher hook mode.

CAUTION: E-boom and hook may interfere with each other in RESTRICTED AREA on Rated Total Load chart.

Do not exceed 40 degrees of boom angle when E-boom offset position is in SH1.

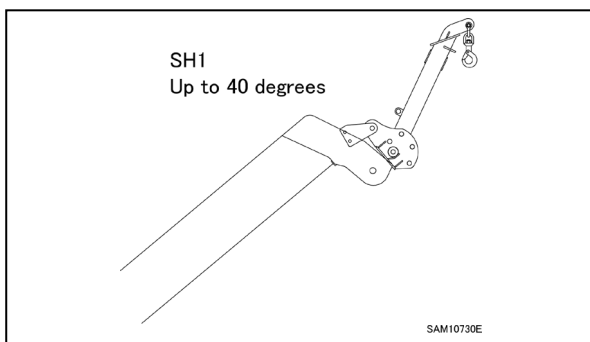


Fig. 4-424

FLY-JIB SAFETY PRECAUTIONS

WARNING!

- Whenever Fly-Jib is installed, it is essential to set up outriggers (minimum outrigger extension is permitted). Failure to do so may cause a serious hazard, such as tipping over or damage to the machine.
- Whenever Fly-jib is installed, you must not travel with a hoisted load. Failure to do so may cause a serious hazard, such as tipping over or damage to the machine.
- The Fly-jib is fixed on main boom by four bolts and two position pins. The Fly-jib is a 2-stage jib. Number 1 and 2 fly-jibs are fixed by one position pin.

Before crane operation, confirm two following points.

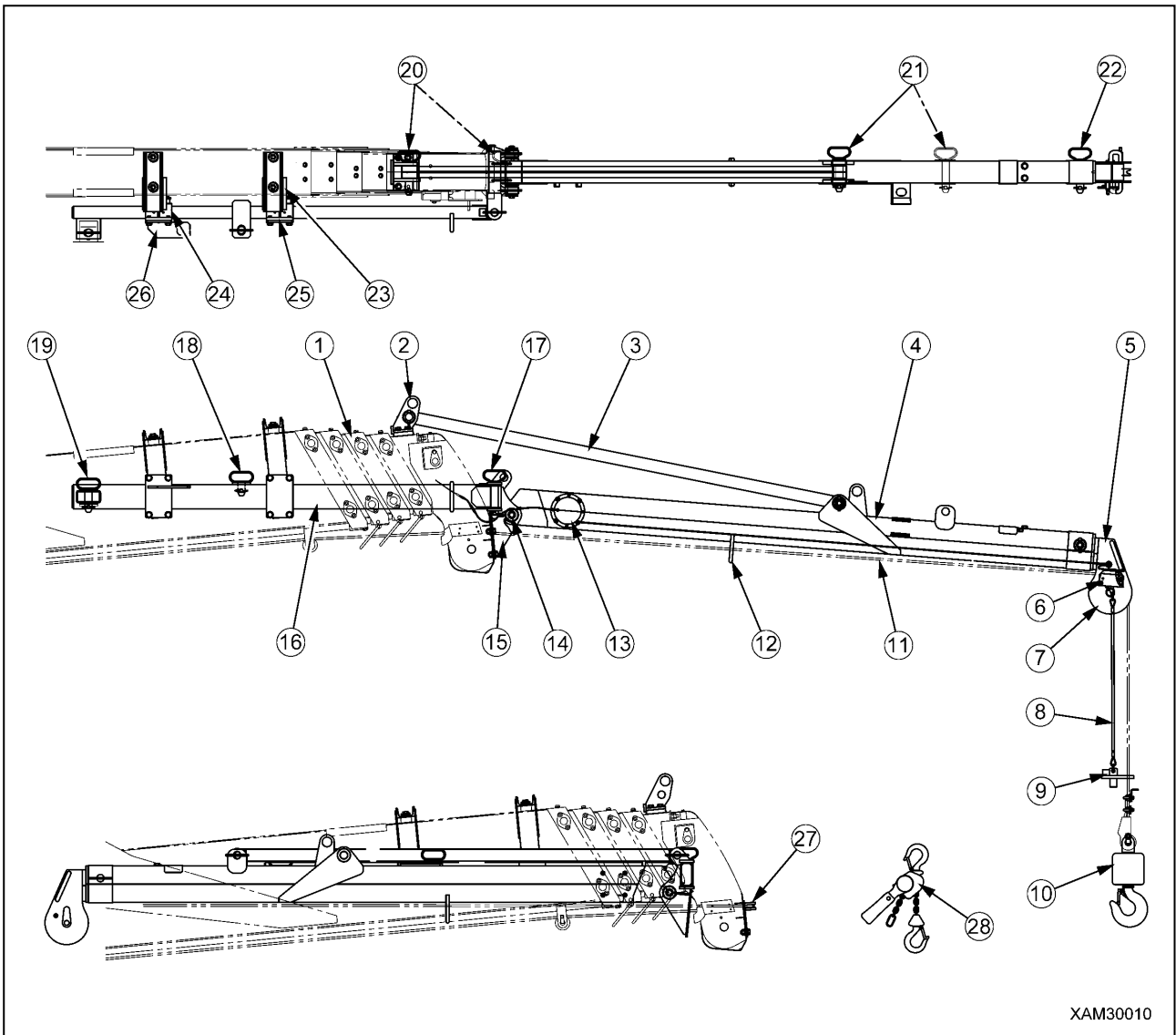
1. Confirm the four bolts and nuts are firmly fixed.
2. Confirm three position pins are inserted into correct positions and firmly fixed by lynch-pins.

If a position pin or bolt comes out, it may cause the fly-jib to remove resulting in a serious hazard.

- Whenever the Fly-jib is installed, it is essential to re-connect the over winding detector harness from the Main boom detector to the Fly-jib detector. Always ensure the over winding detector of the fly-jib is operational before starting work. In the event that the over winding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard.
- Whenever using the Fly-jib, extend jib to second stage and set the moment limiter to fly-jib mode before starting operation. Before crane operation, confirm the three position pins are inserted into the correct positions and their lynch-pins are fitted. Failure to do so may cause a serious hazard, such as tipping over or damage of the machine. Failure to do so may cause a serious hazard, such as tipping over or damage to the machine.

- The fly-jib is stowed on the side of main boom and fixed by three position pins. Confirm that the three position pins are inserted into correct positions and secured by lynch-pins before you start travelling the machine. If a position pin comes out it may cause the fly-jib to drop resulting in a serious hazard.
- When the Fly-jib is stowed, always re-connect the over winding detector harness from the Fly-jib detector to the Main boom detector. Ensure correct operation of the over winding detector of the Main boom before starting work. In the event that the over winding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard.

FLY-JIB COMPONENTS (OPTION)



XAM30010

Fig. 4-425

- | | |
|-----------------------------|---|
| 1 - Main boom | 15 - Jib bracket |
| 2 - Rod bracket | 16 - Stowing bar |
| 3 - Supporting rod | 17 - Position pin 150L |
| 4 - No.1 fly-jib | 18 - Position pin 55L |
| 5 - No.2 fly-jib | 19 - Position pin 95L |
| 6 - Over winding detector | 20 - Position pin 135L |
| 7 - Sheave | 21 - Position pin 135L |
| 8 - Protective rope | 22 - Position pin 135L |
| 9 - Protective Weight | 23 - Bar guide A |
| 10 - Single fall hook block | 24 - Bar guide B |
| 11 - Wire rope | 25 - Bar guide C |
| 12 - Hook holder | 26 - Bar guide D |
| 13 - Cord reel | 27 - Sheave for fly-jib stowing (Accessory) |
| 14 - Hook pin | 28 - Lever block (Accessory) |

FLY-JIB INSTALLATION AND STOWAGE

WARNING!

- Fly-jib installation and stowage requires two trained people. Prior to erecting or dismantling operation, communication of each person's duties during the operation and the use of signals during the operation should be agreed. Where signals are not adequate, it may cause an accident and could result in injury or death.
- Fly-jib installation and stowage must be practiced on level and solid ground. Otherwise, the Fly-jib may turn due to its own weight and could cause a serious hazard.
- Fly-jib installation and stowage require a rigid stepping stool of sufficient height; an unstable stool may result in a fall from height causing an accident.
- Fly-jib installation and stowage must be undertaken after lowering the main and on firm level ground. Otherwise, the Fly-Jib may turn due to its own weight and cause a serious hazard.
- The fly-jib is fixed on the main boom by four bolts and two position pins. The fly-jib is a 2-stage jib. Number 1 and 2 sections of the fly-jib are fixed by one position pin. Tighten four installation bolts by normal torque.
Insert three position pins into correct positions and fix with lynch-pins. If position pin or installation bolt comes out, it may cause the fly-jib to drop resulting in a serious hazard.
- Whenever Fly-jib is installed, always extend the jib to second stage. The working radius and lifting height indication of fly-jib mode moment limiter is calculated based on the length of second stage Fly-jib.
- Whenever the Fly-jib is installed, it is essential to re-connect the over winding detector harness from the Main boom detector to the Fly-jib detector. Also, always ensure the correct operation of the over winding detector of the Fly-jib before starting work. In the event that the over winding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard.

- Fly-jib is stowed the side of main boom fixed by three different length position pins. Insert three position pin into correct position and secure using the lynch-pin. If the position pin comes out, it may cause the fly-jib to drop resulting in a serious hazard.
- When the Fly-jib is stowed, always re-connect the over winding detector harness from the Fly-jib detector to the Main boom detector. Ensure the correct operation of the over winding detector of the Main boom before starting work. In the event that the over winding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard.

CAUTION: A lever block is used align the bolt holes of main boom and No.1 Fly-jib and the installation and removal of the supporting rod.

For Lever Block usage, please read the attached operation manual thoroughly.

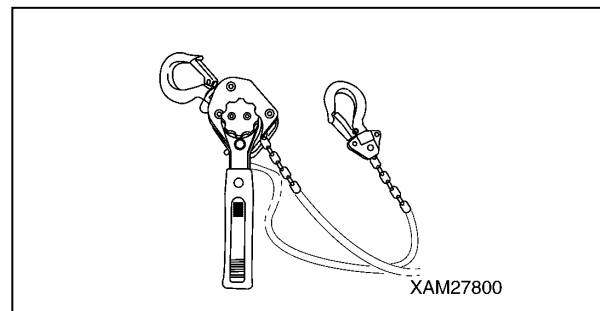


Fig. 4-426

Fly-Jib Installation

WARNING! Stop the engine during operating machine. If you operate crane without stopping engine, the machine will suddenly move to resort in a serious hazard.

According to following instructions, install fly-jib from the left side of main boom to the head of main boom.

1. Place the crane on solid and level ground.

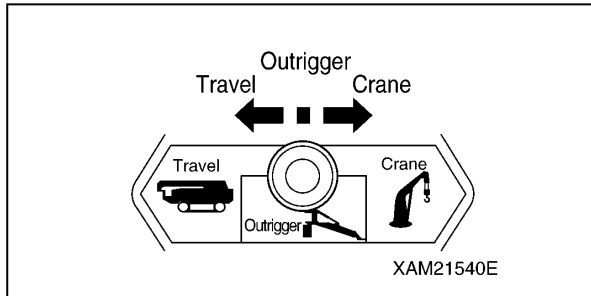


Fig. 4-427

2. Retract main-boom to the minimum length and lower to the limit.
3. Set up outrigger, and setting switch to "crane mode".
4. Set moment limiter to "Fly-jib mode".

NOTICE: For more information, see "FLY-JIB MOMENT LIMITER CONTROL" on page 4-167.

5. Follow next procedures to remove wire rope connected to hook block.

CAUTION:

- Take care to avoid the wire rope winding randomly.
- Avoid unwinding after the hook is grounded; otherwise it will make the wire rope wind randomly around the winch drum.

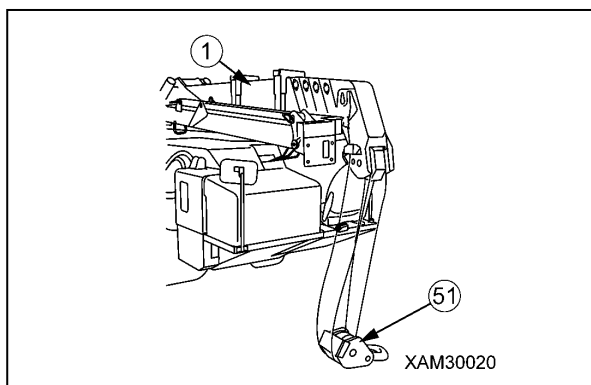


Fig. 4-428

- (1) Raise the boom (1) to 5°, then lower the hook (51) so that it almost touches the ground.

- (2) Press boom stowing switch to lower the boom (1) to level, and deposit hook (51) slowly on the ground.
- (3) Stop the engine.
- (4) Remove bolt (54) and pull wedge socket pin (53) out and remove wedge socket (52) from main boom.
- (5) Remove wire clip (56).

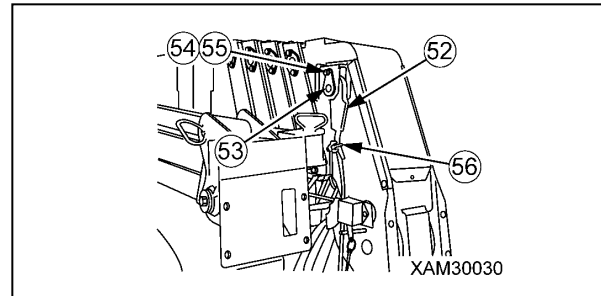


Fig. 4-429

- (6) Put a bar (A) (4 - 6mm in diameter) to rope wedge (57) and hammer it to direction arrow indicates (a). Then remove wire rope (57).

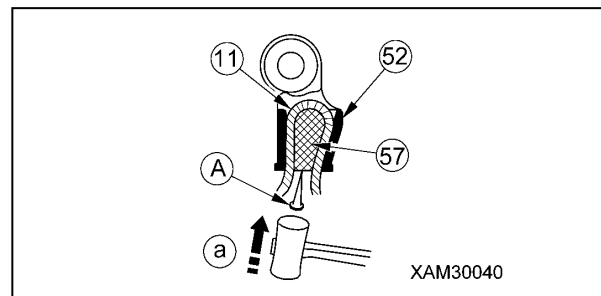


Fig. 4-430

- (7) Remove the wire rope (11) from the hook.
- (8) Remove the wire rope (11) from the over winding detector weight (58).
- (9) Remove over winding detector rope (59) and over winding detector weight (58).

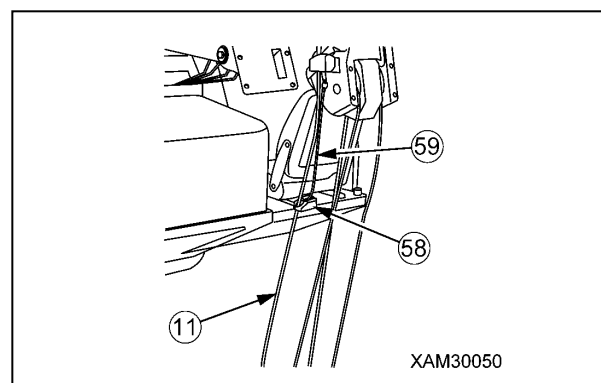


Fig. 4-431

- Pull lynch-pin (29) out from position pin (18) inserted at storage bar (16), then pull position pin (18) (length: 55mm) out from storage bar (16).

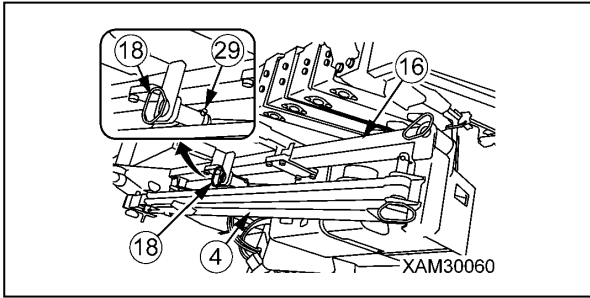


Fig. 4-432

- Slide No.1 Fly-jib (4) and storage bar (16) to head of the main boom direction.

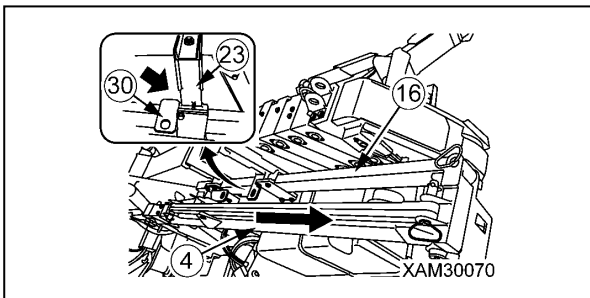


Fig. 4-433

NOTICE: Slide No.1 Fly-jib (4) and storage bar (16) until stopper (30) of storage bar (16) hit the bar guide A (23).

- Pull lynch-pin (29) from position pin (19) inserted at storage bar (29), then pull position pin (19) (length: 95mm) out from storage bar (16).

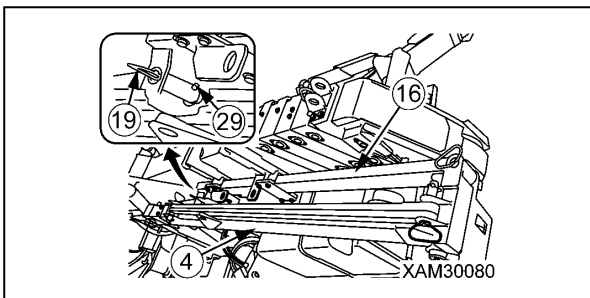


Fig. 4-434

- Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) on the right side of the head of main boom.

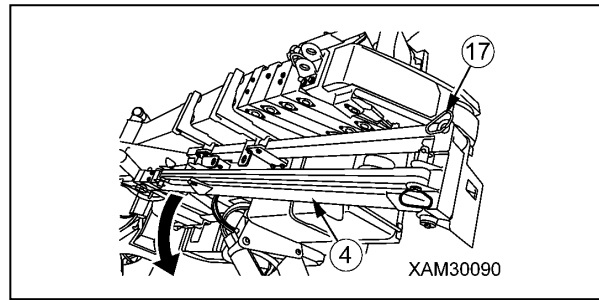


Fig. 4-435

- Lace the wire rope (11) which pulled out at section five through the hole (B) of No.1 Fly-jib bracket (15), and pull the wire rope (11) out to Fly-jib side.

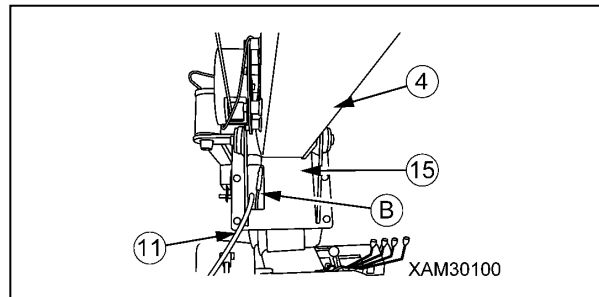


Fig. 4-436

- Hang attachment lever block (28) between No.1 Fly-jib bracket (32) and bracket (2).

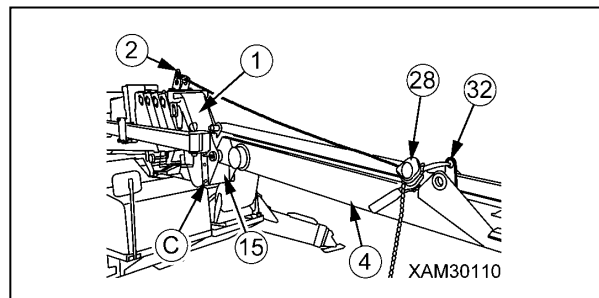


Fig. 4-437

NOTICE: Lever block (28) will be easy to operate to hook lever to No.1 Fly-jib bracket side.

- Operate lever block (28) to put attachment hole of No.1 Fly-jib bracket (15) with the hole on the underneath of main boom together.

NOTICE: Insert bar (D) into attachment hole (C) to put the hole (C) on No.1 Fly-jib bracket (15) and the hole on the downside of main boom.

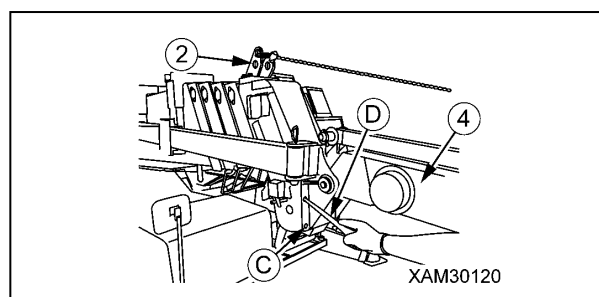


Fig. 4-438

- Fix the No.1 Fly-jib bracket (15) and main boom by four attachment bolts (33) (M12x30L), washers (34) and nuts (35).

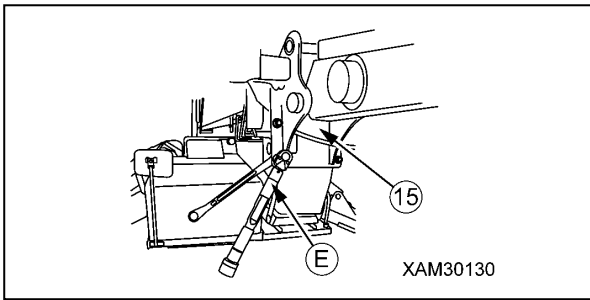


Fig. 4-439

NOTICE: Insert attachment bolt from main boom side.

DANGER!

- Use tightening torque of 93Nm to grip attachment bolt of Fly-jib. Also, use torque wrench (E) to grip attachment bolt of Fly-jib. If attachment bolt comes out, it may cause the Fly-jib to drop resulting in a serious hazard.
- Check condition of the bolts before use.

- Pull lynch-pin (36) out from position pin (20) which fixing two supporting rod (3), then pull out position pin (20) (length: 135mm).

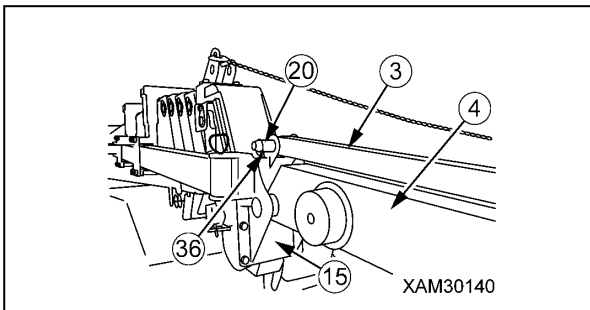


Fig. 4-440

NOTICE: The position pin (20) which you pulled out will be used later to connect supporting rod (3) with bracket on the head of main boom.

- Pull lynch-pin (36) out from position pin (21) which fixing two supporting rods (3), then pull out position pin (21) (length: 135mm).

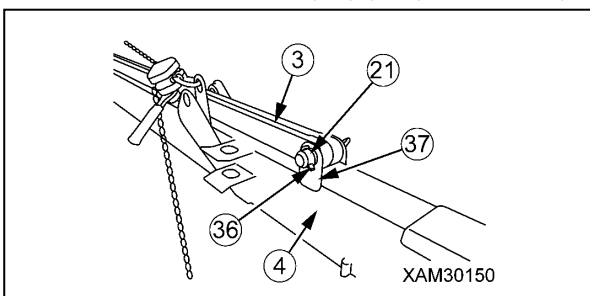


Fig. 4-441

NOTICE: The position pin (21) which you pulled out will be used later to connect support rod (3) with the No.1 Fly-jib bracket.

- Move two supporting rods (3) to bracket (2) on the head of main boom and put position of the hole together.

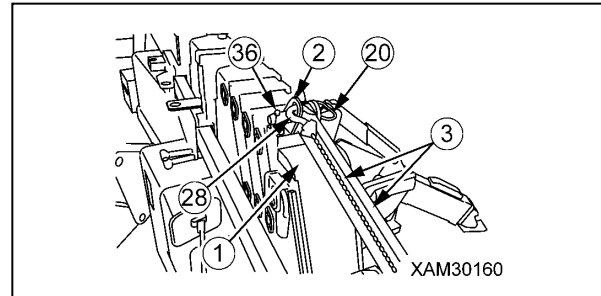


Fig. 4-442

NOTICE: Supporting rod (3) is composed of two rods. Move the rod one by one when you change the position of supporting rod (3).

- Insert position pin (20) (length: 135mm) into bracket (2) on the head of main boom, and lock position pin (20) firmly by lynch-pin (36).

CAUTION: According to decal on the machine to insert position pin from the direction shown in the figure. If you insert position pin from opposite direction, it makes it difficult to remove supporting rod because of interference of lever block and grip of position pin.

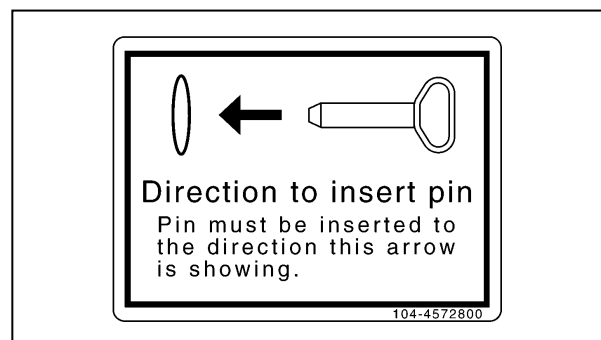


Fig. 4-443

- Operate lever block (28) to move No.1 Fly-jib (4), and put the hole position of No.1 Fly-jib bracket (32) and supporting rod (3) together.

19. Insert position pin (21) (length: 135mm) into the No.1 Fly-jib bracket (32), and lock position pin (21) firmly by lynch-pin (36).

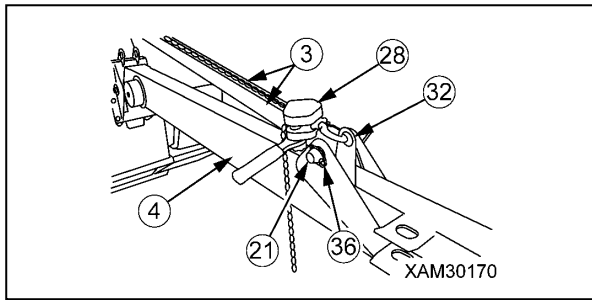


Fig. 4-444

CAUTION: According to decal on the machine to insert position pin from the direction shown in the figure. If you insert position pin from opposite direction, it makes it difficult to remove supporting rod because of interference of lever block and grip of position pin.

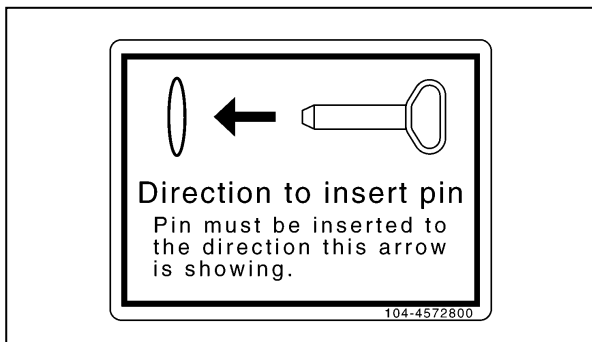


Fig. 4-445

20. Remove lever block (28).
21. Pull lynch-pin (29) out from position pin (17) on the head of storage bar (16), then pull position pin (17) (length: 150mm) out from storage bar (16).

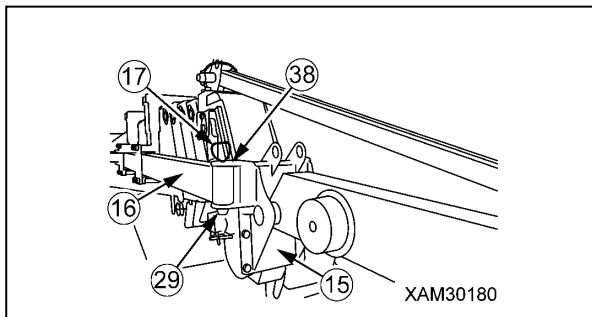


Fig. 4-446

22. Slide the storage bar (16) to the back edge side of the main boom.

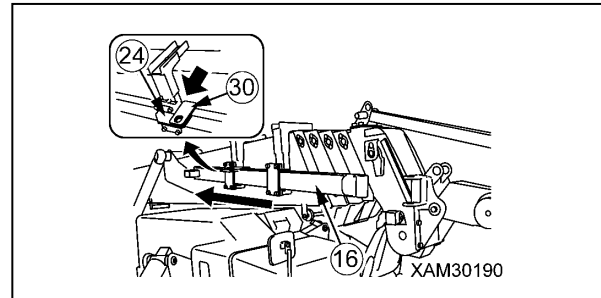


Fig. 4-447

NOTICE: Slide storage bar (16) until stopper (30) of storage bar (16) hit the bar guide B (24), and put the hole of stopper (30) and bar guide B (24) together.

23. Insert position pin (18) (length: 55mm) into the hole of stopper (30) on the centre of storage bar (16), and lock position pin (18) firmly by lynch-pin (29).
24. Insert position pin (19) (length: 95mm) into the hole of the bracket (39) on the tail of storage bar (16), and lock position pin (19) firmly by lynch-pin (29).
25. Insert position pin (17) (length: 150mm) into the hole of the bracket (38) of the No.1 Fly-jib bracket (15), and lock position pin (17) firmly by lynch-pin (29).

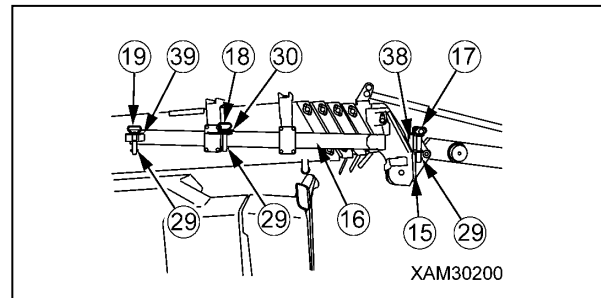


Fig. 4-448

26. Pull lynch-pin (36) out from position pin (22) on the head of No.1 Fly-jib (4), then pull out position pin (22).

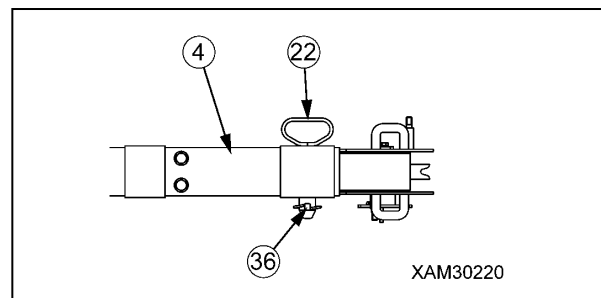


Fig. 4-449

NOTICE: Position pin (22) which pulled out is used to fix No.2 Fly-jib (5).

27. Hold handles on the both side of No.2 Fly-jib (5) to pull out No.2 Fly-jib (5).

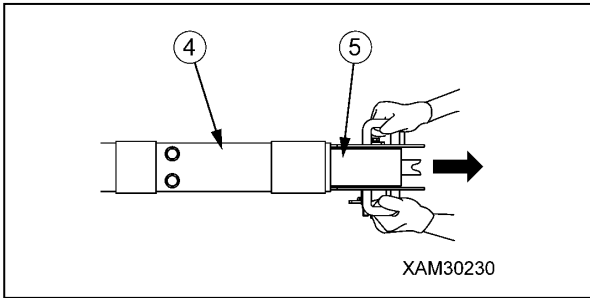


Fig. 4-450

28. After pull out No.2 Fly-jib (5), put the hole together on the side of No.1 (4) and No.2 Fly-jib (5).

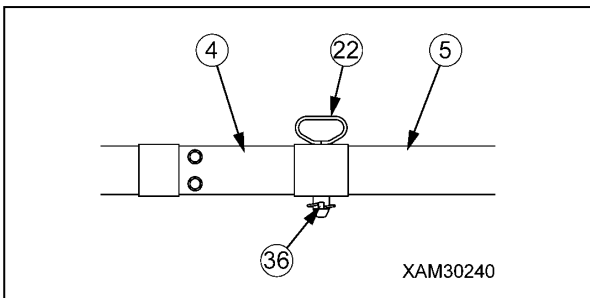


Fig. 4-451

29. Insert position pin (22) into the hole on the side of No.1 Fly-jib (4), and lock position pin (22) firmly by lynch-pin (36).

30. Connect wire rope with hook block according to following point.

- (1) Lace the wire rope (11) which pulled out at section 10 through hook rack (12) on the bottom of No.1 Fly-jib (4) or guide sheave (7) on the head of No.2 Fly-jib (5).

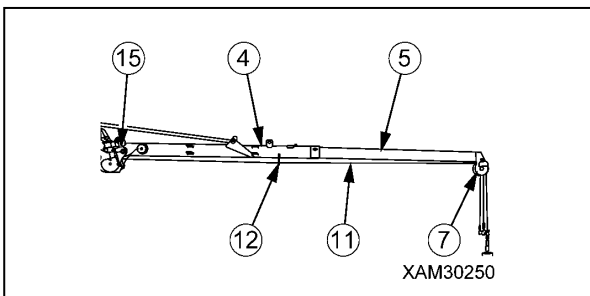


Fig. 4-452

- (2) Use shackle (46) to attach two over winding detector ropes (8) (length: 700mm) and weight (9) to over winding detector (6) and plate (45) on the head of No.2 Fly-jib (5).

(3) Lace the wire rope (11) through the hole of over winding detector weight (9).

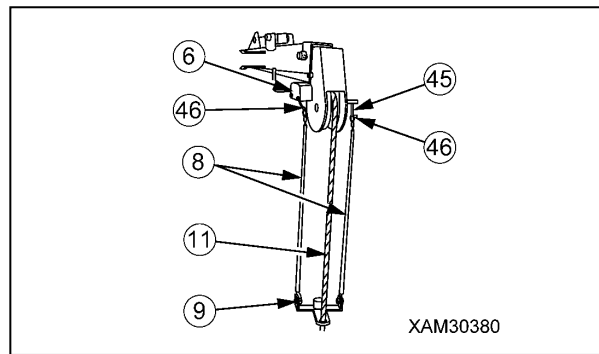


Fig. 4-453

- (4) See the figure to lace wire rope (11) through wire socket (52) removed on Step 5, and put rope wedge (57) into position (a), and pull wire rope (11) to direction which arrow indicate.

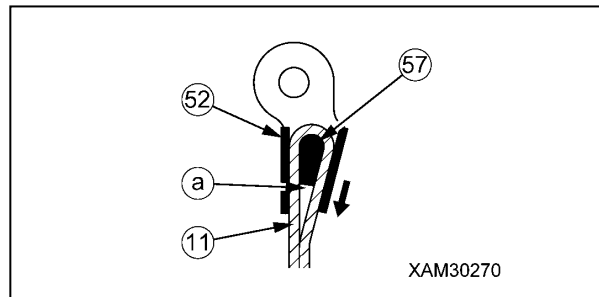


Fig. 4-454

- (5) Attach two wire clips (56) and weight stopper (44) to wire rope (11). See the figure for the points to attach of rope clips (56).

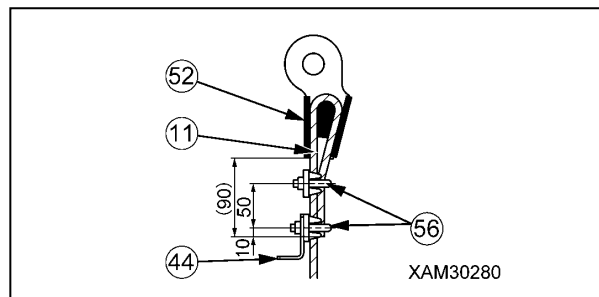


Fig. 4-455

NOTICE: Fasten wire clips (56) and weight stopper (44) together 10mm back from end of the wire.

- (6) Set wedge socket (52) to single fall hook (10) and insert wedge socket pin (53), and fix firmly by one bolt (54) (M8x12L) and one washer (55).

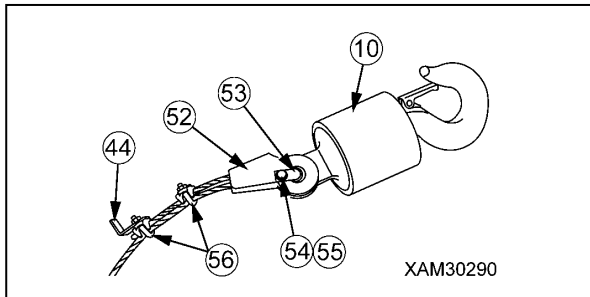


Fig. 4-456

27. Disconnect of wiring (41) of over winding detector (40) and wiring (42) from main boom at connector, then connect wiring (42) with extension cord (43) from No.1 Fly-jib code reel (13).

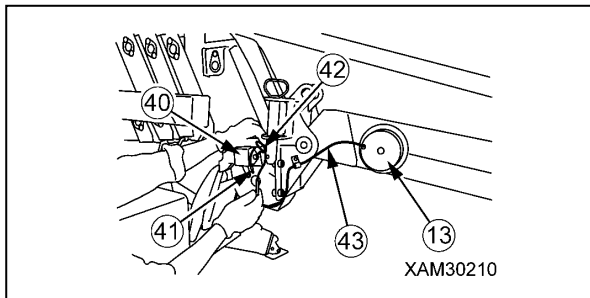


Fig. 4-457

NOTICE: After connect wiring (42) with extension cord (43), push wiring into inside of main boom.

WARNING!

- Always connect wiring (42) from main boom with extension cord (43) from No.1 Fly-jib cord reel (13). If you do not change the connection of wiring, over winding detector will not work normally and may cause the hook or load to drop resulting in a serious hazard.
- After connected extension cord (43), please confirm that wiring is not strained. If wiring is strained strongly, it will cause wiring to snap.
- Before crane operation, regularly raise hook to confirm whether hook will stop automatically when hook hits the over winding detector weight.

Fly-Jib Stowage (Single Fall Hook Mode)

NOTICE: This section is an explanation of method to stow fly-jib with single hook.

WARNING! Stop the engine before stowage operation crane. If not the crane may suddenly move and result in a serious hazard.

1. Pull lynch-pin (36) out from position pin (22) on No.1 Fly-jib (4), then pull position pin (22) out from No.1 Fly-jib (4).

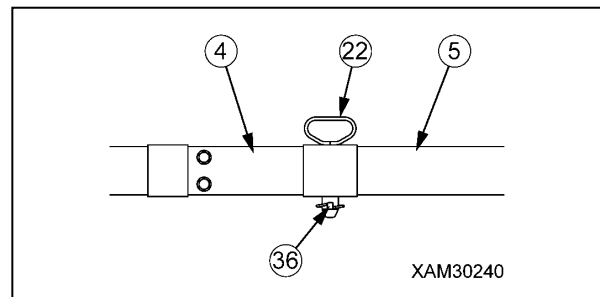


Fig. 4-458

NOTICE: The position pin (22) will be used for fixing No.2 Fly-jib (5) after retract No.2 Fly-jib (5).

2. Hold the handle on the both side of the head of No.2 Fly-jib (5) and push No.2 Fly-jib (5) into No.1 Fly-jib (4).

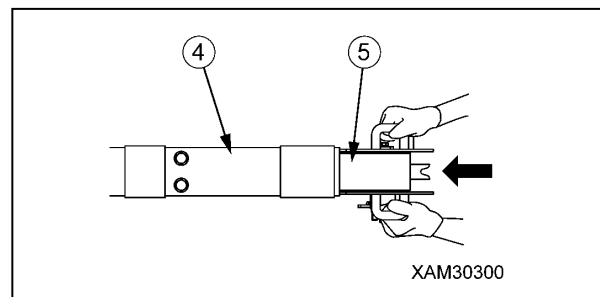


Fig. 4-459

3. Put the hole together on the side of No.1 Fly-jib (4) and No.2 Fly-jib (5).

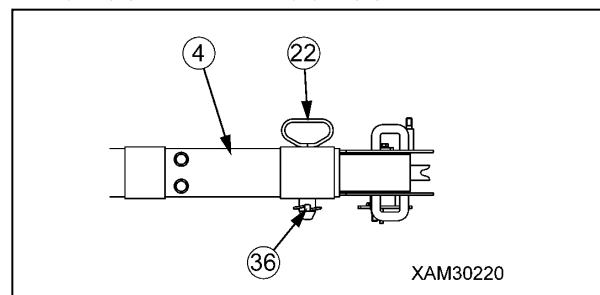


Fig. 4-460

4. Insert position pin (22) and fix it firmly by lynch-pin (36).

5. Pull lynch-pin (29) out from position pin (17) inserted at the No.1 Fly-jib bracket (38), then pull position pin (17) (length: 150mm) out from the bracket (38).
6. Pull lynch-pin (29) out from position pin (18) inserted at the stopper (30) on the centre of storage bar (16), then pull the position (18) (length: 55mm) pin out from stopper (30).
7. Pull lynch-pin (29) out from position pin (19) inserted at the bracket (39) on the rear of storage bar (16), then pull the position (19) (length: 95mm) pin out from bracket (39).

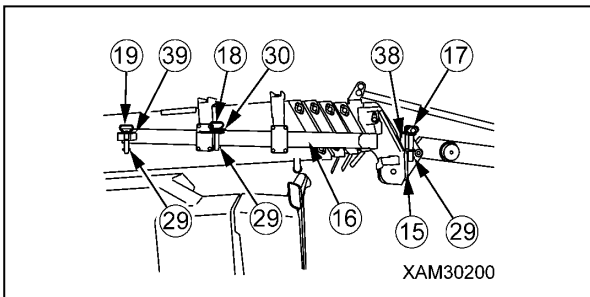


Fig. 4-461

NOTICE: Position pin (17), (18), (19) pulled out on section 6, 7 will be used for storage of No.1 Fly-jib (4).

8. Slide storage bar (16) to the direction of the head of main boom.

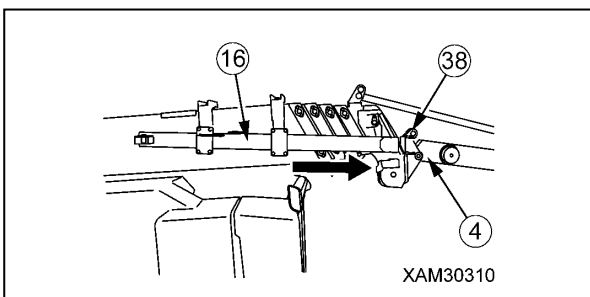


Fig. 4-462

NOTICE: Insert storage bar (16) into the head of No.1 Fly-jib bracket (38), and put position of the hole on the head of storage bar (16) and bracket (38) together.

9. Insert position pin (17) (length: 150mm) into the hole on bracket (38) of No.1 Fly-jib bracket (15), then insert lynch-pin (29) into position pin (17) to fix position pin firmly.

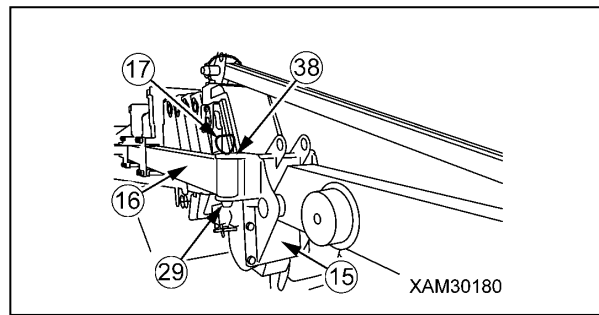


Fig. 4-463

WARNING! Always insert position pin (17) from upside. If you insert position pin (17) from downside, it will come out and result in a serious hazard.

10. Hang lever block (28) between brackets (32) shown in the figure, and operate the lever block (28) to strain the chain.

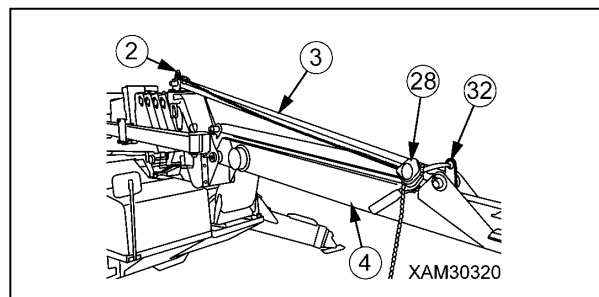


Fig. 4-464

NOTICE: Hanging lever on No.1 Fly-jib bracket (32) side makes it easy to operate lever block (28).

11. Pull lynch-pin (36) out from position pin (20) inserted at the bracket (2) of the head of main boom, then pull position pin (20) (length: 135mm) out from the bracket (2).

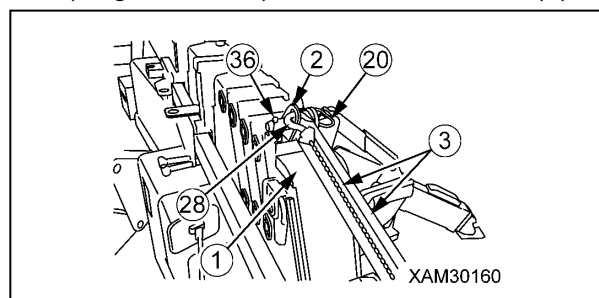


Fig. 4-465

NOTICE: Position pin (20) pulled out will be used to connect supporting rod (3) with No.1 Fly-jib bracket later.

- Pull lynch-pin (36) out from position pin (21) inserted at the bracket (32) of No.1 Fly-jib bracket, then pull position pin (21) (length: 135mm) out from the bracket (32.).

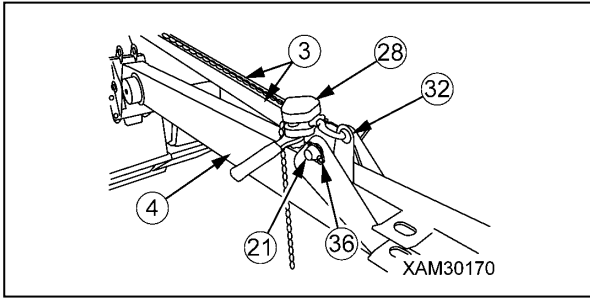


Fig. 4-466

NOTICE:

- Hold two supporting rods (3) whilst pulling position pin (21) out. If you were not hold supporting rod (3), they will drop.
- Position pin (21) pulled out will be used to connect supporting rod (3) with No.1 Fly-jib bracket later.

- Insert two supporting rods (3) into upside of No.1 Fly-jib bracket (15), and put positions of the hole together.

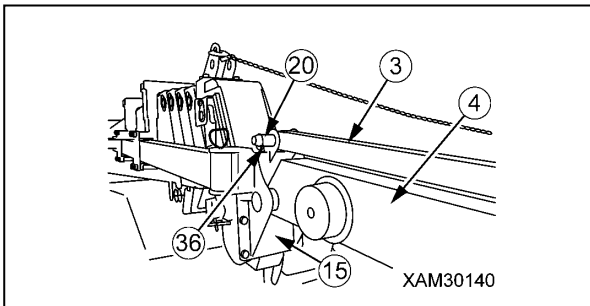


Fig. 4-467

- Insert position pin (20) (length: 135mm) into the hole on the upside of No.1 Fly-jib bracket (15), and lock position pin (20) firmly by lynch-pin (36).

NOTICE: Supporting rod (3) is composed of two rods. Move the rod one by one when you change the position of supporting rod (3).

- Operate lever block (28) to move No.1 Fly-jib (4), and put the hole of supporting rod (3) and No.1 Fly-jib (4) bracket (37) together.

- Insert position pin (21) (length: 135mm) into the hole of No.1 Fly-jib (4) bracket (37), then fix position pin (21) firmly by lynch-pin (36).

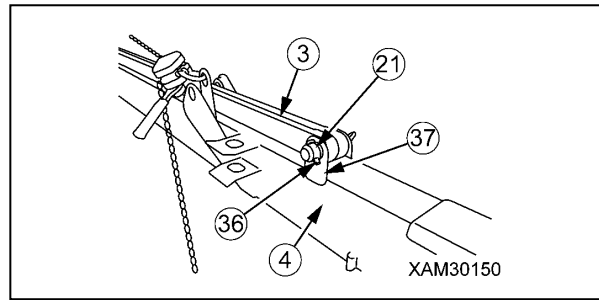


Fig. 4-468

- Hang single fall hook (10) on the hook holder (12) underneath the No.1 Fly-jib (4).

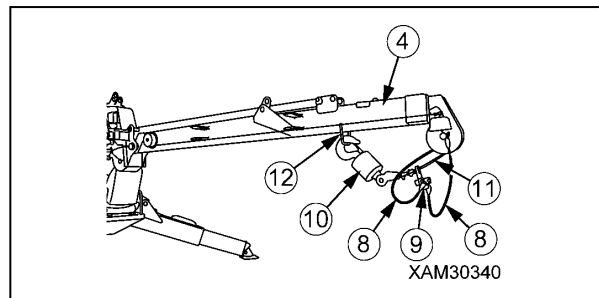


Fig. 4-469

NOTICE: Slacken off wire rope (11) slightly.

- Remove four attachment bolts (33), four washers (34), and four nuts (35) which are used on the No.1 Fly-jib bracket (15).

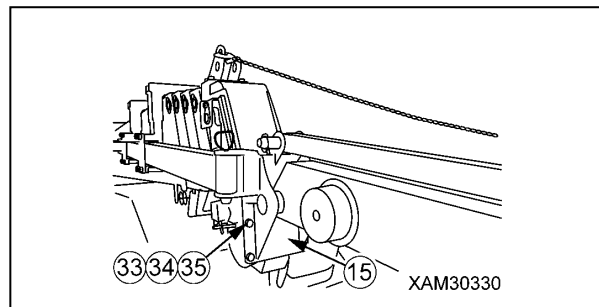


Fig. 4-470

- Remove lever block (28).

20. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) on the right side of the head of main boom.

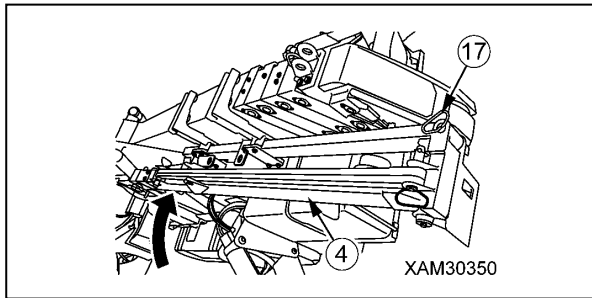


Fig. 4-471

21. Put the hole of storage bar (16) and bracket on the head of No.1 Fly-jib (4) together.
22. Insert position pin (19) into the hole of No.1 Fly-jib (4) bracket, then fix position pin (19) firmly with lynch-pin (29).

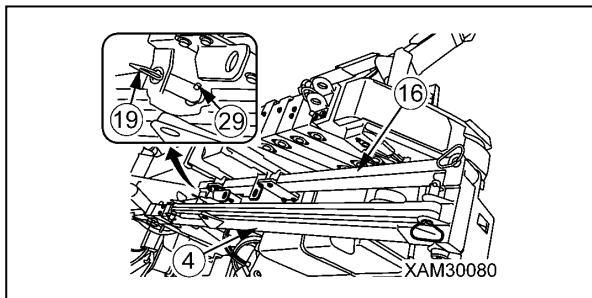


Fig. 4-472

WARNING! Always insert position pin (19) from upside. If you insert it from downside, position pin will come out and result in a serious hazard.

23. Slide storage bar (16) and No.1 Fly-jib (4) to the direction of the head of No.1 Fly-jib (4), put the hole of the stopper (30) on the storage bar (16) and No.1 Fly-jib (4) together.

24. Insert position pin (18) into the hole of stopper (30) on the storage bar (16), then fix position pin (18) firmly by lynch-pin (29).

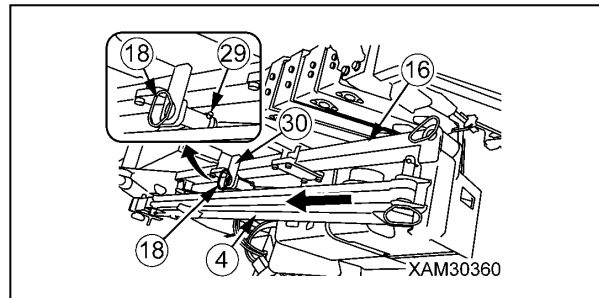


Fig. 4-473

WARNING! Always insert position pin (18) from upside. If you insert it from downside, position pin will come out and result in a serious hazard.

25. Set the sheave (27) for Fly-jib stowing to the hole on the head of main boom, and fix by attachment bolt (33) (M12x30L), washer (34), and nut (35).
26. Hang wire rope (11) on the sheave (27) of Fly-jib stowing.

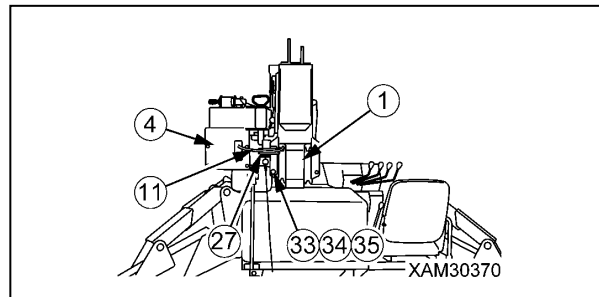


Fig. 4-474

CAUTION: If you are to stow No.1 Fly-jib with single fall hook, always attach sheave (27) for Fly-jib stowing, and hang wire rope (11) from main boom to this sheave (27). If you do not use this sheave (27), the wire rope (11) will bend and result in early damage of wire rope.

Change to Single Fall Hook from Main-Boom Hook Block

NOTICE: This section is the explanation of the method to change single fall hook block for regular hook block after stowing Fly-jib.

WARNING! Always stop the engine during changing of hook block. If you work without stopping the engine, machine may suddenly move to result in a serious hazard.

1. Disconnect wiring (42) from main boom and extension cord (43) from No.1 Fly-jib cord reel (13) at connector, then connect wiring (42) with wiring (41) from over winding detector (40).

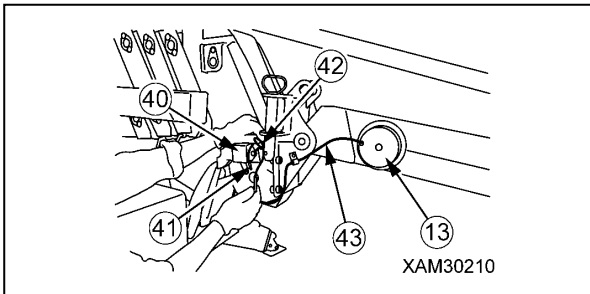


Fig. 4-475

WARNING!

- Always connect wiring (42) from main boom with wiring (41) from over winding detector (40). Without changing connection of wiring, over winding detector will not work and may drop the hook or load, and result in a serious hazard.
- Before crane operation, always raise hook to confirm whether hook will stop automatically when hook hits the over winding detector weight.

2. Remove single fall hook according to following information.
 - (1) Press boom stowing switch to lower boom to level, and deposit single fall hook (10) slowly on the ground.
 - (2) Take off one bolt (54) (M8x12L) and one washer (55) and pull wedge socket pin (53). Then remove wedge socket (52) from single fall hook (10).
 - (3) Remove two wire clips (56) and weight stopper (44).

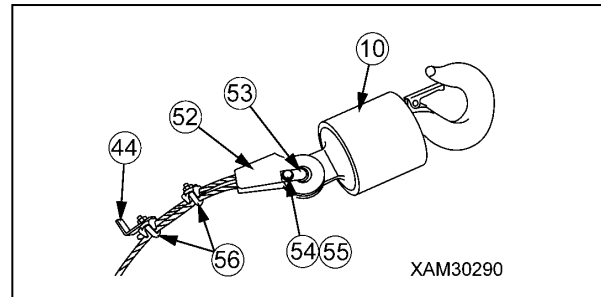


Fig. 4-476

- (4) Fit the bar (A) (4 - 6mm in diameter) to the rope wedge (57) and hammer to the direction as indicated by arrow (a) to remove the rope wedge (57).
- (5) Remove wire rope (11) from rope wedge (52).

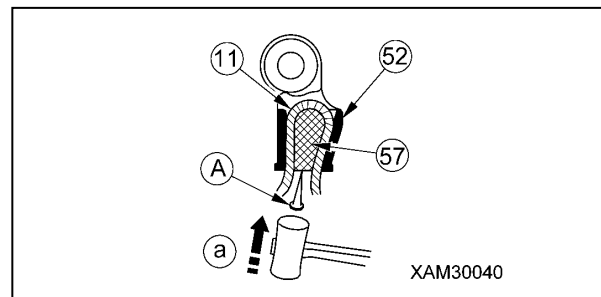


Fig. 4-477

- (6) Pull wire rope (11) out from weight (9) of over winding detector (6).
- (7) Remove protective rope (8) and protective weight (9).

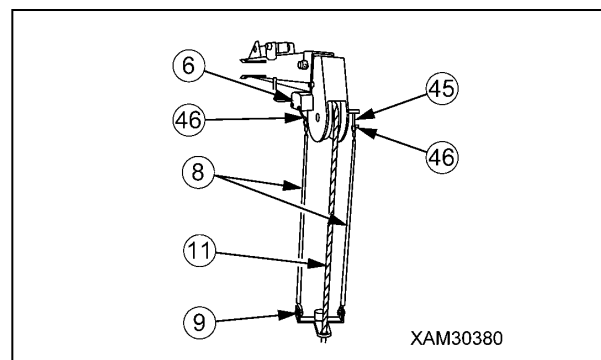


Fig. 4-478

3. Pull wire rope out (11) from guide sheave (7) on the head of No.2 Fly-jib (5) and hook holder (12) on the underneath of No.1 Fly-jib (4).

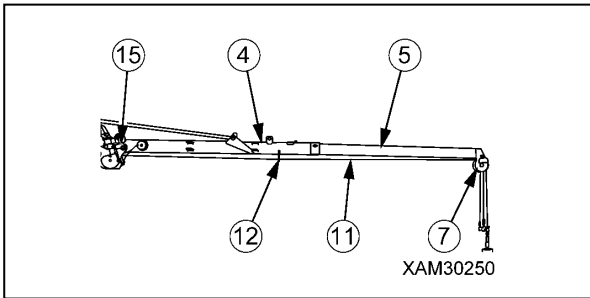


Fig. 4-479

4. Put wire rope (11) out from the hole (B) of No.1 Fly-jib bracket (15) to main boom side.

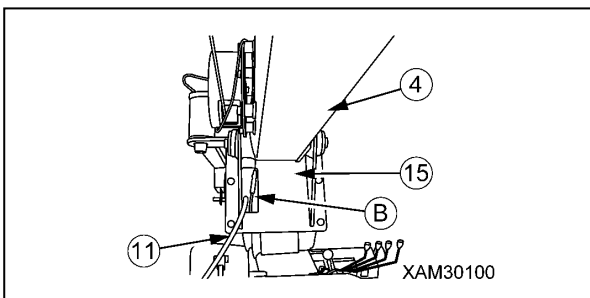


Fig. 4-480

5. See "Fly-Jib Stowage (Single Fall Hook Mode)" on page 4-156 and stow Fly-jib.
6. The following information is to attach the wire rope to 4 fall hook block.

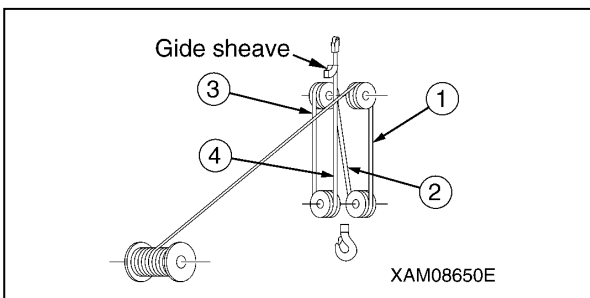


Fig. 4-481

- (1) Take up wire rope to winch operation.
- (2) Accommodate the type of hook block (single to 4 fall hook), lace wire rope to load sheave, hook block sheave and guide sheave as shown in the figure.

- (3) Lace wire rope (11) into the weight (58) of over winding detector.

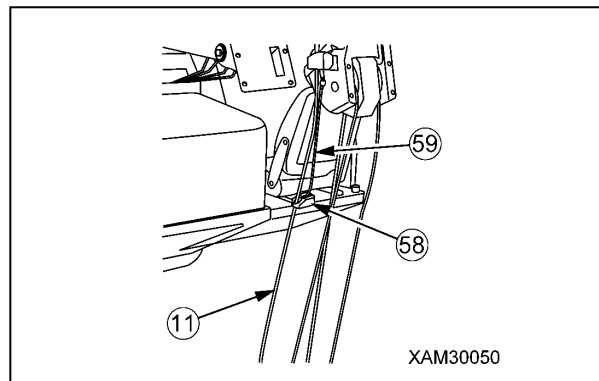


Fig. 4-482

- (4) Insert wire rope (11) with rope wedge (57) into wire socket (a) position, then pull wire rope (11) to the direction the arrow is showing.

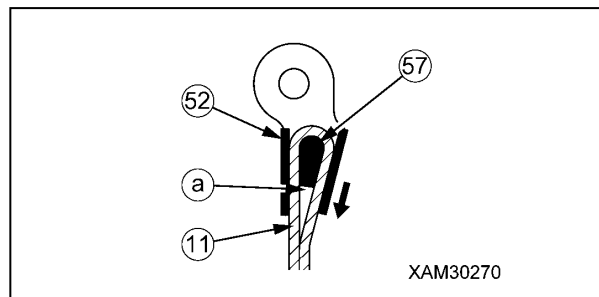


Fig. 4-483

- (5) Attach wire clip (56) to the wire rope (11).
- (6) Set the wedge socket (52) and insert wedge socket pin (53) into it, and fix firmly by one bolt (54) (M8x12L) and one washer(55).

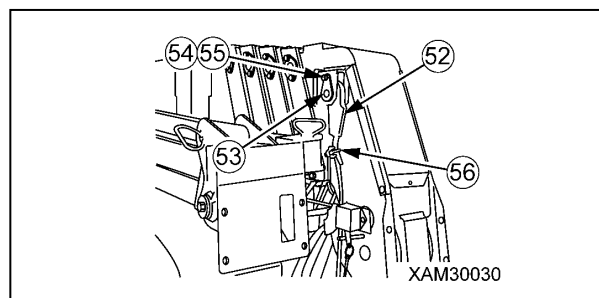


Fig. 4-484

Removal of Fly-Jib Assembly

NOTICE: This section is an explanation of the method to remove Fly-jib from machine. Use crane to remove Fly-jib.

WARNING!

- Always stop the engine regularly during changing hook block. If you work without stopping engine, machine may suddenly move resulting in a serious hazard.
- The hoisting attachments such as wire rope and shackle used in hoisting shall be sufficiently strong for the weight of Fly-jib.

CAUTION: The crane operator who operates a Fly-jib may have to acquire a qualification provided by local law or regulation. All operators must be trained and have reached a good standard.

1. Pull lynch-pin (29) out from position pin (18) inserted at storage bar (16), then pull out position pin (18) (length: 55mm).

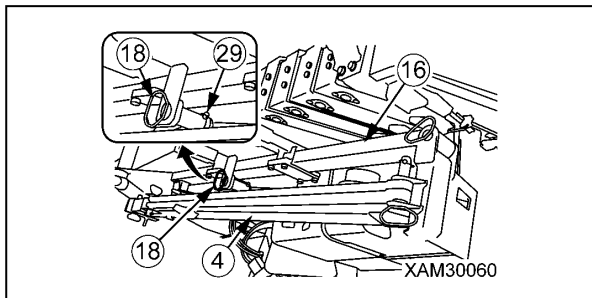


Fig. 4-485

2. Move No.1 Fly-jib (4) and storage bar (16) to the direction of head of the main boom.

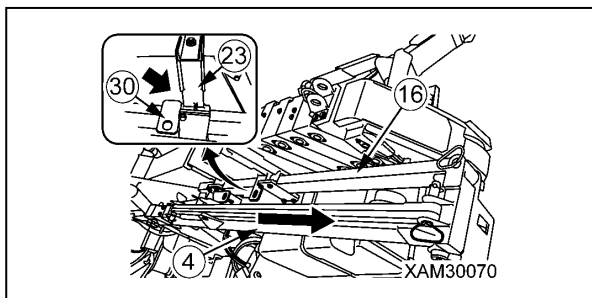


Fig. 4-486

NOTICE: Move No.1 Fly-jib (4) and storage bar (16) until stopper (30) of the storage bar (16) has hit bar guide A (23).

3. Pull lynch-pin (29) out from position pin (19) inserted at storage bar (16), then pull out position pin (19) (length: 95mm).

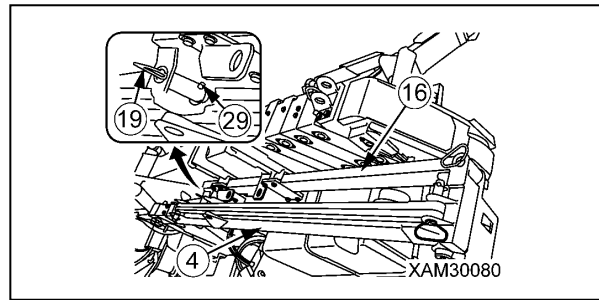


Fig. 4-487

4. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) on the right side of the head of main boom.

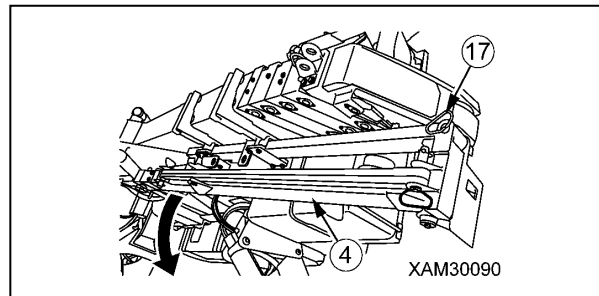


Fig. 4-488

5. Hang hoisting wire rope to No.1 Fly-jib (4), and hoist the jib interim.

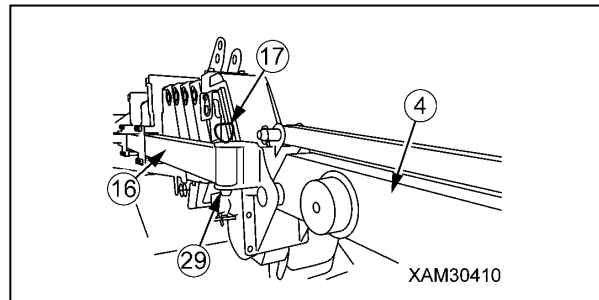


Fig. 4-489

6. Pull lynch-pin (29) out from position pin (17) inserted at storage bar (16), then pull out position pin (17) (length: 150mm).
7. Hoist No.1 Fly-jib (4) and remove it.
8. Take off four attachment bolts (61) and four washers (62) from bar guide D (26), then remove bar guide D (26).

9. Take off four attachment bolts (61) and four washers (62) from bar guide C (25), then remove bar guide C (25).

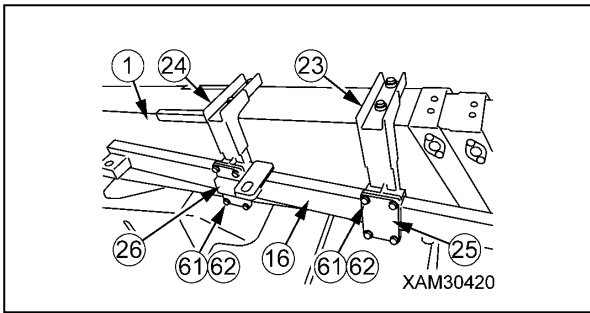


Fig. 4-490

WARNING! Hold the storage bar (16) firmly when you remove bar guide C (25). Storage bar (16) will fall down, after removing bar guide C (25).

10. Remove storage bar (16).
11. Take off two attachment bolts (63) and washers (64) from bar guide A (23), then remove bar guide A (23).
12. Take off two attachment bolts (63) and washers (64) from bar guide B (24), then remove bar guide B (24).

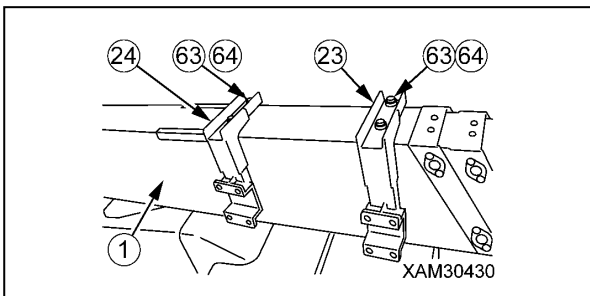


Fig. 4-491

CAUTION: Record the number of washer (64) when you remove bar guide (23), (24). Refer it to attach storage bar again.

- Washer on the each bar guide attachment bolt.
- Washer on each bar guide and between main booms.

Installation of Fly-Jib Assembly

NOTICE: This section is an explanation of Fly-jib attachment to the machine. Use crane to attach Fly-jib.

WARNING!

- Always stop the engine during changing of hook block. If you work without stopping engine, the machine may suddenly move and result in a serious hazard.
- The hoisting attachments such as wire rope and shackle used in hoisting shall be sufficiently strong for the weight of Fly-jib.

CAUTION: The crane operator who operates a Fly-jib may have to acquire a qualification provided by local law or regulation. All operators must be trained and have reached a good standard.

1. Set the bar guide B (24) to regular position on the main boom, then tighten it by two attachment bolts (63) and plural washers (64).
2. Set the bar guide A (23) to regular position on the main boom, then tighten it lightly by two attachment bolts (63) and plural washers (64).

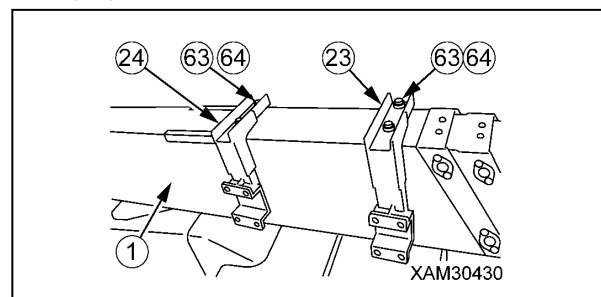


Fig. 4-492

CAUTION:

- If you attach bar guide A (23) to machine, replace washers (64) to each part with the same number of washers as recorded when you removed it.
- Washer on the each bar guide and attachment bolt.
- Washer on the each bar guide and between main booms.
- When you attach new Fly-jib, use number of washers (64) as directed below, and set Bar guide A (23) of Stowage Bar so that it faces slightly upper side.
- Use washer one by one to each attachment bolt on bar guide.
- Use washer one by one to bar guide A (23) and between main booms.
- Do not use washer for bar guide B (24) and between main boom.
- When you attach bar guide A (23), tighten attachment bolt lightly. It is necessary to remove attachment bolt (63) again because of regulating storage bar height.

3. Push storage bar (16) into bar guide A (23) and bar guide B (24).

WARNING! Hold storage bar (16) firmly, until bar guide C (25) is attached.

4. Set bar guide C (25) into bar guide A (23), and tighten it by four attachment bolts (61) and plural washers (62).
5. Set bar guide D (26) into bar guide B (24), and tighten it by four attachment bolts (61) and plural washers (62).

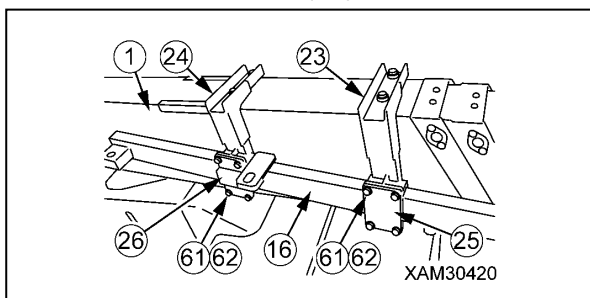


Fig. 4-493

6. Hang wire rope to No.1 Fly-jib (4), then operate crane to set No.1 Fly-jib (4) to Fly-jib bracket (15) on the head of main boom.

7. Use four attachment bolt (33) (M12x30L), four washers (34) and four nuts (35) to tighten attach Fly-jib bracket (15) with main boom.

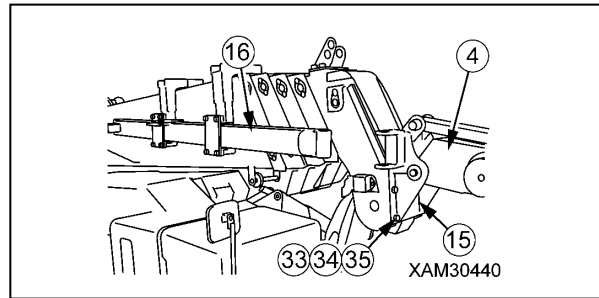


Fig. 4-494

NOTICE: Insert attachment bolt from main boom side.

8. Move storage bar (16) to No.1 Fly-jib (4) side, and confirm whether storage bar (16) could be inserted smoothly into No.1 Fly-jib bracket (38).

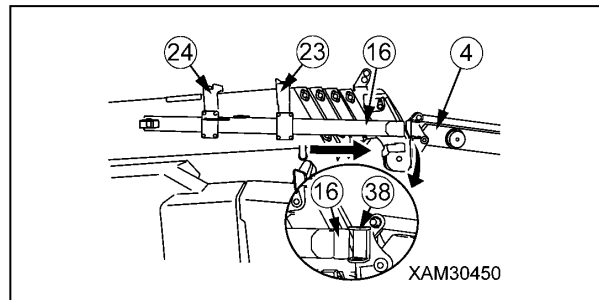


Fig. 4-495

CAUTION: In case the storage bar (16) were not to insert smoothly into No.1 Fly-jib bracket (38), confirm condition. After confirmation, if there is something wrong with storage bar, reset bar in accordance with "METHOD to REGULATE THE HEIGHT of STORAGE BAR" to re-set it.

1. In case storage bar (16) faced to upper side toward bracket (38), it indicate bar guide A (23) is on a higher position than bar guide B (24).

2. In case storage bar (16) face to downwards toward bracket (38), it indicate bar guide A (23) is on a lower position than bar guide B (24).

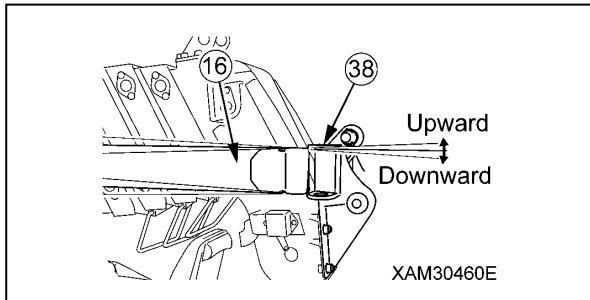


Fig. 4-496

METHOD to REGULATE THE HEIGHT of STORAGE BAR

- Basically adjust the number of washer on bar guide side A (23) to regulate the height of storage bar (16).
1. After confirmation, in the case applicable to the above section 1, remove attachment bolt (63) on the bar guide A (23) side, reduce the number of washers (64) between main boom (1) and bar guide A (23).
 2. After confirmation, in the case applicable to the above section 2, remove attachment bolt (63) on the bar guide A (23) side, increase the number of washers (64) between main boom (1) and bar guide A (23).

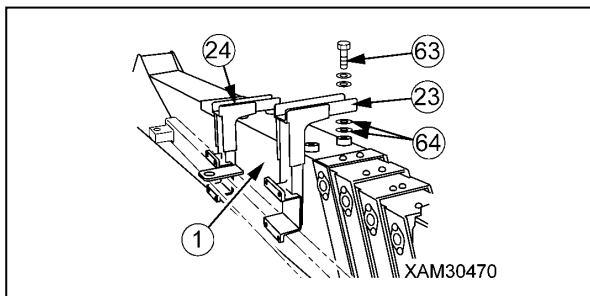


Fig. 4-497

9. Tighten two attachment bolts (63) and plural washers (64) on bar guide A (23).
10. Insert storage bar (16) into bracket (38) to put the hole position together.

11. Insert position pin (17) into bracket (38), then fix position pin (17) (length: 150mm) firmly by lynch-pin (29).

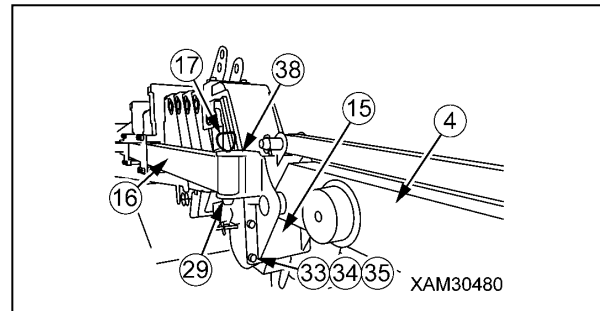


Fig. 4-498

WARNING! Always insert position pin (17) from upper side. If you insert it from underside, position pin (17) can drop out resulting in a serious hazard.

12. Remove four attachment bolts (33) (M12x30L), four washers (34) and four nuts (35) from Fly-jib bracket (15).
13. Operate crane to lower the hook, then remove No.1 Fly-jib (4) hanging wire rope.
14. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) to the main boom side.

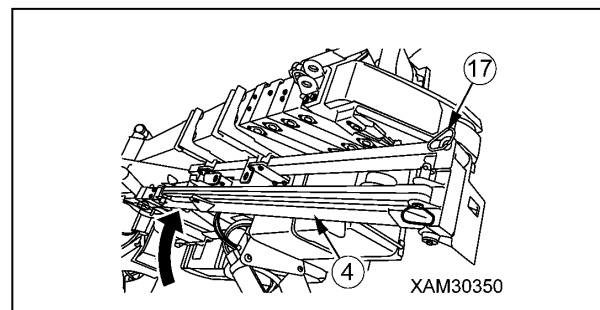


Fig. 4-499

15. Put the hole on storage bar (16) and bracket on the head of No.1 Fly-jib (4) together.
16. Insert position pin (19) into the hole on the bracket on the head of No.1 Fly-jib (4), then fix position pin (19) securely with the lynch-pin (29).

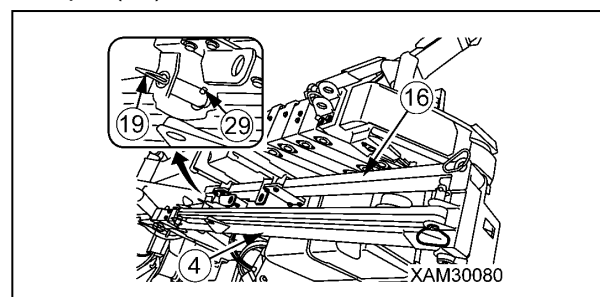


Fig. 4-500

WARNING! Always insert position pin (19) from upper side. If you insert position pin (19) from under side, it will drop out resulting in a serious hazard.

17. Slide No.1 Fly-jib (4) and storage bar (16) to the head of No.1 Fly-jib (4), then put the hole on stopper (30) of storage bar (16) and No.1 Fly-jib (4) together.
18. Insert position pin (18) into the hole on the stopper (30) of storage bar (16), then fix position pin (18) securely with the lynch-pin (29).

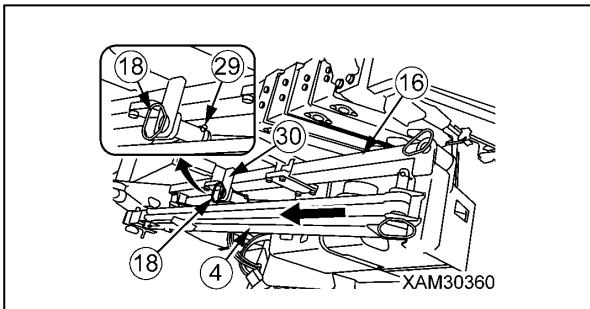


Fig. 4-501

WARNING! Always insert position pin (18) from upper side. If you insert position pin (18) from under side, it will drop out resulting in a serious hazard.

FLY-JIB MOMENT LIMITER CONTROL

DANGER! For safety, always turn the operation mode of moment limiter to fly-jib operation, prior to starting its operation. Operation in improper mode may cause a serious accident such as breakage of wire rope, tipping and/or damage to fly-jib.

Moment Limiter Display

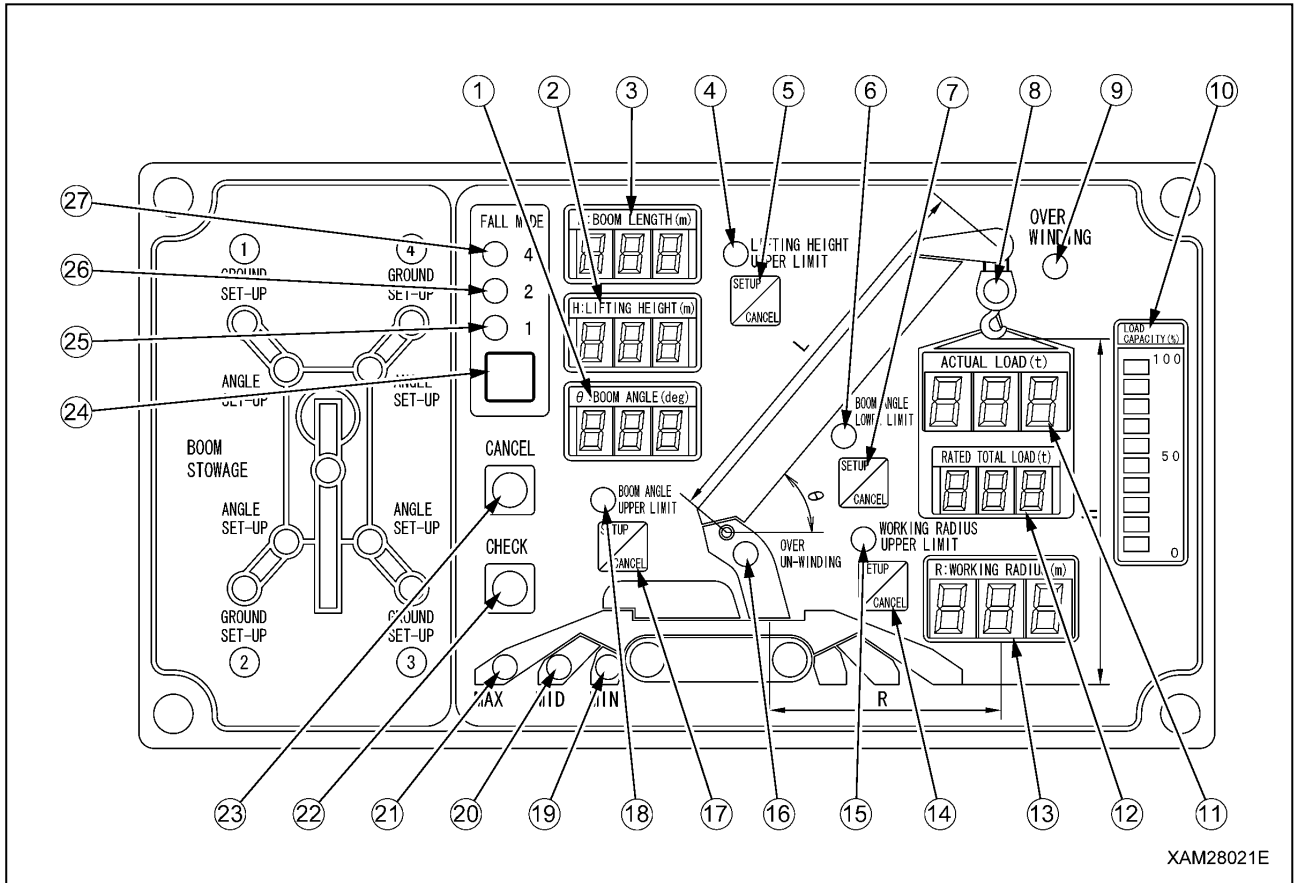


Fig. 4-502

- | | |
|--|--|
| 1 - Boom angle display | 14 - Working radius upper limit switch |
| 2 - Lifting height display | 15 - Working radius upper limit LED (Orange) |
| 3 - Boom length display | 16 - Over un-winding LED (Orange) |
| 4 - Boom lifting height upper limit LED (Orange) | 17 - Boom angle upper limit switch |
| 5 - Boom lifting height upper limit switch | 18 - Boom angle upper limit LED (Orange) |
| 6 - Boom angle lower limit LED (Orange) | 19 - Outrigger MIN. extension LED (Blue) |
| 7 - Boom angle lower limit switch | 20 - Outrigger MID. extension LED (Blue) |
| 8 - Load factor LED
(Changes to green, yellow, and red) | 21 - Outrigger MAX. extension LED (Blue) |
| 9 - Over winding detection LED (Red) | 22 - Check switch |
| 10 - Load capacity display (Yellow) | 23 - Cancel switch |
| 11 - Actual load display | 24 - Fall mode selector switch |
| 12 - Rated total load display | 25 - 1-fall LED (Blue) |
| 13 - Working radius display | 26 - 2-falls LED (Blue) |
| | 27 - 4-falls LED (Blue) |

NOTICE: For general operation, see "MOMENT LIMITER (OVERLOAD DETECTOR)" on page 4-68.

Items of Moment Limiter Restriction for Operation

Operation Control by Moment Limiter

Moment limiting is just for emergency.

Operations depending on it may cause hazards such as auto stop.

Always try to avoid automatic stop of crane operation.

DANGER! In the case of automatic stop of crane operation due to over-load, operations as below are strictly prohibited which may cause hazards such as tipping of crane or breakage of boom.

- Boom lowering
- Boom extending
- Hoist hook up

Under conditions as below, moment limiter shall control operations:

- (1) Restrict operation under over-load condition.
- (2) Working radius restriction by optional control by an operator.
- (3) Restriction by over winding detector.
- (4) Restriction of slewing and boom angle range in pick and carry mode.
- (5) Restriction of boom working radius in fly-jib mode.

All the operators and maintenance technicians should read this standard manual carefully for thorough understand before actual operation, inspection and maintenance.

Restriction in Fly-Jib Mode

In fly-jib mode, practicable working radius is restricted.

See "Working Radius/Lifting Height for Fly-jib" on page 3-28.

DANGER!

- Any crane operation under conditions that moment limiter's load capacity display indicates 90% or higher must only be practiced carefully in decelerated mode with low engine revolutions. If engine is in high revolutions or crane is operated in accelerated mode, lifted load may bounce and exceed its range which may result in hazards such as tipping of crane or breakage of the boom.

- In fly-jib mode, main-boom angle is restricted within safe operation range. Any operation beyond the range shall result in boom breakage or crane tipping. Be careful and confirm the correct angle during crane operations.

Boom Angle Restriction

Operation range of fly-jib mode is restricted by main-boom angle, regardless of the extended length. Keep operation within the range.

[Operation range: 76° to 55°]

Detail of restriction is as specified below:

1. Boom angle 72° to 57° (Safety range)

While main-boom angle is within this range, indicators below on moment limiter control panel shall light simultaneously:

- Boom angle upper limit LED (18) (Orange)
- Boom angle lower limit LED (6) (Orange)

This shows normal operating condition.

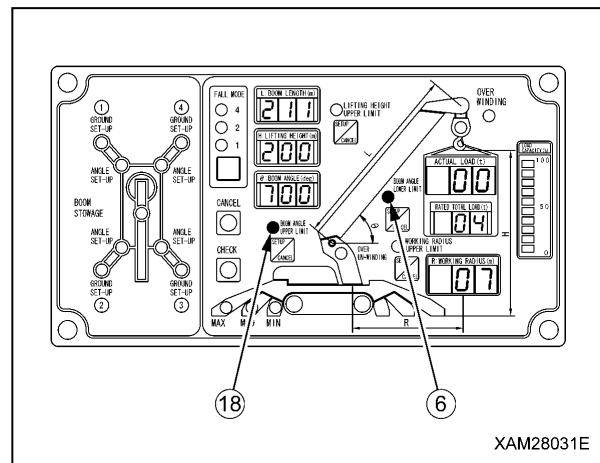


Fig. 4-503

2. Boom angle 76° to 72° (Pre-warning range of boom angle upper limit)

While main-boom angle is within this range, indicator below on moment limiter display will flash.

- Boom angle upper limit LED (18)

At the same time the warning buzzer beeps to warn the operator and others that the boom is reaching its limit. (Boom angle lower limit LED (6) light flashes.)

3. Boom angle approx. 76° (Boom angle upper limit range)

While main-boom angle is within this range, the indicator below on moment limiter display will flash.

- Boom angle upper limit LED (18)

In addition, all the values shall be put out except Boom angle display (1) and rated load display (12). Also, Rated load display (12) shall indicate "E-J".

Red light of working status lamp shall light and rotate, also the warning buzzer beeps continuously. Boom raising is automatically interrupted, then.

In such event, lower the boom to the safety range from restricted zone.

Boom raise operation shall be interrupted until the boom is lowered and reaches the safety range.

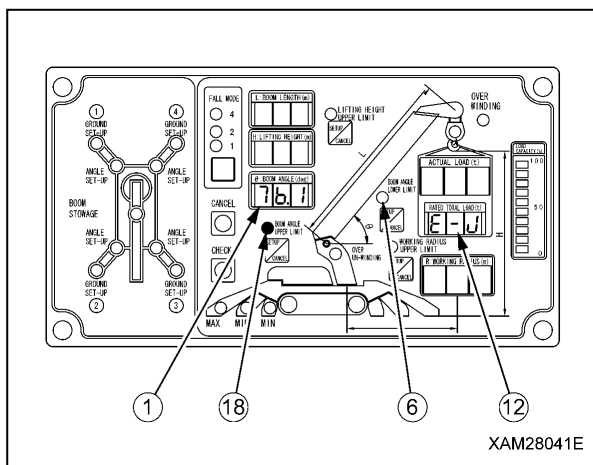


Fig. 4-504

4. Boom angle 57° to 55° (Lower marginal range of boom angle)

While main-boom angle is within this range, indicator below on moment limiter display will flash.

- Boom angle lower limit LED (6)

At the same time the warning buzzer beeps to warn the operator and others that the boom is reaching its limit. (Boom angle upper limit LED (18) will light and flash.)

5. Boom angle approx. 55° (Boom angle lower limit range)

While main-boom angle is within this range, the indicator below on moment limiter display will flash:

- Boom angle upper limit LED (18)

In addition, all the values will be put out except Boom angle display (1) and Rated load display (12). Also, Rated load display (12) will indicate "E-J".

The red light of the working status lamp will light and the warning buzzer will beep continuously.

Boom lowering and extending are automatically interrupted, then.

(When the boom length is 12.5m or less, the boom can be lowered for the purpose of stowing boom.)

In such event, raise the boom to the safety range from restricted zone.

Boom lowering operation shall be interrupted until the boom is raised into its safety range.

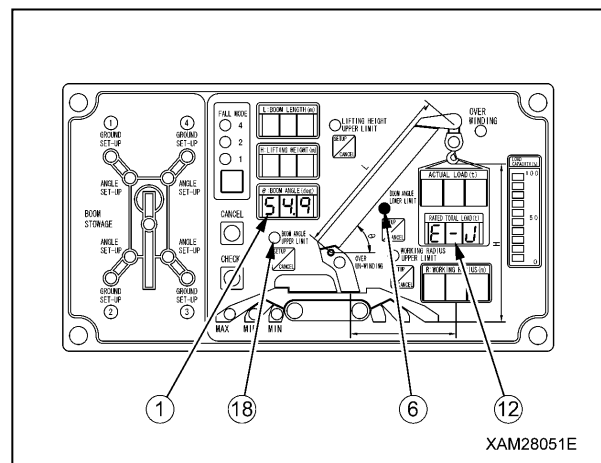


Fig. 4-505

Restriction for Boom Stowing Operation

In fly-jib mode, though crane operation is not available when main-boom angle is less than 55°, boom can be lowered for the purpose of stowing boom when the boom length is 12.5m or less (; two stages of main boom are fully extended in maximum).

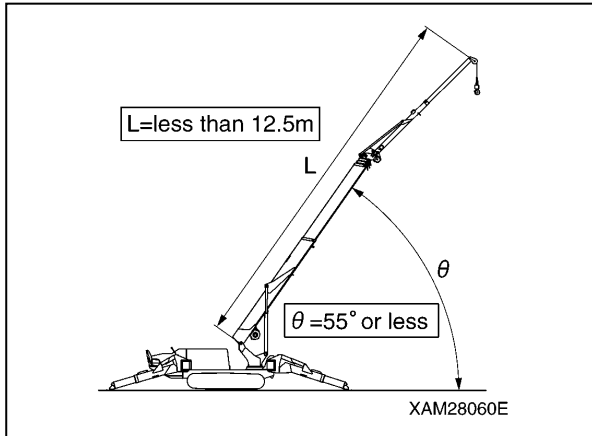


Fig. 4-506

Moment limiter display (Rated load display (12)) is "E-J" as it indicates in case of boom angle lower limit range.

In addition, red light of working status lamp will light and rotate.

In such condition, when the main-boom is retracted to 12.5m or less, boom can be lowered without the beeping of the warning buzzer.

However, moment limiter only indicates "E-J" and Actual load display (11) is not available.

Except that Boom length display (3) indicates "Jlb", moment limiter only displays "E-J" in Boom angle display (1) and Rated load display (12), as it indicates in case of boom angle lower limit range.

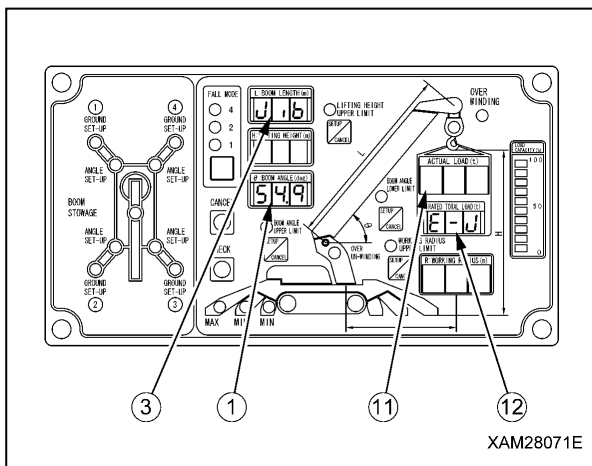


Fig. 4-507

DANGER! For stowing fly-jib, main-boom could be lowered to the angle less than 55° and extended under the condition that boom length is less than 12.5m. However, such a condition is very dangerous because Rated load display (12) or Actual load display (11) do not work. Never lift load under such condition, otherwise critical accident of damage to fly-jib shall result.

Instruction for Fly-Jib Operation

DANGER!

- For safety, always turn the operation mode of moment limiter to fly-jib operation, prior to starting its operation. Operation in improper mode may cause a serious accidents such as tipping.
- Pick and carry by fly-jib is strictly prohibited since it will result in a serious hazard such as tipping or machine damage.

Moment Limiter Mode Change

1. Turn work selector switch to crane mode.

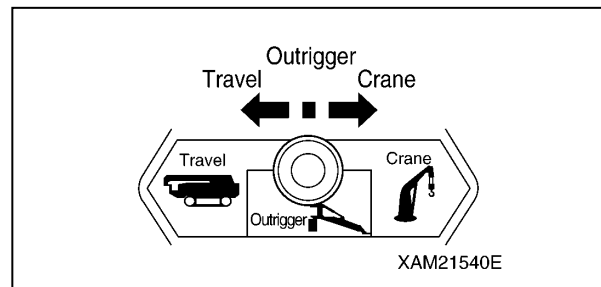


Fig. 4-508

2. Push Fall mode selector switch (1) for 2 seconds or more. Operation mode will change as shown below. Keep in mind that the switch should be released and re-pushed to proceed to next mode.

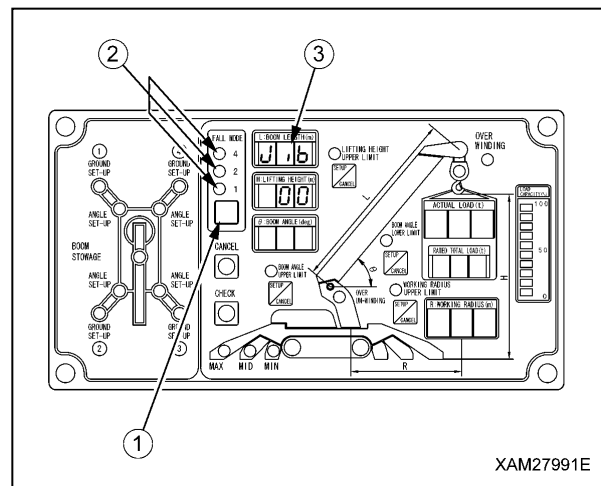


Fig. 4-509

Mode (Wire fall indicator LED (2) combination)

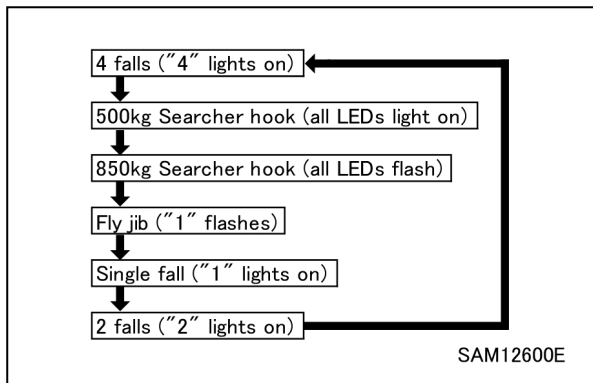


Fig. 4-510

NOTICE: In fly-jib mode, Boom length display (3) indicates "boom length" and "Jib", alternately. Now fly-jib operation is ready for operation.

WARNING! Always fully extend two stages of fly-jib in use, because moment limiter's fly-jib mode computes working radius and lifting height on basis of full length and so indicated.

Hence, it fails to indicate correct working radius in the event that fly-jib is retracted; that may result in a serious accident.

Instruction for Operation

DANGER! Fly-jib operation causes a bigger risks of tipping or bouncing of the load, because the longer boom will be affected more by inertia or wind.

Hence, fly-jib operation should be in decelerated mode, and never in accelerated.

- Both manual operation lever and remote control are available, also, as normal operation. However, main-boom angle and length is restricted for fly-jib operation.
- Rated total load for fly-jib operation is restricted by main-boom angle, regardless of the length.

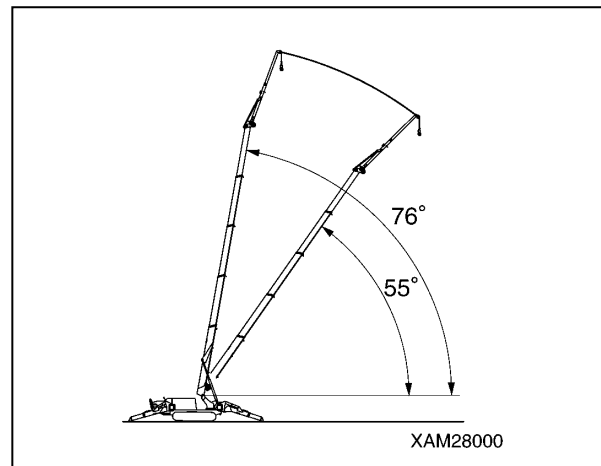


Fig. 4-511

[Operation range: 76 ° to 55°]

The warning signs below will appear to prohibit operations out of the range.

Boom should be immediately restored to operation range (72° to 57°).

[Indication]

- Rated load display of moment limiter will indicate "E-J".
- Red light of rotary lamp will light and rotate.
- All the values will be off except Boom angle display (1) (indicates angle) and Rated load display (2) (indicates error "E-J").

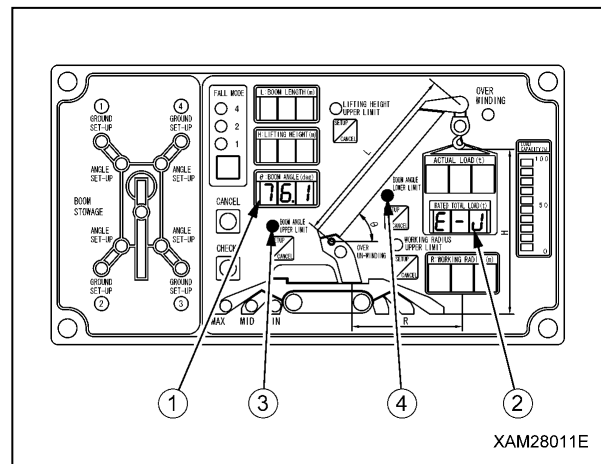


Fig. 4-512

NOTICE: All the values are off except Boom angle display (1) and Rated load display (2) when boom angle is out range. (They resume when the boom returns to range.)

- Boom raising over 76° is prohibited. (Boom angle upper limit LED (3) flashes when exceeding 76°.)
- Boom lower and extend under 55° (at boom length 12.5 m or longer) is prohibited. (Boom lower limit LED (4) flashes below 55°.)

Operation for Boom Retraction

DANGER! For stowing fly-jib, main-boom should be lowered to the angle less than 55° and retracted to a boom length of less than 12.5m. However, such condition is very dangerous because Rated load display or Actual load display do not work. Never lift load under such condition, otherwise a critical accident or damage to fly-jib may result.

Main-boom is allowed to be stowed only under the condition below in fly-jib mode.

[Boom length must be less than 12.5m (Two stages of main boom are fully extended to maximum.)]

Under this condition, boom lowering is available. For stowing, retract the boom first, then control the boom to stow position. In any event, however, lifting in such a configuration is prohibited because Rated load display (2) of moment limiter only indicates "E-J".

TRANSPORTATION

Observe the related laws and regulations and transport the machine safely.

Transport Precautions Cautions When Loading or Unloading

- Be especially careful when loading or unloading the machine because the risks intervene.
- Select a location that is level and has firm road surface when loading or unloading the machine. In addition, keep enough distance from the roadside.
- Use the ramps under 15 degrees or smaller angle. In addition, decide the clearance between ramps to meet the centre of the rubber tracks.

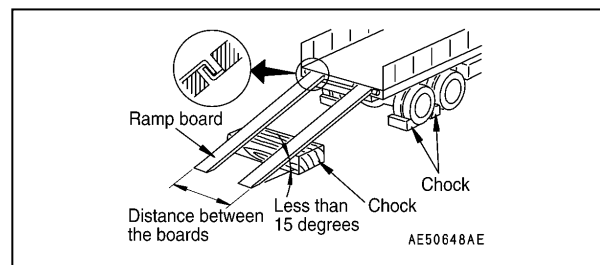


Fig. 4-513

- Always set the machine in the "travelling posture" and securely insert the position pins (4 pieces) to the outrigger rotary parts before loading or unloading the machine.

For more information, see "TRAVELLING POSITION" on page 4-23.

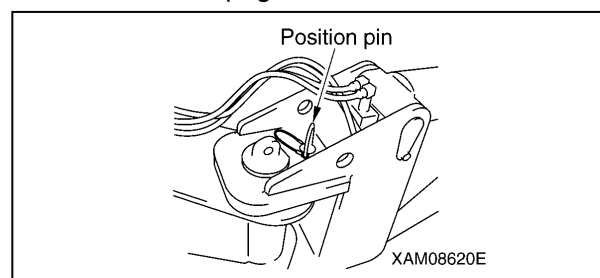


Fig. 4-514

- Always move backward when loading the machine. Travelling forward may cause a trip.

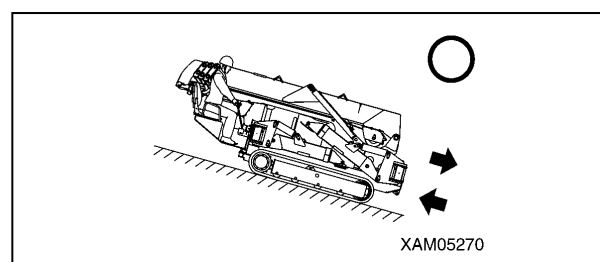


Fig. 4-515

- When loading or unloading, set the engine rotation to low idling (low speed rotation) and operate slowly by low speed travels.
- Use the ramps that have fully strong width, length and thickness, and that enable safe loading/unloading.
Reinforce with blocks or other substances if the ramps deflect much.
- Remove the mud and other substances from the footing to prevent the machine from skidding over the ramps. Remove the substances stuck the ramps such as grease, oil or ice, and keep clean.
Be especially careful in the rainy days where slips easily occur.
- Do not change direction over a ramp. Temporarily leave the ramp before correcting the direction.
- Be slow when operating to change the direction on the truck platform where the footing is unstable.
- After loading the machine, apply the wood blocks so that the machine does not move, and securely fix with wire ropes or other means.
For more information, see "Loading/Unloading" on page 4-174, and "Cautions on Loading Machine" on page 4-176.

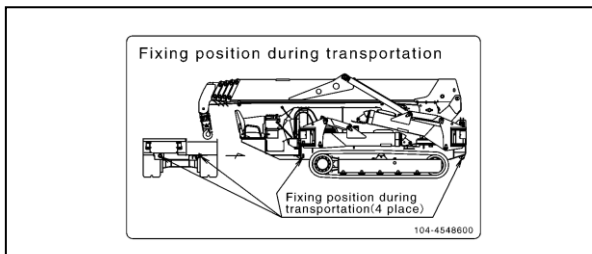


Fig. 4-516

Cautions During Transport

Observe the related regulations and exercise safety during transport.

Cautions When Loading/Unloading with Crane

Be careful of the followings when loading or unloading the machine by hoisting with a crane.

- Do not use those brackets on the boom to hang the whole unit.
- Before hoisting the machine, attach the hoisting brackets (1) (for instance shackles) to the outrigger rotary holes (four), and hang the wire ropes (2) (four) on the hook (3).

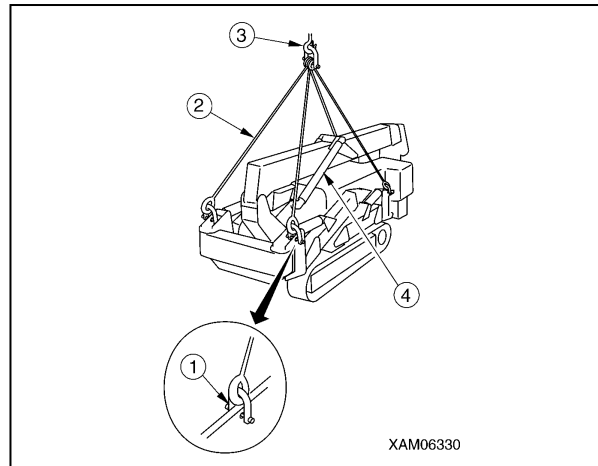


Fig. 4-517

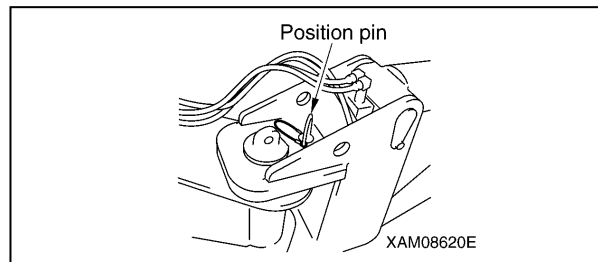


Fig. 4-518

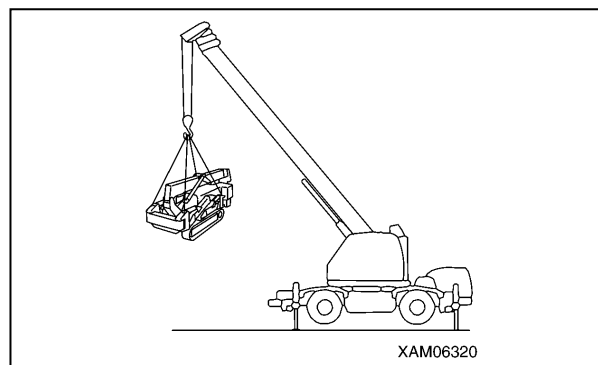


Fig. 4-519

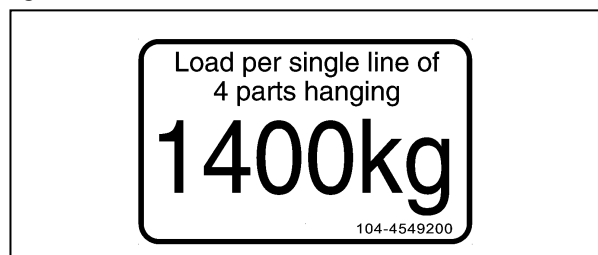


Fig. 4-520

- To hoist, use the crane, wire ropes (2) and hoisting bracket (1) (for instance shackles) having enough strength against the machine mass (weight).

Following is the load force that applies to each of the wire ropes when the machine main body is hoisted by four wire ropes.

★ Standard specification: 1400kg

- Always set the machine in the "travelling posture" and securely insert the position pins (4 pieces) to the outrigger rotary parts before hoisting the machine.

The centre of gravity position of the machine has been decided under the condition where the machine posture was "travelling posture".

For more information, see "TRAVELLING POSITION" on page 4-23.

- Use the carrying instruments shown the right figure and work safely when carrying the machine using a crane.
 - ★ Recommended hoisting equipment
- Wire ropes (front two): Length 2400 mm, Breaking force 8.7t or better, with single eye lock and single thimble
- Wire ropes (rear two): Length 2000 mm, Breaking force 8.7t or better, with single eye lock and single thimble
- Shackle: Breaking force 8.7t or better

Loading/Unloading

WARNING!

- For more information on the dimensions and mass of the machine, see "PRINCIPLE SPECIFICATIONS LIST" on page 3-4.
- Select and use the ramp boards that satisfy the following conditions.
 - Has the length that when placed, the angle from the track is 15 degrees or less.
 - Has the width no narrower than the rubber tracks.
 - Has the thickness and strength that can fully withstand the mass of the machine.
- Be sure to place the ramp boards perpendicular to the truck box. Also, match the centre of the each of the rubber tracks with the centre of corresponding ramp board. Misguided ramp boards and unmatched rubber crawlers may cause the machine to slip out of the ramp boards and cause serious accidents.

- Use ramp boards with slope of 15 degrees or less. The space between boards shall be set to be appropriate to the centre of the rubber tracks.
- Always put the machine in the "travelling posture" when loading/unloading the machine. For more information on travelling posture, see "TRAVELLING POSITION" on page 4-23.

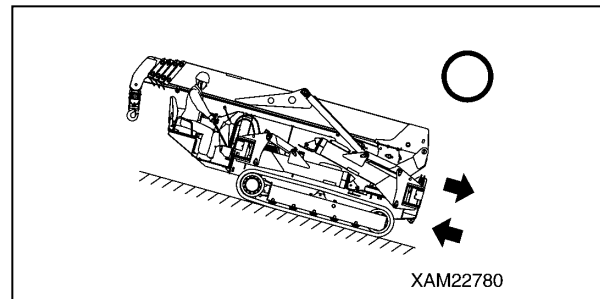


Fig. 4-521

- Always load the machine by travelling backward. Travelling forward involves overturning hazard. The operator must be on the back side of the truck.
- Always unload the machine by travelling forward. Travelling backward involves overturning hazard. The operator must be on the back side of the truck.
- Loading/Unloading the machine involves danger. Be extremely careful.
- Select flat and solid ground for loading/unloading the machine. Keep sufficient distance from the shoulders.
- Remove dirt around the crawlers to prevent side slip of the machine on the ramp boards. Remove any materials on the loading ramps such as ice, grease, and oil.
- Never change direction on the ramp boards. Go down from the ramp board, and then change the direction.

Always put the machine in the "travelling posture" when loading/unloading the machine. Always use ramp boards or forwarding blocks when loading/unloading the machine and use the following procedure.

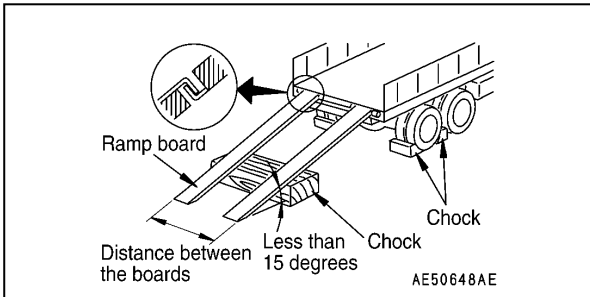


Fig. 4-522

1. Brake the trailer securely. Place wheel blocks to the wheels of the trailer to secure the trailer.
2. Secure the ramp boards in a way that the centre of the trailer and the machine agree.

NOTICE: Verify that the two ramp boards are at the same height.

3. Operate the acceleration pedal and keep the engine at low speed.
4. TRAVEL slowly toward the ramp boards, and load/unload the machine in a way that the boom does not hit the trailer. Move backward to load the machine, and forward to unload the machine.
5. Do not operate any other lever than travelling levers on the ramp boards.
6. Load the machine properly to the desired position on the trailer.

Hoisting Machine

WARNING!

- The hoisting attachments such as wire rope and shackle used in hoisting shall be sufficiently strong for the weight of this machine.
- When hoisting the machine, always put the machine in the "travelling posture" and securely insert the four position pins into the rotary of the outriggers.

As for the centre of gravity of the machine, the machine posture is determined to be "travelling posture".

For more information on travelling posture, see "TRAVELLING POSITION" on page 4-23.

- Hoisting the machine for long time will cause the boom derricking cylinder to extend, shifting the centre of gravity and thus, the machine losing the balance.
- When transporting the machine by using the crane, use the transportation equipment shown in the figure and transport safely.

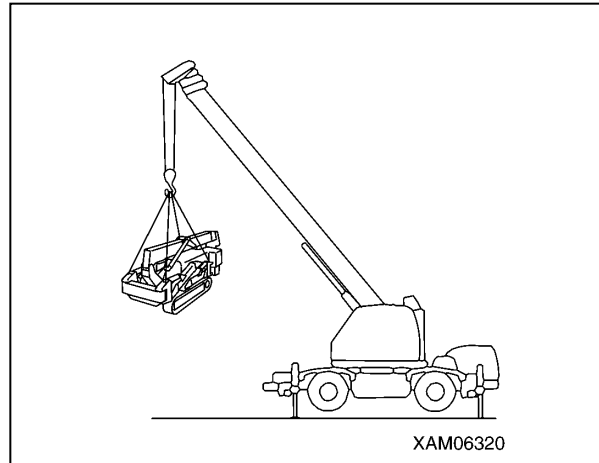


Fig. 4-523

- Do not hoist the machine in the posture other than those described in the following procedure. The machine may lose its balance.

CAUTION:

- When the local laws and regulations are applicable, the person who uses the crane to perform hoisting operation must be qualified to do it. If not, the operator must be well trained and skilled.
- See the Dimension or the nameplate attached to the machine for the weight of the machine.

MC405C-3 MACHINE WEIGHT	
Component	Weight
Main Unit	5600 kg
Electric Unit	+150 kg
850kg Searcher Hook	+30 kg
Fly-Jib	+150 kg

104-4760600

Fig. 4-524

The dimensions are for standard specifications. The hoisting method varies depending on the attachments and options mounted. In that case, contact us or our sales service agency.

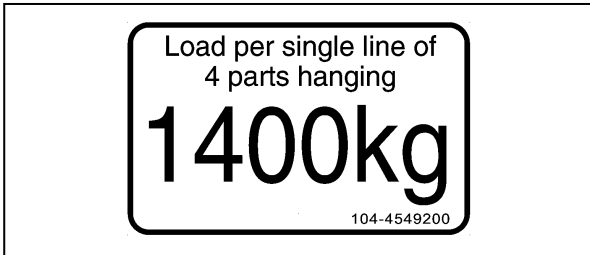


Fig. 4-525

Hoist the machine on the solid and flat ground using the following procedure.

1. See "TRAVELLING POSITION" on page 4-23 and put the machine in the "travelling posture".
2. Verify that the position pins (four) are securely inserted in the rotary joint of the outrigger.
3. Install a shackle (1) to the holes (4 locations) on the outrigger rotaries and hang the hoisting attachments (2) over the hook (3).
4. As soon as the machine leaves the ground, stop and wait until the machine is stabilised. Then slowly hoist the machine.
5. Check the changes in the posture due to the leakage from the hydraulic circuit on the head side of the derricking cylinder (4) when the machine is hoisted.

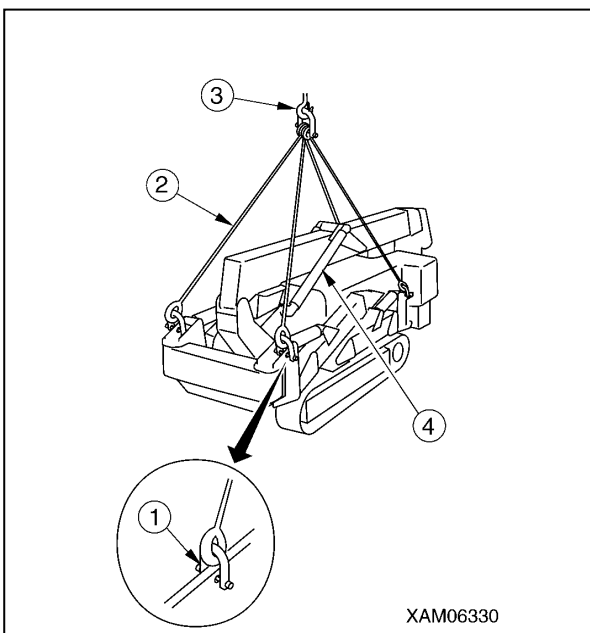


Fig. 4-526

NOTICE:

Recommended hoisting attachments

- Wire ropes (two in front):
breaking force of 9.0 t or more
- Wire ropes (two in back):
breaking force of 9.0 t or more
- Shackle: load used 1.5 t or more

Cautions on Loading Machine

WARNING! Select flat and solid ground for loading/unloading the machine. Keep sufficient distance from the shoulders.

Load the machine to the specified position on the trailer and secure the machine with the following procedure.

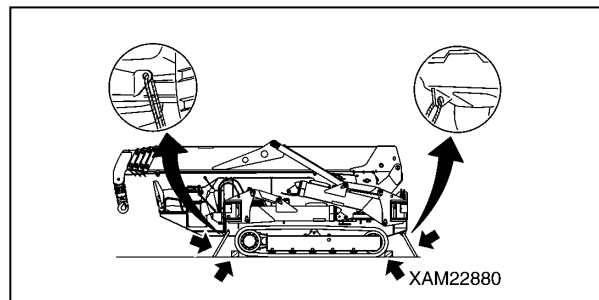


Fig. 4-527

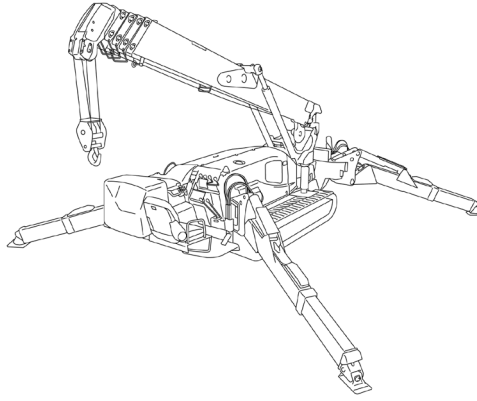
1. Stop the engine and remove the key of the starter switch.
2. Provide a square timber in front and back of the rubber tracks to prevent the machine from moving during transportation. Secure the machine with chain or wire rope. Secure it surely, especially not to let it slip to the side.

Cautions During Transportation

WARNING! Take road width, height, and weight into consideration in determining the transportation route.

If there are applicable local laws and regulations, observe these laws and regulations for safe transportation.

If not, contact us or our sales service agency.



Section 5

**MAINTENANCE AND
INSPECTION**

GENERAL MAINTENANCE INFORMATION AND PRECAUTIONS

Thorough understanding of the inspection and maintenance items is required to perform efficient inspection and maintenance that contributes to safe use of this machine.

WARNING!

- **Do not perform any inspection or maintenance that is not described in this manual.**
Potential serious accident or machine failure may occur if it is performed at the discretion of the individual.
In the event that a judgment on the severity of a failure or malfunction is unable to be made, contact us or our sales service agency.
- **In the event that a failure or malfunction is encountered in machine operation or found in inspection, report it to your employer or supervisor immediately. Contact us or our sales service agency.**
- **Inspection and maintenance should be performed with the machine placed on a level and strong footing.**

Precautions Before Maintenance

Failure Report

Execution of a maintenance not described in our manual may cause unexpected failures.

Ask us or our sales service agency for repair.

Clean Before Inspection or Maintain

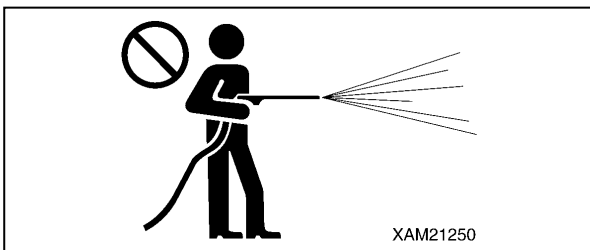


Fig. 5-1

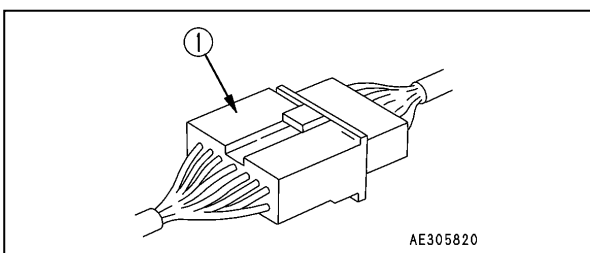


Fig. 5-2

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

Tidy Up Workplace

In the workplace, put away the tools, hammers and other things that obstruct the works, wipe of slippery items such as greases and oils, and exercise tidy up and cleaning for safe work.

Untidy workplace may cause stumbles and slips that result in injury caused by tipping.

Follow Supervisor Instruction During Teamwork

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

Use Appropriate Tools

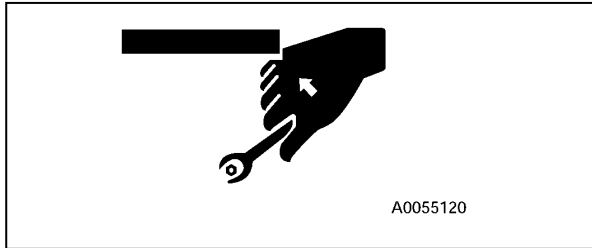


Fig. 5-3

Do not use damaged or deteriorated tool, or use a tool for a purpose that is not a proper purpose of use. Use tools suitable for the maintenance work.

Entrance of a broken piece of a tool such as a boss with crashed head or a hammer may destroy eyesight.

Handling Illumination Devices

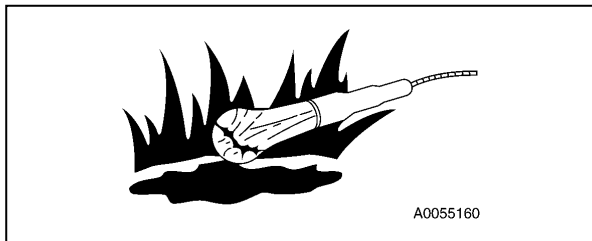


Fig. 5-4

- Use explosion proof illumination device when inspecting with fuel, oil, or similar substance. Failure to use explosion proof illumination device may cause leap fire and explosion.
- Attempt to work without using illumination device in a dark place may cause injury or other issue. Always use illumination device. Do not use a lighter or other burning object even if dark. Such use may cause fire, and furthermore the battery gas may catch fire and explode.

Stop Engine Before Inspection or Maintenance

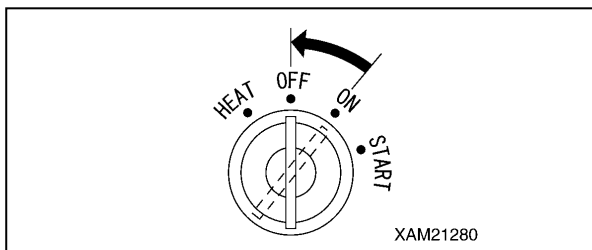


Fig. 5-5

- Before inspection or maintenance, always park the machine at a location where the ground is level, rock-falls and landslides do not occur, is a lowland and flood does not occur, and fully retract and lower the boom, and stop the engine.

- Operate each of the crane operation levers forward backward several times to relief the pressure remaining in the hydraulic circuits.
- Apply pawls to so that the prevent rubber tracks do not move.
- Persons in charge of the maintenance should pay attention to prevent physical body and clothes from contacting the moving parts.

Fire Risk Prevention

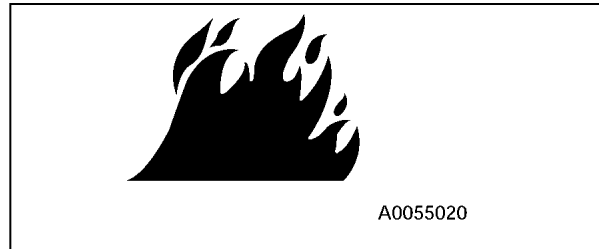


Fig. 5-6

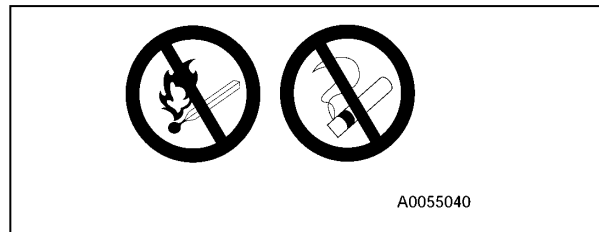


Fig. 5-7

Always observe the followings during maintenance where the fuel, oil, battery or other substance that may catch fire is handled.

- Keep the fuel, oil and any other easily combustible oil and fats away from fire during storage.
- Do not leave the site when replenishing the fuel or oil.
- Use incombustible cleaning oil for the objects such as the components, and do not use light petroleum, gasoline or anything else that may catch fire.
- Do not smoke when inspecting or maintaining. Smoke at a location designated to do so.
- When inspecting fuel, oil, or similar, use explosion proof illumination devices but do not use fires such as a lighter or a match for illumination.
- Loosened and damaged electrical connections may cause short circuit that may result in a fire. Inspect accordingly during the inspections before starting work.
- Make sure a fire extinguisher is place near the inspection / maintenance site.

Precautions During Maintenance

No Unauthorised People

Do not admit anyone other than necessary workers during maintenance. And post a guard as necessary.

Be especially careful in case of a polishing, welding work, or digging work.

Measures upon Finding Abnormality During Inspection

- Always repair whenever an abnormality is found during inspection. Attempt to use without repairing the defect may cause bodily accidents.
- Ask us or our sales service agency for repair depending on the failure type.

Do Not Drop Tool or Part Inside Machine

- Do not drop any bolt, nut or tool inside the machine when inspecting while opening the inspection port or tank replenishment port. Dropped object may damage the machine or cause the machine to operate improperly and thus may cause accidents. If dropped, always retrieve.
- Do not keep anything unnecessary for the inspection in your pocket.

Noise Caution

Large noise in the surroundings may cause hearing difficulty or deafness.

Put on ear covers or earplugs before long time noise exposure for instance an engine maintenance.

Work by at Least Two Persons during Maintenance with Engine Running

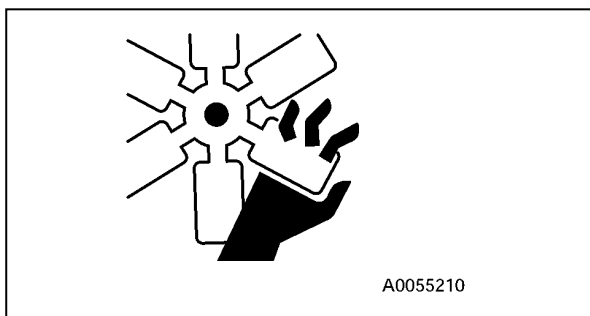


Fig. 5-8

To prevent accidents, do not attempt maintenance when the engine is running.

Always observe the followings in case of maintaining with the engine running for unavoidable reason.

- One should seat in the operation seat, and keep checking each other while ensuring that the engine can be stopped any time.
- Be especially careful when working near a rotating part which may entangle.
- Do not touch operation levers. Before handling an operation lever for unavoidable need, always give a sign to other person and let him/her evacuate to a safe place.
- Do not contact with the alternator belt or other part that severs upon contact with human body or tool.

Cautions When Working Below Machine

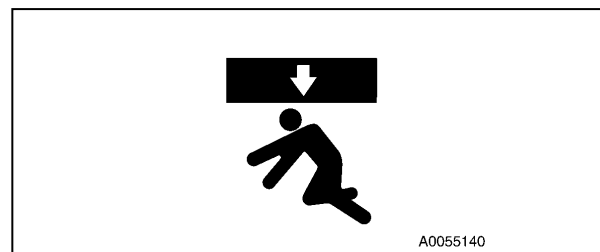


Fig. 5-9

- Park the car over a level and firm location, and fully retract and lower the boom.
- Before the maintenance below the machine, extend the outriggers maximum so the machine lifts. When doing so, insert support platforms (height increasers) below front and rear of the machine to stabilise the machine.

Cautions When Working Above Machine

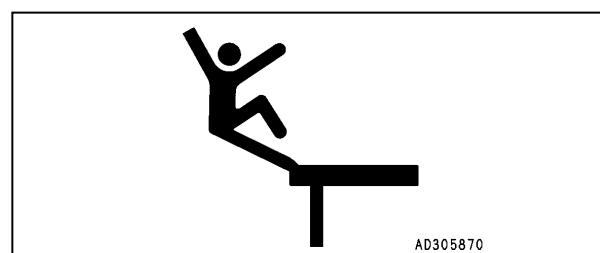


Fig. 5-10

- Tidy the footing to avoid falling and always observe following precautions during maintenance above the machine.
 - Do not spill oil or grease.
 - Do not sprawl the tools.
 - Beware of the footing when walking.

- Do not jump from the machine under any circumstance.
Use a platform, and secure your body with three locations of the limbs (both feet and one hand, or both hands and one foot) when climbing up or down the machine.
- Use protective equipment that suit the work.
- Do not step on the boom, outrigger or machinery cover to prevent bodily accidents such as falling or tripping due to slippage.

Cautions When Replenishing Fuel or Oil

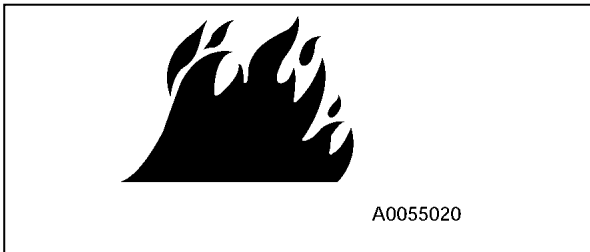


Fig. 5-11

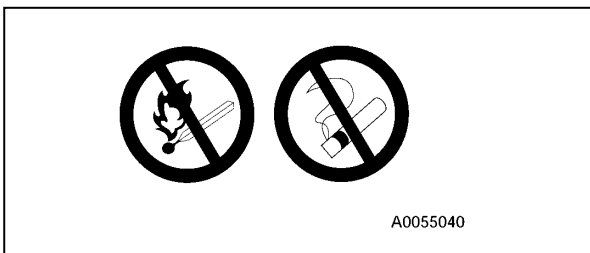


Fig. 5-12

The fuel, oils and similar substance may catch fire if a fire comes near.

Light petroleum is used as the fuel and thus requires extra effort to observe the followings.

- Keep the engine stopped when supplying.
- Do not smoke when supplying.
- Immediately wipe away dripped fuel or oil.
- Securely tighten the fuel and oil caps.
- Supply fuel/oil at a location with good ventilation.
- Do not leave the site when replenishing the fuel or oil.

Beware of Chips When Working with Hammer

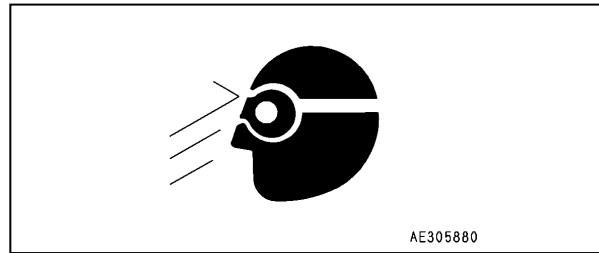


Fig. 5-13

During the hammering works, keep protective equipment such as protective glasses and a helmet on, and insert a copper bar or similar object between the hammer and the target when hitting.

Giving impact to a hard metal part such as a pin or a bearing may cause the broken chip to enter eye and inflict injury.

Cautions During Welding Repair

Weld in a location with good facility, and, only authorised personnel are permitted to weld.

Unauthorised personnel are strictly prohibited since risks such as gas generation, fire and electrical shock are present when welding.

The personnel authorised to weld are requested to always observe the followings.

- Disconnect the battery terminals to prevent battery explosions.
- Peel off the paint from the welding section to prevent gas generation.
- Attempt to heat up a hydraulic machinery, piping or a section near such part may cause combustible vapour or mist to be generated and catch fire. Avoid heating such section.
- Directly heating a pressurised piping or rubber hose may cause a sudden snip. Apply a fire protection cover.
- Disconnect the wiring connectors of the radio control and remote control system, moment limiter display and converter.
- Put on protective equipment.
- Keep the ventilation well.
- Put away the combustibles and prepare a fire extinguisher.
- Do not ground to a location near electrical part. Such may cause the electrical part to malfunction.

Disconnect Battery Terminal

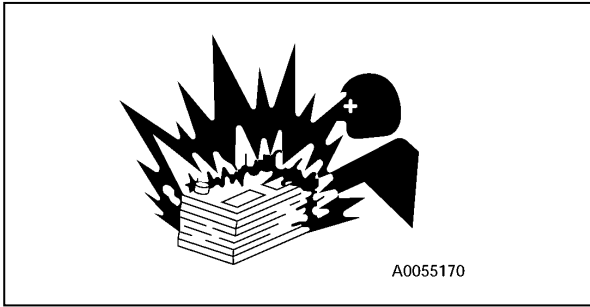


Fig. 5-14

Disconnect (-) terminal of the battery and stop the electrical flow before repairing the electrical system or starting an electrical weld.

For details, see "Battery Precautions" on page 5-56.

Cautions When Adjusting Rubber Track Tension

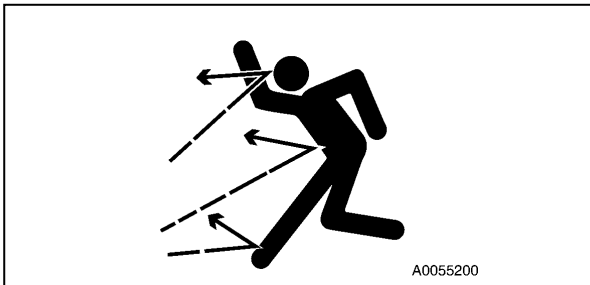


Fig. 5-15

- Grease is sealed inside the rubber track tension adjuster. The grease is at a high pressure because of the tension of the rubber track. Attempt to release the grease without observing the following precautions may cause the grease valve to pop out and result in serious accident.
- Do not loosen the tension adjustment grease valve one full turn or above. Doing so may cause the grease valve may pop out.
- To avoid the risk during tension adjustment, do not place your body in right front of the grease valve.

For more information, see "Check / Adjust Rubber Track Tension" on page 5-31.

High Pressure Hose Handling Cautions

Oil leaking from high pressure hose may cause fire or bodily accident due to faulty operation.

Whenever a damaged hose or loosened bolt is found, abort working and ask us or our sales service agency for a repair.

- Replacement of high pressure hose requires experienced skill. In addition, the tightening torques are decided by the hose types and size.
Customers are prohibited to repair.
- Replace the applicable part if any of the following conditions is found.
- Hose sleeve damage or leak.
- Scratch or truncation of the coat, or exposure of reinforcing layer of a wire
- Coat is partially swollen.
- Indication of twist or collapse is at a movable part of hose.
- Alien object buried in coating.
- Hose sleeve deformation.

High Pressure Oil Cautions



Fig. 5-16

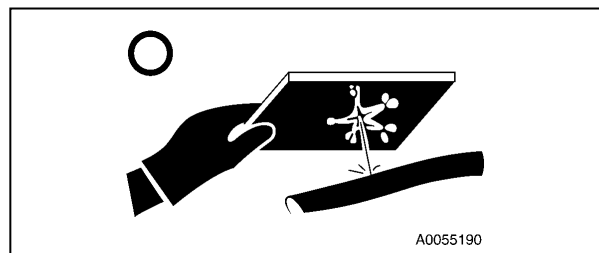


Fig. 5-17

Failure to make sure the pneumatic circuit pressure is relieved before inspection or replacement of a high pressure piping or hose may result in bodily accidents.

Always observe the followings.

- Do not start any inspection or replacement before the pressure dissipates.
- Put on protective glasses and leather gloves.
- When a piping or hose leak exists, the piping/hose itself or vicinity or the ground is wet. If such is seen, a piping crack, hose crack or inflation is considerable, so always ask us or our sales service agency for a repair.
- High pressure oil leaking through a small hole may puncture the skin or destroy eyesight upon contacting with skin or eye.

If the high pressure oil gave serious injury to skin or eye, wash away with flowing water and see the doctor as soon as possible.

Cautions When Temperature Is High

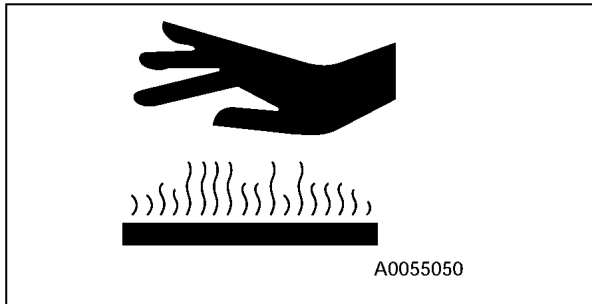


Fig. 5-18

Parts such as the engine, all oils, exhaust system manifold and muffler are at high temperature during short time after stopping the engine.

Attempt to remove the cap or execute a maintenance such as oil draining, water draining or filter replacement may result in suffering burns.

Wait until the temperature lowers, then execute the inspection/maintenance following the procedure written in this manual.

"Pre-Start Inspection - Before Starting Engine" on page 5-24: checking coolant level, checking oil level in engine oil pan, checking oil level in hydraulic oil tank

"Maintenance Every 500 Hours" on page 5-46: Replacement engine oil and oil filter, replacement hydraulic oil return filter, replacement hydraulic oil suction filter

"Maintenance Every 1000 Hours" on page 5-51: Replacement oil inside hydraulic oil tank

Checks After Inspection/Maintenance

Failure to execute an inspection/maintenance item or failure to check the function and operation of the maintained part may cause an unexpected fault which may result in bodily accidents.

Always observe the followings.

- Checks with engine stopped
 - Check for unexecuted inspection/maintenance.
 - Check that inspection/maintenance was done without errors.
 - Check for any dropped tool or part. Ones caught by the interior or lever related link mechanism poses extra danger.
 - Check for any fuel leak, water leak, oil leak, bolt loose and similar issues.

- Check with engine running
 - Be fully careful with safety when checking with the engine running while referring to "Work by at Least Two Persons during Maintenance with Engine Running" on page 5-4.
 - Check that the inspected/maintained part operates normally.
 - Check that issues such as an oil leak do not occur when load is applied to the oil pressure by increasing the engine rotation.

Cautions When Treating Waste

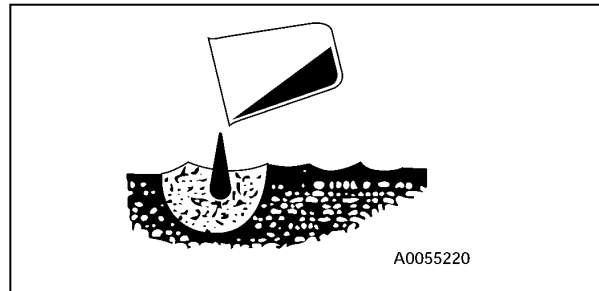


Fig. 5-19

Always observe the following to prevent pollution environment of the district inhabited with human or animal.

- Do not dispose the waste oil down a water system such as sewage or river.
- Always drain into a container when draining the oil from the Machine.
 - Do not directly drain to the ground.
- Observe the applicable legal regulations and rules when disposing harmful substance such as the oil, fuel, solvent, filter or battery.

Check the Service Meters

Read the service meters daily to check for any maintenance item that reached the obligatory maintenance period.

Use Genuine Parts for Replacement

Always use Maeda genuine parts as specified in the parts catalogue for part replacement.

Use Pure Grease

Always use Maeda pure grease. The viscosity of grease must conform to specifications according to ambient temperature.

Use Clean Oil and Grease

Always use clean oil, grease, and container to keep impurities out of them.

Keep the Machine Clean

Keep the machine clean to facilitate the detection of a malfunction. Especially keep the grease nipple, breather, and oil level gauge (oil access door) clean to prevent impurities from finding their way into the machine.

Handle Water and Oil at Adequate Temperature

Drainage, drain oil, and exhaust filter will be at elevated temperatures immediately after the machine comes to a stop. Replace drainage, drain oil, and filter only after they drop in temperature for safety.

If the oil is cold, raise the temperature of the oil to approx. 20 to 40°C.

Check Drain Oil and Oil Filter

For replacement of oil and filter, check the drain oil and exhaust filter to make sure no a considerable amount of metal powder or foreign objects is present.

Cautions for Lubrication

Do not remove the strainer to lubricate if it is attached to the lubrication opening.

Protect Oil from Impurities

Avoid dust when inspecting and replacing the oil to keep impurities out of the oil.

Attach a Warning Tag

When draining coolant and oil, always attach a warning tag to the travel control for the prevention of accidental engine starting.

Follow Safety Precautions

Safety precautions provided on the machine should always be followed when using the machine.

Cautions for Weld Repair

- Power off the machine. (Turn OFF the start switch)
- Do not continuously apply 200V or greater.
- Ground the machine within 1 metre from the welding point.
- Be sure to disconnect the connectors of the radio or remote control system, moment limiting indicator, and moment limiting converter.
- Remove the negative terminal (-) of the battery.
- Make sure no sealing or bearing is present between the welding point and the grounding point.
Potential damage to sealing may occur due to sparks if disregarded.
- Do not ground around the boom pin or the hydraulic cylinder.
Potential damage to a plated section may occur due to sparks if disregarded.

Keep from Flame

Always clean the parts with noncombustible cleaning agent or light oil.

Keep the machine from flame when using light oil.

Keep the Attachment Surface Clean

Be sure to clean the attachment surface after removing a part to which the O-ring and gasket sealing are attached.

Replace the part with a new one with the O-ring and gasket reattached.

Empty Your Pockets

Always empty your pockets before performing inspection and maintenance of the machine in a downward direction with the cover opened.

Assure Safe Rubber Track

When performing crane operation in a rocky location, make sure of no damage to the rubber track and no looseness, cracks, abrasion of bolts and nuts. Loosen the tension of the crawler tread more than usual.

Cautions for Machine Wash

- Do not direct a jet of steam to the electrical parts and connector.
- Keep the operation panel dry.
- Wash the machine with clean cloth, rinsing off dirt and dust.

Pre- and Post-Work Inspection

Before performing crane operation in the muddy water, rain, snow and on the seashore, always check plugs and valves for looseness. Post-work inspection requires check all the units for cracks and damages and check bolts and nuts for looseness and coming off, with the machine washed.

Carry out early greasing. Grease the operating pin that enters the muddy water on a daily basis.

Cautions for Working in a Dusty Site

The following precautions should be observed when working in a dusty site.

- Occasionally check the air cleaner for clogging.
- Clean and replace the fuel filter in a timely manner.
- Be sure to clean the electrical parts, especially the starter and alternator, to protect them from dust.

Do Not Mix Oil

Never use together with different types of oil under any circumstance.

Replace the oil entirely when replenishing a different type of oil.

Always use Maeda genuine parts for part replacement.

BASIC MAINTENANCE

Oil Handling

- Oil is used under extremely harsh conditions (high temperature, high pressure) in the engine and working device, which causes the oil to undergo deterioration with operating time. Always use oil that meets requirements such as grade and operating temperature defined in the operation manual. Be sure to perform periodic replacement of oil irrespective of contamination in the oil.
- Oil is equivalent to human blood. Exercise due caution to handle oil, keeping impurities (such as water, metal powder or dust) out of oil. Most of mechanical failures are attributed to intrusion of impurities. Extra caution is required to prevent impurities from finding their way during machine storage and lubrication.
- Do not mix oil with other oil of different grade or brand.
- Oil lubrication must conform to the designated quantity of oil. Failure to lubricate at adequate quantity can lead to a machine failure.
- In the event that oil used in the working device turns cloudy, potential intrusion of moisture or air into the oil may be considered. Contact us or our sales service agency.
- When replacing oil, always replace the relevant filter as well.
- "ISO VG32" is adopted for a hydraulic oil system as factory default. Do not use any other hydraulic oil that is not recommended by us. Failure to follow the instruction may cause the filters to get clogged. A minute amount of oil remaining in piping and cylinders does not cause problems even if mixed with other oil.

Fuel Handling

- The fuel pump is precision equipment that becomes inoperative if fuel containing moisture or impurities is used.
Extra caution is required to prevent impurities from finding their way during machine storage and lubrication.
- Do not remove the strainer when replenishing fuel.
- Always use fuel that meets requirements such as grade and operating temperature defined in the operation manual.
- Ensure that the fuel tank is filled up after finishing daily work to prevent condensation of the humid air inside the fuel tank that will result in intrusion of moisture.
- Drain deposits and water out of the fuel tank before starting the engine or approximately 10 minutes after fuel replenishment.
- The air should be released from the circuit when the machine runs out of fuel or fuel filter replacement is performed.
- Clean the tank and fuel system if any foreign objects enter the fuel tank.

Stocking and Storage of Oil and Fuel

- Stock and store oil and fuel indoors to keep impurities such as moisture or dust out of them.
- When storing oil and fuel in drums for a long time, line the drums horizontally aligning the drum bungs sideways (to store them away from moisture). Be sure to cover the drums with a waterproof sheet if storing them outside.
- To prevent deterioration of oil and fuel resulted from long-term storage, employ the first-in first-out for using oil and fuel.

Grease Handling

- Grease is designed to prevent the joint from rattling and making noise.
- A nipple that is not described in the Periodic Maintenance chapter is used for overhauls, which requires no grease replenishment.
Grease the nipple if a long-term use hinders its smoothness.
- Wipe off old grease squeezed out after greasing. Extra care is required to wipe a part that the adhesion of sands and dust accelerates the wearing away of the rotating part.

Filter Handling

- A filter is an extremely important part that keeps major equipment free from impurities in oil, fuel, and the air circuit, which prevents an associated failure. Periodic replacement of the filter is required in accordance with the Operation Manual. The replacement period should be shortened in responses to harsh operating environments or the oil used.
- Do not reuse any washed filters (cartridge type one) under any circumstances.
- After replacing an oil filter, check the used filter for any metal powder.
If check finds metal powder on the used filter, contact us or our sales service agency.
- As to a replacement filter, always unpack it immediately prior to its use.
- Always use Maeda genuine filters.

Coolant Handling

- The river water contains a large amount of calcium and impurities. Use of the river water results in accumulation of water stain in the engine and radiator, which causes heat exchange error leading to overheat.
Do not use any non-potable water.
- Always use antifreeze following precautions stated in the Operation Manual.
- Keep antifreeze from flame. Antifreeze is a flammable solution.
- The mixing proportion of antifreeze varies with outside air temperature. For more information on mixing proportions, see "Cleaning Inside Engine Cooling System" on page 5-74.
- In the event of overheating, replenish coolant with the engine cold.
- The machine low in coolant may cause overheating and corrosion attributed to aeration.

Electrical Part Handling

- The electrical parts are susceptible to water damage and damaged coating. A current leakage is developed if the electrical parts are wetted or have damaged coating, which causes the machine to go out of order and malfunction. Exercise due caution to handle the electrical parts.
- Inspection and maintenance include the checking of belt tension, belt damage, and battery charge level.
- Never remove and disassemble equipment (electrical parts) from the machine.
- Only optional electrical parts that accompany the machine can be installed.
- Keep the electrical parts away from water when the machine is washed and used in the rain.
- When using the machine at the seashore, keep the electrical parts free of water and impurities to prevent corrosion.

Hydraulic Equipment Handling

- Hydraulic equipment will be at elevated temperatures during and immediately after operation. Hydraulic equipment operates under high pressure. The following precautions should be observed when performing inspection and maintenance of hydraulic equipment.
- Place the machine in travel position on a level surface to inhibit the application of pressure to the cylinder circuit.
- Be sure to stop the engine.
- Hydraulic oil and lubricating oil will be at elevated temperatures and high pressure immediately after equipment comes to a stop. Perform inspection and maintenance only after the oil drop in temperature for safety. An internal pressure may be exerted despite temperature drop. When removing the plugs, screws and hose joints, stand aside and provide gradual loosening to decompress.
- Be sure to remove the pressure releasing air from the hydraulic oil tank before performing inspection and maintenance of the hydraulic circuit.
- Inspection and maintenance include hydraulic oil level check and replacement of the filters and hydraulic oil.
- Check the O-ring for scratches when removing the high-pressure hose. If check finds scratches, replace the O-ring.
- Air bleed of the hydraulic circuit is required after the following tasks are performed: replacement and cleaning of the hydraulic oil filter element and strainer, repair and replacement of hydraulic equipment, and hydraulic piping replacement.

BREAKING-IN MACHINE

WARNING! Perform breaking-in for the period of about the first 250 hours (hours displayed on the service meter).

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

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

Perform the breaking-in for the first "250 hours" (time displayed on the service meter).

Pay attentions particularly to the followings during the breaking-in period.

- Be sure to perform the warm-up operation and avoid idling away after the engine has started. For more information, see "OPERATIONS AND CHECKS AFTER STARTING ENGINE" on page 4-20.
- Avoid overloaded operation or tasks with high-speed operation.
- Avoid sudden starting, sudden acceleration, unnecessary sudden stop or sudden steering
- When the breaking-in period reaches "50 hours", do not fail to change the engine oil. For more information, see "Initial 50 Hour Maintenance" on page 5-40.

The metal powder produced inside the engine through breaking-in increases in the engine oil and it deteriorates the oil, shortening the engine life.

LEGAL INSPECTION

If periodic inspection for machine safety assurance is stipulated by laws and regulations of your country, perform inspection complying with the inspection items listed below.

1. Make sure no abnormal event is present in the safety devices.
2. Check the hoisting accessories including a hook block for any abnormalities.
3. Check the winch wire rope end and wire clip for breakage.
4. Replace the wire rope promptly if it is damaged.
5. Check the hydraulic hose for oil leaks and friction flaws on the surface. Replace the hose if a surface flaw is detected.
6. Check the structural part including a boom for cracks and deformations.
7. Check the mounting bolts and joints for looseness and falling off.
8. Check if the booms perform proper operation and stop in extending, retracting, raising, lowering, and slewing.

If check finds a malfunction, contact us or our sales service agency.

CONSUMABLES

Consumables such as a filter element and wire rope are to be replaced upon periodic maintenance or prior to the wear limit. Proper replacement of consumables delivers increased economy in machine use.

Always use Maeda genuine parts for part replacement.

See the parts catalogue for part numbers when ordering parts.

List of Consumables	
Item	Replacement cycle
Engine oil filter	Every 500 hrs (initial 50 hrs)
Fuel filter	Every 500 hrs
Hydraulic oil return filter	Every 500 hrs (initial 50 hrs)
Hydraulic oil suction filter	Every 500 hrs (initial 50 hrs)
Air cleaner filter	Every 500 hrs
Cylinder gasket	*3 yrs
Boom slide plate	Every 3 yrs
Winch wire rope	*Every 3 yrs
Boom extending wire rope	*Every 3 yrs
Boom retracting wire rope	*Every 3 yrs

The cycles marked with an "*" in Replacement cycle include a halt period.

Contact us or our sales service agency for part replacement.

LUBRICATING OIL

Use of lubricating oil should vary with changes in temperature.

Lubricating place	Type of oil	Use by temperature									Specified capacity (liter)	Volume to replace (liter)
		-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104 40	122°F 50 °C		
Engine oil pan	Engine oil										6.7	6.7
		SAE30WCD										
					SAE10WCD							
		SAE10W-30CD										
		SAE15W-40CD										
Hydraulic oil tank	Hydraulic oil	ISO VG32									75	55
		ISO VG46										
Swing reducer		ISO VG320									0.6	0.6
Winch reducer	Gear oil	ISO VG150									0.5	0.5
Travel motor reducer		SAE30CD									1.0	1.0
Fuel tank	Diesel fuel	[Blank]									60	—
Cooling system	Water	Nonfreezing fluid addition									4.5	—

Fig. 5-20

- A specified oil quantity is defined as a total quantity of oil including that for unit piping, and a replacement oil quantity is defined as a quantity of oil to be replaced at inspection and maintenance.
- Always use SAE10W-CD, SAE10W-30CD, or SAE10W-40CD to start the engine with temperature at 0°C or below despite rise in diurnal temperature to approx. 10°C.
- Be sure to use our recommended abrasion-resistant hydraulic oil for the hydraulic oil system; ISO VG46 and VG32.
"Nippon Oil Super Highland 32" is adopted for a hydraulic oil system as factory default.
- For adjustment of antifreeze concentrations in coolant with temperature at -10°C or below, see "Cleaning Inside Engine Cooling System" on page 5-74.

CAUTION:

- **Molybdenum disulfide filled grease is to be applied to the boom slide plate (top), both sides and bottom of the boom.**
- **Do not apply molybdenum disulfide filled grease to the slewing bearing.**

SPECIAL TOOLS AND STANDARD TIGHTENING TORQUE

Accessory Tools

Contact us or our sales service agency to request special tools for inspection and maintenance, when necessary.

Standard Tightening Torque List

Bolt and Nut Tightening Torque

Torque the metric bolts and nuts with no specific indication to a values shown in this table.

Adequate tightening torque is determined with respect to a width across flat (b) of a bolt or nut.

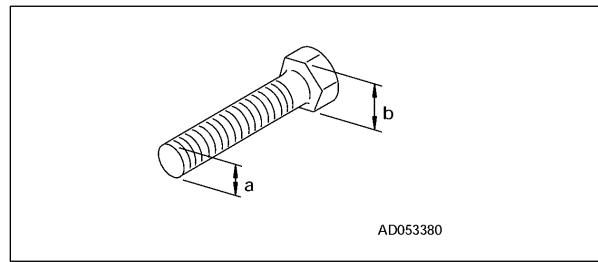


Fig. 5-21

Bolts Marked with 8.8 (Strength Classification) on Head

Nominal Size (Mark "a")	Width Across Flat (Mark "b")	Target Value		Tolerance	
		N·m	kgf·m	N·m	kgf·m
mm	mm	N·m	kgf·m	N·m	kgf·m
6	10	7.8	0.80	6.8-9.0	0.70-0.92
8	13	19.0	1.95	16.5-21.9	1.70-2.24
10	17	37.5	3.85	32.6-43.1	3.35-4.43
12	19	65.5	6.70	57.0-75.3	5.85-7.70
14	22	104	10.6	90.4-120	9.2-12.2
16	24	163	16.6	142-187	14.4-19.1
18	27	224	22.8	195-258	19.8-26.2
20	30	318	32.4	277-366	28.2-37.3
22	32	432	44.0	376-497	38.3-50.6
24	36	549	56.0	477-631	48.7-64.4
27	41	804	81.9	699-925	71.2-94.2
30	46	1090	111	948-1250	96.5-128
33	50	1485	151	1290-1710	131-174
36	55	1910	194	1660-2200	167-223

Bolts Marked with 10.9 (Strength Classification) on Head

Nominal Size (Mark "a")	Width Across Flat (Mark "b")	Target Value		Tolerance	
		N·m	kgf·m	N·m	kgf·m
mm	mm	N·m	kgf·m	N·m	kgf·m
6	10	11.0	1.1	9.4-12.7	0.93-1.26
8	13	27.0	2.7	23.0-31.1	2.3-3.10
10	17	53.0	5.4	45.0-61.0	4.6-6.21
12	19	93.0	9.5	79.0-107	8.10-10.9
14	22	148	15.1	126-170	12.8-17.4
16	24	231	23.5	196-266	20.0-27.0
18	27	317	32.3	269-365	27.5-37.1
20	30	450	45.9	383-518	39.0-52.8
22	32	612	62.4	520-704	53.0-71.8
24	36	778	79.3	661-895	67.4-91.2
27	41	1130	116	961-1300	98.6-133
30	46	1540	158	1310-1770	134-182
33	50	2100	214	1790-2410	182-246
36	55	2700	275	2300-3100	234-316

Bolts Marked with 12.9 (Strength Classification) on Head

Nominal Size (Mark “a”)	Width Across Flat (Mark “b”)	Target Value		Tolerance	
		N·m	kgf·m	N·m	kgf·m
mm	mm				
6	10	13.0	1.30	11.1-15.0	1.11-1.50
8	13	31.5	3.20	26.8-36.2	2.72-3.70
10	17	62.5	6.40	53.1-71.9	5.44-7.35
12	19	109	11.1	92.7-125	9.44-12.8
14	22	174	17.7	148-200	15.0-20.4
16	24	271	27.7	230-312	23.5-31.9
18	27	373	38.1	317-429	32.4-43.8
20	30	529	54.0	450-608	45.9-62.1
22	32	720	73.4	612-828	62.4-84.4
24	36	915	93.3	778-1050	79.3-107
27	41	1340	136	1140-1540	116-156
30	46	1820	185	1550-2090	157-213
33	50	2470	252	2100-2840	214-290
36	55	3180	324	2700-3660	275-373

Other Bolts

Nominal Size (Mark “a”)	Width Across Flat (Mark “b”)	Target Value		Tolerance	
		N·m	kgf·m	N·m	kgf·m
mm	mm				
6	10	3.0	0.30	2.6-3.5	0.26-0.35
8	13	7.5	0.75	6.5-8.6	0.65-0.85
10	17	14.5	1.45	12.6-16.7	1.25-1.65
12	19	25.0	2.55	21.7-28.8	2.20-2.95
14	22	40.0	4.10	34.8-46.0	3.55-4.70
16	24	62.5	6.40	54.3-71.9	5.55-7.35
18	27	86.0	8.75	74.8-98.9	7.60-10.0
20	30	122	12.4	106-140	10.8-14.3
22	32	166	16.9	144-191	14.7-19.4
24	36	211	21.5	183-243	18.7-24.7
27	41	309	31.4	269-355	27.3-36.1
30	46	419	42.6	364-482	37.0-49.0
33	50	570	58.0	495-656	50.4-66.7
36	55	732	74.5	636-842	64.8-85.7

Hose Connector Tightening Torque

Unless otherwise indicated, tighten hose connectors using the torque values shown in the following table:

Determine the appropriate tightening torque based on the hose connector width across flats (a).

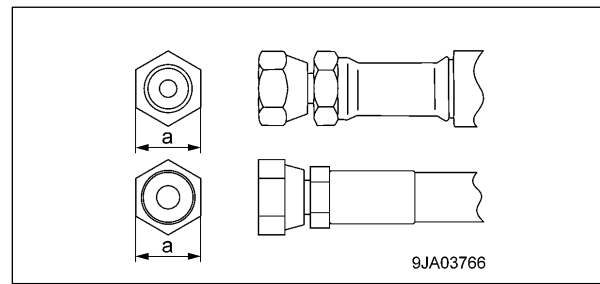


Fig. 5-22

Hose No.	Width Across Flat (Mark "a")	Target value		Tolerance	
		N·m	kgf·m	N·m	kgf·m
-	mm	N·m	kgf·m	N·m	kgf·m
02	19	44	4.5	35-54	3.5-5.5
03	22	74	7.5	54-93	5.5-9.5
	24	78	8.0	59-98	6.0-10.0
04	27	103	10.5	84-132	8.5-13.5
05	32	157	16.0	128-186	13.0-19.0
06	36	216	22.0	177-245	18.0-25.0

MACHINERY COVER

WARNING!

- Be sure to stop the engine and remove the starter switch key before removing the machinery cover.
- Do not remove the machinery cover immediately after the operation while the engine is still hot.

NOTICE: The machinery cover can be removed or reattached while the crane is stowed. Note that extending the outriggers and raising the boom slightly will provide more working space than when stowed and make the process easier.

Removing Machinery Cover

Remove the machinery cover with the following procedure when performing inspection/maintenance inside the machinery cover.

1. Open all of the outriggers to an angle to allow removal of the machinery covers.
2. Remove the 11 retaining bolts (3) from the left-hand machinery cover (1) and right-hand machinery cover (2).

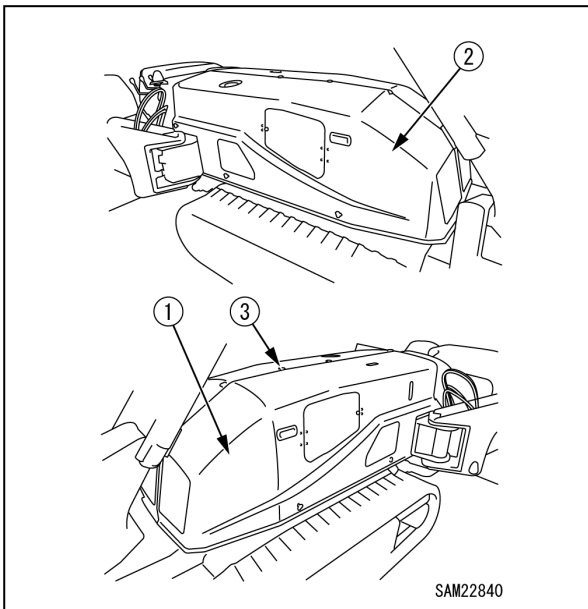


Fig. 5-23

NOTICE: One retaining bolt at the front, four at the top, six at the sides three each on the left and right are used to tighten with the machinery cover.

3. Pull the left-hand machinery cover (1) to the side to remove.

4. Pull the right-hand machinery cover (2) to the side to remove.

Installing Machinery Cover

When you finished inspection/maintenance in the machinery cover, install the machinery cover using the following procedure.

1. Reattach the right-hand machinery cover (2) in its original position.
2. Reattach the left-hand machinery cover (1) in its original position.
3. Securely tighten the 11 retaining bolts on the left-hand machinery cover (1) and right-hand machinery cover (2).
4. Rotate all outriggers back inward to stow.

REAR COVER

Removing Rear Cover

Remove the rear cover as follows when performing inspection or maintenance inside the rear cover.

1. Remove the eight retaining bolts (2) from the rear cover (1).

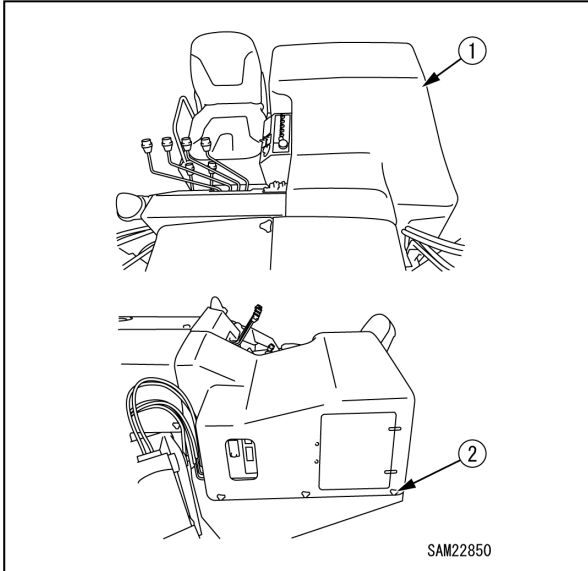


Fig. 5-24

2. Remove the rear cover (1).

Installing Rear Cover

Once inspection and maintenance inside the rear cover is complete, reattach the rear cover as follows:

1. Reattach the rear cover (1) at its original position.
2. Securely tighten the eight retaining bolts (2) on the rear cover (1).

FUSES

CAUTION: Be sure to turn the starter switch to the "OFF" position when checking or replacing a fuse.

CAUTION: Fuses protect electrical components and wires from being burnt out.

- Fuses are blade fuses. If a fuse was corroded and shows white powder, be sure to change the fuse.
- If a fuse has melted down, always check the cause in the circuit and repair the problem before changing the fuse.
- Always use a fuse of the same capacity when replacing one.

The fuse box is provided at the lower section of the instrument panel.

Check and replace a fuse using the procedure below.

1. Remove the buckle (2) of the cover (1) at the bottom of the instrument panel to open the cover (1).

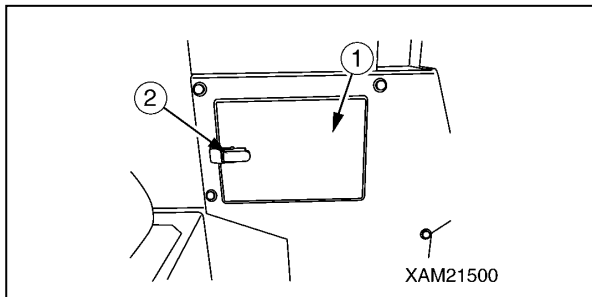


Fig. 5-25

2. Remove the cover (3) of the fuse box.

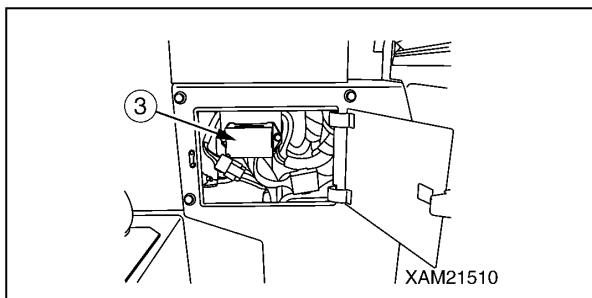


Fig. 5-26

3. Remove the fuse from the fuse box and check/replace the fuse.
4. Insert a new or checked fuse to the original position in the fuse box.

[Fuse Capacity and Circuit Names]

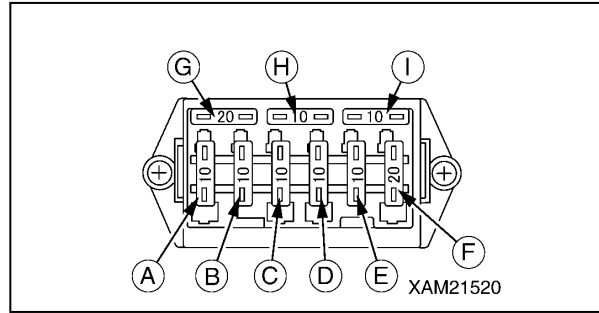


Fig. 5-27

The table below shows the fuse system and its capacity.

Index	Capacity	Circuit Name
A	10 A	Main P.S.
B	10 A	PCB
C	10 A	Engine control
D	10 A	Solenoid valve
E	10 A	Horn, light
F	20 A	Moment limiter, remote control system
G	20 A	Spare
H	10 A	Spare
I	10 A	Spare

INSPECTION

Pre-Start and Post-Start Inspection Items

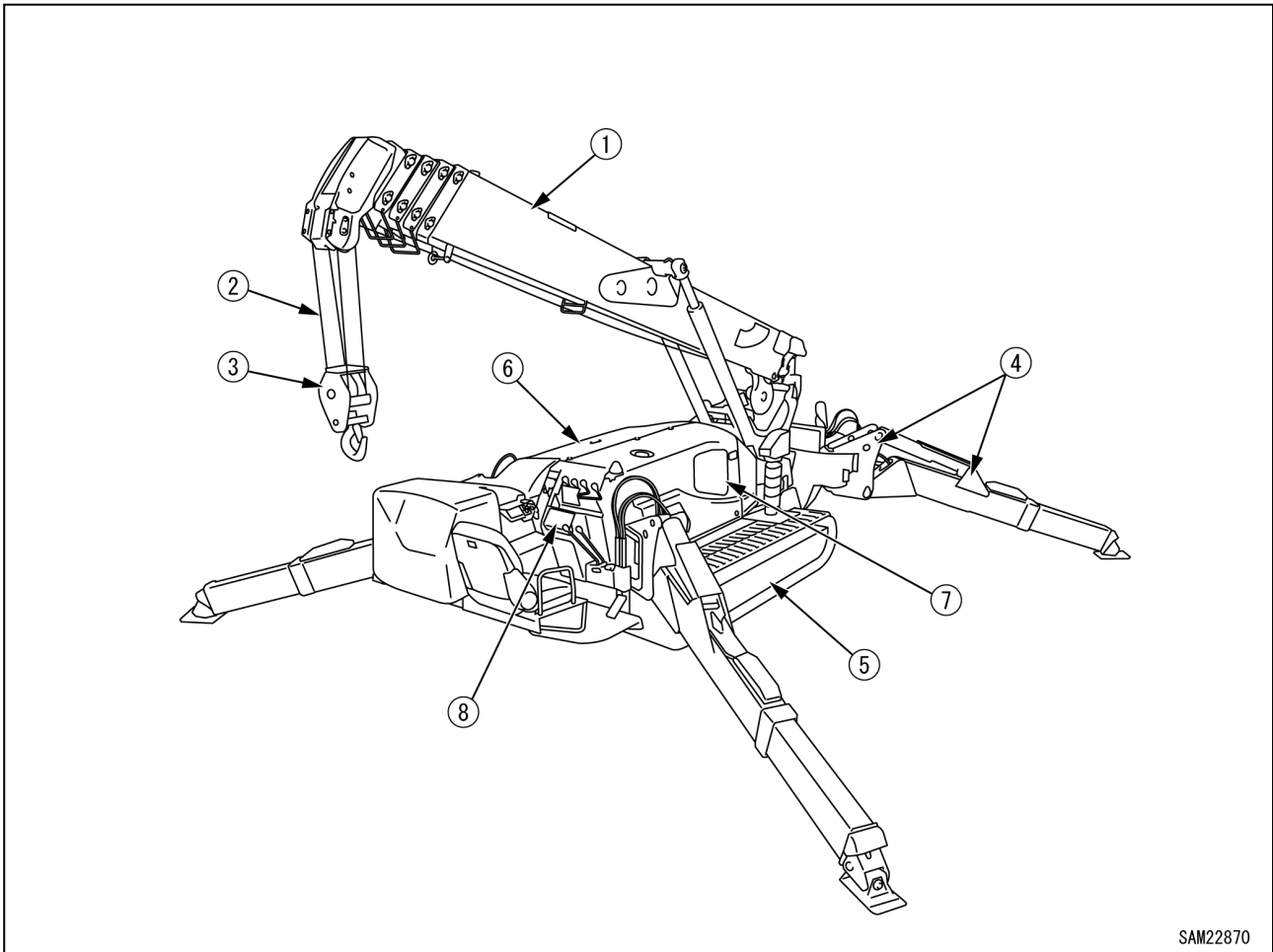
Inspection Item	Reference
Pre-Start Visible Checks	
Check Crane	See "Crane" on page 5-23.
Check Wire Ropes	See "Wire Ropes" on page 5-23.
Check Hook Block	See "Hook Block" on page 5-23.
Check Outriggers	See "Outriggers" on page 5-23.
Check Track and Frame	See "Tracks and Frame" on page 5-24.
Check Travelling Dolly	See "Travelling Dolly" on page 5-24.
Check Engine	See "Engine" on page 5-24.
Check Travel and Crane Controls	See "Travel and Crane Controls" on page 5-24.
Pre-Start - Before Starting Engine	
Check / Add Engine Coolant Level	See "Check / Add Engine Coolant" on page 5-24.
Check / Add Engine Oil	See "Check / Add Engine Oil" on page 5-25.
Check / Add Fuel	See "Check / Add Fuel" on page 5-26.
Check / Clean Water Separator	See "Check / Clean Water Separator" on page 5-26.
Check / Add Hydraulic Oil	See "Check / Add Hydraulic Oil" on page 5-27.
Check / Add Slewing Motor Reduction Gear Case Oil	See "Check / Add Slewing Motor Reduction Gear Case Oil" on page 5-28.
Check / Add Travel Motor Reduction Gear Case Oil	See "Check / Add Travelling Motor Reduction Gear Case Oil" on page 5-28.
Check Dust Indicator	See "Check Dust Indicator" on page 5-29.
Check Battery Charge Level	See "Check Battery Charge Level" on page 5-29.
Check Horn Operation	See "Check Horn" on page 5-30.
Check Working Light Operation	See "Check Working Light Operation" on page 5-30.
Check Fuse Box	See "Check Fuse Box" on page 5-30.
Check Outrigger Display Operation	See "Check Outrigger Display" on page 5-30.
Adjust Operation Seat	See "Adjust Operation Seat" on page 5-31.
Post-Start - After Starting Engine	
Check / Adjust Rubber Track Tension	See "Check / Adjust Rubber Track Tension" on page 5-31.
Check Rubber Tracks for Damage and Wear	See "Check Rubber Tracks for Damage and Wear" on page 5-33.
Check Outrigger Safety Device Operation	See "Check Outrigger Safety Device Operation" on page 5-33.
Check Outrigger Operation	See "Check Outrigger Operation" on page 5-35.
Check Crane Operation	See "Check Crane Operation" on page 5-35.
Check Over Winding Detector Operation	See "Check Over Winding Detector Operation" on page 5-37.
Check Moment Limiter Operation	See "Check Moment Limiter Operation" on page 5-37.
Check Outrigger Extension Positions	See "Check Outrigger Extension Positions" on page 5-38.
Check Engine Exhaust Gas Colour, Noise and Vibration	See "Check Engine Exhaust Gas Colour, Noise and Vibration" on page 5-38.
As Required	
Replace Rubber Tracks	See "Removal of Rubber Tracks" on page 5-64.
Replace Winch Wire Rope	See "Wire Rope" on page 5-65.
Check / Adjust Boom Telescoping Wire Rope	See "Check / Adjust Boom Telescoping Wire Rope" on page 5-70.
Inspect / Clean / Replace Air Cleaner	See "Inspection, Cleaning and Replacement of Air Cleaner" on page 5-72.
Clean Inside Engine Cooling System	See "Cleaning Inside Engine Cooling System" on page 5-74.
Drain Contaminant Water/Deposits in Fuel Tank	See "Draining Contaminant Water/Deposits in Fuel Tank" on page 5-76.
Drain Contaminant Water/Deposits in Water Separator	See "Draining Contaminant Water/Deposits in Water Separator" on page 5-76.

Pre-Start Visible Checks

WARNING!

- This machine has a diesel engine.
If it smells fuel around the engine, the fuel may be leaking. Carefully check the cracks on the fuel hose or fuel hose connections.
- Buildup of combustibles and oil leakage around the hot engine section such as engine and muffler and around the battery can cause fire in the machine.
Carefully check around these areas. Should you find any abnormality, be sure to fix it or contact us or our sales service agency.

Check the items shown in this section as routine surveillance before starting the first work of every day.



SAM22870

Fig. 5-28

Crane

- Look around and below the boom and post and look for any oil leak or similar. Be especially careful to check up the derrick cylinder and lower part of the winch motor near the post. If you find any abnormality, repair.
- Check each part of the post for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. Be especially careful to check for looseness of decelerator mounting bolt of the post, slewing ring or slewing device. If you find any abnormality, repair.
- Check each part of the boom for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. Be especially careful to check for excessive abrasion and damage of the boom support pin or derrick support pin. If you find any abnormality, repair.
- Check for excessive damage and deformity of the over winding weight wire rope of the overwinding alarm device at the tip of the boom. If there is any abnormality, repair.
- Check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.

Wire Ropes

For more information on wire ropes, see "Wire Rope" on page 5-65.

- Check the wire ropes for damage, deformation, wear, twists, kinks, corrosion, etc. If you find any abnormality, replace
- Check the bound condition of the wire rope ends. If you find any loosened wire rope end, replace.
- Check for irregular winding of the wire ropes (wind drum). If you find any irregular winding, rewind.

Hook Block

- Verify that the wire rope latch (1) functions normally. If there is any abnormality, repair.

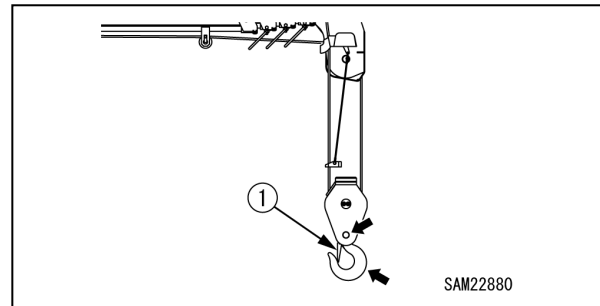


Fig. 5-29

- Rotate the hook and verify that the hook rotates smoothly and that trunnion does not emit any abnormal sound. If there is any abnormality, repair.
- Check the hook for any crack or excessive deformation. If there is any abnormality, repair.
- If dimension a between the punch marks punched on the hook became "105 mm or more" or the hook lower part dimension b became "49.5 mm or less", replace the hook.

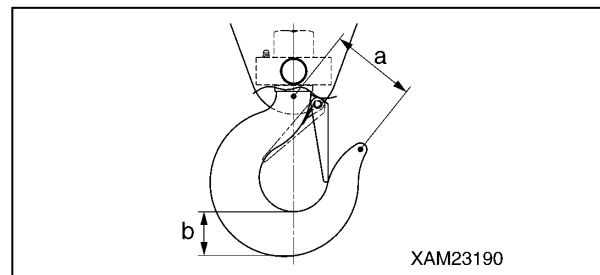


Fig. 5-30

Outriggers

- Look below each of the outriggers and check for any oil leak or similar. Be especially careful to check below the outrigger cylinders. If you find any abnormality, repair.
- Check each of the rotaries, outriggers, holders and outrigger cylinders for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. If you find any abnormality, repair.
- Check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.
- Pull out the position pin of each of the outriggers, rotate the relevant rotary and verify that the operation is smooth. If you find any abnormality, repair.

Tracks and Frame

Check each of the frames, rubber tracks, rollers, idlers and sprockets for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts and pins for any looseness, drop, damage and other matters. If you find any abnormality, repair.

Travelling Dolly

- Look around and below the machine and check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. If you find any abnormality, repair.
- Look around and below the machine and look for any oil leak or similar. Be especially careful to check below the hydraulic oil tank, travel/crane operation section and each travelling motor. If you find any abnormality, repair.
- Look around and below the machine and check for breakage, excessive deformation, contamination and similar of lights such as the outrigger unset lamps and working status lamp. If you find any abnormality, repair.
- Look around and below the machine and check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.
- Check each of the frames, machinery covers, rear cover and other parts for cracks, excessive deformation, contamination and others. If you find any abnormality, repair.

Engine

- Check for fuel, oil or water leaking from the engine. If you find any abnormality, repair.
- Check the hot engine sections such as the engine muffler and around the battery for the buildup and deposit of combustibles such as dead leaves, paper wastes, dust, oil, and grease. If there is any, remove them.
- Check the starter, alternator, around battery and similar parts for sagged electrical cables, piping joints, and the trace of burn. If you find any abnormality, repair.

Travel and Crane Controls

- Verify that all of the operation levers, travelling levers, travelling lock lever and acceleration pedal operate smoothly. If you find any abnormality, repair.
- Check the moment limiter display and the monitor panel on the instrument panel for damages and dirtiness. If you find any abnormality, repair. If dirty, clean.
- Verify that all of the switches on the outrigger operation panel and instrument panel operate smoothly. If you find any abnormality, repair.
- Check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.

Pre-Start Inspection - Before Starting Engine

Check the followings in this section without starting the engine and before starting the first work every day.

Check / Add Engine Coolant

WARNING! Do not check or refill the coolant with the radiator cap removed. Always check and refill in the reserve tank. Heated coolant may spout, causing burns.

1. Stop the machine at levelled location.
2. Open the access hatch in the right-hand machinery cover.
3. Check the coolant level in the reserve tank (1) to be between "FULL" and "LOW".

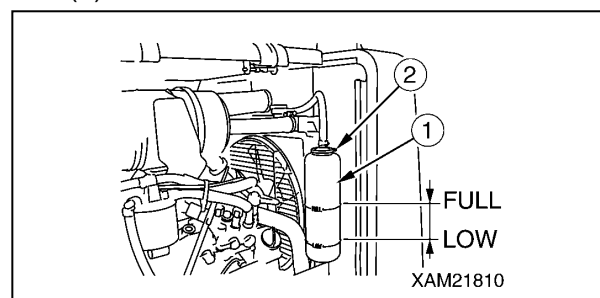


Fig. 5-31

4. If the coolant level is lower than the "LOW" level, use the following procedure to refill with tap water.
 - (1) Remove the cap (2) of the reserve tank (1) and fill water from the filler opening to the level "FULL".

- (2) After refilling with coolant, securely install the cap (2) of the reserve tank (1).
5. If the reserve tank was empty, follow the steps below.
 - (1) Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
 - (2) Remove the radiator cap (5) and check the coolant level in the radiator.

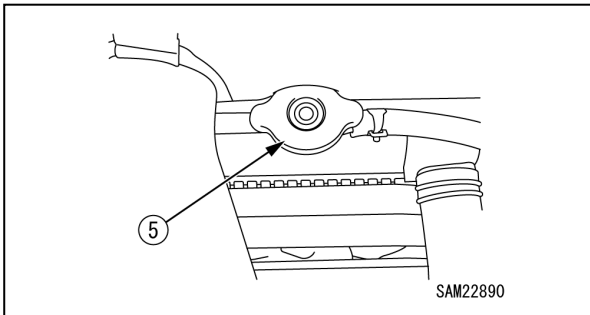


Fig. 5-32

- (3) If the coolant level in the radiator was low, check the radiator, radiator hose, and engine for water leakage.
- (4) Fill water from the radiator filler opening and securely install the radiator cap (5).
- (5) Remove the cap (2) of the reserve tank (1) and fill water from the filler opening to the level "FULL".
- (6) After refilling with the coolant, securely install the cap (2) of the reserve tank (1).
- (7) Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.
6. Close the access hatch.

Check / Add Engine Oil

CAUTION: Securely install the oil level gauge and filler cap after checking the oil level and refilling with the oil. If the oil level gauge falls during the operation, the hot oil spouts out of the pan, causing burns.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14. Using other oil than those specified may shorten the life of the engine. Be sure to refill with the specified oil.

- **Keep the engine oil at the appropriate level. The oil level being too high will result in too much oil consumption and this tends to increase the oil temperature, deteriorating the oil faster. The oil level being too low may burn out the engine.**
- **Be careful not to let any foreign substance go into the filler opening when refilling with the oil.**

1. Stop the machine at levelled location.
2. Open the access hatch in the right-hand machinery cover.
3. Pull the oil level gauge (G) out and wipe the oil with a disposable cloth.

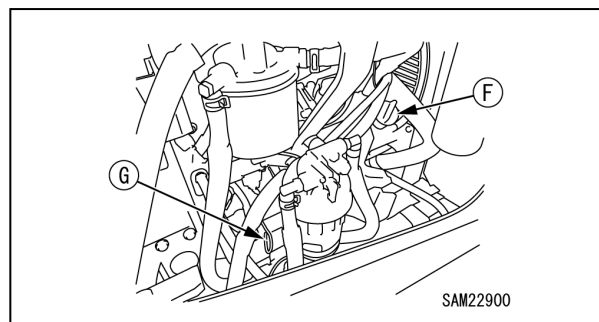


Fig. 5-33

4. Insert the oil level gauge (G) into the gauge guide and pull it out.
5. If the oil level is between the "H" mark and "L" mark on the oil level gauge (G), the oil level is normal.

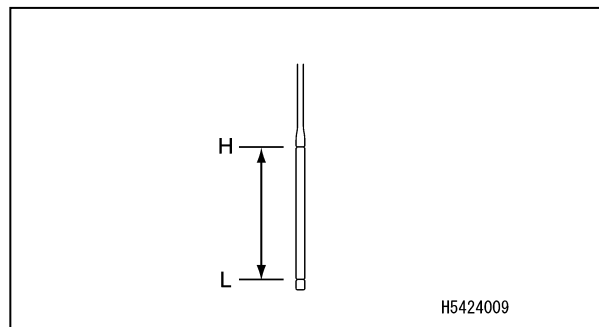


Fig. 5-34

6. If the oil level is lower than the "L" mark, remove the filler cap (F) and refill with the engine oil from the filler opening.

NOTICE: Refill with the engine oil so that the oil level will be in the middle of the "H" and "L" marks on the oil level gauge (G).

7. After refilling with the oil, securely install the oil level gauge (G) and the filler cap (F).
8. Close the access hatch.

Check / Add Fuel

DANGER!

- Be extremely careful with fire such as cigarette.
- Be sure to stop the engine when refuelling. If refuelling was done with the engine in operation, the fuel spilled on the section where it gets hot such as muffler can catch fire.
- Over-refilling may cause fuel spill. Refuel to the level slightly lower than the specified upper limit level. If the fuel spills, be sure to thoroughly wipe it off.
- Be sure to close the tank cap after refuelling.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Be careful not to let any foreign substance go into the filler opening when refuelling.

1. Turn the starter switch to the "ON" position.

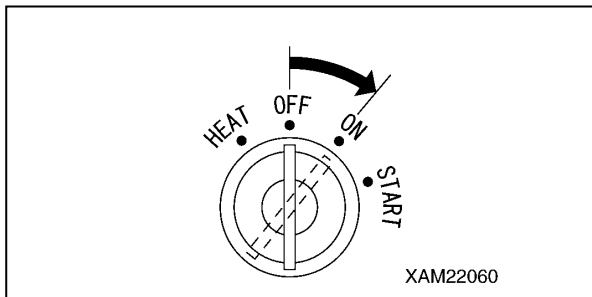


Fig. 5-35

2. Looking at the fuel gauge on the monitor panel, check if the fuel is filled to almost full (around "F").

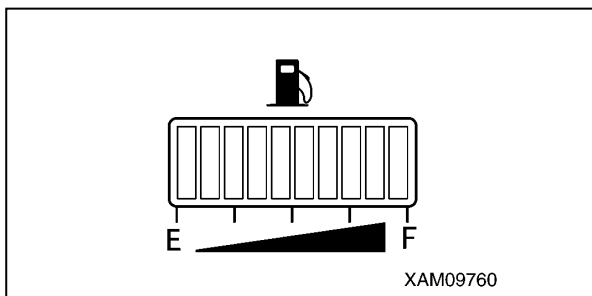


Fig. 5-36

3. If the fuel level is low, remove the tank cap (F) on the top of the fuel tank and refuel from the filler opening while watching the fuel gauge.

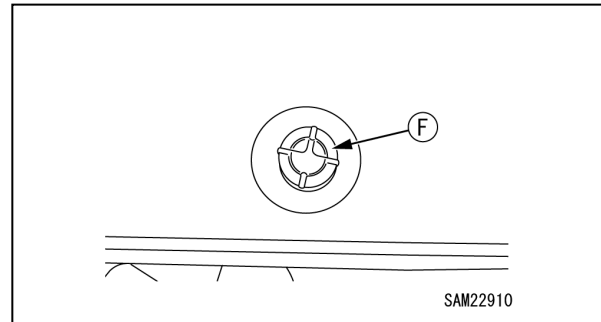


Fig. 5-37

4. After refuelling, turn the tank cap (F) to securely close it.

NOTICE: Fill the fuel tank to full after finishing the work for the day.

Check / Clean Water Separator

WARNING!

- The water separator pot has fuel (diesel oil) inside. Be extremely careful of fire such as cigarette when cleaning the water separator pot.
- If the fuel spills when the water separator pot is removed, thoroughly wipe it off.

CAUTION:

- Water or dust accumulated inside the water separator pot will cause engine failure. Check inside the pot and remove any water or dust accumulated inside.
- If water remains in the water separator pot, it is assumed that much water is also mixed in the fuel tank. See "Draining Contaminant Water/Deposits in Fuel Tank" on page 5-76 and eliminate water and dust mixed into the fuel tank.

1. Stop the machine at levelled location.
2. Open the access hatch in the right-hand machinery cover.

3. Check the water separator pot (1) for any water or dust in the pot and verify if the red float (2) in the pot has not come up from the bottom.

The red float (2) in the pot (1) coming up indicates that the water has mixed in.

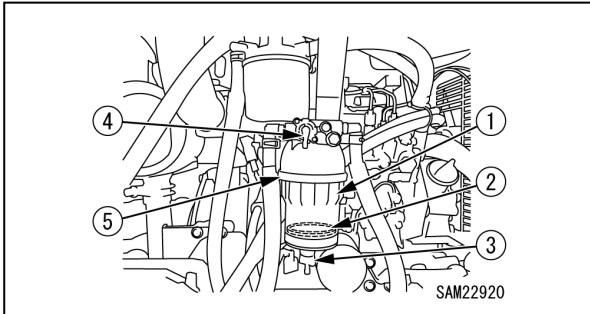


Fig. 5-38

4. If there is water accumulated in the pot (1), drain the water in the pot using the following procedure.

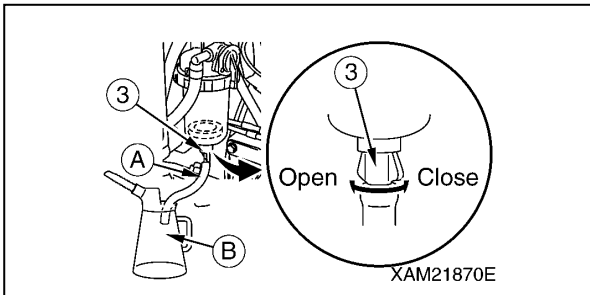


Fig. 5-39

- (1) Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
 - (2) Connect the hose (A) to the drain outlet of the valve (3) at the bottom of the pot (1) and to the container (B) to receive drained fuel.
 - (3) Turn the valve (3) at the bottom of the pot (1) counterclockwise (left) to loosen and drain the fuel until the red float (2) in the pot (1) sinks to the bottom.
 - (4) When the fuel drain has completed, turn the valve (3) at the bottom of the pot (1) clockwise (right) to tighten.
 - (5) Disconnect the hose (A) connected to the drain outlet of the valve (3).
 - (6) Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.
5. Close the access hatch.

Check / Add Hydraulic Oil

WARNING!

- The oil may spout out when the cap of the hydraulic oil tank is removed.
Turn the cap slowly to let the inner pressure escape before removing.
- Do not refill with the oil to the level higher than the "H" (upper limit) of the level gauge. Too much oil may cause the oil to spout out of the air breather during travelling or crane operation, causing burns.
- Be careful not to let dust go in from the filler opening when refilling with oil.
- Securely close the tank cap after refilling with the oil.
The tank cap may fall, and the hot oil may spout out, causing burns.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Be sure to put the machine in the travelling posture when checking the oil level. Checking the oil level in the working posture will cause overfilling since the oil in the cylinders has not returned to the tank.
- Be careful not to let dust go in from the filler opening when refilling with oil.

1. Stop the machine at levelled location.
2. Look at the oil level gauge (G) on the left machinery cover to check if the oil level is between "H" and "L".

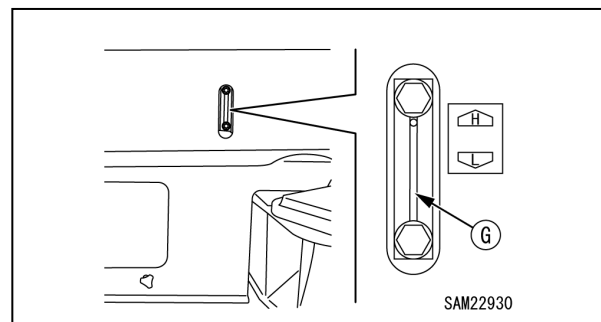


Fig. 5-40

3. If there is not sufficient oil, refill with the hydraulic oil using the following procedure.
 - (1) Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.

- (2) Remove the filler cap (F) on the top of the hydraulic oil tank.

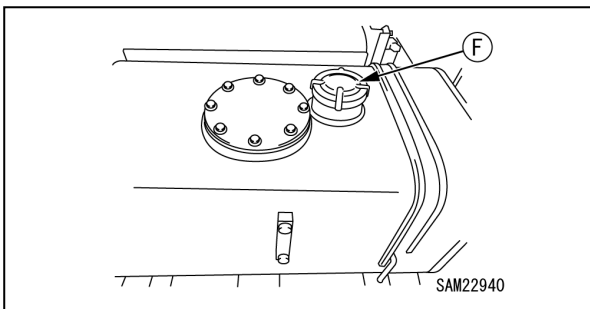


Fig. 5-41

- (3) Refill with the hydraulic oil from the filler opening (F) while looking at the oil level gauge (G).
- (4) Securely close the filler cap (F) after refilling with oil.
- (5) Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Check / Add Slewing Motor Reduction Gear Case Oil

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

1. Stop the machine at levelled location.
2. Go under the machine and check the site gauge (G) for checking oil level in the slewing reduction gear case. Verify that the oil is filled up to the centre of the site gauge (G).

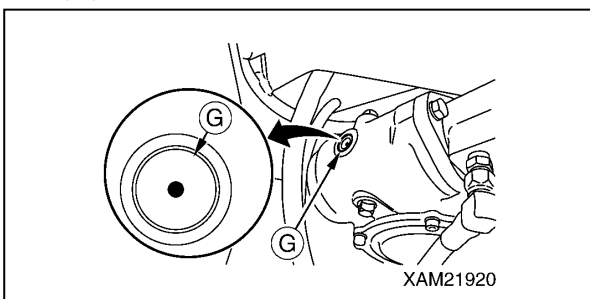


Fig. 5-42

3. If there is not sufficient oil, refill with the gear oil using the following procedure.

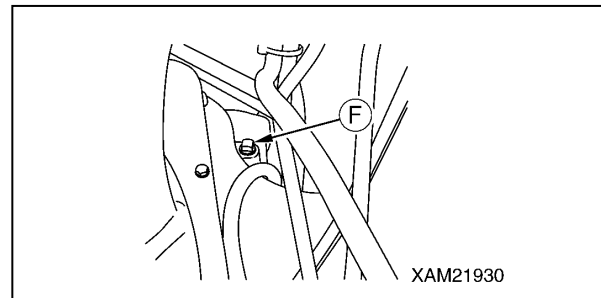


Fig. 5-43

- (1) See "OUTRIGGER SETTING" on page 4-42 to rotate the rotary of the "outrigger [2]" outward.
- (2) Remove the filler opening plug (F) at the back of the post and pour in oil from the filler opening.

NOTICE: Pour in the oil to the centre of the site gauge (G) from the filler opening.

- (3) After refilling with the oil, install the filler plug (F) and securely tighten the plug.
- (4) See "OUTRIGGER STOWING" on page 4-49 and rotate the rotary of the "outrigger [2]" inward and stow.

Check / Add Travelling Motor Reduction Gear Case Oil

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Use seal tape, etc. at the thread of the oil level check plug to stop the oil leak and securely tighten the plug after refilling with the oil.

1. Move the machine forward and backward so that one of the two drain plugs (P) of the travelling motor reduction gear case will come right under.

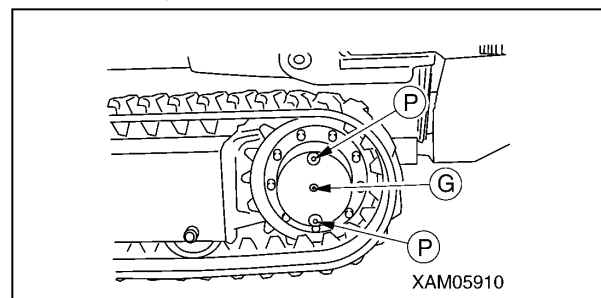


Fig. 5-44

2. Remove the oil level check plug (G) of the travelling motor reduction gear case to check if the oil will come out of the plug hole.
3. If there is no sufficient oil, remove the top drain plug (P) and pour in gear oil from the plug hole.

NOTICE: Pour in the gear oil until the oil comes out of the oil level check plug (G).

4. Install the oil level check plug (G) and upper drain plug (P) and securely tighten them after checking and refilling with the oil.

Check Dust Indicator

1. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
2. Inspect the dust indicator (1) on the air cleaner to confirm that the red piston is not visible in the transparent section.

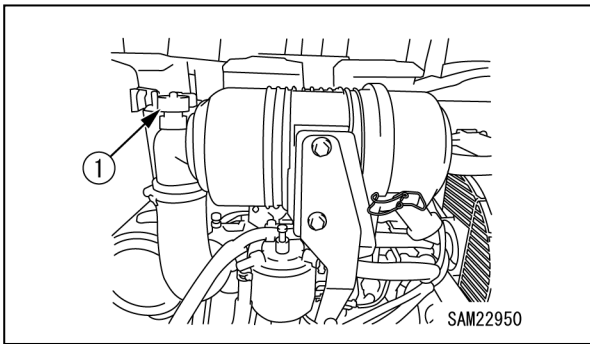


Fig. 5-45

3. If the red piston is visible, clean or replace the element immediately.
For more information on cleaning the element, see "Inspection, Cleaning and Replacement of Air Cleaner" on page 5-72.
4. After inspecting, cleaning, or replacing, press the knob on the dust indicator (1) to return the red piston to its original position.

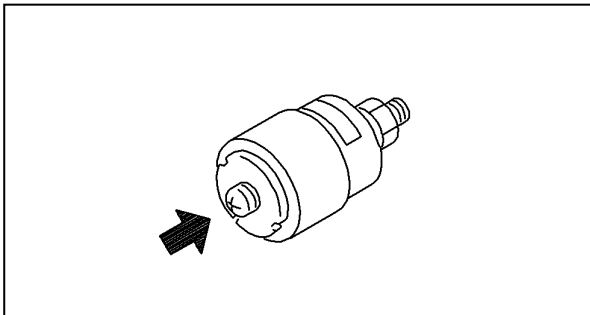


Fig. 5-46

5. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Check Battery Charge Level

WARNING!

- The electrolyte generates combustible gas and presents explosion hazard. Do not bring any fire close to the electrolyte.
- The electrolyte is a hazardous substance. Avoid contact with eyes or skin. Should it come into the contact with eyes or skin, wash the affected area with plenty of water and consult a physician.

Check the status by the colour displayed on the meter on the top of the battery.

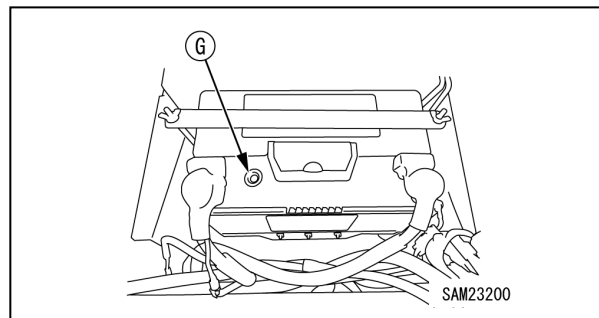


Fig. 5-47

The meter indications are as follows:

- Green: Normal, with no problems.
- Black: Charge is low. Recharge the battery.
- White: Inspect the exterior.

NOTICE:

If the meter indication remains black even after the battery has been recharged, the battery may be at the end of its life cycle and therefore should be replaced.

If the meter indication is white, check that the casing is not damaged and there is no fluid leakage. Replace if it is damaged.

Even if no exterior damage is visible, it may be damaged internally or it may be at the end of its life cycle and therefore should be replaced.

Check Horn

1. Turn the starter switch to the "ON" position and check the followings.

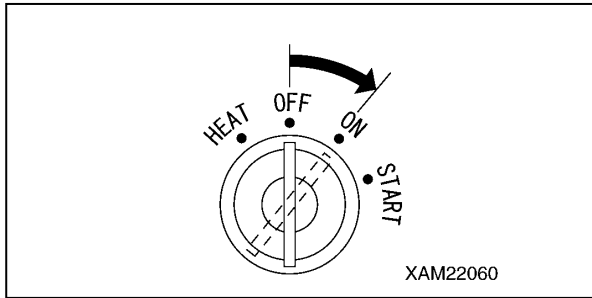


Fig. 5-48

2. Press the horn switch to verify that the horn sounds.

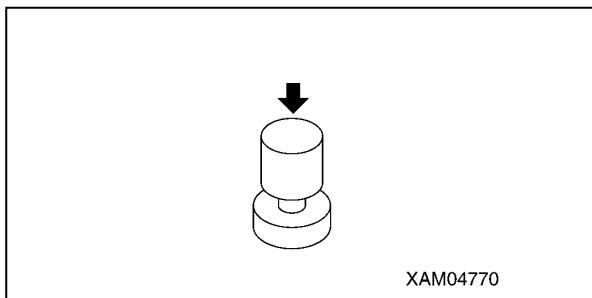


Fig. 5-49

Check Working Light Operation

1. Turn the starter switch to the "ON" position and check the followings.

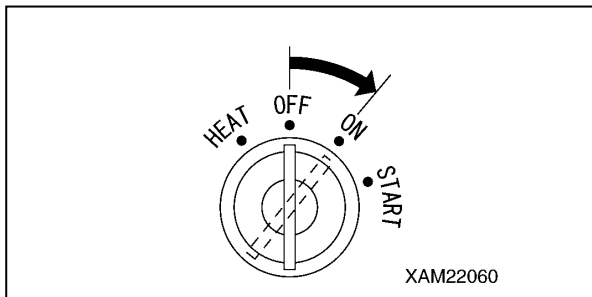


Fig. 5-50

2. Push the working light switch in the back and verify that the pilot lamp of the switch section and the working light on front of the machine lights up.

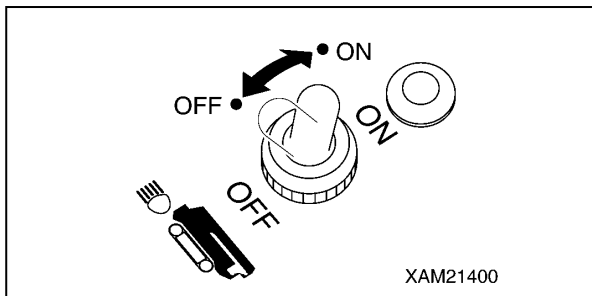


Fig. 5-51

Check Fuse Box

WARNING! If fuses are brown frequently or if you find the trace of a short circuit created in the electrical wiring, be sure to find the cause and fix the problem.

Check the fuse at the lower section of the instrument panel for damage and meltdown and if the fuse of specified capacity is being used.

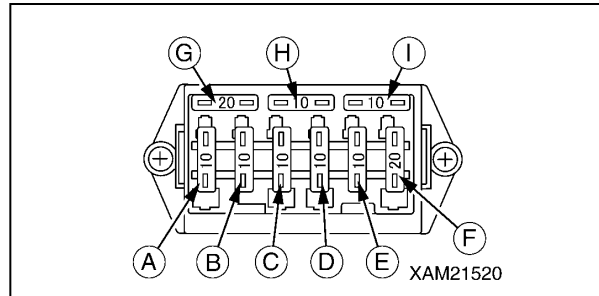


Fig. 5-52

Check Outrigger Display

1. Turn the starter switch to the "ON" position.

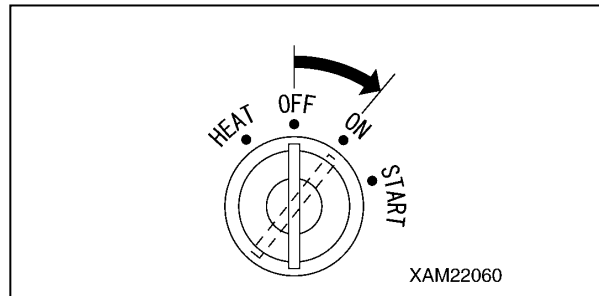


Fig. 5-53

2. Operate the work selector switch on the outrigger operation panel to the "Outrigger" position.

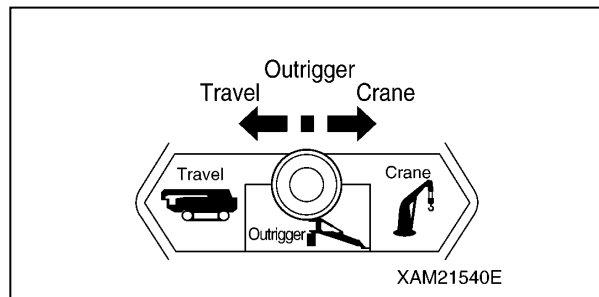


Fig. 5-54

- Verify that the lamps on the outrigger display light up and go off in the order shown below.

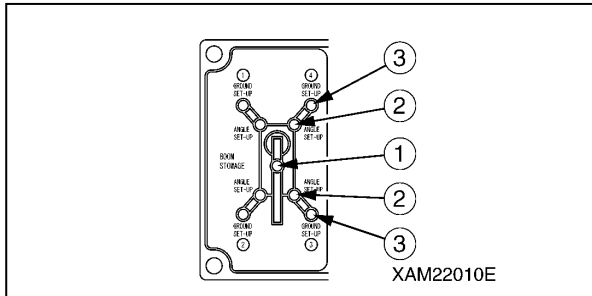


Fig. 5-55

- All of the boom stowing lamp (1), extension lamps (2), and setting lamps (3) light up in green for 2 seconds, and go off.
- The boom stowing lamp (1) (green) lights up, and at the same time, all the extension lamps (2) and setting lamps (3) flash in red.

NOTICE: If a lamp on the outrigger display does not light up for 2 seconds in green, the outrigger display may be faulty.

Please ask us or our sales service agency for repair.

- Verify that the outrigger un-set warning lamp flashes and the red of the working status lamp lights up.

Adjust Operation Seat

WARNING!

- Adjust the operation seat before operation or when the operator changes.
- Press your back against the back of the operation seat and adjust the seat so that you can fully step on the acceleration pedal.

Forward/Backward Adjustment of the Seat

- While pushing the slide adjusting lever (1) to the left, set the seat to the desired position.

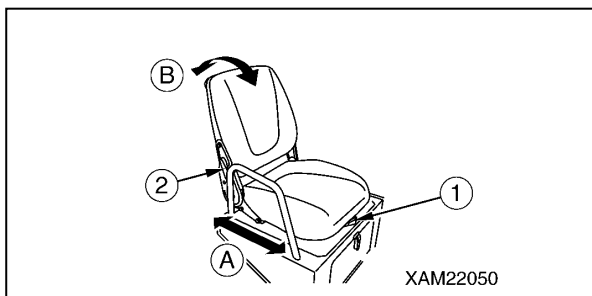


Fig. 5-56

- Release your hand from the slide adjusting lever (1).

NOTICE: The forward/backward slide adjustment distance is 120 mm in 6 steps.

Reclining Adjustment

CAUTION: Watch the space in the back while adjusting the angle when reclining the backseat backward.

- While pushing the reclining adjusting lever (2) forward, set the backseat to the desired angle.
- Release your hand from the reclining adjusting lever (2).

NOTICE: The reclining adjustment angle is 75 degrees in 7 steps forward and 23 steps in backward.

Post-Start Inspection - After Starting Engine

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

CAUTION: The checkups described in this section should be carried out after starting the machine.

See "STARTING ENGINE" on page 4-18 and later to execute the engine startup, travelling operations, outrigger operations and crane operations.

Check / Adjust Rubber Track Tension

CAUTION:

- Set the outriggers and raise the rubber track for about 50 mm from the ground when checking/adjusting the tension of the rubber tracks.
 - The standard tension of the rubber track is that the clearance between the wheel tread of the track roller at centre and the shoulder of the rubber track is 5 to 10 mm.
 - If the tension is not sufficient even after injecting the grease, the rubber track or the sealing of the tension adjustment cylinder needs to be changed.
- Contact us or our sales service agency for the judgement of whether to replace, repair, or keep the rubber track.

The rubber tracks are worn out differently depending on the working conditions and soil quality. Regularly check the wear and tension of the rubber tracks.

Especially, with the new machine or when a new part was installed, "initial slack" appears with 5 to 30 hours of operation after adjusting the tension to the specified value.

Adjust the tension frequently until the period of "initial slack" passes. This will prevent "rubber track from coming off due to insufficient tension on the rubber track".

Tension Check

1. Move the left and right crawlers so that the junction of the rubber track (indicated by M) comes to the top centre between the axles.

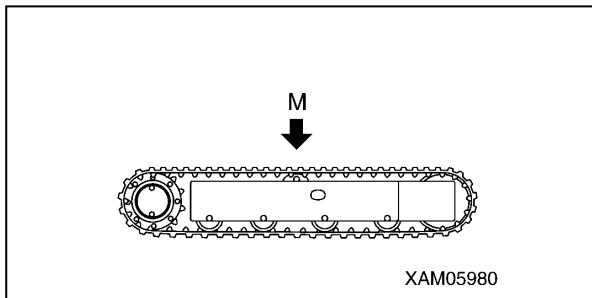


Fig. 5-57

2. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the crawlers for about 50mm from the ground.
3. Measure the clearance between the wheel tread of the track roller at centre and the shoulder of the rubber track.

NOTICE: The clearance of 5 to 10 mm indicates the standard tension.

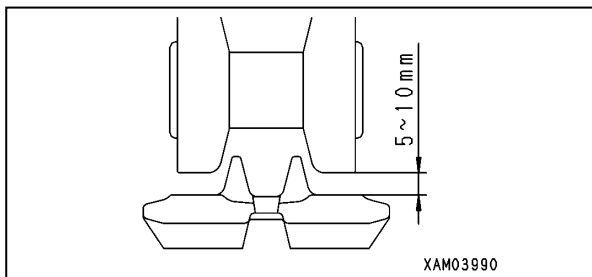


Fig. 5-58

4. If the tension is out of the standard range, see "Tension Adjustment" below to make adjustments.

Tension Adjustment

If the "tension check" of the rubber track found the tension lower than standard tension of the rubber track, make adjustments as described below.

Working with the loose rubber track (the tension of the rubber track at 15 mm or more) will cause run-off or early wear of the core metal.

• Loose Tension (Increase Tension)

Have a grease gun (pump) ready.

1. Inject the grease from the grease valve (1) using the grease gun.

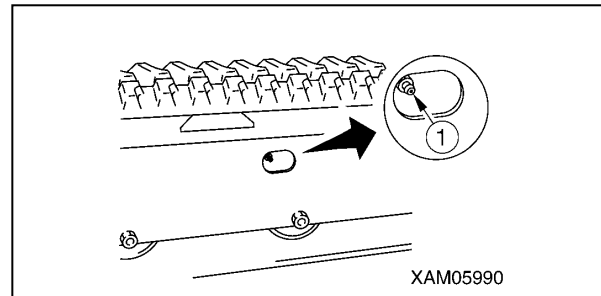


Fig. 5-59

2. Perform the following tasks to verify the proper tension.
 - (1) See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers and lower the machine on the ground.
 - (2) Move the machine forward/backward.
 - (3) See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the crawlers again for about 50mm from the ground.
3. Perform the "tension check" of the rubber track again. If the tension is not appropriate, make another adjustment.
4. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers and lower the machine on the ground.

• Tight Tension (Decrease Tension)

WARNING! Inside the rubber track tension adjustment device has the grease sealed. The grease is under high pressure due to the tension of the rubber track.

Making adjustments without observing the followings may cause the grease valve to fly away, resulting in serious accidents.

- Do not loosen the grease valve for tension adjustment for more than 1 turn. The grease valve may pop out.
- Do not place yourself right in front of the grease valve when adjusting the tension to avoid any danger.

1. Slowly loosen the grease valve (1) to drain the grease.

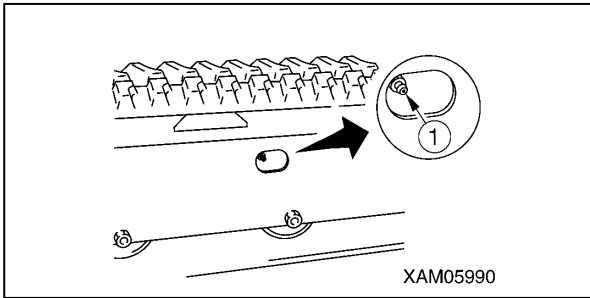


Fig. 5-60

NOTICE: When loosening the grease valve (1), do not loosen more than for one turn.

2. If the grease is not drained easily, perform the following to drain the grease.
 - (1) See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers and lower the machine on the ground.
 - (2) Move the machine forward/backward.
 - (3) See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the crawlers again for about 50mm from the ground.
3. Tighten the grease valve (1).
4. Perform the "tension check" of the rubber track.
If the tension is not appropriate, make another adjustment.
5. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers and lower the machine on the ground.

Check Rubber Tracks for Damage and Wear

See "Inspection of Rubber Tracks" on page 5-63.

Check Outrigger Safety Device Operation

Checking Operation of Crane Interlock Function

1. Turn the starter switch to the "ON" position.

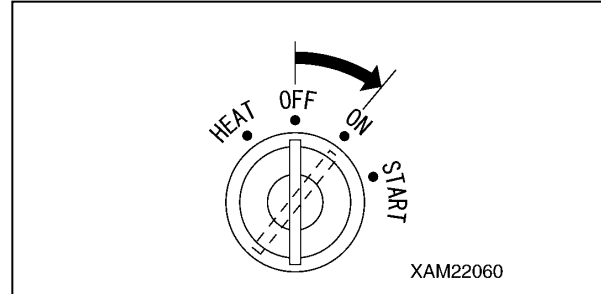


Fig. 5-61

2. Operate the work selector switch on the outrigger operation Panel to the "Outrigger" position.

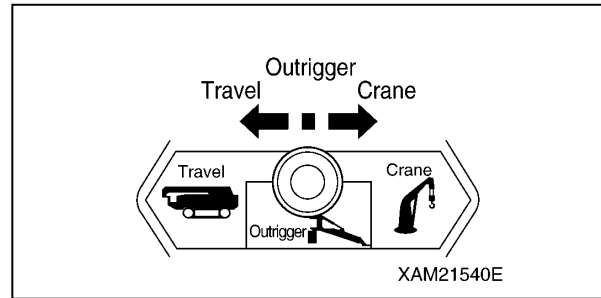


Fig. 5-62

3. Verify that only the boom stowing lamp (1) (green) remains ON on the outrigger display.

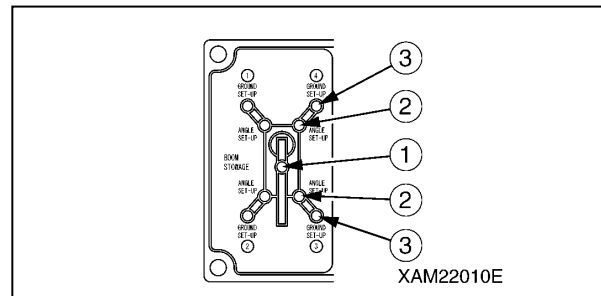


Fig. 5-63

- Rotate the rotary of all the four outriggers outward and properly insert the position pin (4).
Verify that all the extension lamps (2) light up on the outrigger display.

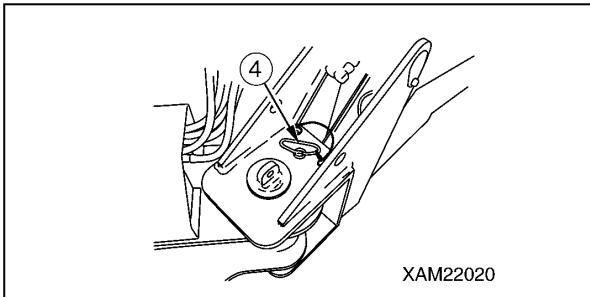


Fig. 5-64

NOTICE: Verify that the position pin (4) is properly inserted after outrigger rotary extension operation.

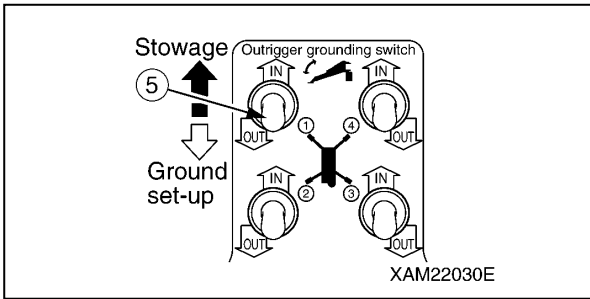


Fig. 5-65

- Operate the outrigger grounding switch (5) on the outrigger operation panel to "OUT" position and set all the four outriggers. Then set the tray securely.
Verify that all the setting lamps (3) on the outrigger display light up.

CAUTION: If any of the setting lamps (3) is flashing in red, remove the cover (7) of the outrigger tray (6) and check if there is any foreign object engaged in the bending section.

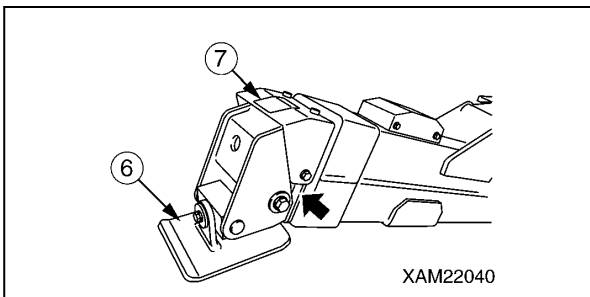


Fig. 5-66

- Operate one of the four outrigger grounding switches (5) to "ON" position and raise the outrigger tray above the ground.

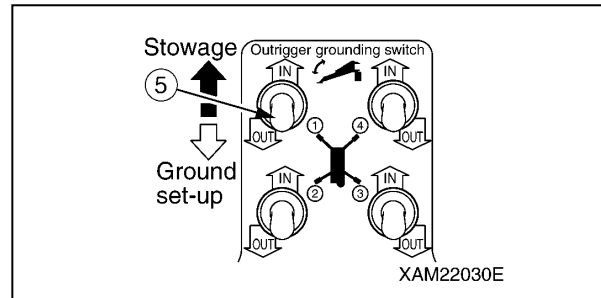


Fig. 5-67

- Operate the work selector switch on the outrigger operation panel to the "Crane" position.
- Operate the crane derricking lever to the "RAISE" side and verify that the crane does not operate.

NOTICE: Perform the tasks described in the step 6 to 8 to all the four outriggers.

Checking Operation of Outrigger Interlock Function

- Set all the four outriggers.

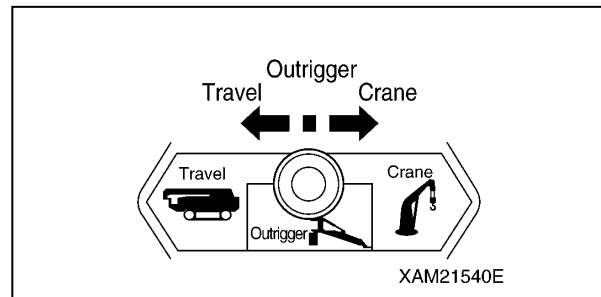


Fig. 5-68

- Operate the work selector switch on the outrigger operation panel to the "Crane" position.
- Operate the crane derricking lever to the "RAISE" side and raise the boom until the boom stowing lamp (1) on the outrigger display goes off.

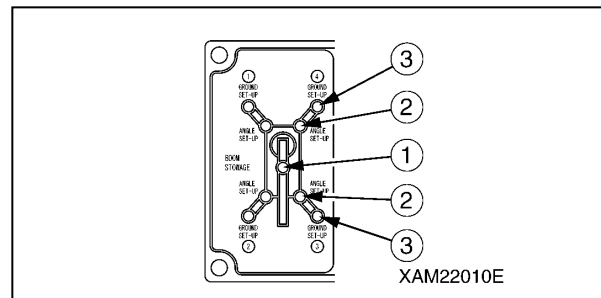


Fig. 5-69

4. Operate the work selector switch on the outrigger operation panel to the "Outrigger" position.
5. Operate the outrigger grounding switch (5) on the outrigger operation panel to the "ON" position and verify that the outriggers do not operate.

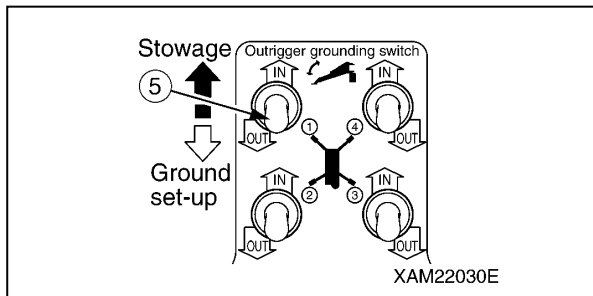


Fig. 5-70

Check Outrigger Operation

WARNING! Be sure to see "OUTRIGGER SETTING" on page 4-42 and "Crane Stowing Operation" on page 4-66, and strictly observe the methods described and cautions given when checking operations of the outriggers.

1. Verify that the outrigger inner box extends smoothly when the outrigger extension switch is pushed down to the "OUT" position. Also, verify that the inner box retracts smoothly when the outrigger extension switch is pushed down to the "IN" position.

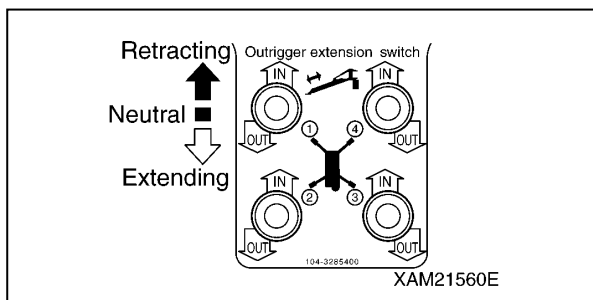


Fig. 5-71

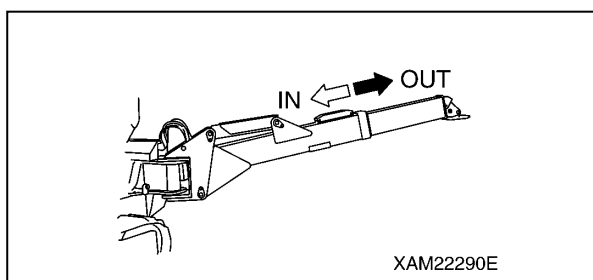


Fig. 5-72

When doing the above, check for any abnormal noise generated by part of the outrigger.

Operate the other switches likewise and check the operations.

If there is any abnormality, repair.

2. Verify that the outrigger lowers smoothly when the outrigger grounding switch is pushed down to the "OUT" position. Also, verify that the inner box rises smoothly when the outrigger grounding switch is pushed down to the "IN" position.

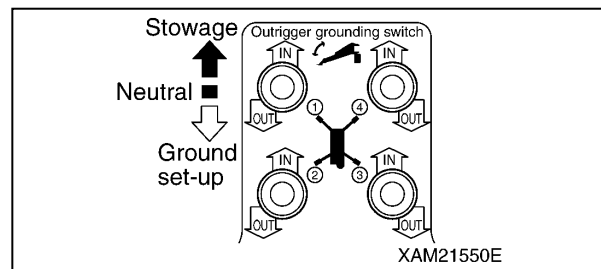


Fig. 5-73

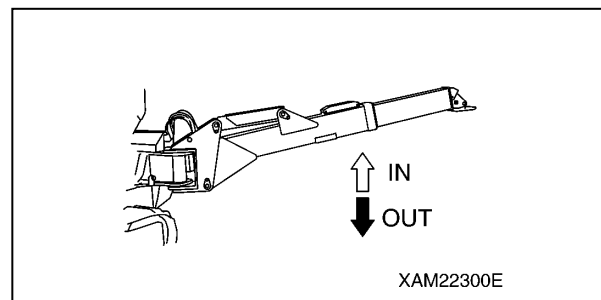


Fig. 5-74

When doing the above, check for any abnormal noise generated by part of the outrigger.

Operate the other switches likewise and check the operations.

If there is any abnormality, repair.

Check Crane Operation

WARNING! Be sure to set the outriggers by the maximum extension state by referring to "OUTRIGGER SETTING" on page 4-42 before checking the crane operations.

Be sure to refer to the sections between "Before Crane Operations" on page 4-62 and "Crane Stowing Operation" on page 4-66, and strictly observe the methods described and cautions given when checking crane operations.

1. Operate the winch lever (3) to "DOWN" side to leave the hook block from the stow position.

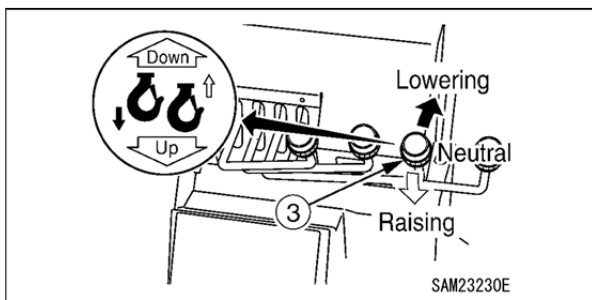


Fig. 5-75

2. Verify that the boom rises smoothly when the boom derricking lever (4) is operated to "RAISE" side (pull toward you). Also, verify that the boom lowers smoothly when the boom derricking lever (4) is operated to "LOWER" side (push forward). When doing the above, check for any abnormal sound emitted by part of the boom or from the boom derrick cylinder. If there is any abnormality, repair.

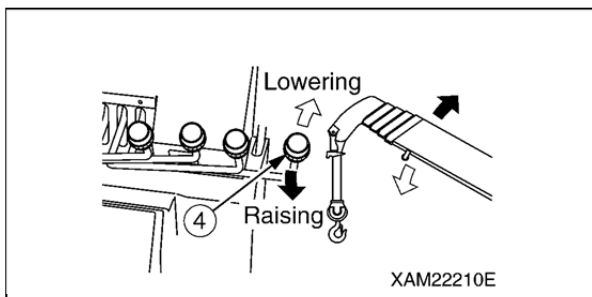


Fig. 5-76

3. Verify that the boom extends smoothly when the boom telescoping lever (2) is operated to "EXTEND" (push forward). Also, verify that the boom retracts smoothly when the boom telescoping lever (2) is operated to "RETRACT" (pull toward you). When doing the above, check for any abnormal sound emitted by part of the boom or from the boom telescoping cylinder. If there is any abnormality, repair.

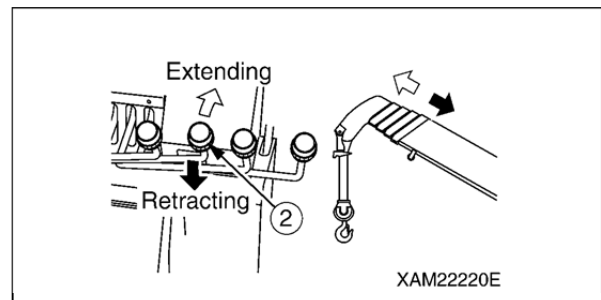


Fig. 5-77

4. Verify that the hook is wound down smoothly when the winch lever (3) is operated to "DOWN" (push forward). Also, verify that the hook is wound up smoothly when the winch lever (3) is operated to "UP" side (pull toward you). When doing the above, check for any abnormal sound emitted by part of the boom or from the winch motor. If there is any abnormality, repair.

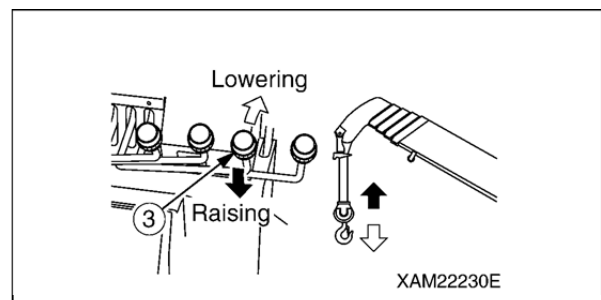


Fig. 5-78

- Verify that the crane smoothly slews counterclockwise (left) when the slewing lever (1) is operated to "LEFT" side (push forward).
Also, verify that the crane smoothly slews clockwise (right) when the slewing lever (1) is operated to "RIGHT" side (pull toward you).
When doing the above, check for any abnormal sound emitted nearby the post. If there is any abnormality, repair.

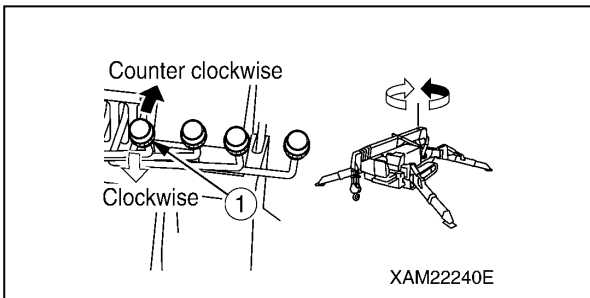


Fig. 5-79

Check Over Winding Detector Operation

Over wind the hook block (1), and raise the hook with winch and extend the boom, and verify that the buzzer sounds and an audible message saying "Over hoisted" is spoken, the hook raising operation and boom extending operation stop. If these events do not happen, the over winding detector may be faulty. If the alarm does not stop, the over winding detector may be faulty or the circuit may be open.

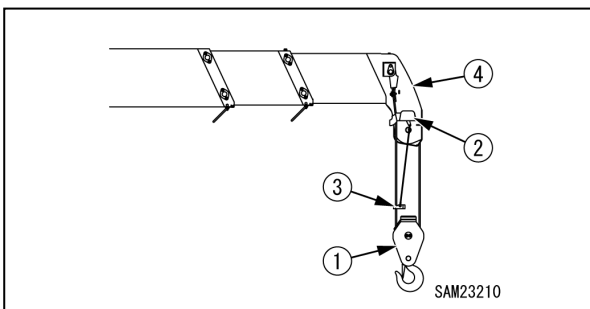


Fig. 5-80

NOTICE: If you do not hear the message from the speaker, check the volume of the remote control system.

Check Moment Limiter Operation

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

- Turn the starter switch to the "ON" position.
- Check with the working status lamp. The red of the lamp lights up for 2 seconds and then the green lights up.
- Check the moment limiter display unit. Verify that no error code is displayed at the "RATED TOTAL LOAD" display on the display panel.
- Start the engine and operate the crane as follows to verify if the moment limiter properly displays the value.

Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed "boom length" with the boom length at minimum	4.7 m
Displayed "boom length" with the boom length at maximum	16.5 m
Displayed "working radius" with the boom length of "7.7 m" (2-row booms) and boom angle of "60.5 °"	3.5 ± 0.1 m
Displayed "ACTUAL LOAD" when the weight of the known weight was hoisted <ul style="list-style-type: none"> • Must be equal to the total weight of weight + rigging • Note that it may show some errors depending on the boom conditions. 	Actual load

- Operate the crane until the moment limiter display values indicate the boom length is "7.7 m" (booms (1) + (2)) and boom angle is "60.5 degrees", then measure the "boom angle" and "working radius". If the measured value(s) differ from the moment limiter display value, contact us or our sales agency.

Check Outrigger Extension Positions

Start the engine, execute each of the "MID" and "MAX" outrigger extension operations, and verify that the outrigger display on the moment limiter display section is proper in both case.

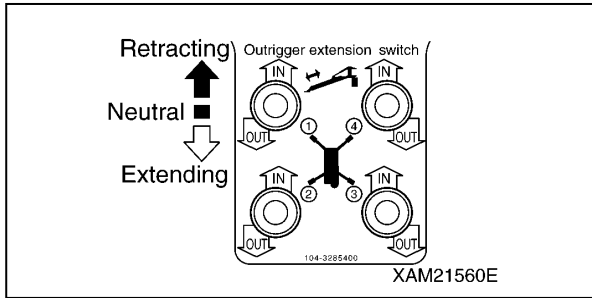


Fig. 5-81

NOTICE: Look to the sticker (MID, MAX) affixed to the top of the inner box when adjusting the outrigger extension.

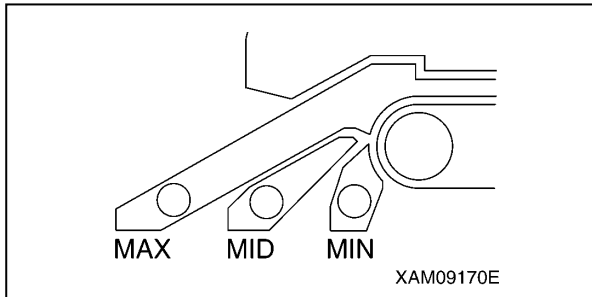


Fig. 5-82

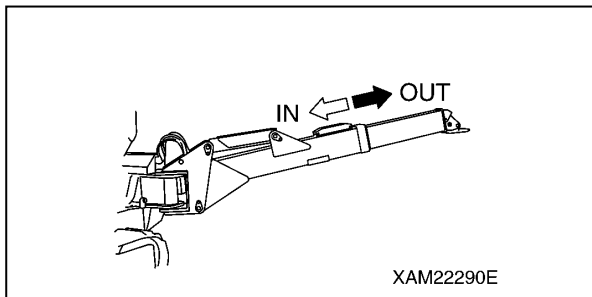


Fig. 5-83

Check Engine Exhaust Gas Colour, Noise and Vibration

1. Leave your foot away from the acceleration pedal (6). Keep the engine idling and continue the operation with no load for about 5 minutes.

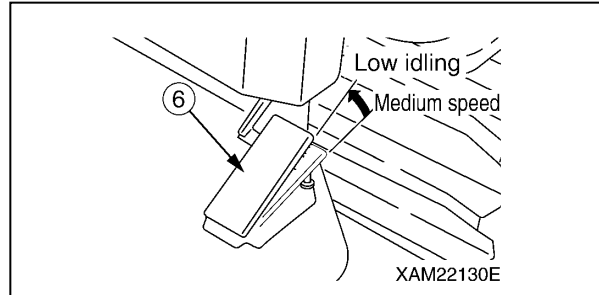


Fig. 5-84

2. Verify that the engine exhaust gas colour is either transparent or slightly blue. Also, check for abnormal noises and vibrations. If there is any abnormality, repair.

PERIODIC MAINTENANCE

Periodic Maintenance Schedule

System	Operation	Initial			Periodic								
		10	50	250	50	100	250	500	1000	1500	2000	3000	
Machine	Grease machine units	X			X								
Engine Oil	Replace engine oil		X					X					
Alternator Belt	Check/Adjust Alternator Belt tension		X				X						
Filter	Replace engine oil filter cartridge		X					X					
Hydraulic	Replace hydraulic oil return filter		X					X					
	Replace hydraulic oil suction filter		X					X					
	Replace oil in hydraulic oil tank		X						X				
Slewing Gearcase	Replace oil in slewing reduction gearcase			X					X				
Winch Gearcase	Replace oil in winch reduction gearcase			X					X				
	Check oil level and refill oil in winch reduction gearcase					X							
Travel Gearcase	Replace oil in travelling motor reduction gearcase			X					X				
	Check/Refill oil in travelling motor reduction gearcase						X						
Fuel	Replace fuel filter							X					
	Check/Clean/Test fuel injector									X			
Engine Air Cleaner	Replace air cleaner element							X					
Inlet Valve and Exhaust Valve	Inspect/Adjust inlet valve and exhaust valve clearance								X				
Engine Coolant	Check/Replace engine coolant										X		
Radiator and Oil Cooler Fin	Check/Clean radiator and oil cooler fin						X						
Slew Ring Mounting Bolt	Check slew ring mounting bolt							X					
Crankcase Breather	Check crankcase breather									X			
EVR Valve	Check/Clean EGR valve												X

Refer to the engine operation manual for details on engine.

Periodic Maintenance Procedure

Initial 10 Hour Maintenance

The following maintenance should be performed after 10-hour operation, limited to the first maintenance of a new machine.

- **Greasing Machine Units**

See "Grease Machine Units" on page 5-41.

Initial 50 Hour Maintenance

The following maintenance should be performed after 50-hour operation, limited to the first maintenance of a new machine.

- **Replacement Engine Oil and Oil Filter**

See "Replace Engine Oil and Oil Filter" on page 5-46.

- **Oil Replacement in Hydraulic Oil Tank**

See "Replace Oil in Hydraulic Oil Tank" on page 5-51.

- **Replacement Hydraulic Oil Return Filter**

See "Replace Hydraulic Oil Return Filter" on page 5-48.

- **Replacement Hydraulic Oil Suction Filter**

See "Replace Hydraulic Oil Suction Filter" on page 5-49.

- **Checking / Adjustment Alternator Belt Tension**

See "Check / Adjust Belt Tension" on page 5-44.

Initial 250 Hour Maintenance

The following maintenance should be performed after 250-hour operation, limited to the first maintenance of a new machine.

- **Oil Replacement Slewing Reduction Gear Case**

See "Replace Oil in Slewing Reduction Gear Case" on page 5-52.

- **Oil Replacement Winch Motor Reduction Gear Case**

See "Replace Oil in Winch Reduction Gear Case" on page 5-53.

- **Oil Replacement Travelling Motor Reduction Gear Case**

See "Replace Oil in Travelling Motor Reduction Gearcase" on page 5-54.

Maintenance Every 50 Hours

Grease Machine Units

CAUTION:

- **Grease type varies with greasing points. Failure to grease properly may cause the machine to shorten its useful life. See the following table for grease types.**
- **Greasing a new machine is required once every 10 hours until the machine attains the first 100 hours of operation that initial fit emerges.**
- Use proper grease specified below according to the greasing points.

№	Greasing point	Grease type
1	Greasing of the boom mounting pin	1 place
2	Greasing of the derricking cylinder bottom mounting pin	1 place
3	Greasing of the derricking cylinder rod mounting pin	1 place
4	Greasing of the outrigger rotary shaft	4 places
5	Greasing of the mounting pin of the outrigger grounding cylinder bottom	4 places
6	Greasing of the mounting pin of the outrigger grounding cylinder rod	4 places
7	Greasing of the slewing gear	2 places
8	Greasing of the hook block	1 place
9	Greasing of the boom slide plate	8 places
10	Greasing of both sides and bottom of a boom	Each boom
11	Greasing of the boom telescoping wire rope	2 pieces
12	Greasing of the winch wire rope	1 piece

1. With the use of the grease gun, grease the greasing points (No.1 to 9) specified in the above table through corresponding grease plugs. (See the following page)
2. Wipe off old grease squeezed out after greasing.
3. Place the outriggers when greasing the outrigger cylinders.
4. Place the boom derricking lever in the "Raise" position (pull it toward you) to raise the boom slightly for greasing the derricking cylinder mounting pin and slide plate that is located on top of the boom.
5. Place the boom telescoping lever in the "Extend" position (push it toward the front) to extend the boom for greasing both sides and bottom of the boom and wire rope.
6. Apply red rope grease to prevent wire rope abrasion and rust formation. With the rope surface cleaned, grease the rope with a brush.

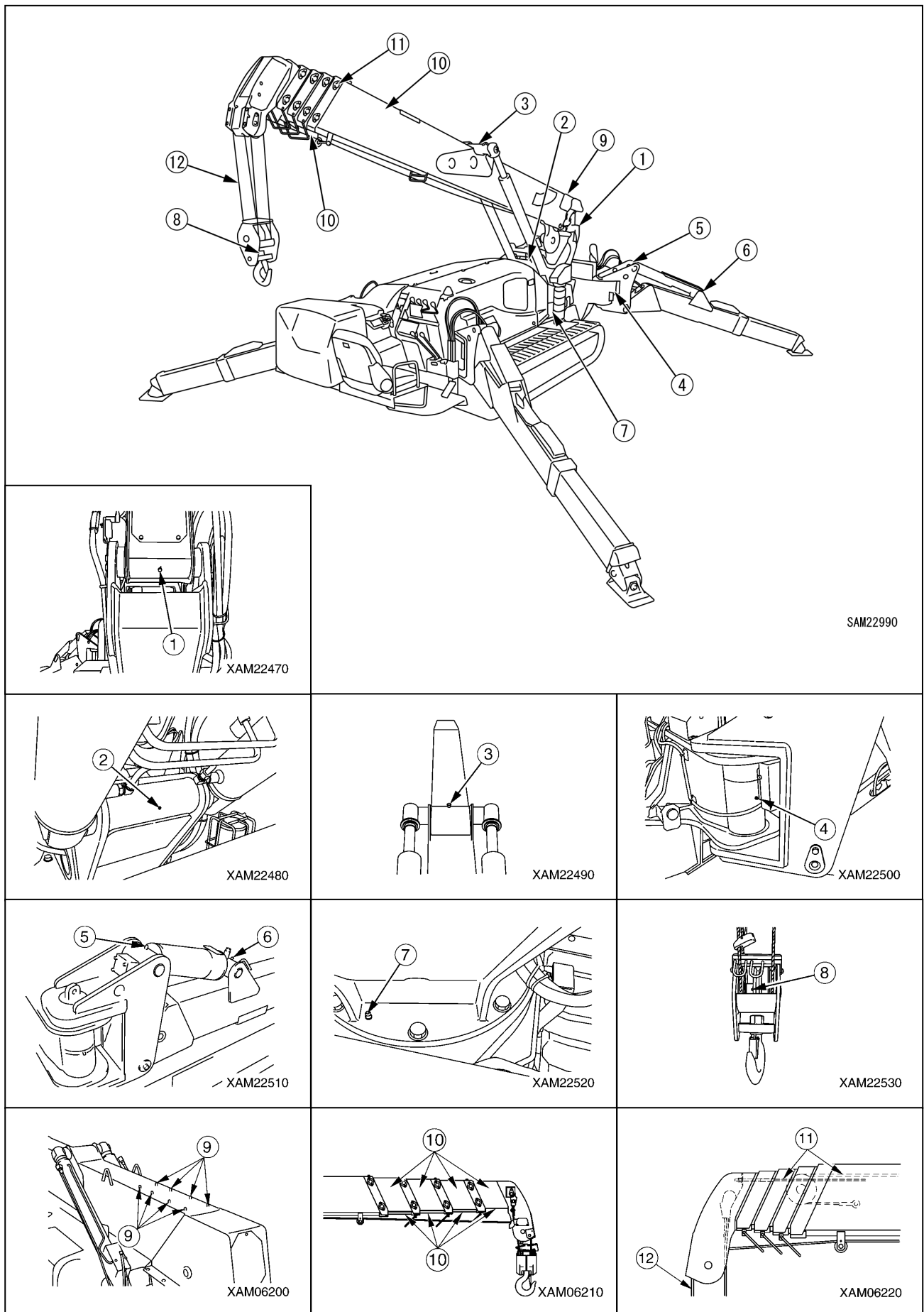


Fig. 5-85

Maintenance Every 100 Hours

Perform this maintenance in tandem with maintenance every 50 hours.

Check Oil Level and Refill Oil in Winch Reduction Gear Case**WARNING!**

- Oil will be at elevated temperatures immediately after engine operation, which urges you not to unplug the inspection port. Unplug the port with the oil cold.
- Always perform inspection and replenishment of oil with the engine stopped.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

- Hexagonal wrench for plug removal: 8mm
1. Place the machine on a level surface.
 2. See "OUTRIGGER SETTING" on page 4-42 to rotate the rotary of the "outrigger [4]" outward.
 3. Rotate the winch slowly until the oil inspection plug (G) reaches a point where it can be seen through the post side inspection hole (A).

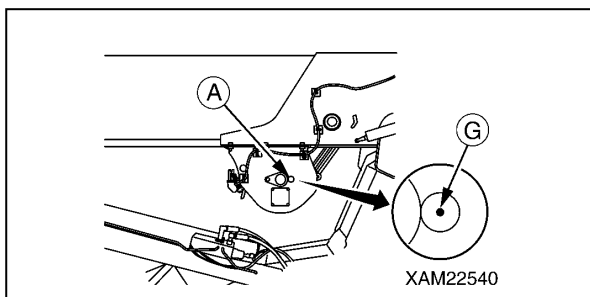


Fig. 5-86

4. Use the hexagonal wrench (C) to loosen the oil inspection plug (G). Check if the gear oil exudes from the oil inspection plug (G).

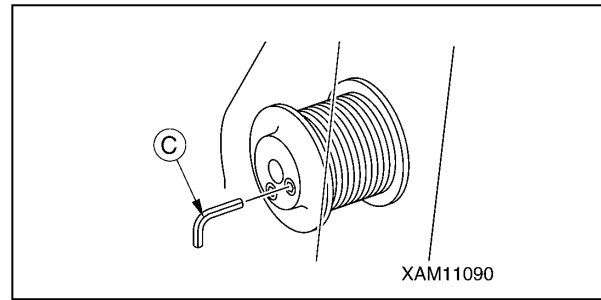


Fig. 5-87

5. If check finds no exudation of the gear oil, rotate the oil inspection plug (G) slowly to remove it. Replenish gear oil with the use of an oil pump (D).

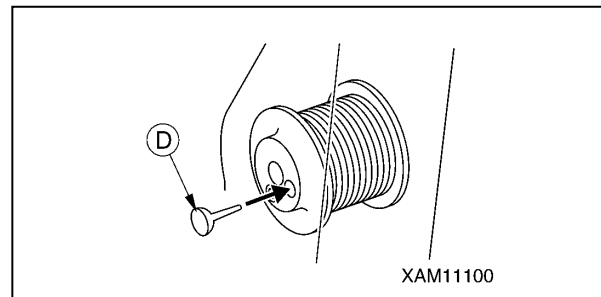


Fig. 5-88

NOTICE: Wipe off the oil completely if spilled.

6. Put in the oil inspection plug (G) and secure it upon completion of oil replenishment.
7. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers.

Maintenance Every 250 Hours

Perform this maintenance in tandem with maintenance every 50/100 hours.

Radiator and Oil Cooler Fin Inspection/Cleaning

WARNING! Note dust and debris hazards when using compressed air. Always wear protective goggles and a mask.

CAUTION:

- To avoid damaging the fins when cleaning with compressed air, use compressed air at a pressure of approximately 0.20 to 0.29 MPa (2 to 3 kg/cm²) and blow from a safe distance from the fins. Damage to the fins may result in water leaks and overheating.
- In dusty locations, inspect the fins daily and clean when necessary.

1. Position the machine on a level surface.
2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
3. Apply compressed air (0.20 to 0.29 MPa (2 to 3 kg/cm²)) to the oil cooler (3) and radiator (4) to dislodge any dirt or debris clogging the fins.

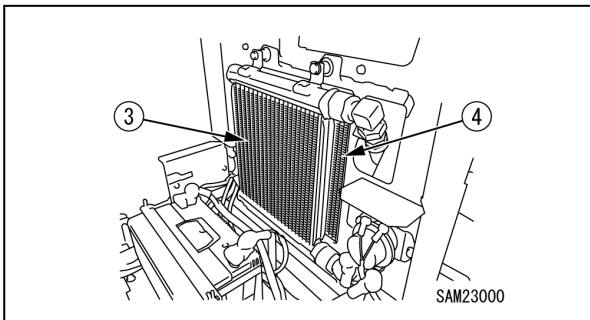


Fig. 5-89

4. After cleaning, reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Check / Adjust Belt Tension

Tension Check

1. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
2. With the fingers, push (by approximately 98 N {10kgf}) the midpoint between the fan pulley (2) and alternator pulley (1) of the belt (3), and if the strain is between 10 and 12 mm it is within standard.

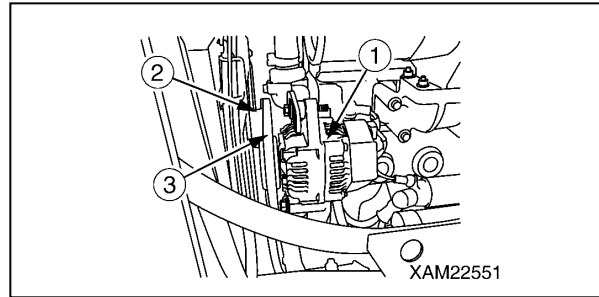


Fig. 5-90

3. If the inspection result indicated that the strain of the belt (3) is out of the standard value range, see the Tension check section and adjust the tension of the belt (3).

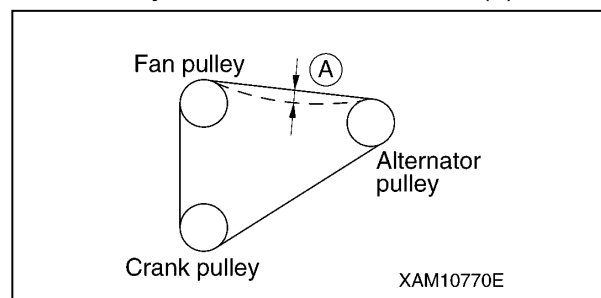


Fig. 5-91

NOTICE: Inspect the followings as well when you inspect the tension of the fan belt.

- Check the pulleys for breakage, the V groove and belt for wear. Ensure that the belt is not in contact with the bottom of the V groove.
- Prompt belt replacement is required if belt adjustment is no longer enabled due to a stretched belt or if the belt is scratched or cracked.
- At least 5 minute long test run is required after belt replacement. Re-adjust the belt tension upon completion of test run.

Tension Adjustment

- Have a wooden bar available.
1. Insert the bar between the alternator (1) and cylinder block.

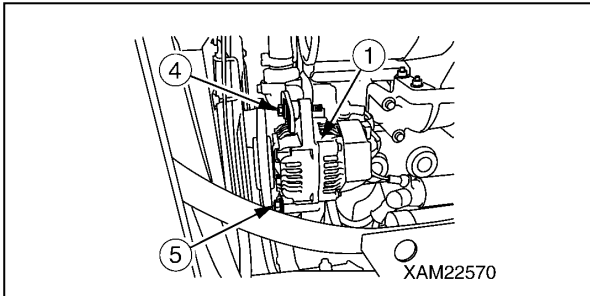


Fig. 5-92

2. Loosen the lower bolt (5) and adjusting bolt (4).
3. Move the alternator (1) until strain of the belt (3) falls within the standard value range, pulling the bar toward you.
4. Tighten the alternator lower bolt (5) and then the adjusting bolt (4) to secure the alternator (1).
5. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Check / Refill Oil in Travelling Motor Reduction Gear Case**CAUTION:**

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

1. Move the machine forward and backward to position it immediately above the drain plug (P) of the travelling motor reduction gear case.

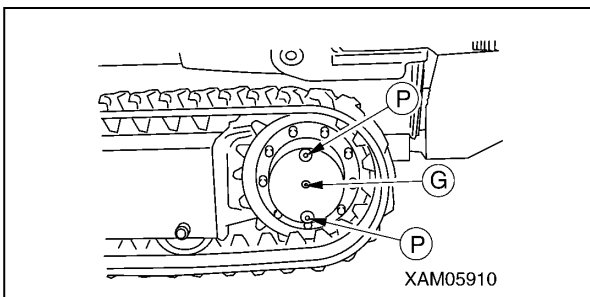


Fig. 5-93

NOTICE: This machine is equipped with two drain plugs (P). Either drain plug must be positioned directly underneath the machine.

2. Remove the oil inspection plug (G) of the travelling motor reduction gear case, and make sure oil is drained from the plug hole.
3. In the case of insufficient oil in the casing, remove the top drain plug (P) and replenish gear oil through the plug hole.

NOTICE:

- Replenish the gear oil until it exudes from the oil inspection plug.
 - Wipe off the oil completely if spilled.
4. Put in the top drain plug (P) and oil inspection plug (G), and secure the plugs upon completion of oil inspection and replenishment.

Maintenance Every 500 Hours

Perform this maintenance in tandem with maintenance every 50/100/250 hours.

Replace Engine Oil and Oil Filter

WARNING!

- The drain plug of the engine oil pan is located directly underneath the machine. Place the outriggers and raise the machine 50mm from the ground for draining engine oil. Insert square timbers between both rubber track and the ground to gain stability for safety assurance.
- Make sure the oil level gauge is secured properly after inspection and replenishment of the oil. Potential fall of the oil level gauge during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.
- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace oil and the filter cartridge. Always perform replacement with the engine cold to touch.

CAUTION:

- Ensure that no old gasket adheres to the filter stand. Potential oil leak may occur if old gasket remains on the stand.
- Be sure to use oil specified in "LUBRICATING OIL" on page 5-14. Failure to use proper oil may cause the engine to shorten its useful life. Always use the specified oil for replenishment.
- The engine oil must be maintained at a proper amount.
- The complete draining of oil is disabled if the engine becomes cold completely. Oil draining is allowed when the engine is cold to touch.
- Keep impurities out of the filler cap when replenishing oil.
- Oil drain pan: An 8-litre container
- Quantity of oil for replacement: 6.7L

1. Place the machine on a level surface.

2. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the rubber track for about 50mm from the ground.

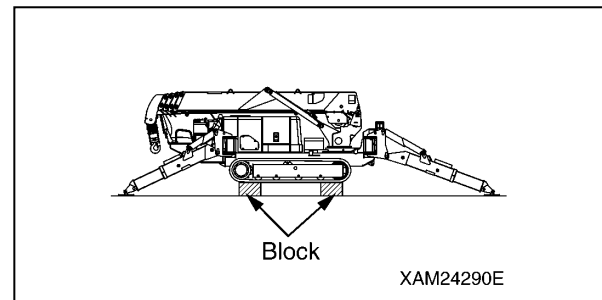


Fig. 5-94

WARNING! Check the following before crawling under the machine:

- Ensure that the outriggers are extended at the maximum.
- Visually check the level to make sure the machine is in a horizontal position.
- Insert solid blocks between the crawler and the ground to keep the machine raised.

3. Crawl under the machine and place a drain pan directly underneath the drain plug (P) at the bottom of the engine oil pan to receive drained oil.

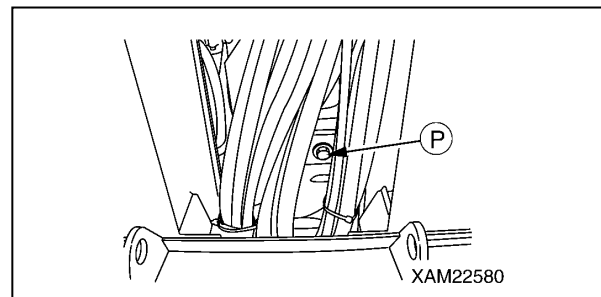


Fig. 5-95

4. Remove the drain plug (P) slowly to drain the oil, keeping from contact with draining oil.
5. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency.
6. Put in the drain plug (P) and secure it.
7. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers and lower the machine on the ground.
8. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.

9. Turn the filter cartridge (3) counterclockwise (left) with the use of the filter wrench to remove it.

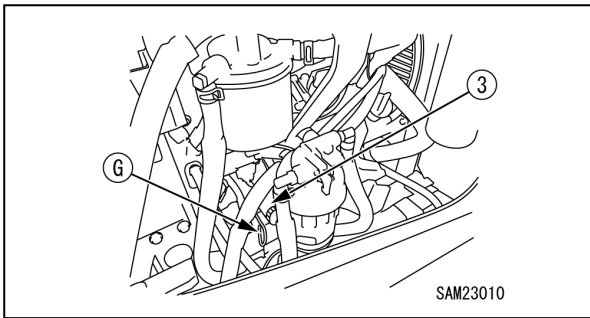


Fig. 5-96

NOTICE: The oil is to be drained in large quantity immediately after the engine is stopped. Wait for 10 minutes before removing the filter cartridge (3).

10. Clean the filter stand. Apply clean engine oil (or a light coating of grease) to a new filter cartridge gasket and thread part, and install the filter cartridge.

NOTICE: With the gasket surface maintained contact with the sealing surface of the filter stand, rotate the filter cartridge one-half to three-quarters of a turn to secure it.

Always give manual tightening to the filter cartridge.

11. Check around the filter cartridge (3) for oil leaks. Be sure to wipe off oil completely if spilled.
12. After replacing the filter cartridge (3), supply the engine oil at a specified amount from the filler cap (F).
13. With the oil level gauge (G) pulled out, wipe off the oil with a waste cloth.
14. With the oil level gauge (G) inserted in the gauge guide, pull the oil level gauge out.
15. Make sure the oil level is in the range "H" to "L" marked on the oil level gauge (G).

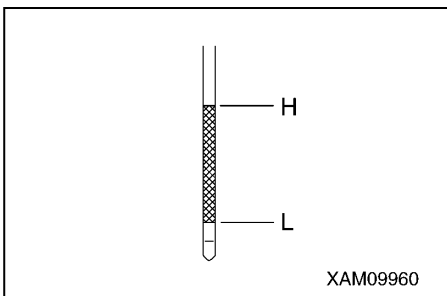


Fig. 5-97

16. Attach the oil level gauge (G) and filler cap (F) properly upon completion of oil replacement.
17. Start the engine, and idle it for 5 minutes. Stop the engine.
18. Make sure again the oil level is in the range "H" to "L" marked on the oil level gauge (G).
19. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Replace Fuel Filter Cartridge

WARNING!

- Keep from heat and flame, including cigarettes, when replacing the fuel filter element.
- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace the fuel filter element. Always perform replacement with the engine cold to touch.

1. Place the machine on a level surface.
2. Open the access hatch in the right-hand machinery cover.
3. Turn the filter cartridge (1) counterclockwise (left) with the use of the filter wrench to remove it.

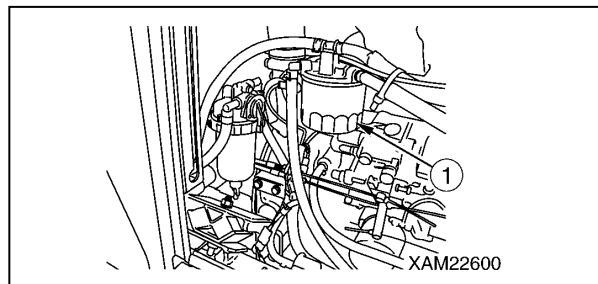


Fig. 5-98

4. Clean the filter stand. Apply clean engine oil (or a light coating of grease) to a new filter cartridge gasket and thread part, and attach the filter cartridge.

NOTICE: With the gasket surface maintained contact with the sealing surface of the filter stand, rotate the filter cartridge one-half to three-quarters of a turn to secure it.

Always give manual tightening to the filter cartridge.

5. Check around the filter cartridge (1) for fuel leaks. Be sure to wipe off fuel completely if spilled.
6. Close the access hatch.

Replace Hydraulic Oil Return Filter

WARNING!

- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace the filter. Always perform replacement with the engine cold.
- Potential gush of oil may occur upon removing the filler cap of the hydraulic oil tank.
Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.
- Make sure the filler cap is closed properly after replenishment of the oil. Potential fall of the filler cap during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Place the machine in travel position for oil quantity inspection.
Oil quantity inspection with the machine in working position may deceive your eyes to deem the quantity of oil low. Owing to improper judgment, the oil may be supplied at an excessive amount.
- The engine must be at halt until piping and hydraulic equipment is filled with oil after replacement of the hydraulic oil filter.
- Oil replenished should remain below "H" (upper limit) on the level gauge. Excessive oil replenishment may cause the oil to gush from the air breather during machine travelling and crane operation, which could result in burns.
- Keep impurities out of the filler cap when replenishing oil.

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
3. Turn the filter cartridge (3) counterclockwise (left) with the use of the filter wrench to remove it.

4. Clean the filter stand. Apply clean engine oil (or a light coating of grease) to the gasket and thread part of a new filter cartridge (3), and attach the filter cartridge.

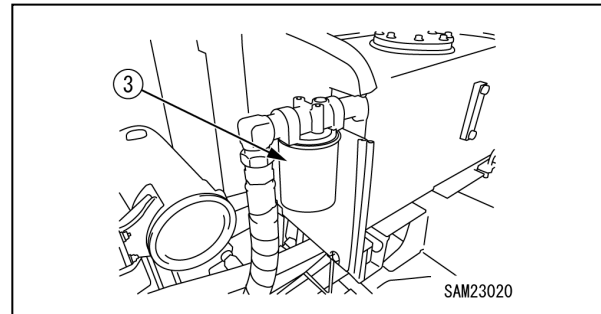


Fig. 5-99

NOTICE: With the gasket surface maintained contact with the sealing surface of the filter stand, rotate the filter cartridge one-half to three-quarters of a turn to secure it.

Always give manual tightening to the filter cartridge.

5. Check around the filter cartridge (3) for oil leaks. Be sure to wipe off oil completely if spilled.
6. See "Pre-Start Inspection - Before Starting Engine" on page 5-24 to check the oil level in the hydraulic oil tank.
Prompt oil refilling is required if check finds insufficient oil.
7. Install the inspection cover (2), and secure it with the four mounting bolts (1).
8. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Replace Hydraulic Oil Suction Filter

WARNING!

- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace the filter. Always perform replacement with the engine cold.
- Potential gush of oil may occur upon removing the filler cap of the hydraulic oil tank.
Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.
- Make sure the filler cap is closed properly after replenishment of the oil.
Potential fall of the filler cap during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Place the machine in travel position for oil quantity inspection. Oil quantity inspection with the machine in working position may deceive your eyes to deem the quantity of oil low. Owing to improper judgment, the oil may be supplied at an excessive amount.
- The engine must be at halt until piping and hydraulic equipment is filled with oil after replacement of the hydraulic oil filter.
- Oil replenished should remain below "H" (upper limit) on the level gauge. Excessive oil replenishment may cause the oil to gush from the air breather during machine travelling and crane operation, which could result in burns.
- Keep impurities out of the filler cap when replenishing oil.

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.

3. Remove the eight mounting bolts (4) and remove the flange (3) on top of the hydraulic oil tank.

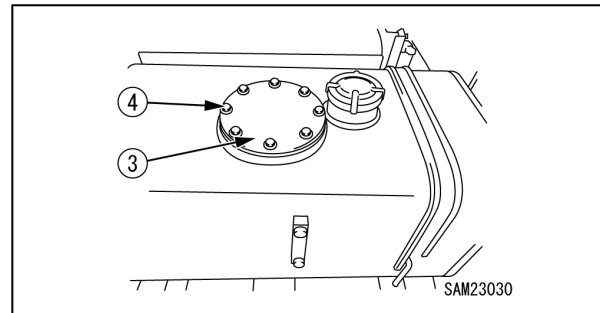


Fig. 5-100

4. Remove the flange (3) and pull out the suction filter (5) from inside the hydraulic oil tank.
5. Insert the new suction filter (5) to the inside of the hydraulic oil tank.
6. Put the flange (3) in place with liquid packing applied to the rubber plate (6). Secure the flange (3) with the eight mounting bolts (4).

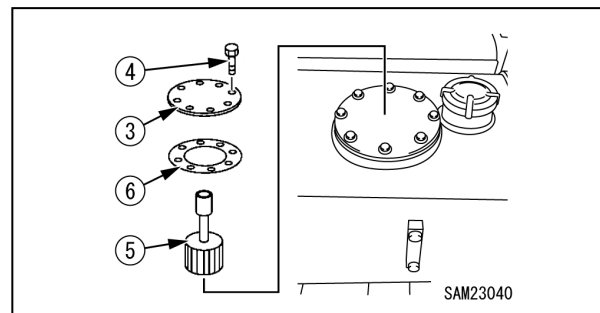


Fig. 5-101

NOTICE: Wipe off the oil completely if spilled.

7. See "Pre-Start Inspection - Before Starting Engine" on page 5-24 to check the oil level in the hydraulic oil tank.
Prompt oil refilling is required if check finds insufficient oil.
8. Use the following procedure for air bleed.
 - (1) Start the engine with piping and hydraulic equipment filled with oil. Make sure the engine runs at low idle for 10 minutes.
 - (2) Move the cylinders and winch motor slowly with a crane control lever at low idle speed.
Always stop the boom derricking cylinder and telescoping cylinder approx. 100mm back from the stroke end when operating the cylinders.
Repeat this task 4 to 5 times.

- (3) Allow all the outriggers to be extended, referring to "OUTRIGGER SETTING" on page 4-42. Extend and retract the outrigger cylinder, keeping the machine down on the ground.
Always stop the outrigger cylinder approx. 100mm back from the stroke end when operating the cylinder.
Repeat this task 4 to 5 times.

- 9. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Slew Ring Mounting Bolt Inspection

WARNING!

- If the slew ring mounting bolts become loose and break, there is a risk of serious injuries due to the upper part of the crane becoming detached and toppling. Be sure to inspect the slew ring mounting bolts, and retighten them to the specified torque if they are loose.
- Be sure to replace the slew ring mounting bolts periodically. The bolts should be replaced every 7 years or after 7,000 hours, whichever comes sooner.

Slew ring mounting bolt tightening torque

No.	Mounting position	Dimensions	Number used	Tightening torque
(1)	Bearing inner ring side	M20	25	363 to 392 Nm
(2)	Bearing outer ring side	M18	10	235 to 265 Nm

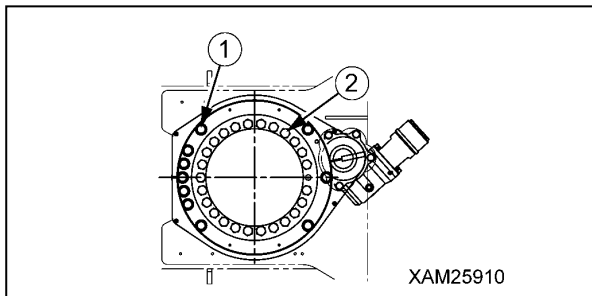


Fig. 5-102

Inspect the inner ring mounting bolts (2) as follows.

- 1. Remove the two mounting bolts (4) and remove the inspection cover (3) to the right of the slew post.

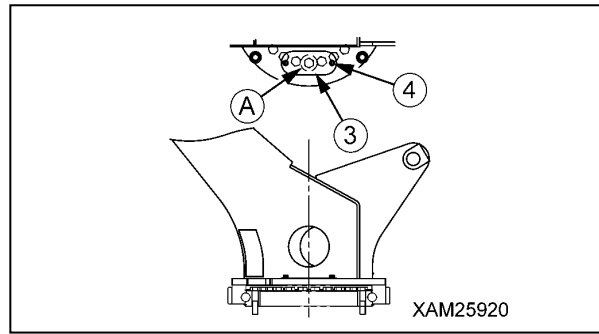


Fig. 5-103

- 2. Rotate the post to position each bearing inner ring side mounting bolt (2) in the middle of the inspection opening (A), and inspect all of the mounting bolts (2) to confirm that none are loose, missing, or damaged.
- 3. If any of the bolts are loose, retighten using the tightening torques given in the table above. If bolts are damaged or missing, they should be replaced with new ones.
- 4. Once inspection is complete, reattach the inspection cover (3).

Inspect the outer ring mounting bolts (1) as follows.

- 1. Rotate the post to position each bearing outer ring side mounting bolt (1) at the side of the machine, and inspect all of the mounting bolts (1) to confirm that none are loose, missing, or damaged.
- 2. If any of the bolts are loose, retighten using the tightening torques given in the table above. If bolts are damaged or missing, they should be replaced with new ones.

Replace Air Cleaner Element

CAUTION: For more information on replacement procedure, see "Inspection, Cleaning and Replacement of Air Cleaner" on page 5-72.

Maintenance Every 1000 Hours

Perform this maintenance in tandem with maintenance every 50/100/250/500 hours.

Replace Oil in Hydraulic Oil Tank**WARNING!**

- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace oil. Always perform replacement with the oil cold.
- Potential gush of oil may occur upon removing the filler cap of the hydraulic oil tank.
Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.
- Make sure the filler cap is closed properly after replenishment of the oil. Potential fall of the filler cap during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Place the machine in travel position for oil quantity inspection. Oil quantity inspection with the machine in working position may deceive your eyes to deem the quantity of oil low. Owing to improper judgment, the oil may be supplied at excessive amount.
- The engine must be at halt until piping and hydraulic equipment is filled with oil after replacement of the hydraulic oil filter.
- Oil replenished should remain below "H" (upper limit) on the level gauge. Excessive oil replenishment may cause the oil to gush from the air breather during machine travelling and crane operation, which could result in burns.
- Keep impurities out of the filler cap when replenishing oil.

- Oil drain pan: An 70-litre container
- Quantity of oil for replacement: 55L

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.

3. Remove the filler cap (F) located on top of the hydraulic oil tank.

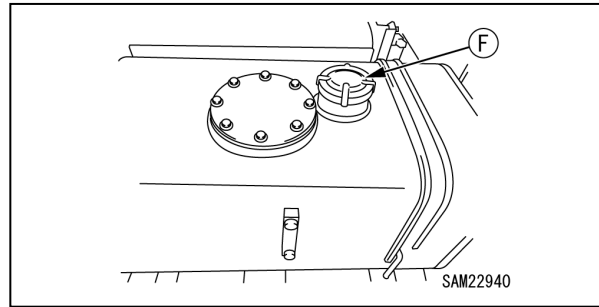


Fig. 5-104

4. Place a drain pan directly underneath the drain plug (P) to receive drained oil.

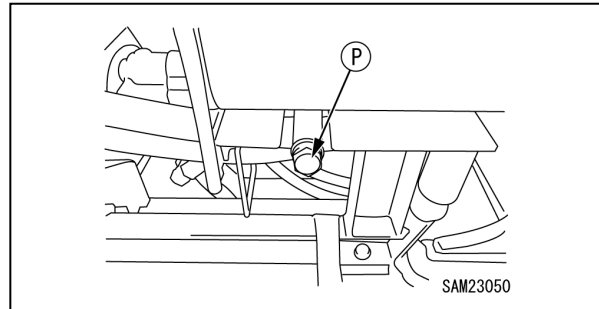


Fig. 5-105

5. Remove the drain plug (P) slowly to drain the oil, keeping from contact with draining oil.
6. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency
7. Put in the drain plug (P) and secure it.
8. Supply the hydraulic oil to a specified level point from the filler cap (F), visually checking the oil level gauge (G).

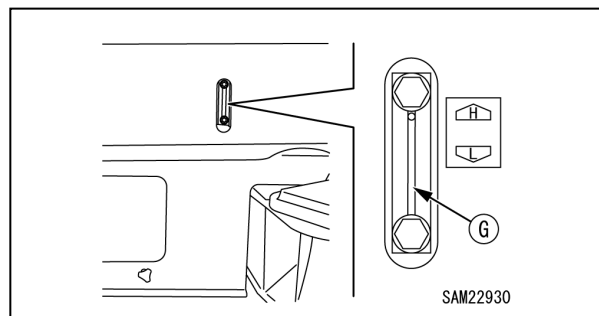


Fig. 5-106

9. Close the filler cap (F) after replenishment of the oil.

NOTICE: Wipe off the oil completely if spilled.

10. Use the following procedure for air bleed.
 - (1) Start the engine with piping and hydraulic equipment filled with oil. Make sure the engine runs at low idle for 10 minutes.
 - (2) Move the cylinders and winch motor slowly with a crane control lever at low idle speed.
Always stop the boom derricking cylinder and telescoping cylinder approx. 100mm back from the stroke end when operating the cylinders. Repeat this task 4 to 5 times.
 - (3) Allow all the outriggers to be extended, referring to "OUTRIGGER SETTING" on page 4-42. Extend and retract the outrigger cylinder, keeping the machine down on the ground.
Always stop the outrigger cylinder approx. 100mm back from the stroke end when operating the cylinder. Repeat this task 4 to 5 times.
11. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Replace Oil in Slewing Reduction Gear Case

WARNING! The drain plug of the slewing reduction gear case is located directly underneath the machine.

Place the outriggers and raise the machine 50mm from the ground to allow a drain pan to be placed under the machine for draining oil. If the machine becomes unstable and wobbles, insert supports under the front and back of the machine to gain stability.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.
- Oil drain pan: A 1-litre container
- Quantity of oil for replacement: 0.6L

1. Place the machine on a level surface.

2. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the machine from the ground.

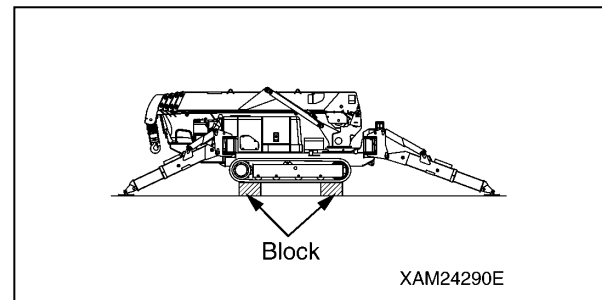


Fig. 5-107

WARNING! Check the following before crawling under the machine:

- Ensure that the outriggers are extended at the maximum.
- Visually check the level to make sure the machine is in a horizontal position.
- Insert solid blocks between the crawler and the ground to keep the machine raised.

3. Remove the filler plug (F) from the slewing reduction gear case.

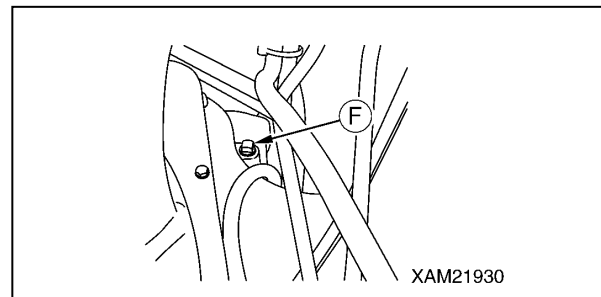


Fig. 5-108

4. Crawl under the machine and place a drain pan directly underneath the drain plug (P) of the slewing reduction gear case to receive drained oil.
5. Remove the drain plug (P) slowly to drain the oil, keeping from contact with draining oil.
6. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency.

7. Put in the drain plug (P) and secure it.

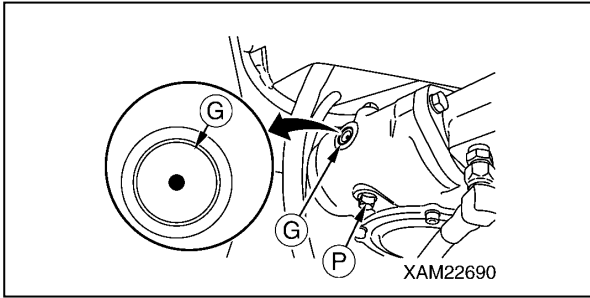


Fig. 5-109

8. Supply the gear oil to the slewing reduction gear case through the filler plug (F).

NOTICE:

- The gear oil must be filled from the filler cap, up to the midpoint of the site gauge (G).
- Wipe off the oil completely if spilled.

9. Put in the filler plug (F) and secure it after oil replacement.
10. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers.

Replace Oil in Winch Reduction Gear Case

WARNING! Oil will be at elevated temperatures immediately after engine operation, which urges you not to unplug the inspection port and drain port. Unplug the port with the oil cold.

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.
- Oil drain pan: A 1-litre container
- Hexagonal wrench for plug removal: 8mm
- Quantity of oil for replacement: 0.5L

1. Place the machine on a level surface.
2. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers.

3. Remove the four mounting bolts (2) and remove the cover (1).

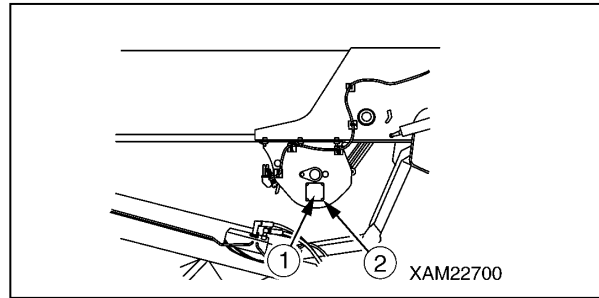


Fig. 5-110

4. Rotate the winch slowly to a point where the oil inspection plug (G) and drain plug (P) come in sight.
- (1) Stop the winch at a point where the oil inspection plug (G) can be seen through the post side inspection hole (A).
 - (2) Stop the winch at a point where the drain plug (P) of the winch reduction gear case can be seen above the inspection hole (B).

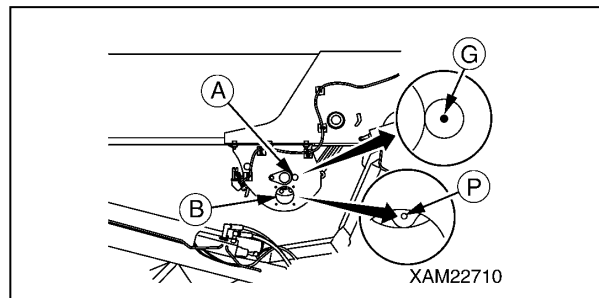


Fig. 5-111

5. Use the hexagonal wrench (C) to remove the drain plug (P).

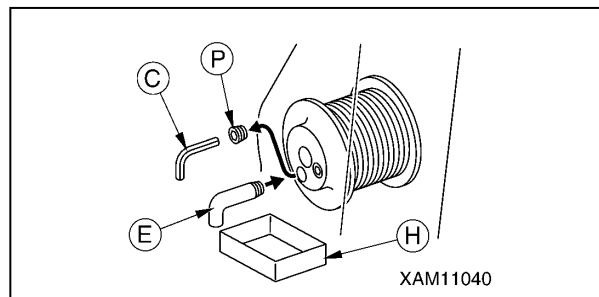


Fig. 5-112

6. Install the elbow (E) to the screw hole of the drain plug (P) for draining oil.

- Place a drain pan (H) directly under the elbow (E) to receive drained oil.

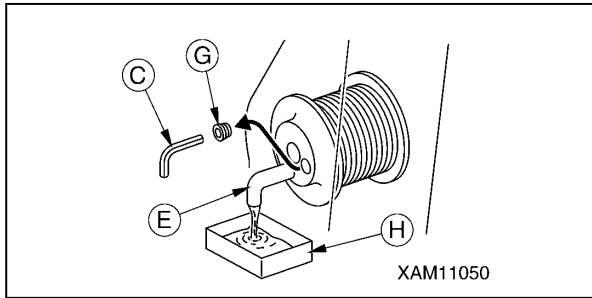


Fig. 5-113

- Use the hexagonal wrench (C) to remove the oil inspection plug (G). The gear oil is drained from the winch reduction gear case upon plug removal.
- Remove the elbow (E) after the gear oil is completely drained from the winch reduction gear case. Put in the drain plug (P) and secure it.
- Install the cover (1), and secure it with the four mounting bolts (2).
- Pump the gear oil through the oil inspection plug (G) with the use of the oil pump (D).

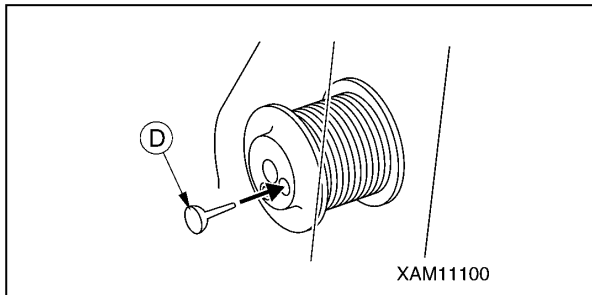


Fig. 5-114

NOTICE: Pump the gear oil until it exudes from the oil inspection plug.

- Put in the oil inspection plug (G) and secure it upon completion of oil replenishment.

NOTICE:

- Perform a proper break-in with no object hoisted for 5 minutes after oil replacement.
- Wipe off the oil completely if spilled.

- See "OUTRIGGER STOWING" on page 4-49 to stow the outrigger.

Replace Oil in Travelling Motor Reduction Gearcase

CAUTION:

- For more information on the which oil to be used, see "LUBRICATING OIL" on page 5-14.

- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

- Oil drain pan: A 1-litre container
- Quantity of oil for replacement: 1.0L

- Place the machine on a level surface.
- Move the machine forward and backward to position it immediately above the drain plug (P) of the travelling motor reduction gear case.

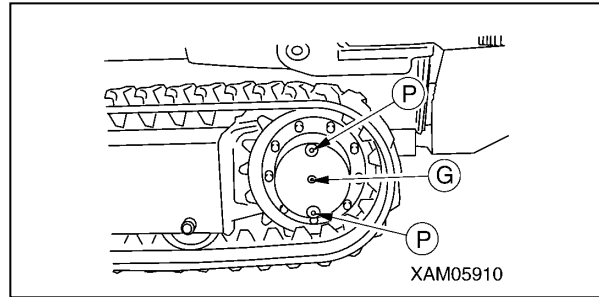


Fig. 5-115

NOTICE: This machine is equipped with two drain plugs (P). Either drain plug must be positioned directly underneath the machine.

- Place a drain pan directly under the lower drain plug (P) to receive drained oil.
- Remove the upper drain plug (P) and oil inspection plug (G).
- Remove the lower drain plug (P) slowly to drain the oil, keeping from contact with draining oil.
- Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency.
- Put in the lower drain plug (P) and secure it.
- Supply the gear oil to the travelling motor reduction gear case through the upper drain plug hole (P).

NOTICE: Pour in the gear oil until the oil comes out of the oil level check plug (G).

- Put in the upper drain plug (P) and oil inspection plug (G), and secure them after oil replenishment.

NOTICE: Wipe off the oil completely if spilled.

Inspect / Adjust Inlet Valve and Exhaust Valve Clearance

Inspecting and adjusting the inlet and exhaust valve clearance requires special tools.

Contact us or our sales service agency.

Maintenance Every 1500 Hours

Perform this maintenance in tandem with maintenance every 50/100/250/500/1000 hours.

Inspect / Clean / Test Fuel Injector

Inspection, cleaning, and test of the fuel injector require special tools.

Contact us or our sales service agency.

Check Crankcase Breather

Crankcase breather inspection requires special tools.

Contact us or our sales service agency.

Maintenance Every 2000 Hours

Perform this maintenance in tandem with maintenance every 50/100/250/500/1000 hours.

Check / Replace Engine Coolant

WARNING! Replace the coolant when the engine is cold. If you remove the radiator cap with the engine at high temperatures, there is a danger of being burnt by the heated coolant blowing out.

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
3. Ensure that the surface temperature of the radiator cap (5) is as low as can be touched with a bare hand, and slowly turn it until it comes into contact with the stopper to relieve the internal pressure.

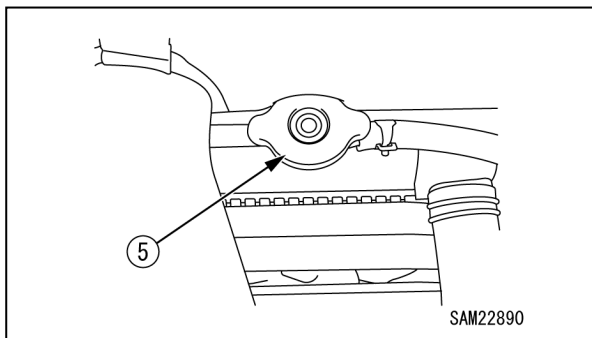


Fig. 5-116

4. Further, remove the radiator cap (5) while turning it until it comes into contact with the stopper.
5. Place a container underneath the drain plug (4) to collect the coolant.

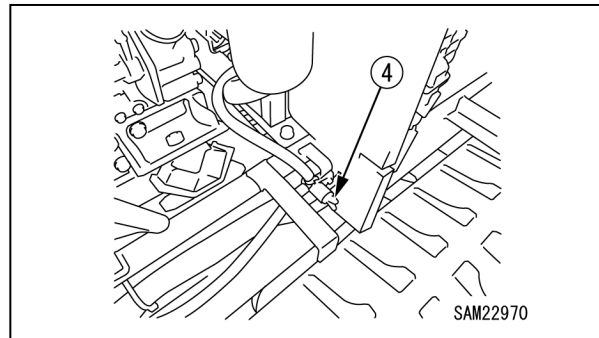


Fig. 5-117

6. Remove the drain plug (4) and drain the coolant.
7. After draining, close the drain plug (4), and inject tap water; when the radiator is filled with water, start the engine, put it in low idling state, raise the water temperature to 90 °C, and run it for approximately 10 minutes.
8. Stop the engine, remove the drain plug (4), and drain the coolant.
9. After draining, clean it using cleaning agent. Clean according to instructions provided on the cleaning agent used.
10. Close the drain plug (4).
11. Start the engine with the radiator cap (5) removed, and ensure that the engine runs at low idle for 5 minutes. Release air from the cooling system with the engine at high idle for another 5 minutes.
12. Wait for approx. 3 minutes after stopping the engine. Supply tap water (soft water) to the radiator through the radiator supply port, up to the supply port, and close the radiator cap (5).
13. Drain the coolant in the sub-tank and then wash the inside.

14. Supply tap water (soft water) to the "FULL" level from the water supply port of the sub-tank.

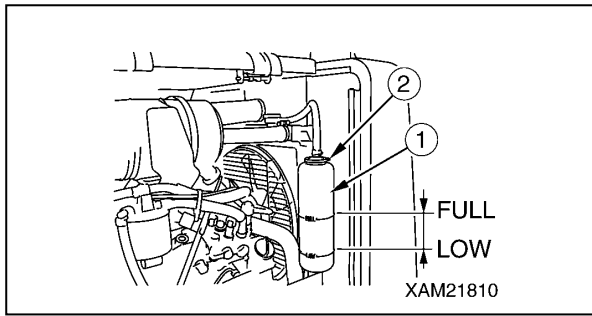


Fig. 5-118

15. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Maintenance Every 3000 Hours

Inspect / Clean EGR Valve

For inspection and cleaning, special tools and expertise are required. Contact us or our sales service agency.

GENERAL MACHINE MAINTENANCE

Batteries

Battery Precautions

Observe the followings when handling the battery.

WARNING!

- Stop the engine and turn the main starter switch to the "OFF" position when checking/handling the battery.
- Wipe off the dust accumulated on the top of the battery with moistened cloth.
- The battery produces hydrogen gas, involving the explosion hazard. Do not put fire such as cigarettes close to the battery or take any actions that can cause sparks.
- The battery fluid is diluted sulfuric acid, which corrodes clothes and skin. Should the battery fluid come into contact with your clothes or skin, wash the affected area immediately with plenty of water. Should it go into your eye, wash your eye immediately with clean water and consult a physician.
- Wear goggles and rubber gloves when handling the battery.
- Disconnect the ground side (normally (-) terminal) first to remove the battery, and conversely, connect the (+) terminal first to install the battery. Objects such as tools coming between (+) terminal and the machine body will cause sparks.
- Slacked battery terminals can cause sparks with poor contact, involving explosion hazard. Tighten securely when installing the terminals.
- Secure the battery when changing the battery to prevent the battery from being displaced. If it is not secured, the terminals will slacken, causing sparks.

- **Verify the (+) terminal and (-) terminal when removing and installing the battery.**

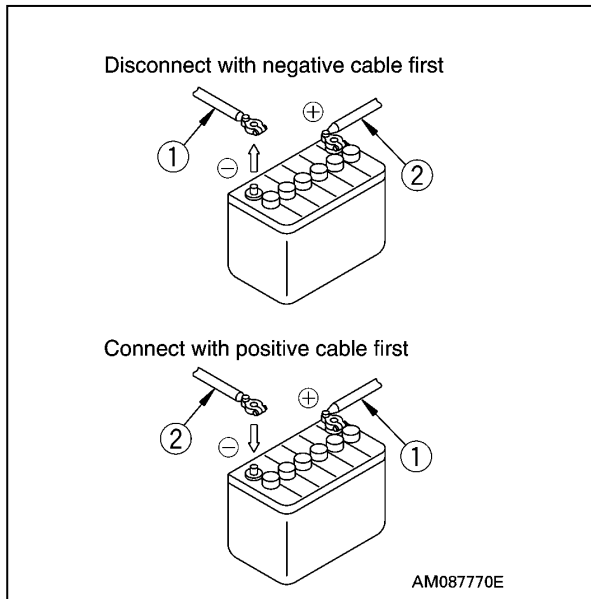


Fig. 5-119

Cautions In Handling Battery

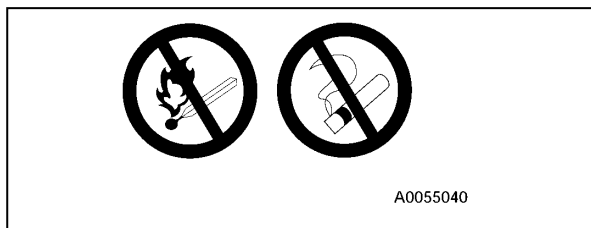


Fig. 5-120

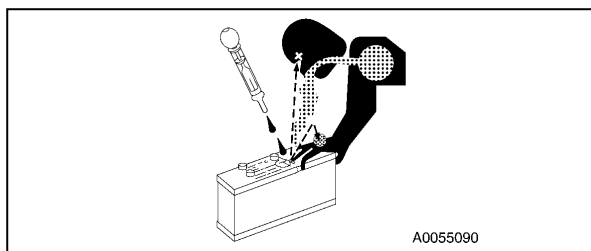


Fig. 5-121

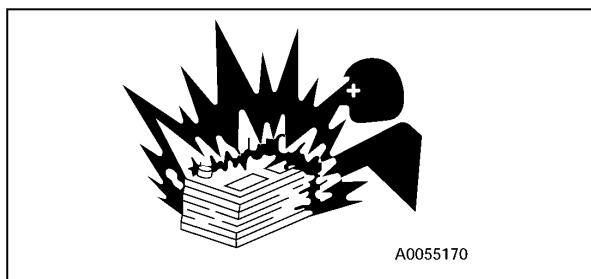


Fig. 5-122

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

- Do not let a cigarette or any fire source approach the battery.
- Always put on protective glasses and rubber gloves before handling the battery.
- If the battery fluid contacted clothing or skin, immediately wash away by huge quantity of water.
- If the battery fluid entered an eye, wash immediately with water and see the doctor as soon as possible.
- If you have swallowed the battery fluid by mishap, immediately drink huge quantity of water, milk, raw egg or vegetable oil, and see the doctor as soon as possible.
- Wipe with a wet clean cloth when cleaning the battery upper surface or related part. Do not use organic solvent or detergent for instance gasoline or paint thinner.
- If the battery fluid is frozen, do not charge battery or start the engine using other power source. Such act may cause the battery to catch fire.
- Before charging or starting up using other power source, defreeze the battery fluid and check that failures such as battery fluid leak do not exist.
- Always detach the battery from the machine frame before charging the battery.
- The battery mounted on the machine is a maintenance-free battery. Because it is a sealed-type battery, the fluid does not need to be checked or replenished.
- Always try to keep the battery charged. The battery should not be charged in rush after being discharged. Charge the battery as needed. Keeping the battery in the best condition lengthens the life of the battery.
- The battery ability remarkably drops during the cold season. Keep the charging rate as close to as 100 % and try to keep it warm for starting the operation next morning.

Remove / Install Battery

CAUTION: Verify that the battery does not move after securing the battery. If it moves, secure it again.

Removal

1. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
2. Disconnect the (-) terminal (5) on the ground side first and then the (+) terminal (6) to disconnect the battery cable.
3. Remove the wing nut (8), battery fixing brackets (7), and then remove the battery (9).

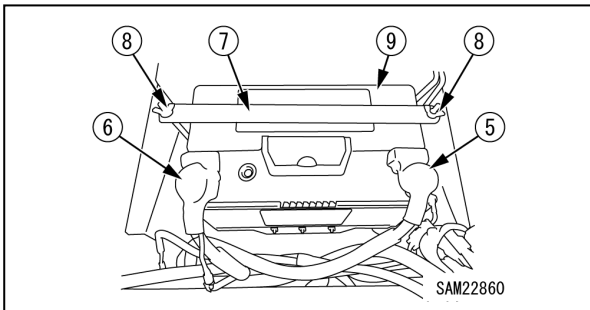


Fig. 5-123

Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Installation

- Reverse the removal procedure to install the battery.

NOTICE: Connect the (-) terminal (5) on the ground side last when connecting the battery.

Cautions on Charging Battery

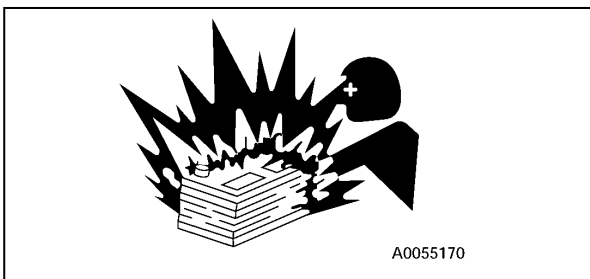


Fig. 5-124

Improper handling when charging the battery may cause the battery to explode. Follow the manuals attached to the machine and the charger, and always observe the followings.

- Adjust the charger voltage to suit the voltage of the battery to charge. Mistake in adjusting the voltage may cause explosions due to overheat and ignition of the charger.
- Securely fix the (+) charge clip of the charger to the (+) terminal of the battery, then securely fix the (-) charge clip to (-) terminal of the battery.
- Set the charge current to no more than 1/10 of the rated capacity of the battery.
- Do not use quick charging.
- Excessive charge current may cause leap fire and explosion caused by fluid leak or fluid deficiency.

When charging the battery mounted to the machine:

- Abnormal voltage may be applied to the alternator, resulting in the breakage. Disconnect the battery terminal wires before charging the battery.
- Stop charging when the battery was overheated (fluid temperature exceeded 45 °C).
- Stop charging promptly once the charging is completed. Charging even after the charging is completed will;
 - (1) overheat the battery
 - (2) reduce the electrolyte level
 - (3) cause failures in battery
- Never inverse the connection of [(+) terminal and (-) terminal]. Doing so can cause damage on alternator.
- Remove the battery cable when handling the battery other than for battery electrolyte level check and specific gravity measurement.

Starting Engine with Booster Cable

Start the engine with booster cable as described below.

Cautions on Connecting/Disconnecting Booster Cable

WARNING!

- Never let the (+) terminal and (-) terminal come into contact with the other when connecting the cable.
- Wear goggles and rubber gloves when starting the engine with the booster cable.
- Do not let the normal machine and machine in failure come into contact with the other. Because the battery produces hydrogen gas, sparks around the battery can cause explosion.
- Do not make mistakes in connecting the booster cable. Note that there will be some sparks when making the last connection. Make this connection at the location as far as possible from the battery.
- Do not let the booster cable clips contact the other or machine when disconnecting the booster cable.

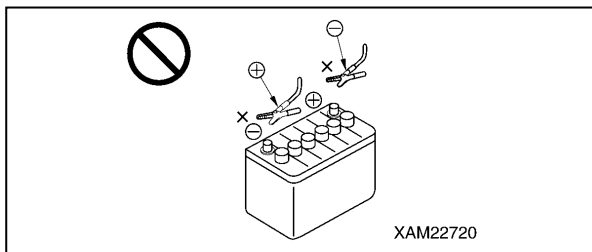


Fig. 5-125

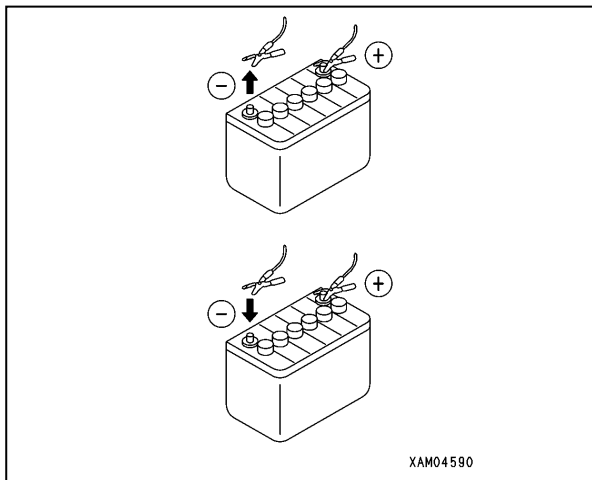


Fig. 5-126

WARNING!

- Start the engine by two persons, with one standing on the operation position in the travel operation panel side.
- When starting using other machine, be careful to prevent contact between the normal machine and broken machine.
- Keep the starter switch key of both the normal machine and the broken machine in OFF position when the booster cable is connected.
- Do not connect to wrong side [connecting (+) to (-), (-) to (+)] when connecting the booster cable.
- Start connecting from (+) terminal first, but start disconnecting from (-) terminal (ground) first.
- Connect the ground to the (-) terminal of the battery of the broken machine when connecting the ground as the last procedure.

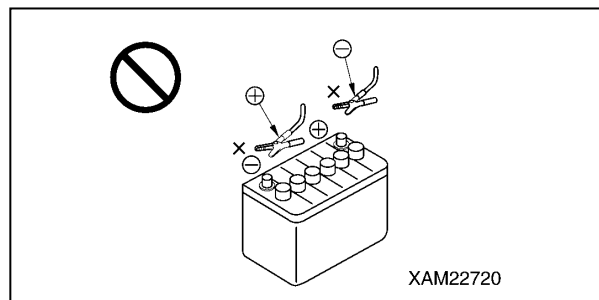


Fig. 5-127

CAUTION:

- Use booster cable and clips of appropriate size for the battery size.
- The battery in the normal machine and machine in failure should be of the same capacity.
- Check that the cable and clips have no breakage and corrosion.
- Connect the clips securely.
- Verify that the operation levers are at the "Neutral" position.

Connecting Booster Cable

Connect the booster cable in the numerical order shown in the figure.

1. Turn the starter switch of both of the normal machine and machine in failure to the "OFF" position.
2. Connect a clip of the booster cable (A) to the (+) terminal of the machine in failure.
3. Connect the other clip of the booster cable (A) to the (+) terminal of the normal machine.
4. Connect a clip of the booster cable (B) to the (-) terminal of the normal machine.
5. Connect the other clip of the booster cable (B) to the engine block of the machine in failure.

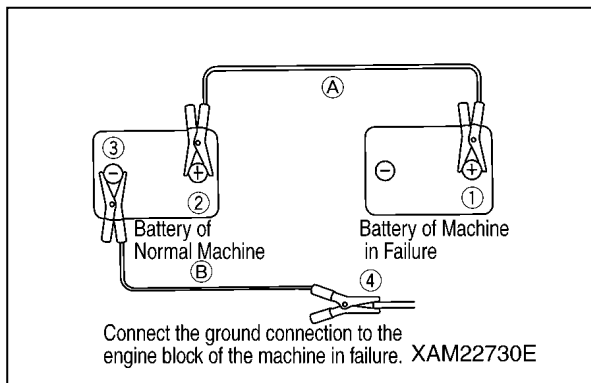


Fig. 5-128

Starting Engine

CAUTION: Verify that the operation levers are at the "Neutral" position. If the safety lock lever is equipped, also verify that the safety lock lever is at the lock position.

1. Verify that the clips are securely connected to the battery terminals.
2. Start the engine of the normal machine and increase the engine speed to full speed (highest speed).
3. Turn the starter switch of the machine in failure to the "START" position to start the engine.
If the engine does not start, wait for more than 2 minutes before re-starting.

NOTICE: For more information on how to start the engine, see "STARTING ENGINE" on page 4-18.

Disconnecting Booster Cable

When the engine started, disconnect the booster cable in the reverse order of connecting the booster cable.

1. Disconnect the clip of the booster cable (B) connected to the engine block of the machine in failure.
2. Disconnect the clip of the booster cable (B) connected to the (-) terminal of the normal machine.
3. Disconnect the clip of the booster cable (A) connected to the (+) terminal of the normal machine.
4. Disconnect the clip of the booster cable (A) connected to the (+) terminal of the machine in failure.

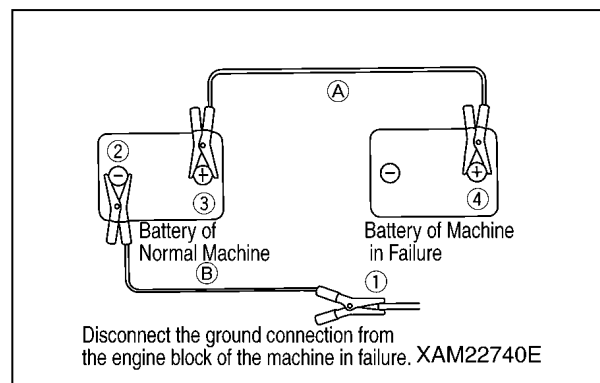


Fig. 5-129

Rubber Tracks

General Information and Precautions

Good Use

While the rubber tracks demonstrate many advantages thanks to its performance characteristic to the material, it has a weak point in strength.

Therefore, we would like you to sufficiently understand the characteristics of the rubber tracks and to respect don'ts operations and observe the cautions on handling so that the life of the rubber tracks can be extended and its advantages exercised.

Be sure to read "Dos and Don'ts" on page 5-61 and "Cautions in Using Rubber Tracks" on page 5-62 before using the machine.

Warranty

Verification of proper tension of the rubber tracks, maintenance of rubber tracks, and damage caused by the fault of customers such as not respecting don'ts operation or not observing cautions in working, for example, "worked at the site where there were objects that may tear the rubber blocks, such as steel plates, U-shaped gutters, corners of bricks, corners of sheer broken stones and rocks, reinforcing steels, and iron scraps", are not covered by warranty.

Dos and Don'ts

The following operations are prohibited.

- Working and slewing on the ground with broken stones, hard rock ground with great irregularity, reinforcing steels, iron scraps, and near the edge of the steel plates will damage the rubber tracks.

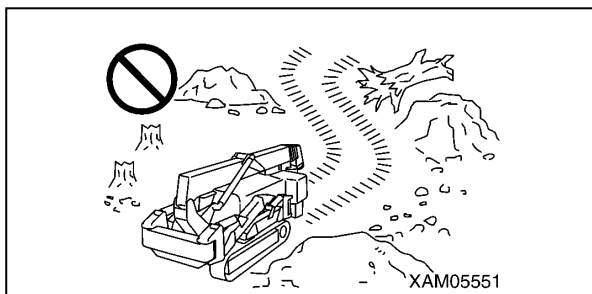


Fig. 5-130

- At the location where there are great amount of large and small boulder stones such as river beds, the stones will go under the machine, tending to damage the rubber tracks or the rubber tracks tend to come off.

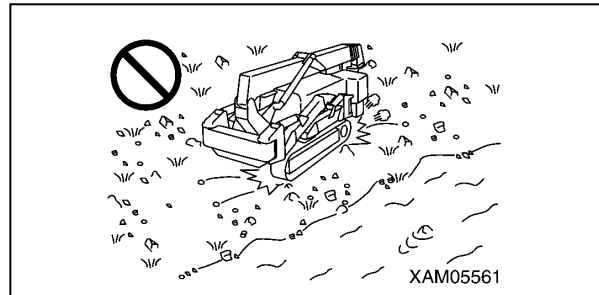


Fig. 5-131

- Keep the oil and chemical solvents away from the rubber tracks.

If these materials come in contact with the rubber tracks, wipe it off immediately.

Do not Travel over the road surface where the oil has built up.

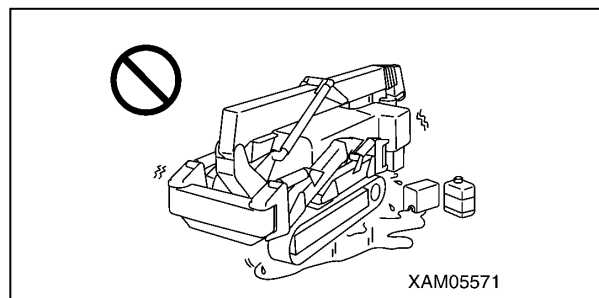


Fig. 5-132

- Do not go in the area where it is hot such as with open fire, the steel plate left under the burning sun, or newly poured asphalt.

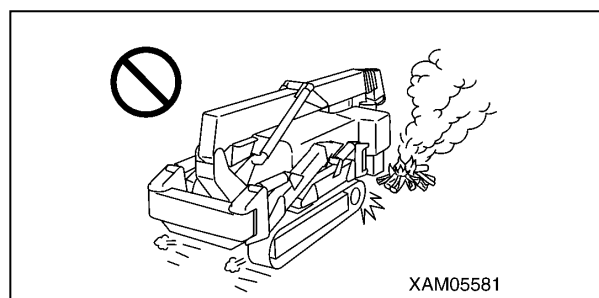


Fig. 5-133

- Keep the rubber tracks indoor where there is no direct sunlight or rain when storing them for long time (three months or more).

Cautions in Using Rubber Tracks

WARNING! Not observing these cautions in using rubber tracks will cause serious accidents or damage on rubber tracks.

Keep the followings in mind during the operation.

- Avoid making spin turns on the concrete surface. Sudden steering cause early wear or defect on the rubber tracks. Avoid making sudden steering whenever possible.

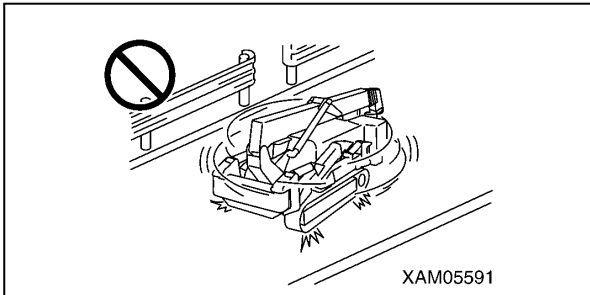


Fig. 5-134

- Do not operate the machine in a way that the edge of the rubber tracks is pressed against the concrete and walls.

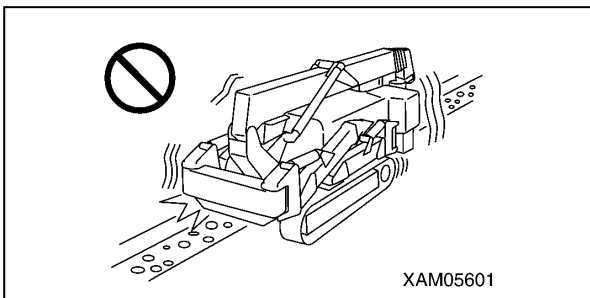


Fig. 5-135

- Avoid steering at the location with a great step. Make the machine perpendicular to the step when going over it. Going over the step diagonally may result in the rubber tracks coming off.

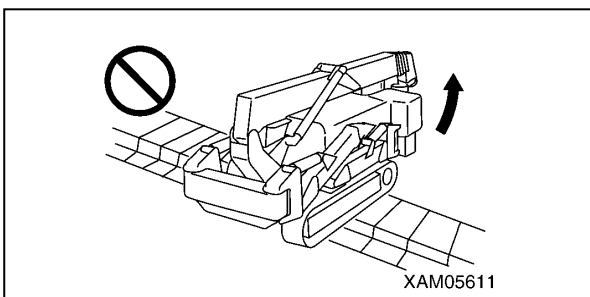


Fig. 5-136

- The rubber tracks slip very easily on a wet steep plate or snowed and frozen surface. Be especially careful not to slip when operating on the slope.

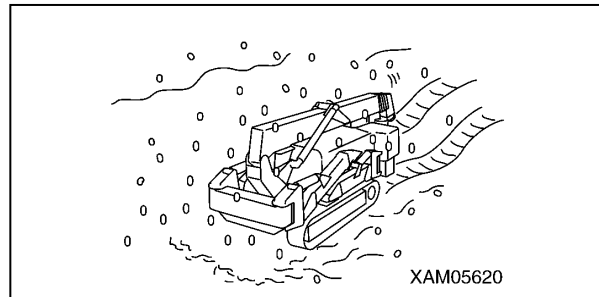


Fig. 5-137

- Avoid using the rubber tracks whenever possible depending on the material to be worked on. If you used the rubber tracks on these materials by necessity, wash thoroughly with water after the use.

- Avoid the operation on the material crushed and yielding oil (such as soy beans, corns, rape cake, etc.)
- Handling salt, ammonium sulfate, potassium chloride, or concentrated superphosphate corrodes the bonding at the cored bar section.

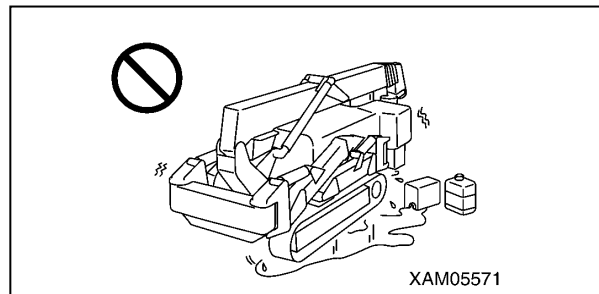


Fig. 5-138

- Salt corrodes the bonding at the cored bar section. Avoid using the machine on the beach whenever possible.

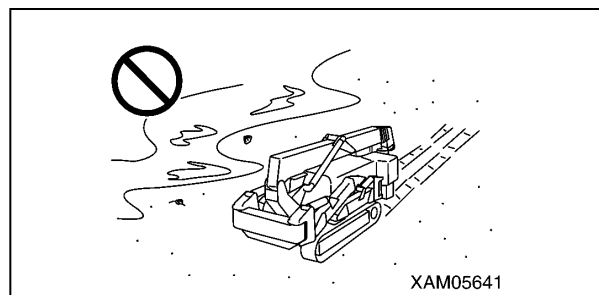


Fig. 5-139

- The operation in the very cold land changes the material of the rubber tracks, shortening its life. Use the rubber tracks in the range of -25°C to +55°C, due to the physical property of the rubber.
- When handling food such as salt, sugar, wheat, and soybeans, some pieces of wire or rubber may be mixed in the food if there is any deep scratch on the rubber tracks. Use the rubber tracks after repairing the cracked rubber.

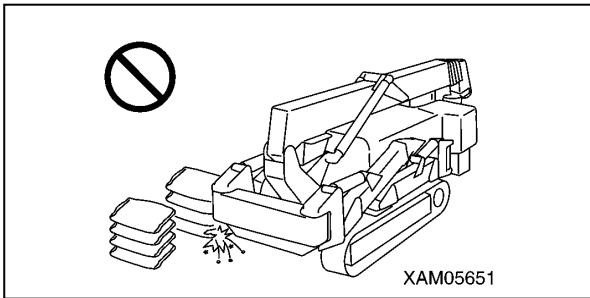


Fig. 5-140

- Always use the rubber tracks at appropriate tension to prevent the rubber track from coming off. Loose tension will allow the rubber tracks to come off.

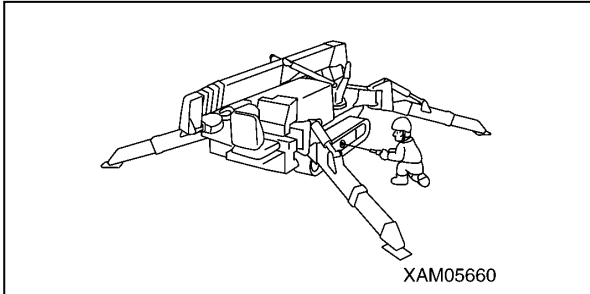


Fig. 5-141

Inspection of Rubber Tracks

CAUTION: Contact us or our sales service agency for determining whether to replace, repair, or keep the rubber track.

The following condition requires the repair or replacement of the rubber track. Ask us or our sales service agency for repair/replacement.

Lug Height

- When the lug height "a" decreases with wear, the traction force drops. Replace the rubber track when the lug height decreases to 5 mm or lower with a new rubber track.

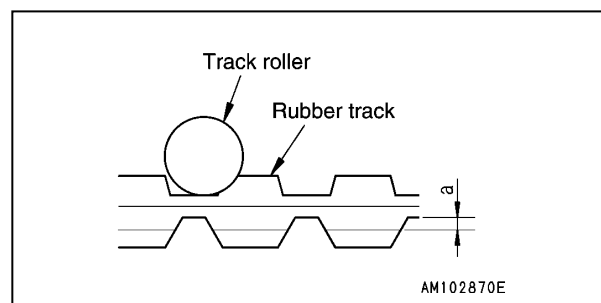


Fig. 5-142

- When the lug is worn out and the steel cord inside the rubber track is exposed for more than 2 links, replace the rubber track with a new one.

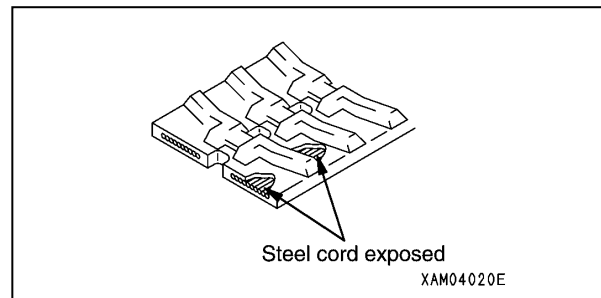


Fig. 5-143

Broken Steel Cord

- If more than half of the steel cord layer is broken on one side, replace the rubber track with a new one.

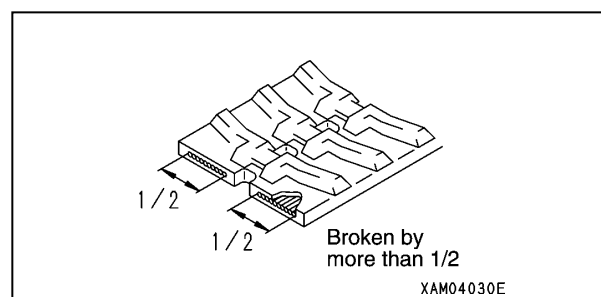


Fig. 5-144

Fallen Core Metal

- If the core metal of the rubber track is fallen out at more than 1 location, change the rubber track with a new one.

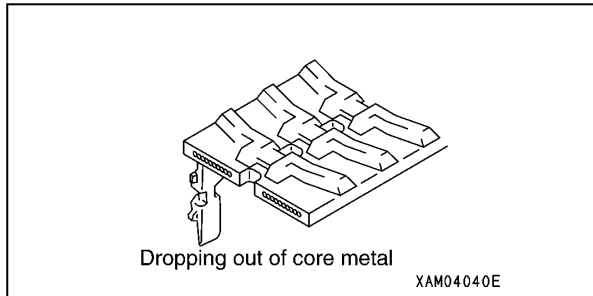


Fig. 5-145

Cracks

- If there is a crack between rubber track lugs, change the rubber track with a new one.

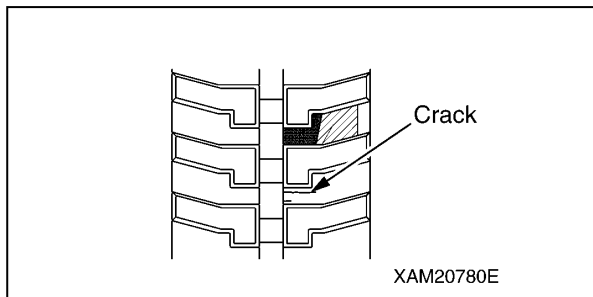


Fig. 5-146

Replace Rubber Track

WARNING!

- The inside of the tension adjusting device of the rubber track is greased. Grease is under high pressure associated with the tension of the rubber track. Failure to follow precautions stated below when removing grease may lead to a serious accident due to the grease valve being popping out.
- Only one full turn of the tension adjusting grease valve is allowed to loosen. The grease valve may pop out if disregarded.
- Always stand aside when conducting tension adjustment of the grease valve to circumvent potential dangers.
- Ensure that grease is completely removed from the inside of the rubber track before rotating the sprocket to remove the rubber track.

Removal of Rubber Track

- Have a steel pipe available.
1. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the rubber track for about 50mm from the ground.

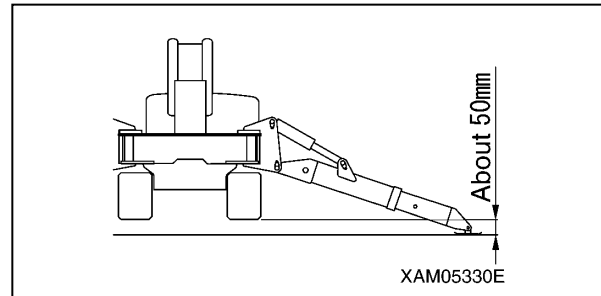


Fig. 5-147

2. Loosen the grease valve (1) gradually and remove grease.

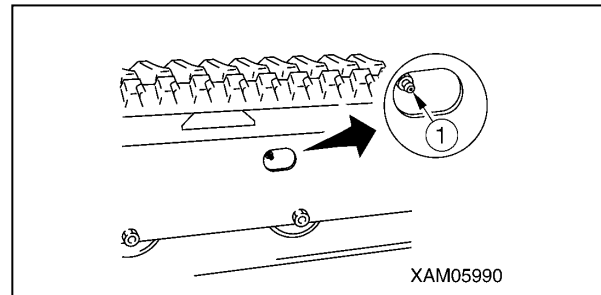


Fig. 5-148

3. Provide only one full turn of the grease valve (1).
4. Insert the steel pipe between the idler and rubber track. Rotate the sprocket backward.

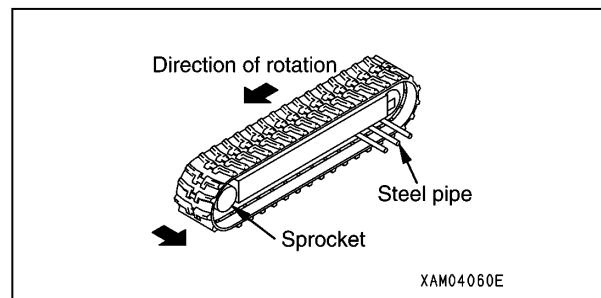


Fig. 5-149

5. When the inserted steel pipe detaches the rubber track from the idler, slide the crawler in a lateral direction to remove it.

Installation of Rubber Track

- Have a grease gun available.
 - Have a steel pipe available.
1. See "OUTRIGGER SETTING" on page 4-42 to set the outriggers and raise the rubber track again for about 50mm from the ground.

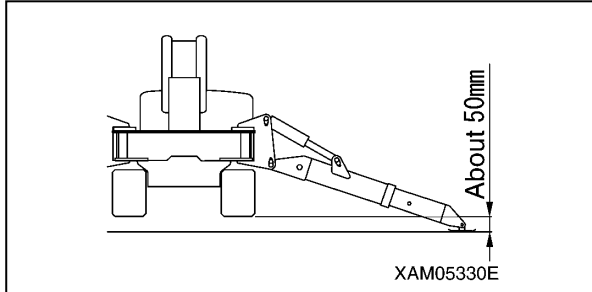


Fig. 5-150

2. With the rubber track engaged with the sprocket, put the crawler on the idler.
3. With the sprocket rotating backward, push the rubber track in to stop rotation.

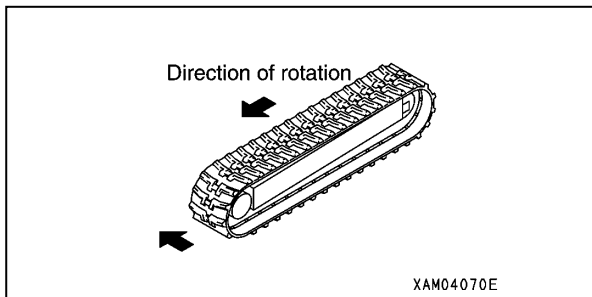


Fig. 5-151

4. Insert the steel pipe between the idler and rubber track again, and re-rotate the sprocket to put the crawler on the idler properly.

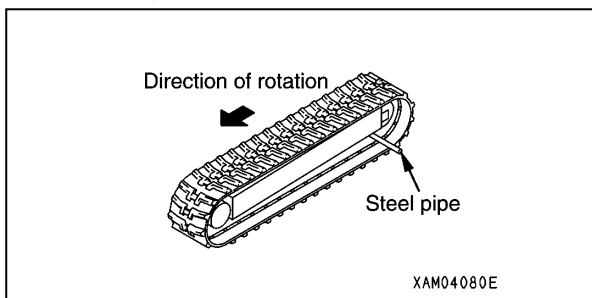


Fig. 5-152

5. Stop rotation, and ensure that the rubber track is on the sprocket and idler properly.

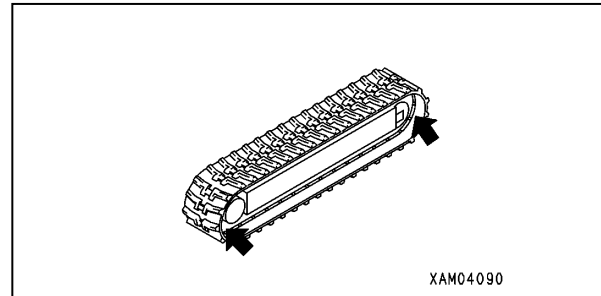


Fig. 5-153

6. Make a tension adjustment to the rubber track according to "Check / Adjust Rubber Track Tension" on page 5-31.
7. Ensure that adequate engagement and tension of the rubber track, sprocket, and idler are obtained.
8. See "OUTRIGGER STOWING" on page 4-49 to stow the outriggers and lower the machine on the ground.

Wire Rope**General Information and Precautions**

Contact us or our sales service agency for additional information on replacing and repairing wire rope.

WARNING! Always wear work leather gloves when replacing the wire rope.

CAUTION:

- A diameter of the wire rope is to be measured at points where the wire repeatedly runs through the sheave. A mean value needs to be determined through three-way measurement. (A measurement should be performed at several points, spacing between the points.)
- Do not use the old wire rope regardless of the frequency of use.
- Always use Maeda genuine wire rope.

Wire Rope Nominal Dimension

- Wire rope for winching:
IWRC 6 x Ws (26) 0/0 ϕ 8 x 95 m
- No. 5 wire rope for extending boom:
IWRC 6 x Fi (29) 0/0 ϕ 10 x 8.01 m
- No. 5 wire rope for retracting boom:
IWRC 6 x Fi (29) 0/0 ϕ 8 x 14.46 m

Inspecting Wire Rope

A wire rope undergoes wear and tear over time. Prompt replacement is required if any of the following events appears in the wire rope.

- 10% or more of strands (except a filler wire) in a twist of the wire rope (6 crests) is broken.

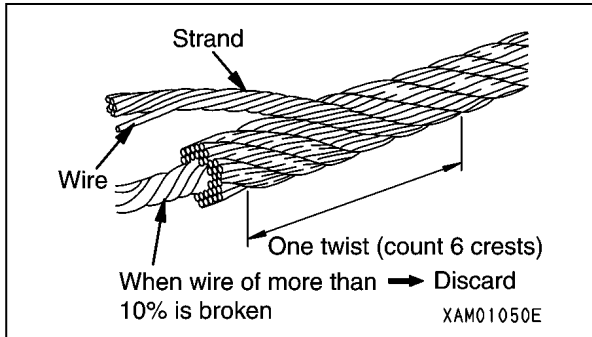


Fig. 5-154

NOTICE: Replace the wire rope for winching if 9 strands or more are broken and one for boom extending/retracting if 13 strands or more are broken.

- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.

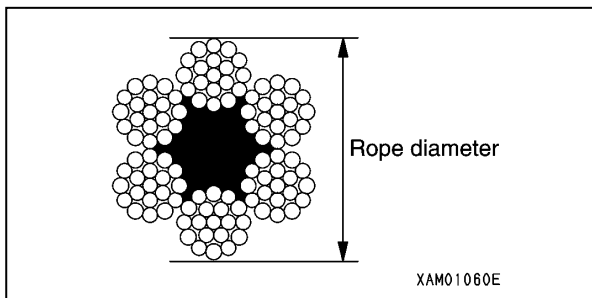


Fig. 5-155

NOTICE:

- Replace an 8-mm-dia wire rope if it is 7.5mm in diameter.
- Replace a 10-mm-dia wire rope if it is 9.3mm in diameter.
- A kink is formed.

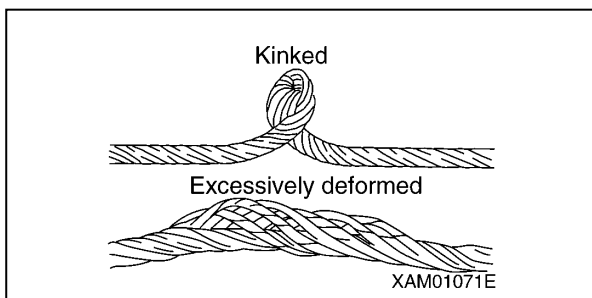


Fig. 5-156

- Considerable deformation or corrosion is developed.
- A faulty end socket is used.

Winch Wire Rope - Correcting Twisted Rope

WARNING! Be sure to wear a pair of thick leather working gloves when handling wire ropes.

CAUTION: Change the hooking direction of the wire rope (inverse the hook block side and winch drum side) from time to time to extend the life of the wire rope.

When the wire rope gets twisted, straighten the twist with the following procedure.

1. With the hook in normal condition, check the twisting direction and how many times the rope is twisted.

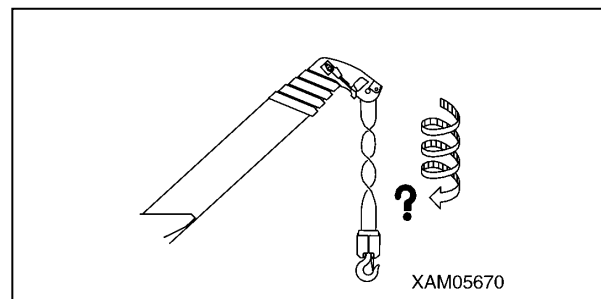


Fig. 5-157

2. Operate the winch lever to "DOWN" (push forward) side to lower the hook block onto the ground. If the hook cannot be lowered, operate the boom derricking lever to the "LOWER" (push forward) side to lower the boom or operate the boom telescoping lever to the "RETRACT" (pull toward you) side to retract the boom to lower the boom.
3. Turn the starter switch to the "OFF" position to stop the engine.

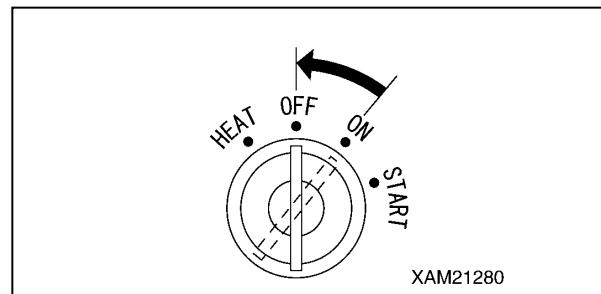


Fig. 5-158

- Remove the wedge socket pin securing bolt (1) to remove the wedge socket (2).

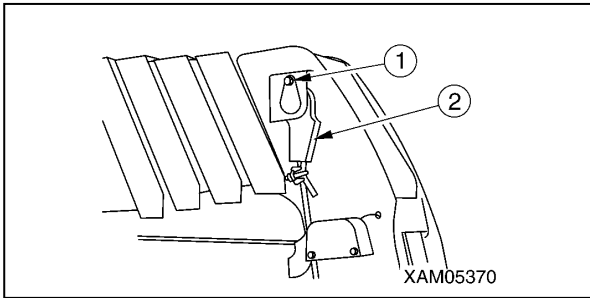


Fig. 5-159

- Force to twist the end of the wire for "n" (number of wire falls) times of the number hook is twisted for in the opposite direction from the direction the hook block is twisted to and which you checked in the step 1 (opposite direction from the one the wire rope tries to go back to naturally when you release your hand from the wedge socket) and install the wire rope.
- Start the engine and operate the boom derricking lever to the "RAISE" (pull toward you) side to increase the boom angle to its maximum.
- Operate the boom telescoping lever to the "EXTEND" (push forward) side to extend the boom to its maximum.

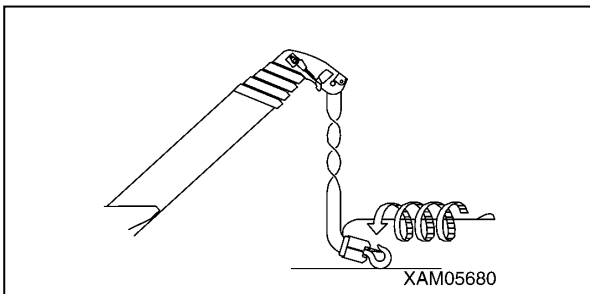


Fig. 5-160

- Operate the winch lever to repeat raising/lowering the hook block for several times.
- Tidily spool up the wire rope into the winch drum with some tension applied to the rope.
- Repeat the above procedure until the hook is no more twisted.

If the wire rope is still twisted after performing the procedure above, change with a new wire rope.

Winch Wire Rope - Removal

Use the following procedure to remove the wire rope.

- Place the machine on a level and firm surface.
- Place the boom telescoping lever in the "Extend" position (push it toward the front) to extend the boom slightly.
- Place the winch lever in the "Down" position (push it toward the front) to lift down the hook block on the ground.
- Undo the wedge socket fixing bolt (2). Remove the wedge socket pin (1) and remove the wedge socket (3).

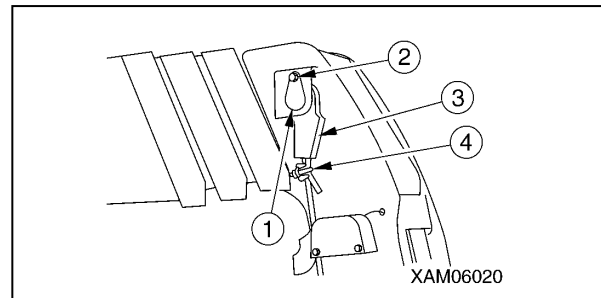


Fig. 5-161

- Remove the wire clip (4).
- Pull the wire rope (5) out of the wedge socket (3), following the procedure provided below.
 - Bring a 4 to 6mm round bar (6) into contact with the rope wedge (7).
 - Remove the rope wedge (7), lightly tapping the round bar (6) with a hammer in the direction indicated by the arrow (a).

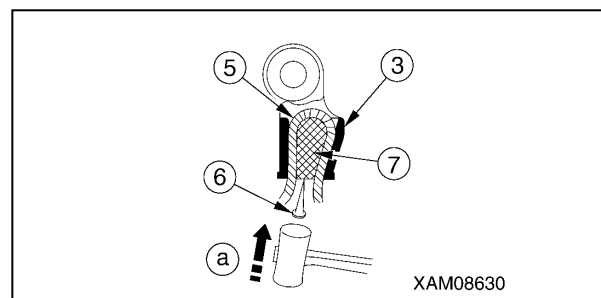


Fig. 5-162

- Place the winch lever in the "Down" position (push it toward the front) to wind up the wire rope (5) from the winch drum.

8. With the wire rope wended up from the winch drum, detach the end of the wire rope (5) from the winch drum (8) by following the procedure provided below.
 - (1) Bring a 4 to 6mm round bar (6) into contact with the rope wedge (9).
 - (2) Remove the rope wedge (9), lightly tapping the round bar (6) with a hammer in the direction indicated by the arrow (b).

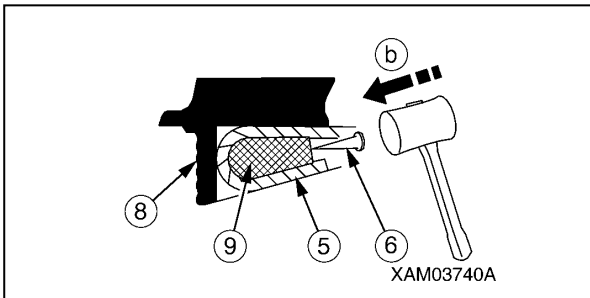


Fig. 5-163

9. Wind up the remaining wire rope (5) completely.

Removal of the winch wire rope is completed.

Winch Wire Rope - Installation

WARNING! Be sure to attach the rope wedge properly to secure the wire rope. Potential serious accident may occur due to detachment of the wire rope during crane operation if disregarded.

CAUTION:

- Avoid irregular winding of the wire rope in the winch drum.
- Always hoist an object (2.9 to 4.9KN {300 to 500kg}) with the boom extended and raised fully immediately after attaching a new rope. Repeat raising and lowering the hook several times until the new rope conforms.
- The wire rope is coiled. Exercise caution not to form a kink in the rope when winding it up. Be sure to unrope by rotating the rope to pull it out of the winch drum.

Use the following procedure to attach the wire rope.

1. With the end of the wire rope held, draw the wire rope (5) through the weight of the over winding detector, load sheave (1) at the boom end, wire guide (2) of No.2, 3, and 4 boom, snap sheave (3), and idler sheave (4).

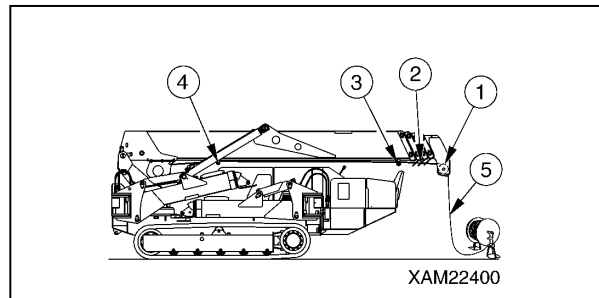


Fig. 5-164

2. Draw the wire rope (5) through the attachment hole of the winch drum (8). Secure the wire rope (5) to the winch drum (8), following the procedure provided below.
 - (1) Draw the wire rope (5) through the winch drum (8) with the rope loose.
 - (2) The rope wedge (9) should be in position (a). Pass the wire rope (5) around the rope wedge and yank at the rope in the direction indicated by the arrow. Let the wire rope (5) protrude approximately 50 mm out of the narrow hole, then fix the end of the wire rope (5) with the plate (10).

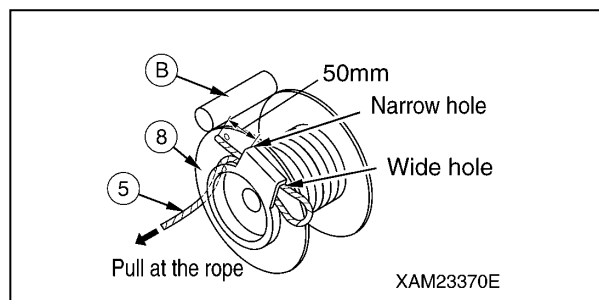


Fig. 5-165

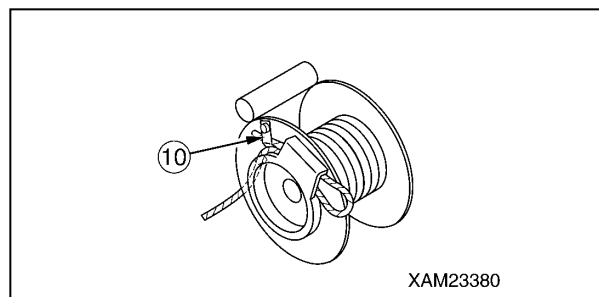


Fig. 5-166

- Place the winch lever in the "Up" position (pull it toward you) slowly to wind up the wire rope (5) in the winch drum (8). Ensure that the wire rope is coiled between the irregular winding protective roller (B) and winch drum. The wire rope needs to jut out the boom end (approx. 10m).

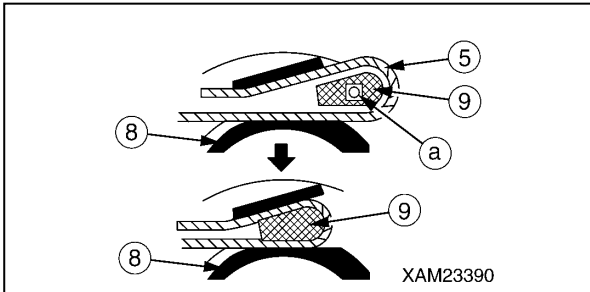


Fig. 5-167

- In response to the number of falls, draw the wire rope through the load sheave at the boom end, hook block sheave, guide sheave, and retraction cam.

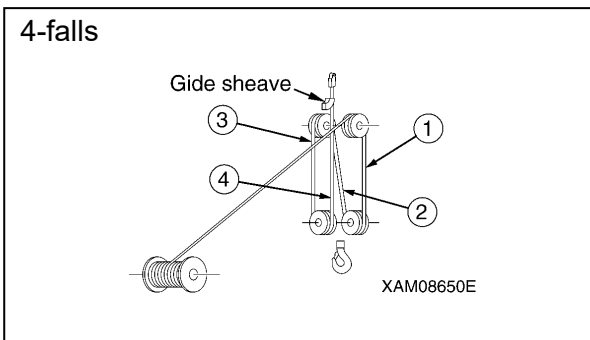


Fig. 5-168

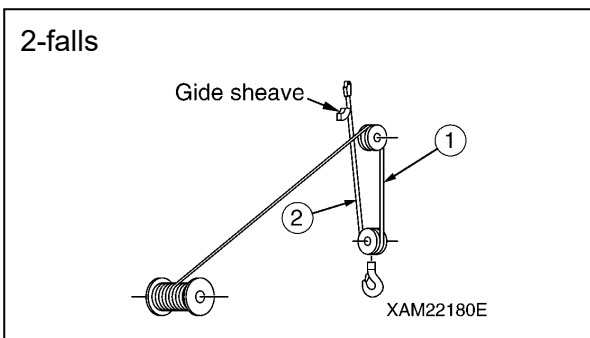


Fig. 5-169

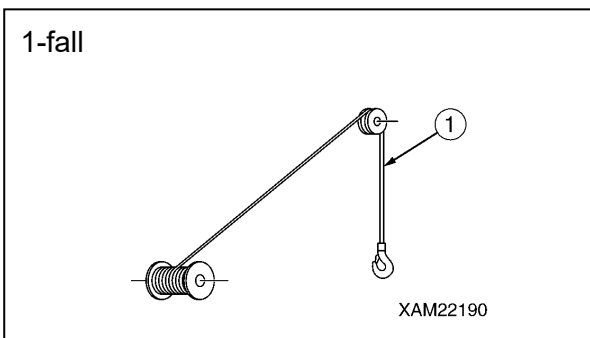


Fig. 5-170

- Secure the end of the wire rope (5) to the wedge socket (3), following the procedure provided below.

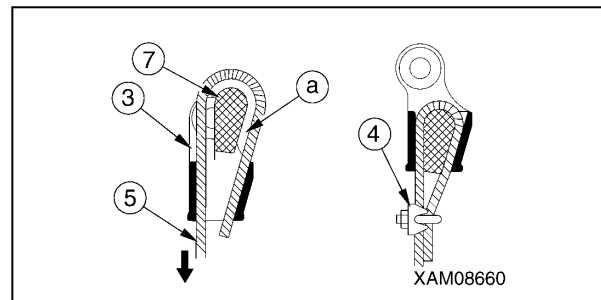


Fig. 5-171

- Draw the wire rope (5) through the wedge socket (3).
- With the rope wedge (7) in position (a), yank at the wire rope (5) in the direction indicated by the arrow.
- Attach the rope clip (4) to the wire rope (5).
- Secure the wedge socket (3) to the boom with the wedge socket pin (1), and tighten the wedge socket fixing bolt (2).

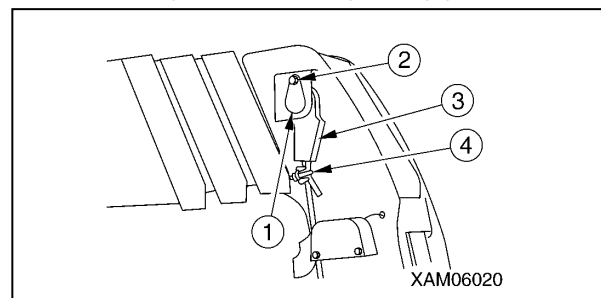


Fig. 5-172

- Place the boom derricking lever in the "Raise" position (pull it toward you) or the boom telescoping lever in the "Extend" position (pull it toward you) to raise the hook block.

NOTICE: Winch operation is allowed only after the hook block is raised.

- With the boom extended and raised fully, place the winch lever in the "Down" position (push it toward the front) to adjust the wire rope (5) until 3 to 4 turns of wire are left in the winch drum (8).
- With the wire rope (5) held under tension, place the winch lever in the "Up" position (pull it toward you) to wind up the wire rope (5) in the winch drum (8).

Checking / Adjusting Boom Telescoping Wire Rope

Checking Boom Telescoping Wire Rope

Prompt adjustment is required if the following event appears in the boom extending wire rope.

1. Retract the boom completely.
2. Remove three mounting bolts (1) at the boom end and remove the cover (2).

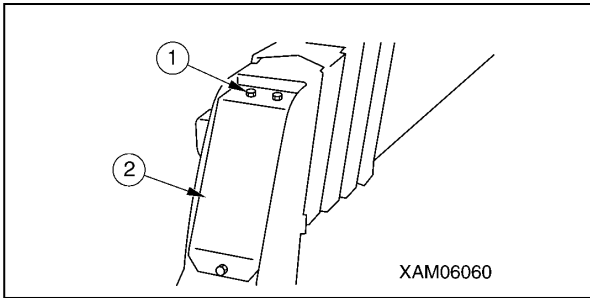


Fig. 5-173

3. Remove lock bolt (6) at the boom telescoping cylinder top, and turn adjustment bolt (9) of the boom extending wire clockwise (right).

The boom extending wire rope (8) is adjusted to the correct tension if boom No.5 extends upon rotating the adjusting bolt (9). If boom No.5 remains retracted, perform proper adjustment according to "Adjustment of Boom Telescoping Wire Rope" on page 5-71.

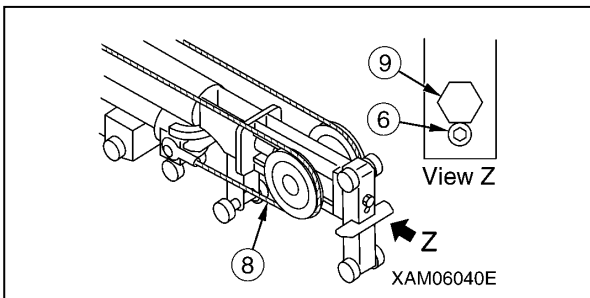


Fig. 5-174

4. Check that 5-mm clearance is formed between booms No.4 and No.5, clearance (a), with the booms retracted in a horizontal position. If check finds clearance of 5mm or more, perform proper adjustment according to "Adjustment of boom telescoping wire rope".

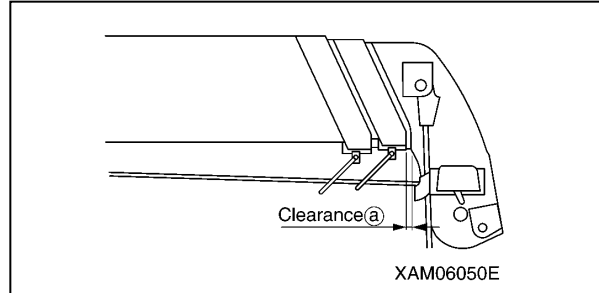


Fig. 5-175

Adjustment of Boom Telescoping Wire Rope

CAUTION: The wire ropes must be adjusted to the correct tightness.

A boom extending wire rope (1 piece) and retracting wire rope (1 piece) are used in this machine. Adjustment of these wire ropes must conform to the specified procedure. Use the following procedure for wire rope adjustment.

1. With the booms retracted in a horizontal position, extend the telescoping booms approx. 2m.

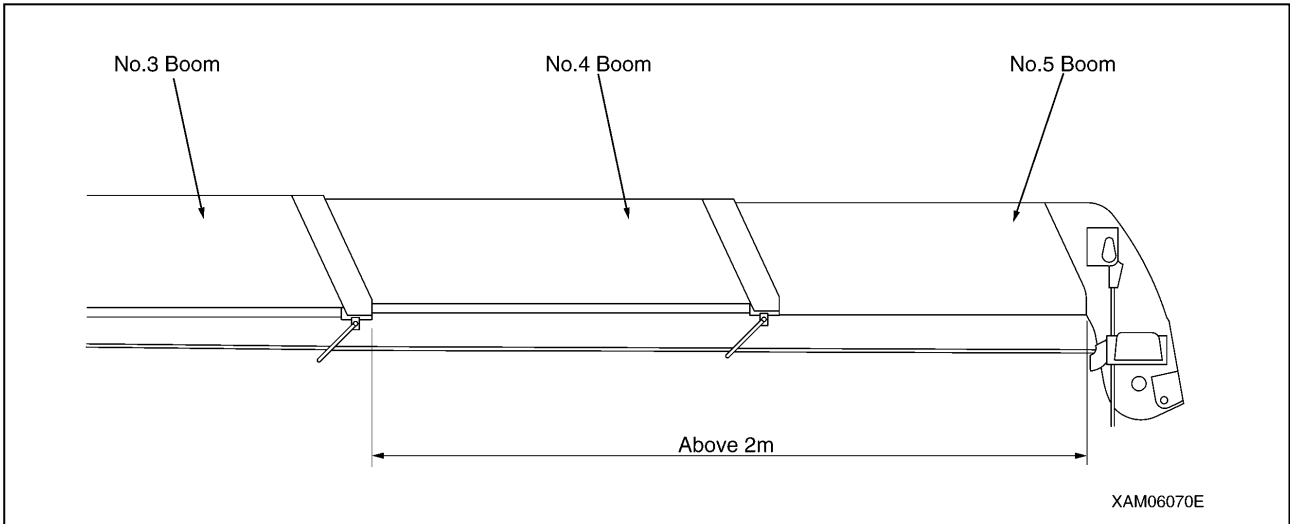


Fig. 5-176

2. Retract the booms completely. Boom stowing is required. Measure clearance (a) to check the following for proper adjustment.
 - If 5-mm or more clearance is formed, adjust the retracting wire rope (5) of boom No.5.
 - If no clearance is formed, perform wire rope adjustment from section 5 "Adjustment of boom No.5 extending wire rope (8)".

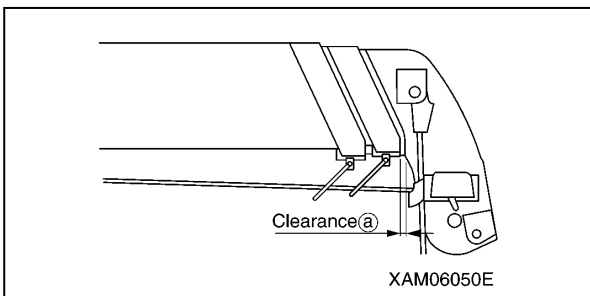


Fig. 5-177

3. Remove the three mounting bolts (1) at the boom end and remove the cover (2). If sag is developed in the wire rope, adjust the wire rope according to "Adjustment of Boom Telescoping Wire Rope" on page 5-71.

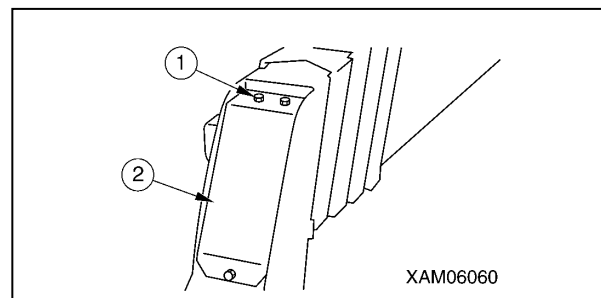


Fig. 5-178

4. Adjustment of boom No.5 retracting wire rope (5)
 - (1) With the lock nut (3) loose, turn the adjusting nut (4) in the direction that the retracting wire rope (5) becomes tight (clockwise (right)) to provide laterally even tightening until clearance (a) is bridged.
 - (2) If the retracting wire rope remains sagging or 5-mm or more clearance remains present after performing steps 1 and 2, readjustment is required.

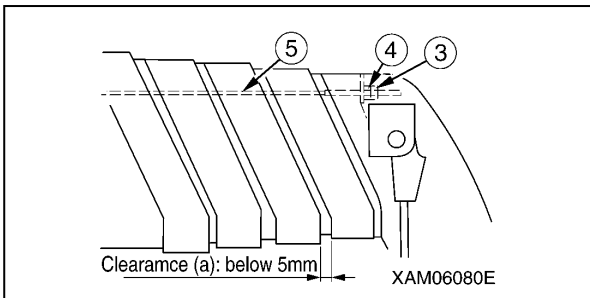


Fig. 5-179

5. Adjustment of boom No.5 extending wire rope (8)
 - (1) Remove the lock bolt (6). Turn the adjusting bolt (9) in the direction that the extending wire rope (8) of boom No.5 becomes tight (clockwise (right)) to provide tightening to the verge of the extension of boom No.5.
 - (2) Provide retightening to both adjusting nuts (4) of the boom No.5 retracting wire rope (5) two turns each.
 - (3) Secure the adjusting nuts (4) of the boom No.5 retracting wire rope (5) with the lock nut (3).
 - (4) Provide retightening to both adjusting bolt (9) of the boom No.5 extending wire rope (8), and secure it with the lock bolt (6).

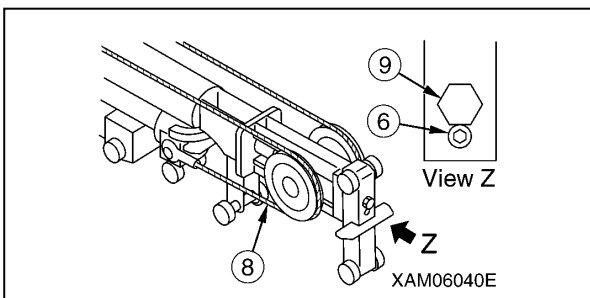


Fig. 5-180

6. Install the cover (2) to the boom end with the three mounting bolts (1) upon completion of adjustment.

Inspection, Cleaning and Replacement of Air Cleaner

WARNING!

- Conducting inspection/cleaning maintenance while the engine is running may allow the entry of rubbish into the engine and damage the engine. Conduct after stopping the engine.
- When using compressed air, rubbish can fly in all directions and may cause personal injuries. Wear goggles, dust mask and other protective equipment.

Inspection

1. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.

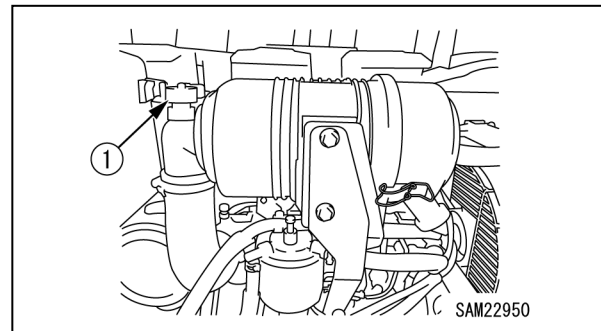


Fig. 5-181

2. Inspect the dust indicator (1) on the air cleaner to check that the red piston is not visible in the transparent section.
3. If the red piston is visible, clean or replace the element immediately.
4. After inspecting, cleaning or replacing, press the knob on the dust indicator (1) to return the red piston to its original position.

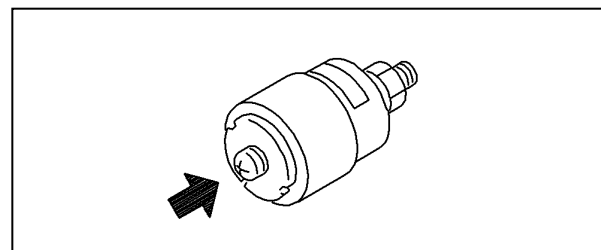


Fig. 5-182

5. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Cleaning/Replacing the Element

1. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
2. Remove the air cleaner clip (2), and remove the dust cup (3).

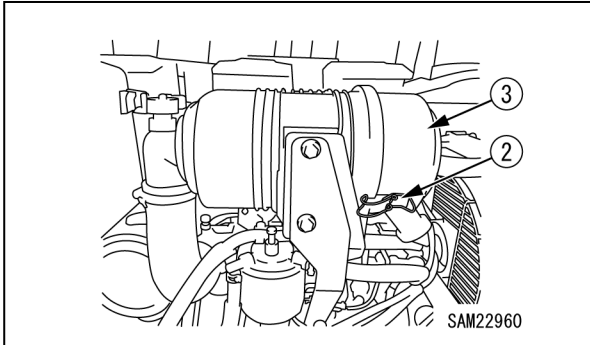


Fig. 5-183

3. Dispose of the rubbish in the dust cup (3) and clean the interior.
4. Remove the element (4) on the outside of the double element.

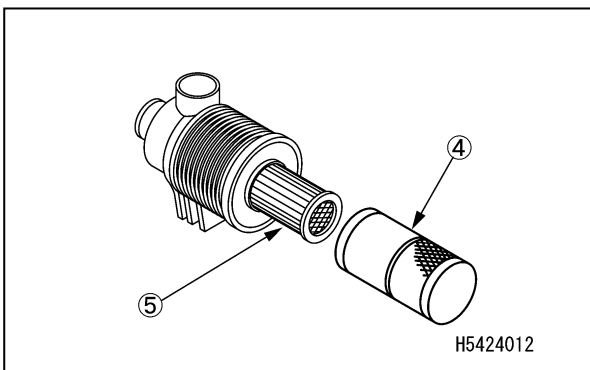


Fig. 5-184

5. Clean the inside of the air cleaner body.
6. Apply dry compressed air (0.29 to 0.49 MPa) from the inner side of the element along the fold. Blow compressed air on the outside of the element along the grooves, and re-blow the air on the inside.

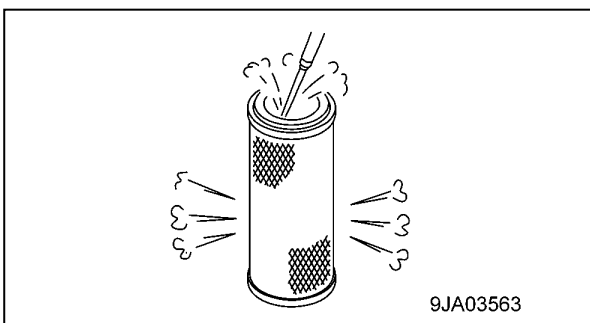


Fig. 5-185

7. Check the inside of the element by illuminating with a light bulb and if any pores or thinned parts are found, replace the element.

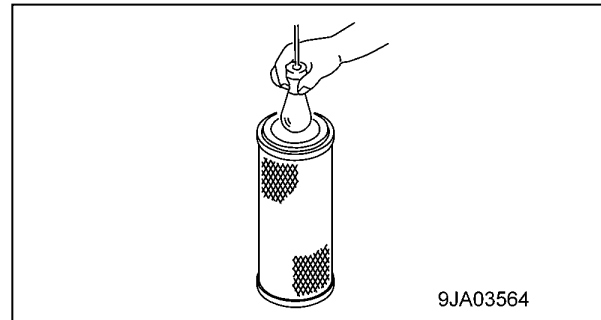


Fig. 5-186

CAUTION: Do not tap or bump the element while cleaning it. Avoid the use of an element if the groove, gasket, or sealing is damaged. Pack the unused elements and store them in a dry place.

8. Set the cleaned outside element (4).

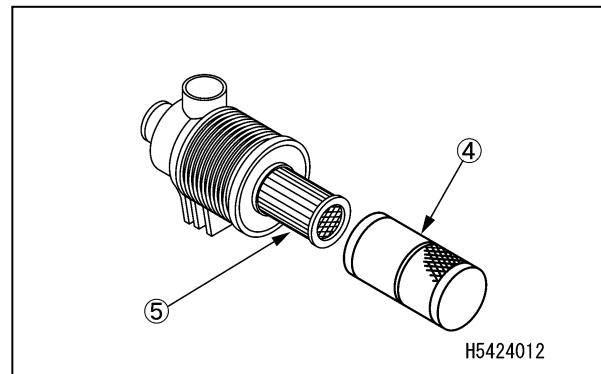


Fig. 5-187

CAUTION: If the filter still clogs quickly despite having cleaned or replaced outside element (4), replace the inside element (5).

9. Match the match mark on dust cup (3) and the match mark on the air cleaner body and fix with clip (2).

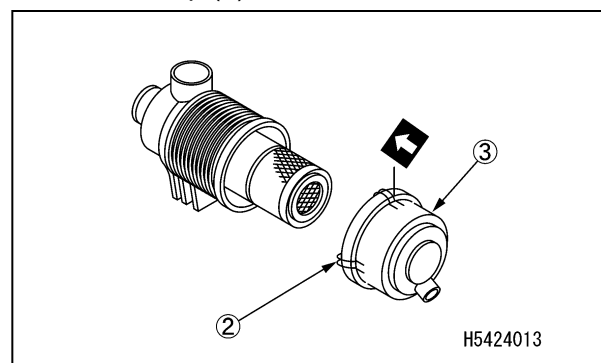


Fig. 5-188

- 10. Press the button on the dust indicator (1) to return the red piston.

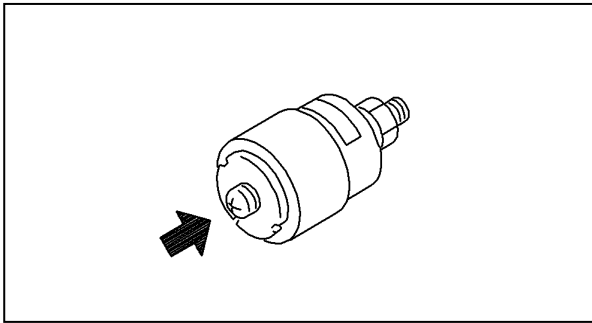


Fig. 5-189

- 11. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Cleaning Inside Engine Cooling System

WARNING!

- Coolant temperature is high immediately after stopping the engine and pressure is accumulated in the radiator. Removing the cap in this state for discharging water may cause burns. Allow it to cool down, and then slowly turn the cap to relieve the pressure.
- Start and clean the engine. Before standing up from the operator’s seat or leaving it, set the lock lever to LOCK.
- For starting the engine, see "Pre-Start Inspection - Before Starting Engine" on page 5-24 and "STARTING ENGINE" on page 4-18.
- While cleaning, the engine is kept running, and thus it is dangerous to stay in the rear of the engine. While running the engine never enter the rear section of the machine.

Stop the machine on a level place and perform cooling system cleaning or coolant replacement.

Cooling system cleaning and coolant replacement should conform to the cycles specified in the following table.

Coolant type	Cooling system cleaning and replacement
Super coolant AF-NAC	Every 2 years (in fall) or every 2000 hours, whichever falls first

While the mixing proportion of coolant varies with temperature, a volumetric proportion of 30% at a minimum is required.

Even in areas where anti-freezing is not needed, use the super coolant at a minimum proportion of 30% to prevent corrosion of cooling system.

The mixing proportion of water and coolant is determined with respect to past minimum temperatures, in accordance with "Mixing proportion of water and coolant" shown below. For actual mixing, set temperature approx. 10°C lower than minimum temperature.

Freezing temperature of 100% undiluted super coolant is -15°C. Be careful not to store the undiluted super coolant below -15°C.

[Table of Mixing Proportion of Water and Super Coolant]

Min. temperature (°C)	-10 or more	-15	-20	-25	-30
Mixed quantity (L)					
Super coolant quantity	1.7	2.0	2.3	2.5	2.8
Water amount	3.8	3.5	3.2	3.0	2.7

WARNING!

- Since the undiluted super coolant is flammable, be cautious of fire.
- The super coolant is toxic. When removing the drain plug, be careful not to get exposed to splashes of the super coolant solution. If it gets in the eyes, wash immediately and thoroughly with water and seek medical attention.
- The disposal of coolant added with the super coolant discharged when replacing the coolant and repairing the radiator should be consigned to a specialised subcontractor, or contact us or our sales service agency. Since the super coolant is toxic, never drain it into drainage or sprinkle it on the ground.

CAUTION: For the coolant, use genuine Maeda super coolant (AF-NAC). Use of any other coolants than genuine Maeda super coolant (AF-NAC) is not recommended in principle.

Always use tap water when diluting. Contact us or our sales service agency if river water, well water, or water through the small water-supply system is necessarily substituted for tap water. The mixing proportion of super coolant is recommended to be controlled by using the super coolant concentration meter.

Cleaning Method

1. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
2. Ensure that the surface temperature of the radiator cap (5) is as low as can be touched with a bare hand, and slowly turn it until it comes into contact with the stopper to relieve the internal pressure.

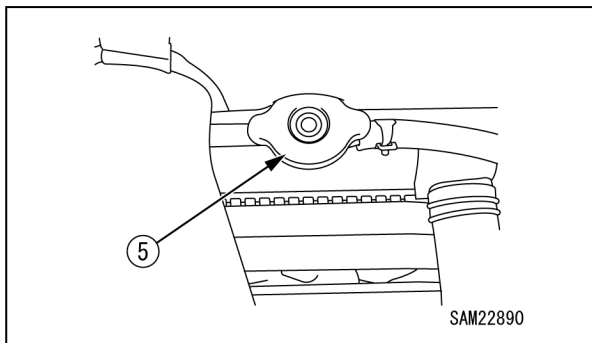


Fig. 5-190

3. Further, remove the radiator cap (5) while turning it until it comes into contact with the stopper.
4. Place a container underneath the drain plug (4) to collect the coolant.

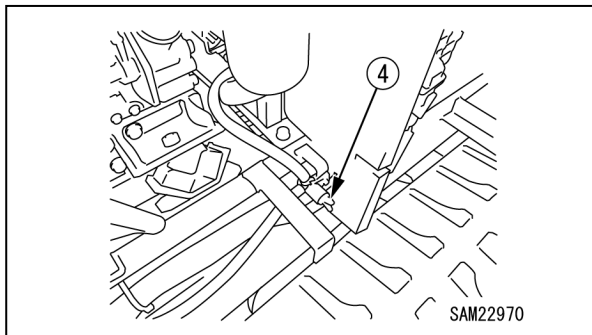


Fig. 5-191

5. Remove the drain plug (4) and drain the coolant.
6. After draining, close the drain plug (4), and inject tap water; when the radiator is filled with water, start the engine, put it in low idling state, raise the water temperature to 90 °C, and run it for approximately 10 minutes.

7. Stop the engine, remove the drain plug (4), and drain the coolant.
8. After draining, clean it using cleaning agent. Clean according to instructions provided on the cleaning agent used.
9. Close the drain plug (4).
10. Inject super coolant and tap water from the water inlet up to the mouth. For the mixing proportion of water and the super coolant, see "Table of Mixing Proportion of Water and Super Coolant" on page 5-74.
11. To remove air mixed into the coolant, operate at low idling for 5 minutes, and a further 5 minutes at high idling. (Keep the coolant cap off at this time.)
12. Drain the coolant from the sub-tank, clean the interior of the sub-tank, and fill with coolant up to the middle point of FULL-LOW.

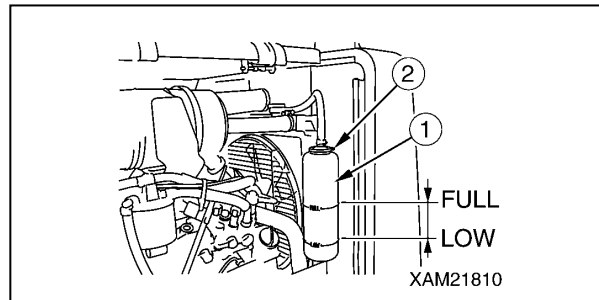


Fig. 5-192

13. Stop the engine, wait approximately 3 minutes, fill with tap water up to near the water inlet, and tighten the cap.
14. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Draining Contaminant Water/Deposits in Fuel Tank

WARNING!

- Keep from heat and flame, including cigarettes.
- Be sure to stop the engine before draining fuel.
Potential ignition may occur through spilled fuel if disregarded.

- Always put in the fuel tank drain plug and secure it after draining fuel.
- The fuel tank drain plug is located directly beneath the machine.

When draining the fuel, use the outriggers to raise the machine and allow access beneath the machine. If the machine is unstable and shaky, place support blocks under the machine body at the front and rear to stabilise it.

- Fuel drain pan: A 1-litre container
1. Place the machine on a level surface.
 2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
 3. Place a drain pan directly under the fuel tank drain plug (P) to receive drained fuel.
 4. Remove the drain plug (P) slowly to drain fuel, keeping from contact with draining fuel.

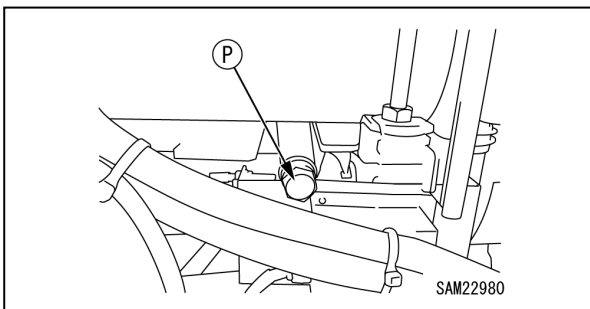


Fig. 5-193

NOTICE: Remove the fuel tank cap (F) if normal or smooth fuel draining fails.

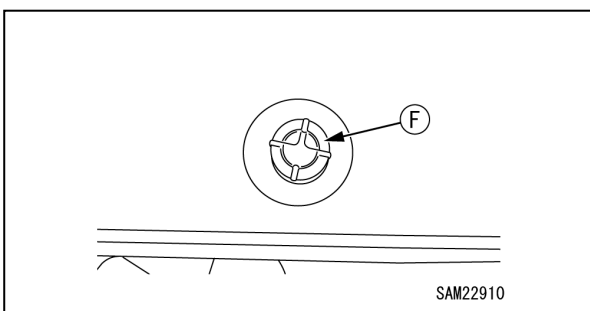


Fig. 5-194

5. Put in the drain plug (P) and secure it upon completion of draining fuel.

NOTICE: Wipe off fuel completely if spilled.

6. Reattach the machinery cover as described in "Installing Machinery Cover" on page 5-18.

Draining Contaminant Water/Deposits in Water Separator

WARNING!

- The water separator pot has fuel (diesel oil) inside. Be extremely careful of fire such as cigarette when cleaning the water separator pot.
- If the fuel spills when the water separator pot is removed, thoroughly wipe it off.

CAUTION: Water or dust accumulated inside the water separator pot will cause engine failure. Check inside the pot and remove any water or dust accumulated inside.

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.
3. Set the fuel lever (4) on the water separator pot (1) to a horizontal position (Close position) to stop fuel supply.

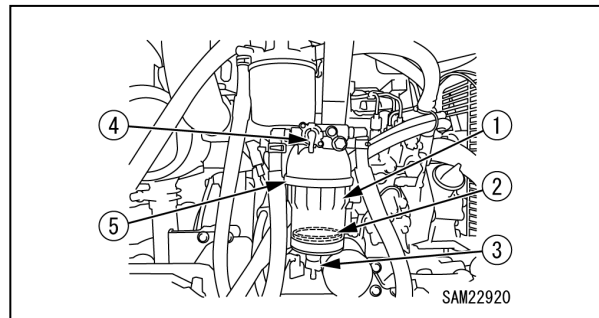


Fig. 5-195

4. Turn the retaining ring (5) counterclockwise (left) to loosen it, and remove the water separator pot (1).

5. Clean the inside of the pot (1) and element with light oil. Blow dry compressed air on the inside of the pot at (0.20 to 0.29MPa {2 to 3kg/cm²}) to remove impurities from the internal surface.

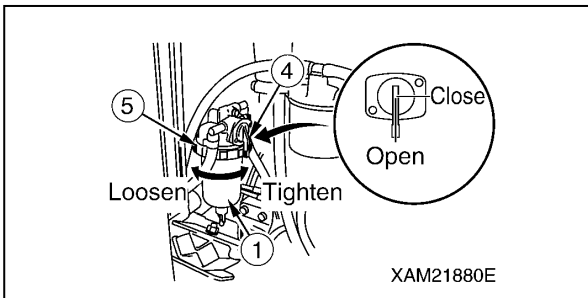


Fig. 5-196

6. Put the pot (1) in place, and turn the retaining ring (5) clockwise (right) to tighten it.
7. Set the fuel lever (4) to a vertical position (Open position).

NOTICE: Wipe off fuel completely if spilled.

8. Use the following procedure for air bleed of the fuel system.
 - (1) Turn ON the starter switch to supply fuel, and wait until the pot (1) is filled up.
 - (2) Upon fill-up of the pot (1), turn OFF the starter switch.

NOTICE: Ensure that a red float (2) in the pot remains on the bottom. If the red float (2) is raised, water is present in fuel.

9. Remove the machinery cover as described in "Removing Machinery Cover" on page 5-18.

LONG-TERM STORAGE

Before Storing Machine

CAUTION: The machine shall take the posture shown in the figure during the long-term storage to protect the cylinder rod. For more information on travelling posture, see "TRAVELLING POSITION" on page 4-26. (To prevent rust on the cylinder rod)

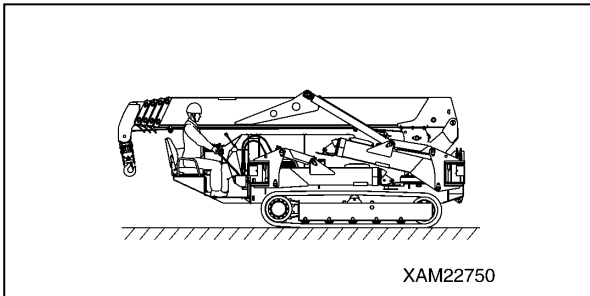


Fig. 5-197

Store the machine as described below for long-term storage.

- Wash and clean each section of the machine and store indoor.
If you absolutely have to leave it outdoor, select a flat location where the machine is not likely to be exposed to flood or other disasters and cover the machine.
- Refuel, grease, and change the oil without fail.
- Disconnect the negative terminal of the battery and cover, or dismantle the battery from the machine for storage.
- If the temperature will go down to 0 degree or below, add antifreezing fluid. Ask us or our sales service agency for the mixing quantity of the antifreezing fluid.

During Storage

WARNING! If you have to perform antirust operation indoor, open the window and entrance for better ventilation to prevent gas poisoning.

Be sure to operate the machine once a month during the storage to maintain the oil film at lubricating section. Charge the battery at the same time.

After Storage

WARNING! If you did not perform antirust operation monthly during the long-term storage, contact us or our sales service agency before using the machine.

Perform the followings before using the machine after the long-term storage.

- Refuel, grease, and change the oil without fail.
- Remove the cover over the battery (install the battery to the machine if dismantled for storage).
Check the electrolyte level and specific gravity, and then connect the battery cable from the positive side.
- Remove the drain plug of the fuel tank, hydraulic oil tank, and engine oil pan to drain the water mixed in.
- Carefully perform the check before starting operation and warm-up operation.
Carefully check the various parts of the machine.

For Electric Motor

Use the following procedure for storing the machine for 6 months or longer (3 months or longer if stored in hot and humid surroundings).

- Cover the electric motor and hydraulic pump of the power unit with a plastic sheet. Keep the machine dry with a dehumidifying agent in the covered sheet.
- Conduct 5-minute idling of engine quarterly during long-term storage.

CAUTION:

- Quarterly insulation resistance test of electric motor wiring is required during long-term storage. Contact us or our sales service agency.
- Insulation resistance test of electric motor wiring is required before resuming the machine after long-term storage. Contact us or our sales service agency.

COLD TEMPERATURE PREPARATION

When the temperature goes down, the machine starts to have some difficulty in starting. Take the following actions.

Lubrication

Change the oil to the one with low viscosity. See For more information on the specified viscosity, see "LUBRICATING OIL" on page 5-14.

Coolant

WARNING! The antifreezing fluid is inflammable. Do not put the fluid close to fire and do not smoke while handling the fluid. Do not smoke when handling the antifreezing fluid.

CAUTION: Never use antifreezing fluid with methanol, ethanol, and propanol.

For more information on the coolant replacement period and mixing rate of antifreezing fluid, see "Cleaning Inside Engine Cooling System" on page 5-74.

Battery

WARNING!

- **The battery produces combustible gas and can be explosive. Do not put fire close to the battery.**
- **The battery fluid is a harmful substance. Keep it away from your eyes and skin. Should it come into contact with your eye or skin, wash the affected area with plenty of water and consult a physician immediately.**

The battery capacity drops when the temperature goes down.

In this condition, the battery fluid can freeze with low battery charging rate. Keep the charging rate as close to as 100 %. Keep the battery warm in order to start the engine next morning.

Cautions After Completing the Operation

Observe the followings to prevent the machine from not being able to function the next morning because of deposits such as dirt and water and materials around the feet frozen.

- Remove the dirt and water on the machine. Keep the hydraulic cylinder rod surface especially clean to prevent seal from being damaged with the dirt coming into the seal together with the water drops.
- Park the machine on the solid and dry ground. If there is no such location to park, place a board on the ground to park the machine on the board. This prevents the ground and around the feet of the machine from freezing and allows the machine to start travelling next morning.
- Remove the drain plug to drain the water in the fuel system to prevent the water from freezing.
- The battery ability remarkably drops at low temperature. Cover the battery or remove the battery from the machine and keep it at warm place to be installed next morning.

After the Cold Weather Is Gone

When the season changed and it started to get warm, take the following action.

- See "LUBRICATING OIL" on page 5-14 to change the oil in the system to the one with specified viscosity.

850 kg SEARCHER HOOK INSPECTION AND MAINTENANCE

Legal Inspection

If a periodic safety inspection is required by the laws and regulations of your country, perform that inspection in addition to the inspection items listed below.

1. Verify that all safety devices are operating properly.
2. Check the hoist accessories, including the hook block, for problems or damage.
3. Check the structural parts of the machine, including the frame and boom, for cracks, deformation and damage.
4. Check for loose or missing mounting bolts and joints.
5. Verify that the boom operates properly by stopping, extending, retracting, raising, lowering and slewing the boom.

Contact us or a our sales service agency to request inspection and repair service as needed.

Consumables

Parts for mounting searcher hook are consumable items. Replace them at periodic inspection or before they reach abrasion limits. Replace consumable items regularly, which will produce economical use of this machine. Always replace with a Maeda genuine item. Check parts catalogue for correct part number for parts request.

List of Consumables	
Item	Replacement cycle
Searcher hook fix bolt M12x35L strength 10.9 (4pcs)	Every 6 months or when damage, crack, or squash is found
Searcher hook fix bolt M12x30L strength 10.9 (4pcs)	
Searcher hook fix bolt M8x16L strength 10.9 (1pcs)	
Searcher hook fix nut M12x1grade (8pcs)	
Searcher hook fix washer M12x3.2t (high tension) (8pcs)	

Items include a halt period. Contact us or a our sales service agency for part replacement information.

Inspection and Maintenance List

The following only covers the searcher hook kit. For the machine body, see "INSPECTION" on page 5-21 and follow its precautions.

Maintain in accordance with the laws and regulations of the relevant country and region.

Pre-Start and Post-Start Inspection Items

Inspection Item	Reference
Pre-Start – Before Starting Engine	
Check E-Boom, Frame and Hook	See "E-Boom, Frame and Hook" on page 5-82.
Check Greasing	See "Greasing" on page 5-82.
Check Searcher Hook Fix Bolts	See "Searcher Hook Fix Bolts" on page 5-82.
Installation Check of Position Pin and Lynch Pin	See "Position Pin and Lynch Pin" on page 5-82.
Post-Start – After Starting Engine	
Check Moment Limiter for Operation (Searcher Hook Mode)	See "Moment Limiter for Operation (Searcher Hook Mode)" on page 5-82.

Pre-Start – Before Starting Engine

Check the following in this section without starting the engine and before starting work every day.

E-Boom, Frame and Hook

Check each part of the E-Boom, frame and Hook for cracks, excessive deformation and contamination etc. In addition, check bolts nuts and pins for any looseness, drop and damage etc. If you find any abnormality, repair.

Check hook for deformation, abnormal noise from bearing and correct function of wire rope latch (1).

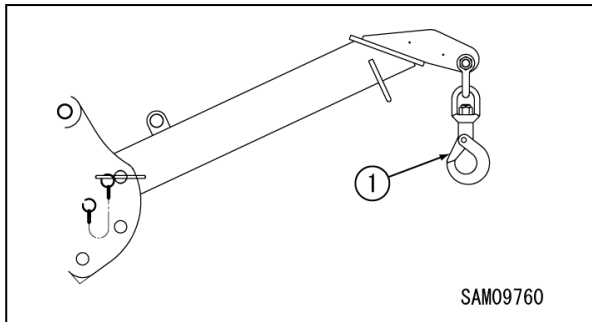


Fig. 5-198

Greasing

Wipe off and clean old grease from contact point (3) of shackle (2) and E-boom hole, and contact point (4) of hook (1) and shackle (2), then apply new lithium grease.

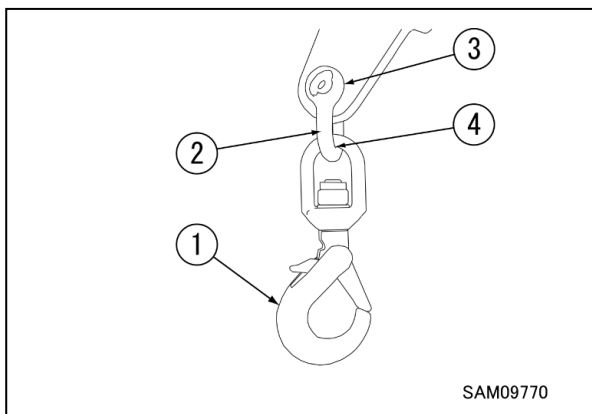


Fig. 5-199

Searcher Hook Fix Bolts

DANGER! If any damage is found on searcher hook fixing bolts, please exchange for new one's right away.

Breakage of bolts will cause the searcher hook to fall off.

Check if bolts used are the designated type.

Also check if there are cracks, damage, squashing, heavy dirt, or rust on bolt.

If any abnormality is found, change the bolt for a new one even it is earlier than expected bolt life.

Position Pin and Lynch Pin

Check if position pin is surely secured with lynch pin.

Pre-Start – After Starting Engine

CAUTION: The checkups described in this section should be carried out after starting the machine.

See "STARTING ENGINE" on page 4-18 and later to execute the engine startup, travelling operations, outrigger operations and crane operations.

Moment Limiter for Operation (Searcher Hook Mode)

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

1. Turn the starter switch to the "ON" position.
2. Check with the working status lamp. The red of the lamp lights up for 2 seconds and then the green lights up.
3. Check the moment limiter display unit.

Verify that no error code is displayed at the "RATED TOTAL LOAD" display on the display panel.

Check if moment limiter is set as 850 kg searcher hook mode, and display in boom length window matches actual searcher hook offset position.

For correct setting, see "Searcher Hook offset position and mode display in boom length window" on page 4-143.

4. Shift the part of line selector switch on moment limiter display unit to "850 kg Searcher hook mode".

5. Start the engine and operate the crane as follows to verify if the moment limiter properly displays the value.

Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed "boom length" with the boom length at minimum	4.7 m
Displayed "boom length" with the boom length at maximum	16.5 m
Displayed "working radius" with the boom length of "7.7 m" and boom angle of "25°"	SH1 7.3 ± 0.1 m
	SH2 7.6 ± 0.1 m
	SH3 7.2 ± 0.1 m

6. Check if displayed actual load value is equal to the total weight of the load + the hoisting accessory, when the weight of the known load is hoisted. There may be slight error in accuracy depending on boom condition.
7. Operate the crane until the moment limiter display indicates the boom length is "7.7 m" and boom angle is "25 degrees", then measure the "boom angle" and "working radius.

If the measured value(s) differ from the moment limiter display value, contact us or our sales service agency.

Lift up load and check if boom extending or boom lowering operation is auto-stopped when overloaded. If the operation is not auto-stopped in overloaded condition, stop using the machine and contact us or our sales service agency.

This checking operation must be operated slowly, and if machine does not auto-stop by overloading, immediately stop the operation, and perform recovery operation caused by overloading.

NOTICE: When measuring actual working radius, measure from hook offset position of searcher hook.

FLY-JIB INSPECTION AND MAINTENANCE

Legal Inspection

In the event that federal or local laws or regulations requires regular inspection to maintain safe operation of machine, check items below:

1. Check condition of safety devices.
2. Check condition of lifting equipment such as hook blocks.
3. Check damage to winch wire rope end and wire clips.
4. Replace wire rope immediately when any damage is detected.
5. Check for cracks or deformations of structure members such as boom.
6. Check loose or missing fasteners and fittings.
7. Check correct motion and stoppage of winch by actual operation.

In the event that such inspections detect any disorder, contact your local distributor.

Consumables

Wire rope and fly-jib fix bolts are consumable items. Replace them at periodic inspection or before they reaches abrasion limits. Replace consumable items regularly which will produce the most economical use of this machine. Always replace with Maeda genuine parts. Check parts catalogue for correct part number before ordering.

List of Consumables	
Item	Replacement cycle
Winch wire rope	Based on wire rope exchange standard
Fly-jib fix bolt M12x30L (4pcs)	Every 6 months or when damaged, cracked, or squashed.

The cycles include a halt period.

Contact us or our sales service agency for part replacement.

Inspection and Maintenance List

The following only covers fly-jib kit. For machine body, see "INSPECTION" on page 5-21 and follow its precautions.

Pre-Start and Post-Start Inspection Items

Inspection Item	Reference
Pre-Start – Before Starting Engine	
Check Boom and Frame	See "Boom and Frame" on page 5-85.
Check Wire Ropes	See "Wire Ropes" on Page 5-85
Check Fly-jib Fix Bolts	See "Fly-jib Fix Bolts" on page 5-85.
Check Electrical Wiring (Fuse Box)	See "Electrical Wiring (Fuse Box)" on page 5-85.
Post-Start – After Starting Engine	
Check Over Winding Detector	See "Over Winding Detector" on page 5-85.
Check Winch and Boom	See "Winch and Boom" on page 5-86.
Check Moment Limiter for Operation (Fly-jib Mode)	See "Moment Limiter for Operation (Fly-jib Mode)" on page 5-86.

Pre-Start – Before Starting Engine

Check the following in this section without starting the engine and before starting work every day.

Boom and Frame

- Check each part of the boom and frame for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts and pins for any looseness, drop, damage and other matters. If you find any abnormality, repair.

Wire Ropes

For more information, see "Wire Rope" on page 5-65.

- Check the wire ropes for damage, deformation, wear, twists, kinks, corrosion, etc. If you find any abnormality, replace
- Check the bound condition of the wire rope ends. If you find any loose wire rope ends, replace.

Fly-jib Fix Bolts

DANGER! If any damage found on fly-jib fix bolt, please exchange it to new one right away.

Breakage of bolt will cause fly-jib to fall off.

- Check if there is any cracks, damage, or squash on screw thread on threaded portion of bolt.
If cracks, damage or squash on screw thread is found, change the bolt to new one even it is earlier than expected bolt life.

Electrical Wiring (Fuse Box)

WARNING! If fuses are brown frequently or if you find the trace of a short circuit created in the electrical wiring, be sure to find the cause and fix the problem.

Check the fuse at the lower section of the instrument panel for damage and meltdown and if the fuse of specified capacity is being used. If a fuse has melted down or the trace of an open/short circuit is found in the electrical wiring, ask us or our sales service agency for repair.

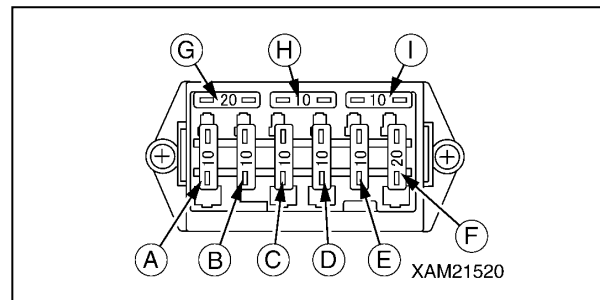


Fig. 5-200

Pre-Start – After Starting Engine

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

CAUTION: The checkups described in this section should be carried out after starting the machine.

See "STARTING ENGINE" on page 4-18 and later to execute the engine startup, travelling operations, outrigger operations and crane operations.

Over Winding Detector

Over wind the hook block (1), and raise the hook with winch and extend the boom, and verify that the buzzer sounds and an audible message saying "Over hoisted" is spoken, the hook raising operation and boom extending operation should stop.

If these events do not happen, the over winding detector (2) may be faulty.

If the alarm does not stop, the over winding detector may be faulty or the circuit may be open.

Ask us or our sales service agency for repair.

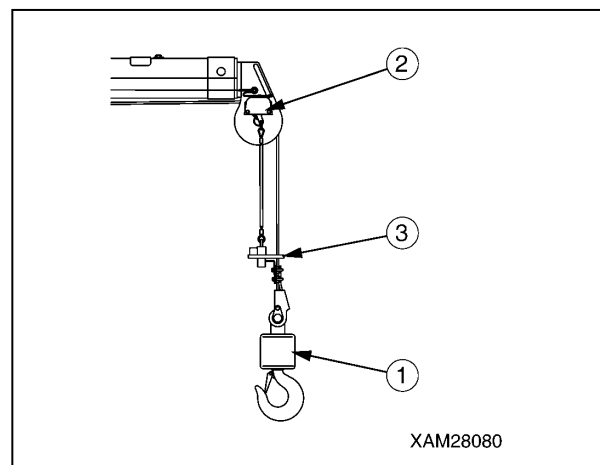


Fig. 5-201

Winch and Boom

WARNING! Whilst performing the function check for winch and boom, ensure the safety of personnel so that the hook and boom do not interfere with any personnel or objects.

1. Check abnormal noise from boom, hook and any area of wire rope during crane operation.
2. Operate crane without load and check for loose or missing bolts.
3. Check hook for deformation, abnormal noise from bearing and correct function of wire rope latch, (1).

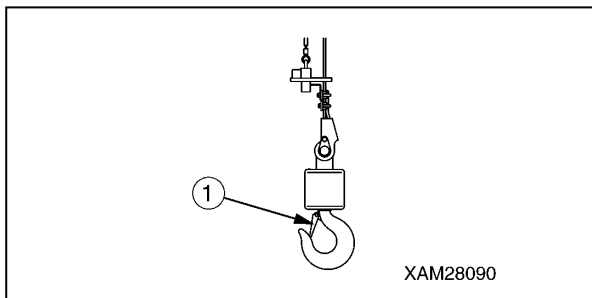


Fig. 5-202

Moment Limiter for Operation (Fly-jib Mode)

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

1. Turn starter switch ON.
2. Check rotary lamp. First, red revolving light will appear for approximately 2 seconds, and then turn to green revolving light.
3. Check moment limiter display. Ensure that error code do not appear in Rated load display.
4. Ensure that fly-jib mode is effective. ("Jib" shall be displayed in Boom length display alternately with boom length in fly-jib mode)
5. Start engine and operate crane as specified below to check correct indication of moment limiter.

Crane motion and moment limiter indication	Value of moment limiter
Boom is extended to 13.0m or longer then lowered. Check boom angle indication when rated load display shows "E-J".	55°
Boom is extended to 13.0m or longer then raised. Check boom angle indication when rated load display shows "E-J".	76°
Indication of working radius display, when boom is extended to "16.5m", with full extension of five stages and boom angle is raised to "72°".	7.0 ± 0.1m
Indication of actual load display when a rated weight is prepared and lifted. <ul style="list-style-type: none"> • Indication shall be identical to total weight including sling equipment. • Some deviation may be allowed under certain boom conditions. 	Actual load

Initial 10 Hour Maintenance

The following maintenance should be performed after 10-hour operation, limited to the first maintenance of a new machine.

Greasing Fly-Jib Foot Pin

For maintenance items and procedure, see "Maintenance Every 250 Hours" on page 5-87.

Irregular Maintenance

Replacement Winch Wire Rope

WARNING! Always wear leather gloves when replacing the wire rope.

CAUTION:

- The diameter of the wire rope is to be measured at points where the wire repeatedly runs through the sheave. A mean value needs to be determined through three-way measurement. (A measurement should be performed at several points, spacing between the points.)
- DO NOT use the old wire rope regardless of the frequency of use.

Criteria for Winch Wire Rope Replacement

A wire rope undergoes wear and tear over time. Prompt replacement is required if any of the following events appears in the wire rope.

- 10% or more of strands (except a filler wire) in a twist of the wire rope (6 crests) is broken.

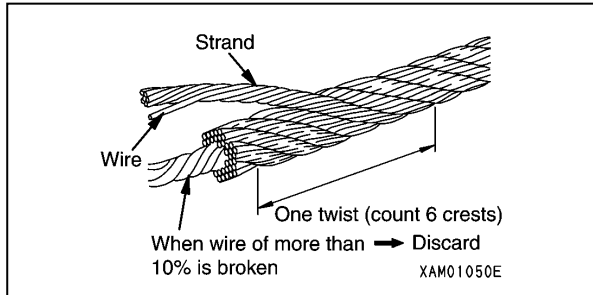


Fig. 5-203

NOTICE: Replace the wire rope for winching if 9 strands or more are broken.

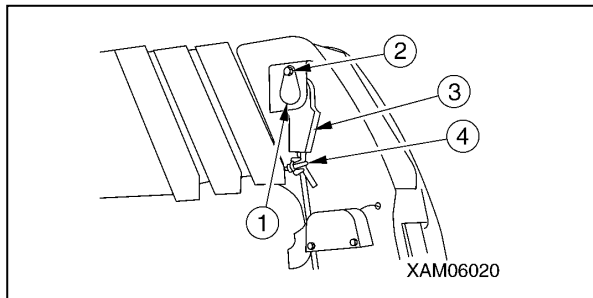


Fig. 5-204

- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.

NOTICE: Replace an 8-mm-dia wire rope if it is 7.5mm in diameter.

- A kink is formed.

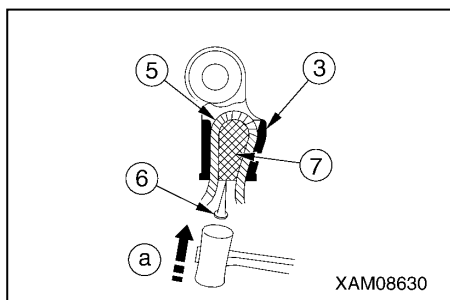


Fig. 5-205

- Considerable deformation or corrosion is developed.
- A faulty end socket is used.

Maintenance Every 250 Hours

Greasing Machine Units

CAUTION:

- Grease type varies with greasing points. Failure to grease properly may cause the machine to shorten its useful life. See the following table for grease types.
- Greasing a new machine is required once every 10 hours until the machine attains the first 100 hours of operation. After that period grease as required.
- Use proper grease specified below according to the greasing points.

No.	Greasing point		Grease type
1	Greasing of the boom mounting pin	1 place	Lithium grease
2	Greasing of the hook block	1 place	
3	Greasing of the winch wire rope	1 piece	Rope oil

1. With the use of the grease gun, grease the greasing points (No.1, 2) specified in the above table through corresponding grease plugs.

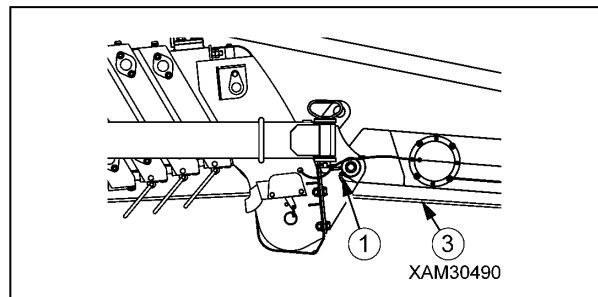


Fig. 5-206

2. Wipe off old grease squeezed out after greasing.
3. Apply red rope grease to prevent wire rope abrasion and rust formation. With the rope surface cleaned, grease the rope with a brush.

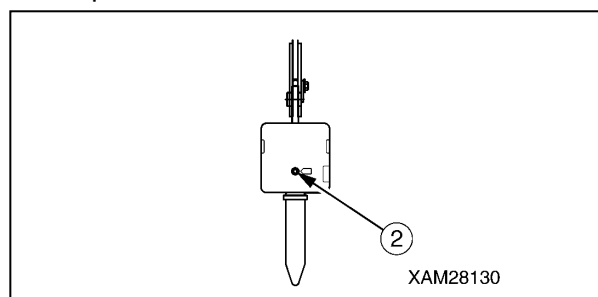


Fig. 5-207

TROUBLESHOOTING

General

- Make sure that you contact us or our sales service agency for the actions indicated in parentheses in the Actions field.
- Contact our sales service agency if you suspect other abnormality or causes than those given below.

Machine Body

Problem	Major Cause(s)	Actions
Crane cannot operate but can travel	<ul style="list-style-type: none"> • Work selector switch not at "Crane" 	<ul style="list-style-type: none"> • Operate the work selector switch to "Crane"
<ul style="list-style-type: none"> • Travelling speed, boom and hook block operation speed too slow • Abnormal noise from pump 	<ul style="list-style-type: none"> • Insufficient hydraulic oil • Hydraulic oil tank strainer and element clogged 	<ul style="list-style-type: none"> • See "Check / Add Hydraulic Oil" on page 5-27 and refill with hydraulic oil to the specified oil level • See "Periodic Maintenance Procedure" on page 5-40, and clean or replace the filter
Hydraulic oil temperature too high	<ul style="list-style-type: none"> • Insufficient hydraulic oil • Between cooling fins clogged 	<ul style="list-style-type: none"> • See "Check / Add Hydraulic Oil" on page 5-27 and refill with hydraulic oil to the specified oil level • Clean
<ul style="list-style-type: none"> • Rubber tracks coming off • Abnormal wear on the sprockets 	<ul style="list-style-type: none"> • Rubber tracks too loose 	<ul style="list-style-type: none"> • See "Check / Adjust Rubber Track Tension" on page 5-31 and adjust the tension
Outriggers cannot operate	<ul style="list-style-type: none"> • Outrigger rotary not rotated to extension position (outward). • Work selector switch not at "Outrigger" 	<ul style="list-style-type: none"> • Secure the rotary at the extension position • Operate the work selector switch to "Outrigger"
Crane and outriggers cannot operate	<ul style="list-style-type: none"> • Work selector switch at "Travel" 	<ul style="list-style-type: none"> • Operate the work selector switch to "Outrigger" or "Crane"

Engine

Problem	Major Cause(s)	Actions
Engine does not start even after the starter key is turned	<ul style="list-style-type: none"> • Insufficient fuel • Insufficient battery charge • Insufficient compression 	<ul style="list-style-type: none"> • See "Check / Add Fuel" on page 5-26 and refuel • Charge the battery (• Check and replace)
Engine starts but stops right away	<ul style="list-style-type: none"> • Insufficient oil in oil pan 	<ul style="list-style-type: none"> • See "Check / Add Engine Oil" on page 5-25 and adjust oil level to appropriate one • See causes and actions for "Engine does not start"
Engine power is low, the power gradually drops	<ul style="list-style-type: none"> • Air cleaner element clogged • Radiator fin clogged • Insufficient compression 	<ul style="list-style-type: none"> • See "Inspection, Cleaning and Replacement of Air Cleaner" on page 5-72 and clean or replace the parts • Clean (• Check and replace)

Problem	Major Cause(s)	Actions
Engine water temperature monitor illuminates while the engine is in operation	<ul style="list-style-type: none"> • Insufficient Coolant • Water leakage from the cooling line • Slackened or broken fan belt • Radiator fin clogged 	<ul style="list-style-type: none"> • See "Check / Add Engine Coolant" on page 5-24 and refill with coolant (•Check and repair) • See "Check / Adjust Belt Tension" on page 5-44 to check, adjust, or change the belt • Check and clean
Engine oil pressure monitor illuminates while the engine is in operation	<ul style="list-style-type: none"> • Insufficient engine oil • Engine oil filter clogged • Engine unit in failure 	<ul style="list-style-type: none"> • See "Check / Add Engine Oil" on page 5-25 and adjust oil level to appropriate one • See "Replace Engine Oil and Oil Filter" on page 5-46 to check, adjust, or change the filter (•Check and repair)

Electrical Components

Problem	Major Cause(s)	Actions
Dark light even at highest engine speed	<ul style="list-style-type: none"> • Defective wiring 	(•Check and repair slackened terminals and open circuits)
Light blinks during engine operation	<ul style="list-style-type: none"> • Defective alternator • Defective wiring 	(•Replace) (•Check and repair)
Battery charge monitor remains illuminated even after the engine starts	<ul style="list-style-type: none"> • Defective alternator • Defective wiring 	(•Replace) (•Check and repair)
Abnormal noise from alternator	<ul style="list-style-type: none"> • Defective alternator 	(•Replace)
Starter not rotating even after the starter switch is turned	<ul style="list-style-type: none"> • Defective wiring • Insufficient battery charge 	(•Check and repair) • Charge the battery
Starter pinion going out and in repeatedly (struggling)	<ul style="list-style-type: none"> • Insufficient battery charge 	• Charge the battery
Starter key turning slow	<ul style="list-style-type: none"> • Insufficient battery charge • Defective starter 	• Charge the battery (•Replace)
Starter disengaged before the engine starts	<ul style="list-style-type: none"> • Defective wiring • Insufficient battery charge 	(•Check and repair) • Charge the battery

Remote Control

"While Crane operates perfectly under manual control, a part or whole functions are un-operable by the remote control."

In such event of failure as above, perform the DIAGNOSIS shown in next pages.

CAUTION: First, check in accordance with the table below before you start the diagnosis, based on next pages.

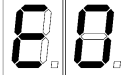

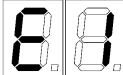
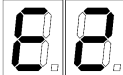
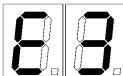

Such an error may be occasionally fixed by simple practice, such as applying another operation procedure or replacing batteries.

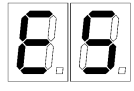

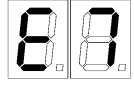
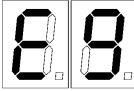
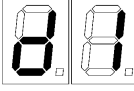
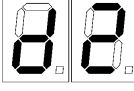
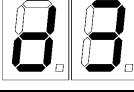
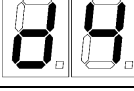
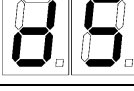

Where the checking by the table below and diagnosis in accordance with the process in the next pages fail to fix the errors or faults, contact us or our sales service agency.

When such errors are due to the electrical failure of remote control system, the Crane is operable under the manual control from the Crane.

Check Points	Cause and Action
The Crane is operable under the manual control from the Crane.	When the Crane operates, this remote control system has a failure. Otherwise, when the Crane does not operate, perform the diagnosis of the Crane, itself.
Power of the Transmitter and Receiver is ON.	Turn ON the power, when not.
The fuse in the Receiver is blown.	Check whether the fuse is blown or not; check the cause when blown, then replace with a new one.
Indications in the LCD screen of the Transmitter are OK.	Turn ON the power, when not. When the indications are still not available, repair or replace.
The Transmitter enclosure is deformed or damaged.	Where the Transmitter enclosure is deformed or damaged, repair or replace it.
Each operation lever of the Transmitter is in its neutral position. The Accelerator lever is completely returned.	In any event of operation levers and control buttons failure, repair or replace.
Manipulation began just after the Power switch of the Transmitter is turned ON.	Allow 3 to 4 seconds after the Transmitter power is turned ON, with no operations.
The LCD screen in the Transmitter or the Monitor display in the Receiver shows error messages or error codes.	In the event where the error messages or error codes are indicated, once power OFF the Transmitter and turn it ON again.

- At the error diagnosis, always verify the indications in the Monitor display in the Receiver and the LCD screen in the Transmitter. Then find the suitable error display description in the table below so that the cause is presumed, then, follow the recommended remedy in it.
- First, perform the "Remedy 1" in the table, then continue the "Remedy 2" where the error is not fixed yet.
- Remedies marked with "*" must inevitably be contacted us or our sales service agency.
- When any other causes are suspected than listed below, contact us or our sales service agency.

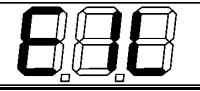










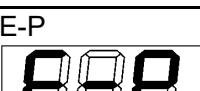

Error display		Main cause	Remedy	
Transmitter	Receiver		Remedy 1	Remedy 2
—	—	Receiver printed circuit board (PCB) input voltage dropped. <ul style="list-style-type: none"> • Relay PCB defective. • Power line wire harness defective between relay PCB and Receiver PCB. 	*Maintenance/replace	
		Receiver PCB defective	*Maintenance/replace	
—		Communication error <ul style="list-style-type: none"> • Relay PCB in the Crane side defective. • Wiring failure between the communication PCB and the Moment limiter display panel. • The Moment limiter display panel defective. 	<ul style="list-style-type: none"> • Power ON again the Transmitter and Receiver • Shut down the electrical power of the Crane, then ON again. 	*Maintenance/replace
		The Transmitter is in emergency stop	<ul style="list-style-type: none"> • Use the Reset button to release the emergency stop. 	*Maintenance/replace
—		The Transmitter defective <ul style="list-style-type: none"> • The Transmitter power is not ON. • The Transmitter PCB defective. • Wire cut in the Connection cable. 	<ul style="list-style-type: none"> • Power ON again the Transmitter 	*Maintenance/replace
		The Receiver defective. <ul style="list-style-type: none"> • The Receiver PCB defective. • Wiring problem in the Receiver 	*Maintenance/replace	
		The Transmitter defective <ul style="list-style-type: none"> • The Transmitter PCB defective. • Voltage dropped in the Transmitter. • Wirings for Accelerator and operation levers cut, or fault of VR. 	<ul style="list-style-type: none"> • Return the Accelerator lever and power ON the Transmitter, again 	*Maintenance/replace
—		The Transmitter defective <ul style="list-style-type: none"> • The Transmitter Accelerator lever position defective. 	<ul style="list-style-type: none"> • Return the Accelerator lever and power ON the Transmitter, again. 	*Maintenance/replace

Error display		Main cause	Remedy	
Transmitter	Receiver		Remedy 1	Remedy 2
—		The Transmitter defective • The Accelerator lever was pulled, when power was turned ON.	• Return the Accelerator lever and push the Reset button.	*Maintenance/replace
—		The Receiver PCB defective • Data error in the memory.	• Power on the Receiver, again.	*Maintenance/replace
—		The Receiver PCB defective • CPU error	• Power on the Receiver, again.	*Maintenance/replace
—		The Transmitter, internal devices defective. • Operation levers were not in the neutral position, when power was turned ON.	• Return operation levers and push the Reset button.	*Maintenance/replace
—	—	The Transmitter, internal Devices defective. • Data error in the memory.	• Power on the Transmitter, again.	*Maintenance/replace
—		Breaking of wire for telescopic control	*Maintenance/replace	
—		Breaking of wire for hoisting control	*Maintenance/replace	
—		Breaking of wire for derricking control	*Maintenance/replace	
—		Breaking of wire for slewing control	*Maintenance/replace	
—		Breaking of wire for accelerator	*Maintenance/replace	
—		Valve neutral error	*Maintenance/replace	
The Crane operates perfectly under the manual mode but some functions are not available in the remote control mode.		• The Receiver PCB defective. • Wiring failure between the Receiver PCB and the control valve solenoids. • Electromagnetic proportional control reducing valve error.	*Maintenance/replace *Maintenance/replace *Maintenance/replace	

Moment Limiter Error Causes and Actions to Be Taken

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

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

Error Code	Error Details	Actions to Be Taken
E1L 	The input to pressure sensor 1 is lower than the specified value.	Check the installation of the pressure sensor 1.
E1H 	The input to pressure sensor 1 is higher than the specified value.	
E2L 	The input to pressure sensor 2 is lower than the specified value.	Check the installation of the pressure sensor 2.
E2H 	The input to pressure sensor 2 is higher than the specified value.	
E3L 	The input to angle detector is lower than the specified value.	Check the installation of the angle detector.
E3H 	The input to angle detector is higher than the specified value.	
E4L 	The input to length detector is lower than the specified value.	Check the installation of the length detector.
E4H 	The input to length detector is higher than the specified value.	
EAD 	The AD converter at the converter section is not functioning properly.	Turn the starter switch to the "OFF" position and then to the "ON" position again. If an error is displayed again, change the converter.
ERS 	The communication between the converter section and the display unit is not carried out properly.	<ul style="list-style-type: none"> • Check the cable between the display unit and the converter. If the cable is normal, change the converter. • Check the fuse built-in the converter.
E-E 	Error with calibration memory. This error is also issued when calibration has not been done yet.	Turn the starter switch to the "OFF" position and then to the "ON" position again. If an error is displayed again, change the display unit.
E-P 	Pick & Carry input was made for conditions that do not allow Pick & Carry.	Turn off Pick & Carry input. Turn on Pick & Carry input once again when Pick & Carry conditions are met.
ER6 	Slewing detection limit switch disconnected or improperly adjusted.	Adjust and check the slewing detection limit switch.
No displayed	---	Check the fuse built-in the display unit.

Electric Motor

Abnormal Phenomenon	Major Cause(s)	Actions
The motor remains off despite the switch being turned to the "START" position.	<ul style="list-style-type: none"> • Improper wiring and power supply error • The Inverter unit breakers: OFF • A break in stator winding 	<ul style="list-style-type: none"> • Check wiring, see "ELECTRIC MOTOR OPERATION" on page 4-134. • Turn ON the breakers. (• Inspection, repair, replacement) (• Inspection, repair, replacement)
The motor comes to a stop during use.	<ul style="list-style-type: none"> • Inverter unit error (Red lamp: ON) • Failure in the Inverter unit • Failure in the power unit 	<ul style="list-style-type: none"> • Check the power supply source (voltage and phase interruption). (• Inspection, repair, replacement) (• Inspection, repair, replacement)
The power output of the motor reaches zero or undergoes gradual decrease.	<ul style="list-style-type: none"> • Phase interruption in the power source of power supply equipment • Slack in motor wiring 	<ul style="list-style-type: none"> • Check the power source of power supply equipment (voltage and phase interruption). • Inspect connection with the motor Terminal block. (• Inspection, repair, replacement)
The cabtyre cable rises in temperature.	<ul style="list-style-type: none"> • Considerable voltage drop 	<ul style="list-style-type: none"> • Ensure that the power supply voltage of power supply equipment is at a specified value. • Replace the cabtyre cable with one adhering to specifications.
An abnormal noise and vibration are present in the power unit during operation.	<ul style="list-style-type: none"> • A break in motor winding • Looseness in the motor and pump fixing bolt • Looseness in the coupling fixing bolt • Impurities on the coupling • Clogging in the hydraulic oil tank strainer and element 	<ul style="list-style-type: none"> • Inspect the motor Terminal block. (• Inspection, repair, replacement) • Perform inspection, repair, and cleaning. See "ELECTRIC MOTOR OPERATION" on page 4-134. (• Replacement) • Clean and replace the strainer and element according to periodic inspection.
The power unit rises in temperature during operation.	<ul style="list-style-type: none"> • High ambient temperature • Ill-ventilated • Considerable voltage drop • Overload • High number of starts 	<ul style="list-style-type: none"> • Use the power unit in environment compliant with specifications. • Perform inspection and cleaning, See "ELECTRIC MOTOR OPERATION" on page 4-134. • Replace the cabtyre cable with one adhering to specifications. • Reduce loads. • Reduce the number of starts.
The leak detector of the Inverter unit main breaker is tripped.	<ul style="list-style-type: none"> • High humidity • Presence of water droplets • Ill-grounded • A break in stator winding 	<ul style="list-style-type: none"> • Use the leak detector in environment compliant with specifications. • Attach the cover properly. • Adhere to ground standards. (• Inspection, repair, replacement)
The trouble lamp (red) of the Inverter unit comes on.	<ul style="list-style-type: none"> • Failure in the Inverter unit 	<ul style="list-style-type: none"> (• Inspection, repair, replacement)

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